



# BeyondTrust

## **Privilege Management for Unix & Linux Administration Guide 10.3**

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# Introduction to Privilege Management for Unix & Linux

This document shows Unix and Linux system administrators how to configure and use the Privilege Management for Unix & Linux software. It also provides a general overview of the relevant components of that are used in conjunction with Privilege Management for Unix & Linux Basic.

Privilege Management for Unix & Linux includes:

- Privilege Management for Unix & Linux
- Privilege Management for Networks
- Privilege Management for Unix & Linux Basic
- Privilege Management for Unix & Linux, Essentials Edition



**Note:** This guide assumes that the user has a basic understanding of Unix or Linux system administration and some experience with a scripting or other computer language. It is recommended that you have experience in these areas before you attempt to create or modify security policy files



**Note:** Privilege Management for Unix & Linux Basic refers to the product formerly known as PowerBroker for Sudo. Privilege Management for Unix & Linux refers to the product formerly known as PowerBroker for Unix and Linux.



**Note:** Specific font and line-spacing conventions are used to ensure readability and to highlight important information, such as commands, syntax, and examples.

## Sample Policy Files

When you install Privilege Management for Unix & Linux, you can choose to copy sample Privilege Management for Unix & Linux policy files to the installation host. These sample policy files include detailed explanations of what they do. You can use these files to learn how policy files are typically written for various scenarios. The directory that these sample files are copied to is determined by the GUI library directory option that you specify during installation. By default, this directory is `/usr/local/lib/pbuilder`. A `readme_samples` text file in that directory includes a brief description of each sample file.

## Privilege Management for Unix & Linux Features

Privilege Management for Unix & Linux enables Unix and Linux system administrators to specify the circumstances users may run certain programs as root or as other important accounts. The result is responsibility for such actions as adding user accounts, fixing line printer queues, etc. can be safely assigned to the appropriate person without disclosing the root password. The full power of root is protected from potential misuse or abuse such as:

- Modifying databases
- File permissions
- Erasing disks

Furthermore, Privilege Management for Unix & Linux is capable of selectively recording all input and output from a session. Having this audit trail combined with the safe partitioning of root functionality provides an extremely secure means of sharing the root password. The **pbreplay** utility enables you to view sessions while they are happening or at a later date. Privilege Management for Unix & Linux can also require a checksum match before running any program, guarding against viruses or Trojan horse attacks on important accounts.

Through its integration with the SafeNet Luna SA Hardware Security Module (HSM), Privilege Management for Unix & Linux provides the first privileged user management solution to use FIPS 140-2 Security Level 2 encryption services to achieve compliance with the most strict key storage requirements and standards.

SafeNet Luna SA is a flexible, network-attached hardware security module that provides powerful cryptographic processing and hardware key management for applications where security and performance are a top priority. With FIPS 140-2 Security Level 2 and Common Criteria EAL 4+ validation, SafeNet Luna SA is an Ethernet-attached hardware security appliance that is designed to ensure the integrity and security of key management for PKI root key protection and smartcard issuance, with blazing cryptographic processing for digital signing applications or SSL acceleration for Web servers.

Privilege Management for Unix & Linux can access existing programs as well as its own set of utilities that execute common system administrative tasks. Utilities that are being developed to run on top of Privilege Management for Unix & Linux can manage passwords, accounts, backups, line printers, file ownership or removal, rebooting, logging people out, killing their programs, deciding who can log in to what machines from where, and so on. Users can work from within a restricted shell or editor to access certain programs or files as root.

Privilege Management for Unix & Linux can also optionally encrypt all network traffic that it generates, including control messages, input that is keyed by users, and output that is generated by commands that are run through Privilege Management for Unix & Linux. This encryption protects sensitive data from network monitoring.

Privilege Management for Unix & Linux is built upon two major concepts:

- Partitioning the functionality of root (and other important accounts) to allow multiple users to carry out system administration actions without full access to the administrative account or its password
- Creating an audit trail of such actions

Privilege Management for Unix & Linux enables system administration actions to be partitioned without compromising root account security. Privilege Management for Unix & Linux enables the system administrator to specify if, and when, a user's request to run a program is accepted or rejected.

Through Privilege Management for Unix & Linux, each user can request that a program be run on a machine as **root** (or as another important account, such as **oracle** or **admin**). Privilege Management for Unix & Linux evaluates the request. If the request is accepted, Privilege Management for Unix & Linux runs the program locally or across a network, on behalf of the user.

With Privilege Management for Unix & Linux, help desk personnel can reset passwords for users that have forgotten them and reinstate user accounts. Project members can clear a jammed line printer queue, kill hung programs, or reboot certain machines. Administration staff can print or delete resource usage logs or start backups.

Through partitioning, Privilege Management for Unix & Linux allows different users to perform those root actions for which they are responsible, but not anything else. Privilege Management for Unix & Linux enables you to specify:

- Which users can perform a particular task
- Which tasks can be run through the system
- When the user can perform the task.
- On which machine the task can be performed
- From which machine the user may initiate a request to perform the task.
- Whether another user's permission (in the form of a password) is required before the task is started.
- The decisions that are to be made by a program that you supply and which Privilege Management for Unix & Linux calls to determine if a request should be accepted or rejected.
- Many other miscellaneous properties of requests.

Privilege Management for Unix & Linux is capable of recording all activity that passes through it to the I/O level. The power to accurately log activities in a safe environment enables you to implement a secure system administration regime with an audit trail. You always know exactly what is happening in root, as well as who did it, when it happened, and where.

Because root can modify any file, special precautions must be taken to ensure the Privilege Management for Unix & Linux logs are secure. Privilege Management for Unix & Linux can be configured to receive user requests from the submitting machine, execute tasks on the execution machine, and log all of the activities on yet another, very secure machine.

If necessary, the machines that contain the policy files and the log files can be made physically inaccessible to users and isolated from remote login over the network. In addition, the logs can be printed to hardcopy on a secure printer or recorded to a WORM drive if required.

This secure machine can also be assigned a root password, which is unknown to the person who has physical access to it, but known to someone else without physical access. Therefore, the two people would have to collude to subvert system security. These and other techniques may be used to achieve a high degree of security around Privilege Management for Unix & Linux, as well as the root activity logs that Privilege Management for Unix & Linux creates.

## Privilege Management for Unix & Linux Overview

To effectively administer Privilege Management for Unix & Linux, it is necessary to understand how the product works. A typical Privilege Management for Unix & Linux configuration consists of the following primary components:

- **pbrun**: Used for secured task submission
- **pbmasterd**: Used for security policy file processing
- **pblocald**: Used for task execution
- **pblogd**: Used for writing event logs and I/O logs

It is possible to install any or all of these components on a single machine, or to distribute them among different machines. For optimal security, the Policy Server hosts and log hosts should be separate machines that are isolated from normal activity.

## Privilege Management for Unix & Linux Task Requests

In the context of Privilege Management for Unix & Linux, there are two types of task requests:

- **Secured**: Requests must undergo security validation processing by Privilege Management for Unix & Linux before they can be run.
- **Unsecured**: Do not undergo security validation processing. These should be tasks that are not potential threats to the system and therefore do not fall under a company's security policy implementation. Unsecured tasks are handled by the operating system. Privilege Management for Unix & Linux is not involved in the processing of such tasks.

### Secured Task Submission to SSH-Managed Devices - pbssh

Secured tasks can also be submitted through **pbssh**. **pbssh** is the Privilege Management component used to access SSH-managed devices where Privilege Management is not installed (routers, firewalls, Windows devices, or Unix/Linux devices where Privilege Management is not installed). **pbssh** connects to the target device using the SSH configuration.

### Secured Task Submission - pbrun

All secured tasks must be submitted through **pbrun**, the Privilege Management for Unix & Linux component that receives task requests. A separate **pbrun** process is started for each secured task request that is submitted. If the use of **pbrun** is not enforced for secured tasks, then a company's security policy implementation could be compromised.



**Note:** *pbrun must be installed on any machine from which a user can submit a secured task request.*

### Policy File Processing - pbmasterd

**pbmasterd** is responsible for applying the security rules (as defined in the Privilege Management for Unix & Linux policy files) which make up a company's network security policy. In other words, **pbmasterd** performs security verification processing to determine if a request is accepted or rejected based on the logic in the Privilege Management for Unix & Linux security policy files. If a request is rejected, then the result is logged and processing terminates. If a request is accepted, then it is immediately passed to **pblocald** for execution.

If **pblogd** is used, then **pbmasterd** terminates when the request is passed to **pblocald**. A separate **pbmasterd** process is started for each secured task request that is submitted. If the **pblogd** component is not being used, then **pbmasterd** waits for the **pblocald** process to complete before terminating.



**Note:** During security verification processing, the first accept or reject condition that is met causes security policy file processing to immediately terminate. No further security verification processing is performed.

If **pbmasterd** recognizes that a command is to be run on the host that submitted the request, then **pblocald** is optimized out of the connection. The command is run directly under the control of the client (that is, **pbrun**, **pbsh**, or **pbksh**), along with all logging and services that would have otherwise been provided by **pblocald**.

### Task Execution - pblocald

**pblocald** executes task requests that have passed security verification processing (that is, requests that have been accepted by **pbmasterd**). After a task request is accepted, it is immediately passed from **pbmasterd** to **pblocald** in normal mode, or to **pbrun**, **pbsh**, or **pbksh** in local and optimized run modes. **pblocald** executes the task request as the user who is specified in the policy variable `runuser`, typically `root` or an administrative account. This action transfers all task input and output information back to **pbrun**.

In addition, **pblocald** logs pertinent task information to the Privilege Management for Unix & Linux event log (using **pbmasterd** or **pblogd**, depending on how Privilege Management for Unix & Linux has been deployed). The run host can also record task keystroke information to a Privilege Management for Unix & Linux I/O log (through **pbmasterd** or **pblogd**, depending on how Privilege Management for Unix & Linux has been deployed). A separate **pblocald** process is started for each secured task request that is submitted.

### Logging - pblogd

**pblogd** is an optional Privilege Management for Unix & Linux component that is responsible for writing event and I/O log records. If **pblogd** is not installed, then **pbmasterd** writes log records directly to the appropriate log files rather than passing these records to **pblogd**. In addition, if **pblogd** is not installed, then **pbmasterd** must wait for the **pblocald** process to complete. If the **pblogd** is used, then **pbmasterd** terminates after task execution starts, and **pblocald** sends its log records directly to **pblogd**.

Using **pblogd** optimizes Privilege Management for Unix & Linux processing by centralizing the writing of log records in a single, dedicated component and eliminating the need for the **pbmasterd** process to wait for task execution to complete.

### Logging - Message Router (pblighttpd-svc)

In Privilege Management for Unix & Linux v10.1.0, a new Message Router service was introduced to streamline the processing of Events and other important messages throughout the system. It allows a single Log Server to quickly accept, process and store tens of thousands of events every second.

## Step-by-Step Task Processing

To make the following information more concise and easier to understand, it is assumed that Privilege Management for Unix & Linux is installed on all of the machines that are involved. It is also presumed that the network is functioning and there are sufficient resources (memory and disk space) to run the application and log what is required. Error processing within Privilege Management for Unix & Linux reports these problems when they occur.

This section describes the process that occurs when a task is submitted in Privilege Management for Unix & Linux, and indicates which modes use each part of the process.

There are three modes for Privilege Management for Unix & Linux:

- **Normal Mode:** In this mode, all tasks are performed including those that are run by **pblocald**.



For more information, please see "[Normal Mode Processing](#)" on page 21.

- Optimized Run Mode:** In this mode, after **pbmasterd** has accepted a request, the specified task runs directly on the submit host, without invoking **pblocald**. Doing this enables the administrator to use **pbmasterd** to validate a command, log the commands that are started in the event log, and record an I/O log for the secured task. The optimized run mode also reconfirms the password, performs time-out processing, and logs the status.



For more information, please see ["Optimized Run Mode Processing" on page 22.](#)

- Local Mode:** In this mode, after **pbmasterd** has accepted a request, the specified task runs directly on the submit host, without invoking **pblocald**. This mode enables the administrator to use **pbmasterd** to authorize a command, log the accepted task. All other Privilege Management for Unix & Linux functionality is bypassed.



For more information, please see ["Local Mode Processing" on page 23.](#)

The following table summarizes the steps that are used for each of the three modes. An **X** represents a task that is processed by a specific mode, and **N/A** means that the task does not apply in the specified mode.

Process Task	Normal Mode	Optimized Run Mode	Local Mode
Secure task submitted	X	X	X
Policy Server daemon starts	X	X	X
Policy file processing	X	X	X
Local daemon started	X	N/A	N/A
Log daemon started	pblocald	pbrun	pbrun
pbrun/pblocald reconnect	X	N/A	N/A
runconfirmuser check	pblocald	pbrun	N/A
Executable check	pblocald	pbrun	pbrun
Secured task runs	X	X	X
Time-out processing	X	X	N/A
Secured task ends	X	X	X
pblocald completes	X	N/A	N/A
pblogd completes	Logs exit status and closes the I/O log	Logs exit status and closes the I/O log	Closes I/O log
pbmasterd completes	X	X	X
pbrun completes	X	X	X

### Task Submitted (All Modes)

The initial step is for a user to execute **pbrun**. This is done either from the command line as:

```
pbrun list
```

or from a shell script such as:

```
#!/bin/sh
/usr/local/bin/pbrun list
```

where **list** is the task that is being requested. **pbrun** checks the settings file and sends the request with other information from the submit host to a Policy Server daemon that is specified in the **submitmasters** setting.

### Policy Server Daemon Starts (All Modes)

The Policy Server daemon (**pbmasterd**) listens for requests from **pbrun**. When a request arrives, the Policy Server daemon checks its settings file. The Policy Server host settings file may be different from the settings file on the submit host because they may be on different machines. Validation that **pbrun** is trying to connect is performed and the rest of the Policy Server processing continues.

If there is an error at any point in the settings file validation or **pbrun** connect verification, then **pbmasterd** stops, and when possible, sends a message for the **pbrun** session to the user, and validates the client host name checks.

### Policy File Processing (All Modes)

The main action of the Policy Server daemon is to confirm that the user may run a request, and to modify or set values for the request. Values can be set in the policy file that affect how the Policy Server daemon runs.

The values that are set in the policy file are shown in the following table:

Policy Values	Description
eventlog	Specifies the file in which the events are logged
iolog	Identifies the file in which the I/O streams are logged
localmode	<p>Deprecated in favor of Optimized Run Mode Processing. This mechanism allowed execution on local host without the use of <b>pblocald</b>, with the expense of several features not available. Optimized Run Mode Processing enables all the features that localmode lacks, also without using <b>pblocald</b>.</p> <div style="border: 1px solid orange; padding: 5px; margin-top: 10px;">  For more information, please see "<a href="#">Optimized Run Mode Processing</a>" on page 22.                 </div>
lognopassword	Specifies whether passwords should be logged
lognoreconnect	Identifies whether the log server should be allowed to run through <b>pblocald</b> or stay connected to <b>pbmasterd</b> and whether the <b>pblocald</b> should be allowed to connect to <b>pbrun</b> on submit host or stay connected to <b>pbmasterd</b> . In Optimized Run Mode, this has no affect.
noreconnect	Controls whether the Policy Server daemon should stay connected.

If necessary as part of the processing, the Policy Server daemon communicates with the **pbrun** session to get further information from the user, such as passwords or input.

If the log daemon is used and the **logmktemp ()** function is called, then **pbmasterd** starts the log daemon to create a log file on the log host. If the policy language variable **lognoreconnect** allows it, the log server reconnects to **pblocald** when the secured task is ready to run.

If the processing of the policy file reaches an accept statement, then **pbmasterd** tries to connect to **pblocald** on the run host.

If the processing of the policy file reaches a reject statement, then **pbmasterd** logs the result (possibly through the log server daemon) and terminates the request.

If the log daemon is being used, then **pbmasterd** tries to connect to the log daemon on the log host.

Privilege Management for Unix & Linux 8.0.2 adds a new **policytimeout** mechanism to protect against policies that appear nonresponsive.



For more information, please see "[Timeout Processing \(Normal Mode and Optimized Run Mode\)](#)" on page 20.



**Note:** As soon as an **accept** or **reject** statement executes, policy file processing stops. No further policy file processing takes place.

### Local Daemon Started (Normal Mode)

The local daemon listens for requests from **pbmasterd**. When one arrives, it checks its settings file. The run host settings file may be different from the settings file on the Policy Server host because they can be on different machines. Validation that **pbmasterd** is trying to connect is performed and the rest of the local processing continues. The local daemon immediately determines whether it can accept requests from the Policy Server daemon by comparing the host to the **acceptmasters** line in the settings file.

If there is an error at any point in the settings file validation or the verification that **pbmasterd** is trying to connect the local daemon, then the process stops. When possible, a message is sent via the **pbmasterd** session for the **pbrun** session to the user. Validate Policy Server host name checks are also performed.

### Log Daemon Started (All Modes)

The log daemon listens for requests from **pbmasterd** or **pblocald**. When one arrives, it checks its settings file. The log host settings file can be different from the settings file on the Policy Server host or run host because they can be on different machines. Validation that **pbmasterd** or **pblocald** is trying to connect is performed and the rest of the local processing continues.

If there is an error at any point in the settings file validation or the verification that **pbmasterd** or **pblocald** is trying to connect, then the log daemon stops. When possible, a message is sent using the requesting session for the **pbrun** session to the user. **pblocald** starts the log daemon in normal mode and **pbrun** starts the log daemon in local mode and optimization run mode.

### pbrun/pblocald Reconnect (Normal Mode)

If **pbmasterd** does not need to stay in the middle of the connection between **pbrun** and **pblocald**, it instructs **pbrun** and **pblocald** to connect directly to each other. **pbmasterd** then exits.

**pbmasterd** removes itself when the following are all true:

- A log daemon is used.
- The **noreconnect** and **lognoreconnect** variables are **false**.

If these conditions are not met, then **pbmasterd** remains in the job stream and passes the data from **pbrun** to **pblocald**.

The only reason a Policy Server daemon would need to stay in the middle of a connection is that the Policy Server daemon is located between two subnets that do not normally allow traffic between them.

### runconfirmuser Check (Normal Mode and Optimized Run Mode)

With all sessions now established, the **pblocald** session determines whether the **runconfirmuser** variable is set and requests the run host password for the **runconfirmuser** user from the **pbrun** session. If this request fails three times, then the **pblocald** session

stops.

### Executable Check (All Modes)

**pblocald** does some final checking before starting the actual command. If the **runcksum** or **runcksumlist** variable is set, **pblocald** determines whether the checksum of the command in **runcommand** matches the value in **runcksum** or **runcksumlist**. If the **runmd5sum** or **runmd5sumlist** variable is set, **pblocald** determines whether the MD5 checksum of the command in **runcommand** matches the value in **runmd5sum** or **runmd5sumlist**.

To log the checksum of the **runcommand** being compared against **runcksum**, **runcksumlist**, **runmd5sum**, or **runmd5sumlist**, use the policy variable **logcksum**.

These actions provide protection against viruses, Trojan horses, or other unintentional changes to the program file. **pblocald** also runs secure command checks. The final checking is done by **pblocald** for the normal mode and by **pbrun** in the optimized run mode and local mode.

### Secured Task Runs (Normal Mode)

When the **pblocald** reaches this point, it can finally execute the command specified in the **runcommand** variable, **pblocald** checks that **runcommand** points to an executable file. If the file is not found or cannot be executed, **pblocald** stops and an error is sent back to the **pbrun** session.

**pblocald** sets up the run environment as follows:

- The runtime environment to execute the command is established according to the values in the **runenv** list.
- The user that is specified in the **runuser** variable runs the command.
- The **utmp** entry is written with the **runutmpuser** variable value as the user.
- The syslog is updated.
- The group is the value of the **rungroup** variable.
- The secondary groups are the value of the **rungroups** variable.
- The arguments to the command are the values that are specified in the **runargv** variable. The current directory is the value that is specified in the **runcwd** variable.
- The **umask** is the value of the **runumask** variable.
- The nice priority is the value of the **runnice** variable.
- If the **runchroot** variable is set, then the top of the file system is set via **chroot**



For more information, please see your Unix/Linux man pages.

- The processing of HUP signals is set based on the value of the **runbkgd** variable.
- **pblocald** then starts the command.

### Timeout Processing (Normal Mode and Optimized Run Mode)

If there is a **mastertimeout**, **submittimeout**, or **runtimeout** in effect (as specified in the policy or overridden by a client's runtimeout keyword in the settings), then the session terminates if there is no input or output activity within the specified number of seconds. These timeouts are effective only after the policy has accepted a request, during the lifetime of the secured task.

The Privilege Management for Unix & Linux 8.0.2 **policytimeout()** procedure provides a timeout mechanism that is effective during policy processing (before an accept; or reject;). This allows protection against **pbrun** that appears nonresponsive waiting for user input, infinite loops within the policy, etc.

### Secured Task Ends (All Modes)

At some point the task ends, because the command finished, the user interrupted it by pressing CTRL+C, or it was exited in some other way.

### pblocald Completes (Normal Mode)

**pblocald** recognizes task completion and stops processing. It captures the reason for the completion (such as a signal or an exit code) and sends it for logging as the **exitstatus** variable. The **exittime** and **exitdate** are also logged. In normal mode, **pblocald** completes.

### pblogd Completes (All Modes)

If a log server is used, then the I/O log is closed. For normal mode and optimized run mode, the exit status of the secured task is also logged.

### pbrun Completes (Normal Mode Only)

If the **pbrun** session is still running, then it shuts down. The **pblogd** session also shuts down.

### pbrun Completes (Normal Mode and Optimized Run Mode)

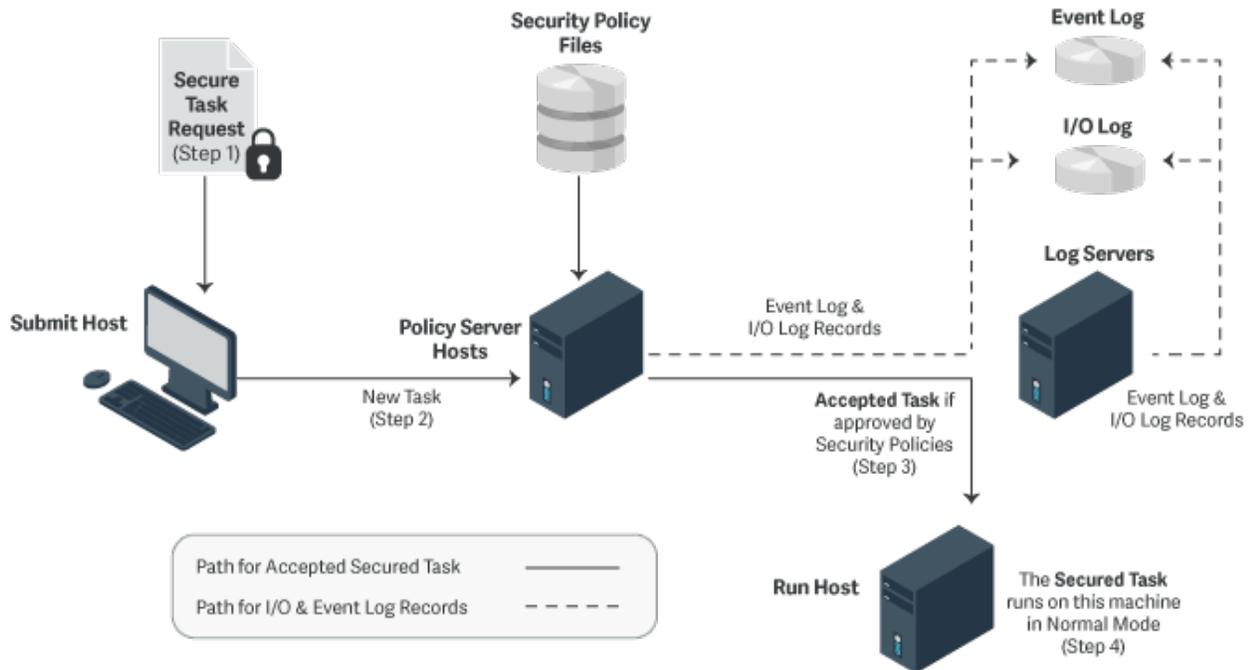
**pbrun** displays the **exitstatus** of the string of the secured task if the task detects an error or abnormal exit.

The exit status of the secured task is also returned in the **pbrun** exit status value.

## Normal Mode Processing

As shown in the following figure, in normal mode, the machine from which a task is submitted is referred to as the submit host. The machine on which security policy file processing takes place is referred to as the Policy Server host. The machine on which a task is actually executed is referred to as the run host. The machine on which event log records and I/O log records are written is referred to as the log host. Use of the log server daemon **pblogd** is optional, but highly recommended.

## How Privilege Management for Unix & Linux Works

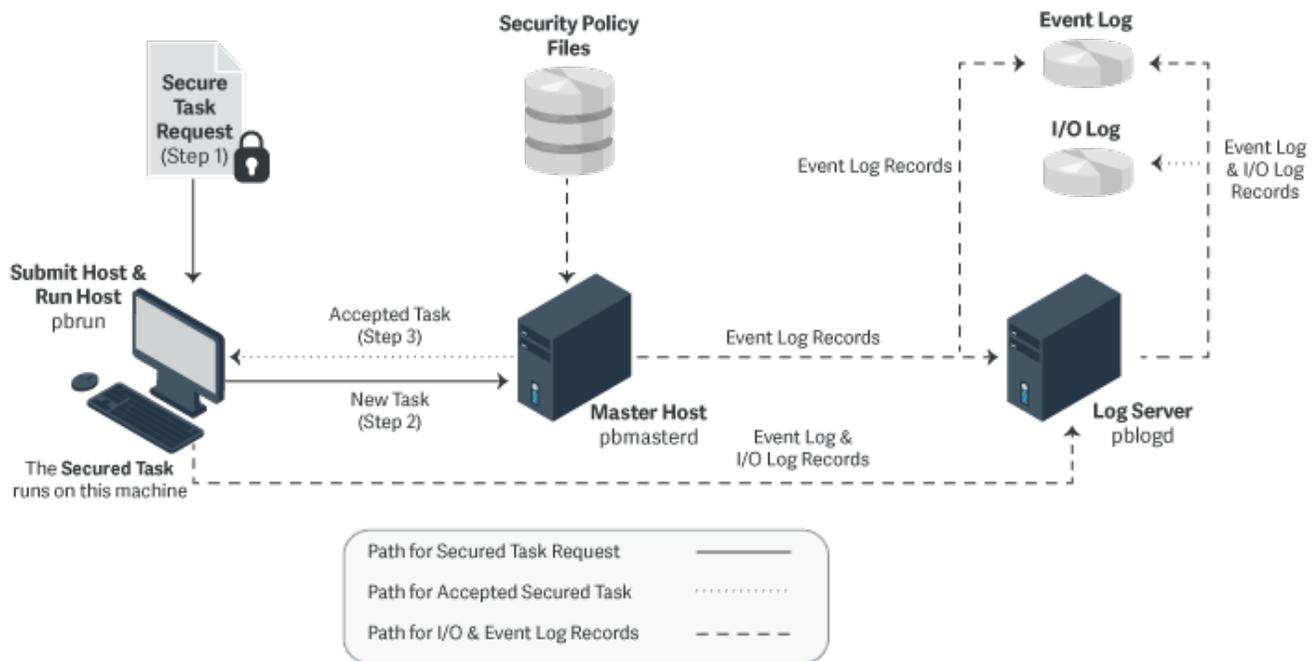


## Optimized Run Mode Processing

- **Version 3.5 and earlier:** Optimized run mode not available
- **Version 4.0 and later:** Optimized run mode available

In optimized run mode, after **pbmasterd** has accepted a request, the specified task runs directly on the submit host, without invoking **pblocald**. This feature enables the administrator to use **pbmasterd** to validate a command, log the commands that were started in the event log, and log the I/O streams for the secured task. The optimized run mode also reconfirms the password, performs time-out processing, and logs the status.

The following figure illustrates the processing when Privilege Management for Unix & Linux is running in the optimized run mode:



## Optimized Run Mode Availability

Optimized run mode is enabled when all of the following conditions are met:

- The Policy Server host must be configured to use a log server.
- The values of the **submithost** and **runhost** variables must be equal.
- **pbrun** must be invoked without the **--disable\_optimized\_runmode** command line option.
- **pbmasterd** must be invoked without the **--disable\_optimized\_runmode** command line option.
- The settings file on the submit host must have the **clientdisableoptimizedrunmode** setting set to **no**.
- The settings file on the Policy Server host must have the **masterdisableoptimizedrunmode** setting set to **no**.
- The policy must set the **runoptimizedrunmode** variable to **true**.

## Local Mode Processing

Deprecated in favor of Optimized Run Mode.



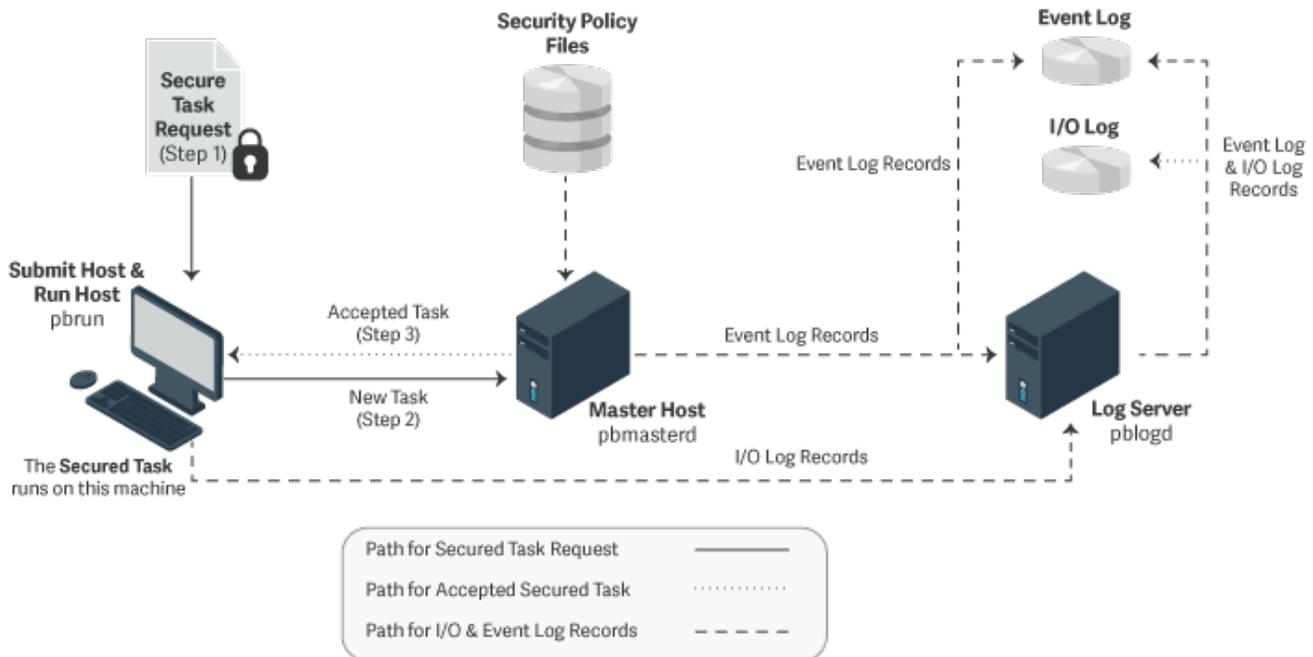
For more information on Optimized Run Mode, please see "[Optimized Run Mode Processing](#)" on page 22.

In local mode, after **pbmasterd** has accepted a request, the specified task runs directly on the submit host, without invoking **pblocald** and without using Optimized Run Mode. This feature enables the administrator to use **pbmasterd** to authorize a command and to log the accepted task in the event log. However, unlike optimized run mode, this mode does not perform time-out processing, or log the exit status of the accepted task, nor Advanced Control and Audit (ACA). In local mode, the process **pbrun** is replaced by the secured task, unless the I/O Logging is on.

With the introduction of optimized run mode, the use of local mode is no longer a benefit, since optimized run mode allows the task to run without invoking **pblocald** (if on the same host), and allows time-out processing, I/O Logging, logs the exit status of the task, and allows ACA.

Local mode processing can be controlled in the `/etc/pb.settings` file (**allowlocalmode** setting) or in the policy (**localmode** and **runlocalmode** variables).

The following figure illustrates the processing when Privilege Management for Unix & Linux is running in local mode.



## Local Mode Availability

Local mode is enabled when the following condition is met:

- The **allowlocalmode** setting on the submit host, Policy Server host, and run host must be set to **yes**.



**Note:** *Deprecated in favor of Optimized Run Mode. For more information on Optimized Run Mode, please see "Optimized Run Mode Processing" on page 22. **pbrun** must be invoked with the **-l** command line option, or the policy must set the **runlocalmode** variable to true.*

## Local Mode Effects

Local mode does the same processing on the submit host and the Policy Server host, including the logging of the accepted request. However, instead of the Policy Server daemon requesting the **pblocald** to run the task, the **pbrun** session is replaced with the task. **pblocald** is not run when using local mode. **pblogd** may be run to record the *accept* event.

In local mode, the accepted task runs on the submit host. Local mode fails with an error if a different runhost is specified.

## Local Mode Limitations

Because the Privilege Management for Unix & Linux programs are not active when a program runs with local mode, the following limitations exist:

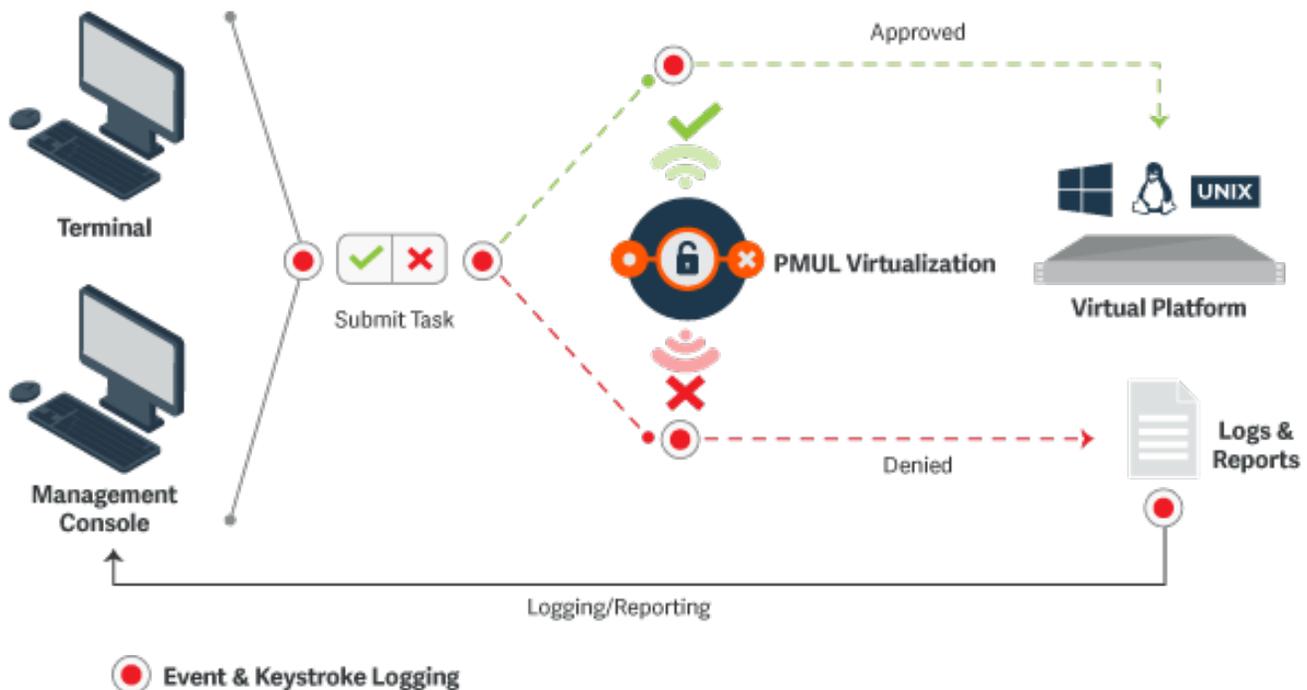
- Exit status of the job is not logged.
- **runtimeout** and **submittimeout** cannot be processed.
- Keystroke actions cannot be processed.
- The program specified by **iologcloseaction()** policy procedure is not executed.
- ACA is not compatible with local mode.

## Privilege Management Virtualization

Privilege Management Virtualization is a cost-effective solution for consistent granular privilege identity management across guest operating systems as well as hypervisor hosts. Privilege Management Virtualization provides granular delegation of administrative privileges on virtual guest and host hypervisors, including detailed and flexible reporting with keystroke logging of administrative actions, for a secure and compliant virtualized datacenter environment.

Privilege Management Virtualization enables organizations that move to virtualized platforms to control administrative access to the Hypervisor/VMM layer while still realizing all virtualization cost efficiencies. Administrative tools prevent the virtualization layer from being compromised that could pose significant security risks to all hosted workloads. Programmable role-constraint mechanisms enforce segregation of duties for users and virtual platform- specific cost-effective deployment capabilities enable secure datacenter virtualization.

The following diagram shows how Privilege Management Virtualization works.



## Privilege Management Virtualization Features

The features of Privilege Management Virtualization include:

- Automated workflows for policy creation and change management.
- Granular delegation of administrative privileges.
- Detailed and flexible reporting including keystroke logging of administrative activities.
- Two-click entitlement reports.
- Programmable role-constrain mechanisms for segregation of duties.

- Secures virtual guest and host hypervisors.
- Supports VMware ESX, Solaris Zones, AIX WPAR, and IBM z/VM.

## Privilege Management for Unix & Linux and AD Bridge

Starting with V7.0, Privilege Management for Unix & Linux can be integrated with AD Bridge. Integrating Privilege Management for Unix & Linux with AD Bridge has the following benefits:

### Event log central collection

AD Bridge features a database-centric reporting architecture that enables event collection from multiple devices as well as the ability to report about this data from a central location using standard plug-ins. Events are forwarded to the AD Bridge collector machines where AD Bridge tools are installed and are running **BTCollector** services. The collector machines then aggregate all events in an enterprise-wide MS SQL Server database.

Starting with V7.0, Privilege Management for Unix & Linux incorporates the collection of Privilege Management for Unix & Linux events (accept events, reject events, finish events, and keystroke action events) by AD Bridge collectors as well as the ability to query this information using the standard AD Bridge report plug-in.

The AD Bridge Enterprise tools on Windows include a management console, which supports a number of plug-ins for performing various tasks. The reports plug-in has many available reports for viewing configuration and event related queries. Privilege Management for Unix & Linux now has dedicated reports for the various operations that it performs.

### Privilege Management for Unix & Linux Health Check

Starting with V7.0, Privilege Management for Unix & Linux, as part of integration with AD Bridge, sends events to AD Bridge Collectors based on the responsiveness of Privilege Management for Unix & Linux Policy Server hosts, log hosts, and **pblocald**. Privilege Management for Unix & Linux clients **pbrun**, **pbsh**, **pbksh**, and **pbssh**, will optionally report a new failover event every time a Privilege Management for Unix & Linux Policy Server host or log host fails to respond in a timely manner.

This feature is closely tied to the current Privilege Management for Unix & Linux failover mechanism. Any Policy Server that does not respond within the number of seconds specified by the **masterdelay** setting will cause the new failover event to be written to both syslog and the AD Bridge event log database. Any log host that does not respond within the number of seconds specified by the **logserverdelay** setting will cause the new failover event to be written to both syslog and the AD Bridge event log database. Similarly, **pbmaterd** will report events any time **pblocald** fails to respond. This new feature also allows for the optional recording of successful connection events.

Another plug-in for the management console is the Privilege Management Operations Dashboard. This is a tool that provides a view on key metrics that an administrator can configure to show green, yellow, and red status indicators depending on user-defined thresholds. The health events are illustrated on this Privilege Management Operation Dashboard using the colors green, yellow, and red to indicate status.

### Privilege Management for Unix & Linux policy creation and deployment

AD Bridge offers a Policy Creation user interface (UI) that provides the ability to create and modify policy data, export policy data to local files, import policy data from local files into the AD Bridge Policy Creation UI, deliver Privilege Management for Unix & Linux policy data from Active Directory to Privilege Management for Unix & Linux Policy Server hosts, and process Privilege Management for Unix & Linux GPO data on a Privilege Management for Unix & Linux Policy Server host. The solution relies on the ability of AD Bridge to edit custom GPO types in AD through the standard Windows Group Policy Management Console and the ability of **gpagent** to deliver the GPOs to a system running a AD Bridge agent.

 For more information about this feature, please see the [AD Bridge Group Policy Guide](https://www.beyondtrust.com/docs/ad-bridge/how-to/group-policy/index.htm) at <https://www.beyondtrust.com/docs/ad-bridge/how-to/group-policy/index.htm>.

## Integration Process

To enable AD Bridge to work with Privilege Management for Unix & Linux, the AD Bridge agent must be installed on the appropriate Privilege Management for Unix & Linux machines:

- On the Privilege Management for Unix & Linux Policy Server host and log host computers to send the event log records (accept, reject, finish, and keystroke actions events) and the health event log records (related to **pblocald**) to AD Bridge.
- On the client computers (where **pbrun**, **pbksh** or **pbsh**, and **pbssh** are installed), Policy Server host, and run host (where **pblocald** is installed), to send the health event log records related to the Policy Server host and log host to AD Bridge.

 For instructions on how to install the products, please see the following:

- [AD Bridge Installation Guide](https://www.beyondtrust.com/docs/ad-bridge/getting-started/index.htm) at <https://www.beyondtrust.com/docs/ad-bridge/getting-started/index.htm>
- [Privilege Management for Unix & Linux Installation Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>
- the Privilege Management for Unix & Linux readme file
- the AD Bridge readme file for more information about supported platforms

To send Privilege Management for Unix & Linux event logs to AD Bridge, you must set the following in the **pb.settings** file:

- **sharedlibpbisdependencies**

 For more information, please see "[sharedlibpbisdependencies](#)" on page 136.

- **pbis\_event\_logging**

 For more information, please see "[AD Bridge Event Logging](#)" on page 134.

To send event records about the health of the Policy Server host, log host, and **pblocald** to the AD Bridge, you must set the following in the **pb.settings** file:

- **sharedlibpbisdependencies**

 For more information, please see "[sharedlibpbisdependencies](#)" on page 136.

- **pbis\_log\_failover**

 For more information, please see "[pbis\\_log\\_failover](#)" on page 135.

- **pbis\_log\_connect\_success**



For more information, please see "[pbis\\_log\\_connect\\_success](#)" on page 135.

## Privilege Management for Unix & Linux and BeyondInsight Console

Starting with v7.5, Privilege Management for Unix & Linux can be integrated with BeyondInsight. This integration with BeyondInsight has the following benefits:

### Event log central collection

BeyondInsight features a database-centric reporting architecture that enables event collection from multiple devices as well as the ability to report about this data from a central location.

Privilege Management for Unix & Linux uses a message router architecture to store its events (accept events, reject events, keystroke action events, and finish events) in a database, defined by **integratedproductsqueuedb**, and uses a scheduler to periodically forward these eventlog records to BeyondInsight Web services. Using BeyondInsight, you can then sort and filter this data into useful reports. BeyondInsight will also use these events to show the list of Privilege Management for Unix & Linux servers in the list of BeyondInsight Assets.

### IO log Indexing for improved search capabilities

This integration will allow BeyondInsight to search for IOLogs via an indexed search. Privilege Management for Unix & Linux will use Solr (with Lucene and Jetty) to index IOLog output data and BeyondInsight will perform Solr queries and interpret/display the results, allowing the user to replay the resulting IOLogs via **pbguid**.

### Integration Process

When installing or upgrading you can enable BeyondInsight Integration and provide values to the necessary keywords to enable these features.



For more information, please see the [Privilege Management for Unix & Linux Installation Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

To enable Privilege Management for Unix & Linux v7.5 (and later) to send the eventlog records to BeyondInsight, you will need to perform the following actions.

1. Copy and convert the BeyondInsight client certificate from BeyondInsight to the Policy Server and Log server hosts.



For more information, refer to the [BeyondInsight documentation](https://www.beyondtrust.com/docs/beyondinsight-password-safe/index.htm) at <https://www.beyondtrust.com/docs/beyondinsight-password-safe/index.htm>.

- Start the BeyondInsight Configuration Tool on the BeyondInsight management console server. Click **Generate Certificate Zip** in the BeyondInsight Configuration Tool.
- Select the output folder for the zip file and a password to apply to the exported **.pfx** file.
- Select a folder where you can securely copy the **certificates.zip** file and uncompress it.
- Copy the following files to a secure directory on the Privilege Management Policy Server and Log server hosts:
  - **eEyeEMSCClient.pem**
  - **<host>\_eEye\_EMS\_CA.pem**
- In the Privilege Management Servers and Log server settings file assign the keyword **sslrcscertfile** to the location of **eEyeEMSCClient.pem**:

```
sslrcscertfile /<secure_directory>/eEyeEMSClient.pem
```

- Assign the keyword **sslrcscafile** to the location of the file **<host>\_eEye\_EMS\_CA.pem**:

```
sslrcscafile /<secure_directory>/<host>_eEye_EMS_CA.pem
```

- Start the BeyondInsight Configuration Tool on the BeyondInsight management console server. Click **Generate Certificate Zip** in the BeyondInsight Configuration Tool.
- Select the output folder for the zip file and a password to apply to the exported **.pfx** file.
- Select a folder where you can securely copy the **certificates.zip** file and uncompress it.
- Copy the following files to a secure directory on the Privilege Management Policy Server and Log server hosts:
  - **eEyeEMSClient.pem**
  - **<host>\_eEye\_EMS\_CA.pem**
- In the Privilege Management Servers and Log server settings file assign the keyword **sslrcscertfile** to the location of **eEyeEMSClient.pem**:

```
sslrcscertfile /<secure_directory>/eEyeEMSClient.pem
```

- Assign the keyword **sslrcscafile** to the location of the file **<host>\_eEye\_EMS\_CA.pem**:

```
sslrcscafile /<secure_directory>/<host>_eEye_EMS_CA.pem
```



**Note:** In the Privilege Management settings file, assign the keyword **rcshost** to the BeyondInsight hostname exactly how it appears in this certificate.

2. If you have not done so during the installation, set the following keywords in **pb.settings** on the Policy Server and Log server hosts:
  - **rcshost**
  - **rcswebsvcport**
  - **sslrcscertfile**
  - **sslrcscafile**



For more information about these keywords, please see "[BeyondInsight Event Logging](#)" on page 136.

To enable Privilege Management for Unix & Linux v7.5 and above to index IO log files, you will need to:

1. Install Solr on a server of your choice.



For more information, please see *Solr Installation* in the Privilege Management for Unix & Linux Installation Guide at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

2. Copy SSL certs from Solr Server to Policy Server and Logserver hosts.
  - On the Solr server, securely copy the PEM encoded files (\*.pem) from the **etc** directory under Solr Install Directory (for example **/opt/pbul-solr/etc**) directory to the directories pointed by **solrcafile**, **solrclientkeyfile** and **solrclientcertfile** on the desired logserver and Policy Server hosts.



For the name of the files to copy, please see the *Post-install* section of *Solr Installation* in the Privilege Management for Unix & Linux Installation Guide at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

3. If you have not done so during the installation, set the following keywords in **pb.settings** on the Policy Server and Log server hosts:
  - **pbreplaylog**
  - **solrhost**
  - **solrport**
  - **solrcafile**
  - **solrclientkeyfile**
  - **solrclientcertfile**
  - **integratedproductsqueuedb**



For more information about these keywords, please see "BeyondInsight I/O Log Indexing and Searching" on page 139.

4. Other keywords to set (common to both Eventlog collection and IO log Indexing):
  - **pbadminpath**
  - **guiport**
  - **sguiport**
  - **sharedlibkrb5dependencies**
  - **sharedlibssldependencies**
  - **sharedlibldapdependencies**
  - **sharedlibcurldependencies**



For more information about these keywords, please see "BeyondInsight Event and I/O Logging Common Settings" on page 147.

## Solr Indexing and Search

There are separate tar files for Solr installation. Each logserver and Policy Server host will be able to communicate with a Solr Server and submit I/O log output data for indexing. BeyondInsight and BIUL (BeyondInsight for Unix & Linux) provide a search GUI, allowing users to search indexed I/O logs using a selected set of variables, but also allowing to search the content of I/O log sessions using queries such as 'this AND that AND NOT other OR somethingelse'.

For each I/O Log file, the result of **pbreplay -O** output of the IOLog file is sent to Solr to be indexed. Some of the eventlog variables in the header of the I/OLog are indexed as well. These variables are:

- **user**
- **runuser**
- **runhost**
- **runcommand**
- **runargv**

The name of the I/O Log file name is also indexed, as well as the start and end time of the IOLog session.

You can add user-defined eventlog variables (defined in the policy) to the list of variables to be indexed by setting **solrvariables** in **pb.settings** to the list of user variables defined in the policy. These variables have to be named **<var>\_pbul**.



For more information about this keyword, please see "[solrvariables](#)" on page 140.

The result displayed will contain a path to the actual I/O log file which can then be replayed using Privilege Management for Unix & Linux GUI (this requires Privilege Management GUI to be installed on the logserver and Policy Server hosts where the I/O log files reside).

If I/O Log indexing with Solr is enabled, the Solr index will be updated when I/O logs get archived.

If a problem occurs while trying to contact the Solr server (broken connection, miscellaneous errors, etc.), an appropriate error will be logged in the diagnostics logfile, and the unsent I/O log file name will be saved to be forwarded to the Solr server at a later time.

Privilege Management will periodically check to see if there are events that are outstanding, and are older than the **autofwdtime** setting. If conditions are met, it will launch the **pbreplay** admin binary to forward the I/O log data to Solr server for indexing. The path where **pbreplay** resides is specified by the setting keyword **pbadminpath**.

Starting with Privilege Management for Unix & Linux v10.0.0, a queue mechanism is used to process iologs for Solr, while limiting the number of indexing processes. This mechanism is shared by the feature I/O Log Close Action.



For more information, please see "[I/O Log Close Action](#)" on page 33.

## I/O Log Close Action

The new Privilege Management Policy procedure **iolocloseaction** allows the Policy to specify a program that is executed for each completed iolog.



For more information, please see the [Privilege Management for Unix & Linux Policy Language Guide](#) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

This mechanism allows the iolog to be processed in some way determined by the specified program. For example, Privilege Management includes a perl script that sends ACA data from the iolog to Splunk.

The **iolocloseaction** mechanism and the Solr indexing mechanism share a queue that allows **pbconfigd** to control and monitor **pbreplay** processes, which in turn perform the Solr indexing and **iolocloseaction** actions. This mechanism uses a combination of fast write to queue files, and a database. Each I/O logging process writes the iolog path and filename to the queue, as well as periodic heartbeat information to inform the queue mechanism that the iolog is still being generated. When an iolog is closed (normally), that information is written to the queue as well. **pbconfig** runs a scheduled task that transfers data from the IO Log Action queue to both **SOLR** and any specified IO Log Close Action scripts and once they have been successfully processed the entry is deleted. The scheduler will automatically try to resend any outstanding entries if the **SOLR** service is down or unavailable.

Both Solr indexing and **iologcloseaction** are ultimately processed by **pbreplay**. **pbconfigd** runs a scheduled task that monitors the **pbreplay** processes handling Solr indexing and/or **iologcloseaction**. The number of allowed **pbreplay** processes is configured with the **iologactionmaxprocs** keyword. **pbreplay** processes are launched as needed to process the database queue. The **iologactionretry** keyword controls the number of retries to acquire a database lock for the internal database queue operations.

## Splunk Integration

Privilege Management can send Accept and Reject event data to Splunk via syslog, using the `syslogsession_start_format` and `syslog_reject_format`.

Privilege Management for Unix & Linux 10.0.1 adds a new keyword `syslogsession_finished_format_logserver`, which adds exit status data, and operates from the logserver (as opposed to the `syslogsession_finished_format` keyword that operates from each runhost). Both syslog and syslogsessions must be set to **yes** to enable those keywords. The syslog keyword needs to be configured to send data to Splunk.



**Note:** Various syslog implementations have data rate limiting and must be configured accordingly.

Privilege Management can also send ACA data to Splunk, via the `iologcloseaction()` procedure defined in the Policy language. This makes use of the Perl script `closeactionsplunk.pl`, normally located in `/opt/pbul/scripts/`.



**Note:** The use of this Perl script may require additional Perl modules to be installed. This script requires a Privilege Management for Unix & Linux REST App ID and App Key to be configured near the top of the script.

### Example Splunk App

Privilege Management for Unix & Linux has an example Splunk app available from the Splunk website.



The Splunk app can be located at <https://splunkbase.splunk.com/app/4017/> or from within the Splunk GUI under **Apps > Find More Apps**.

Once the Splunk App is installed in Splunk, if Splunk is to be configured to accept syslog data, do the following within the Splunk GUI:

1. Click **Settings > Data Inputs > UDP + Add New**.
2. Enter port **514**, then click **Next**.
3. Click **App Context**.
4. Select **BeyondTrust App for Splunk (App-BeyondTrust)**.
5. Click **Select Source Type**.
6. Enter the first few characters of **beyondtrust:syslog**. The search box should find **beyondtrust:syslog**.
7. Select that, click **Review**, and then **Submit**.
8. Click **Settings > Advanced Search > Search Macros**.
9. Select the app: **BeyondTrust App for Splunk**.
10. Verify that the macro named `get_beyondtrust_index_sourcetype` has the **Definition: (index="main" sourcetype="beyondtrust:syslog")**.

To send Reject and Finish event data to Splunk (in a format that the Splunk App recognizes), set the following syslog formatting keywords in `/etc/pb.settings` on the Policy Servers and Log Servers:

```
syslog_reject_format "BeyondTrust_PBUL_REJECT_Event: Time_Zone='%timezone%'; Request_Date='%date%'; Request_Time='%time%'; Request_End_Date='%date%'; Request_End_Time='%time%'; Submit_User='%user%'; Submit_Host='%submithost%'; Submit_Host_IP='%submithostip%'; Run_User='None'; Run_Host='None'; Run
```



```
17
18 my $pbr_appid    = "REPLACE-ME";
19 my $pbr_appkey   = "REPLACE-ME";
20
```

In addition to editing the App ID and App Key, several other edits may be necessary:

The **closeactionsplunk.pl** script currently uses the **auth** syslog facility. Depending on the Log Server OS, this may need to be changed to **authpriv** in **closeactionsplunk.pl**, or **auth** may need to be configured in addition to **authpriv** in **/etc/syslog.conf** (**rsyslog.conf**, etc).

The **closeactionsplunk.pl** script uses **/usr/sbin/pbrestcall** internally. This will work for installations without a prefix or suffix. If a prefix/suffix installation is used, edit the script to use the appropriate prefix/suffix for **pbrestcall**. The **closeactionsplunk.pl** script uses the default rest port (**24351**), which may need to be changed depending on the actual port used. That port number currently appears in the line:

```
my $pbr_url = https://localhost:24351/REST
```

## REST API for Privilege Management for Unix & Linux

A REST API has been developed for Privilege Management for Unix & Linux to allow other software to configure, customize, and retrieve data from Privilege Management for Unix & Linux. The API is web based and uses industry standard modern components, connectors, and data elements within a distributed and secure enterprise environment. The software will be installed on the Policy Server, Logserver or run/submit hosts, sudo clients, alongside a suitable HTTP service (one which supports FastCGI), that will provide the communications between the client and the REST services. The REST API provides a RESTful interface for product settings, policy configuration and IO log retrieval. The REST API can be used with Privilege Management for Unix & Linux v7.1.0 and later.



**Note:** The REST API is not fully supported on Mac OS X.



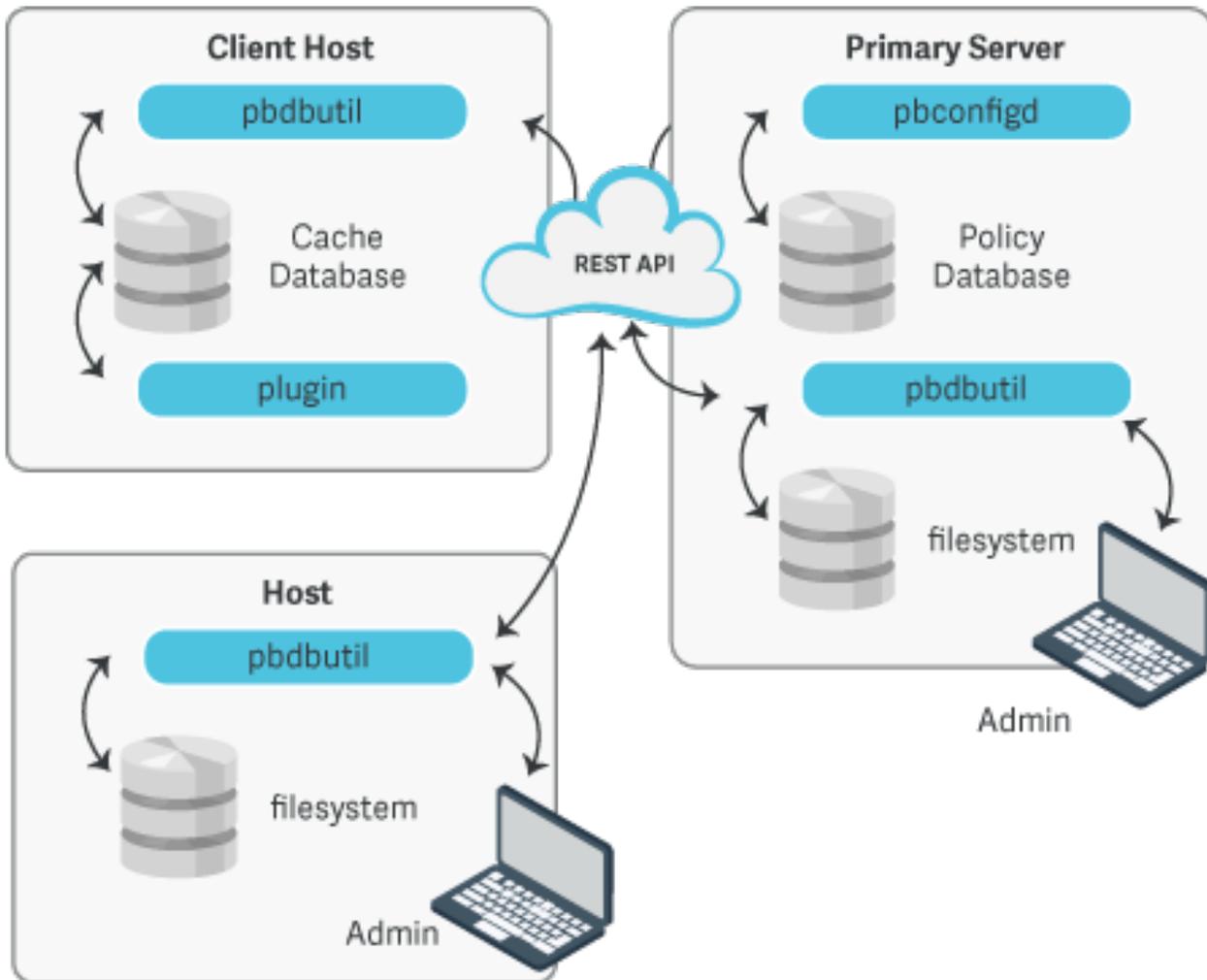
For more information, please see ["REST API" on page 423](#).

## Privilege Management for Unix & Linux Basic

Starting with v9.1, Privilege Management for Unix & Linux can be integrated with sudo. This integration requires Privilege Management for Unix & Linux Basic to be installed on hosts where sudo is installed. Integrating sudo with Privilege Management for Unix & Linux has the following benefits:

- Centralization of sudoers policies, stored in a secure database on the Policy Server host.
- Change management for sudoers policies. Once sudo policies are stored on the policy server, they can be checked out, modified, and checked back in centrally, without the need to go to each sudo host.
- Integration with Privilege Management for Unix & Linux eventlogs. After sudoers policy processing, an accept or reject event is logged in the event log.
- Integration with Privilege Management for Unix & Linux iolog. Sudo commands can be logged in the I/O logs, and read with **pbreplay**.

## Privilege Management for Unix & Linux Basic Architecture



## Privilege Management for Unix & Linux Basic Policy Server

The Privilege Management for Unix & Linux Basic policy server is the central repository of the sudoers policy files. It is highly recommended that hosts designated as a Privilege Management for Unix & Linux Basic policy servers are isolated from regular user activity to shield policies from users that can elevate their privileges.

Whenever Privilege Management for Unix & Linux Basic is installed on a sudo client host, a copy of the sudoers file, and any included policy files, are sent via encrypted file transfer to the Privilege Management for Unix & Linux Basic policy server where they are imported into a SQLite database. From then on, whenever sudo runs on a sudo client host, it ensures that it has the latest copy of the file(s) from the Privilege Management for Unix & Linux Basic policy server. This centralization of the sudoers files gives you better control over the integrity and consistency of the policies to be used across your organization. Modification of policy files is made against a singular location, with tools to check-out a file from the policy server's database and to check it back in when edits are done.

The policy changes are automatically distributed to appropriate hosts when the file gets pulled down at each sudo invocation at the target host, or by on-demand request.

## Install Privilege Management for Unix & Linux Basic Policy Server

Privilege Management for Unix & Linux Basic Policy Server is installed using the **pbinstall** program. It should not be confused with Privilege Management for Unix & Linux Policy Server which is designed to supplant sudo policy processing.



For more information, please see the [Privilege Management for Unix & Linux Installation Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

When you run **pbinstall**, answer **yes** to the install menu:

```
Install PBSUDO Policy Server?
```



**Note:** *tempfilepath* defines a temporary path to be used as the temporary filesystem for PMUL binaries. The default is set as */tmp*. At install time, if **pbinstall** is invoked, using *"-t <tempdir>"* option, *tempfilepath* will be set to *<tempdir>*. *lockfilepath* defines a lock file path for PMUL binaries as needed. The default is */opt/pbul/locks*.

## Create an Appid and Appkey

The installation program for Privilege Management for Unix & Linux Basic Policy Server will create an application ID (**appid**) and application key (**appkey**) which are used during the client registration of Privilege Management for Unix & Linux Basic hosts. The **appid** and **appkey** can be manually created:

```
# pbdbutil --rest -g appid  
{ "appid": "934bbab5-503e-4c40-8486-90c748142431" }
```

## Create a Registration Profile

When installing Privilege Management for Unix & Linux Basic Policy Server for sudo integration, a default profile **sudodefault** is created by **pbinstall** and the file **/etc/pbsudo.settings.default** is generated. When installing Privilege Management for Unix & Linux Basic on sudo hosts, this **sudodefault** profile, in conjunction with the aforementioned **appid** and **appkey**, can be used during the required client registration portion of the installation. However, you can also create your own registration profile. First, create the **/etc/pbsudo.settings.<name>** (where **name** is a name to identify this specific sudo settings file). This file will be used in your Registration profile and should contain the following settings that you will need to copy from **/etc/pb.settings**:

- **restkeyencryption**
- **pbrestport**
- **submitmasters**
- **transparentfailover**
- **logport**
- **logservers**
- **logserverdelay**
- **logserverprotocoltimeout**
- **randomizelogservers**
- **minoutgoingport**

- **maxoutgoingport**
- **networkencryption**
- **enforcehighsecurity**
- **ssl**
- **ssloptions**
- **sslengine**
- **sslcountrycode**
- **sslprovince**
- **ssllocality**
- **sslorgunit**
- **sslorganization**



**Note:** The *sudo*forceiolog in the default sudo profile is set to no.

Create the registration profile by running the following command on the Privilege Management for Unix & Linux Basic Policy Server as **root**:

```
# pbdbutil --reg -u '{"name":"<profile_name>","data":
[{"type":"save","to":"/etc/pbsudo.settings","fname":"/etc/pbsudo.settings.<name>"},
{"type":"save","sname":"networkencryption"},
{"type":"save","sname":"restkeyencryption"},
{"type":"save","sname":"sslservercertfile"}]}'
```

Add the **pbsudo.settings.<name>** to the configuration database by running:

```
# pbdbutil --cfg -l /etc/pbsudo.settings.<name>
```

## Configure Privilege Management for Unix & Linux Basic Policy Server

After the installation, the configuration file **/etc/pb.settings** is created for Privilege Management for Unix & Linux Basic policy server, which it shares with Privilege Management for Unix & Linux, if also installed. The file **/etc/pbsudo.settings.default** is also created, to be used when registering a Privilege Management for Unix & Linux Basic client host with this policy server.

The following settings keywords are added to the **/etc/pb.settings**:

### sudoersdb

The filename and location of the SQLite database where the sudoers files are stored.



For more information, please see "[sudoersdb](#)" on page 239.

### Example

```
sudoersdb /mypath/pbsudo.db
```

## Default

```
sudoersdb /opt/<prefix>pbul<suffix>/dbs/pbsudo.db
```

## sudoersdir

The absolute path of the directory which Privilege Management for Unix & Linux Basic Policy Server will use to export and import sudoers file. Sudoers and included files can be checked out, edited, and checked in using the existing mechanism in **pbdbutil**, within the **--sudo** option.

## Example

```
sudoersdir /mypath/sudoersdir
```

## Default

```
sudoersdir /opt/<prefix>pbul<suffix>/sudoersdir
```

## Privilege Management for Unix & Linux Basic Plugin

Privilege Management for Unix & Linux Basic provides a plugin that fits into sudo's modular framework to handle security policy processing and I/O logging. This plugin, along with supporting components and utilities, make up Privilege Management for Unix & Linux Basic and must be installed on all sudo hosts whose files you want to manage (sudoers files and generated data). During installation, the active sudoers files from this host is securely transported to the centralized Privilege Management for Unix & Linux Basic policy server repository for storage and maintenance, and the local copy effectively disabled.



### IMPORTANT!

*Once the sudo policy is in the Privilege Management for Unix & Linux Basic Policy Server host, and the Privilege Management for Unix & Linux Basic policy plugin is specified in **sudo.conf**, any edits to the sudo client's **/etc/sudoers** or its included files are ignored. The changes to sudoers policies need to be changed on the Privilege Management for Unix & Linux Basic Policy Server, by checking out the sudoers files, making the changes, and checking them back in.*



For more information, please see "[Central Management of Sudoers Policies on Privilege Management for Unix & Linux Basic Policy Server](#)" on page 45.

Whenever sudo is invoked on the target host to run a command, Privilege Management for Unix & Linux Basic on that host first ensures that it has the latest sudoers file from the Privilege Management for Unix & Linux Basic policy server before it proceeds into the policy processing and/or I/O logging. It saves a cached copy of the sudoers policy file so that users are never prevented from issuing sudo commands in case network issues arise. The cached policy remains valid for a configurable amount of time before the next update from the policy server is warranted at the next sudo invocation.



For more information, please see "[pbsudorefresh](#)" on page 242.



**Note:** *sudo* password validation occurs after policy processing (similar to Privilege Management's **runconfirmuser**), so any password errors will not be recorded as "rejects" in the Privilege Management for Unix & Linux Basic eventlog. A finish event will be generated with the **exitstatus** "ConfirmUser <username> failed" (similar to Privilege Management's **runconfirmuser** failures).

## Install Privilege Management for Unix & Linux Basic Plugin

Privilege Management for Unix & Linux Basic must be installed on all *sudo* hosts. The minimum required version of *sudo* is v1.8, but the policy constructs in the *sudoers* file must be available in v1.8.14 or earlier. The installation requires client registration and you will need Privilege Management for Unix & Linux Basic policy server's Application ID, Application Key, Client Profile name, as well as the hostname and port for a REST service.



For more information, please see the [Privilege Management for Unix & Linux Basic Installation Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

The **pbsudoinstall** installer program registers the target *sudo* host and securely transfers the *sudoers* policy file, along with relevant include files, to the Privilege Management for Unix & Linux Basic policy server for storage and maintenance. It then lays down Privilege Management for Unix & Linux Basic's customized policy and I/O plugin (**pbsudoers.so**), hooking it into the *sudo* front end configuration (**sudo.conf**), simultaneously deactivating any pre-existing plugins for policy processing and IO logging.



For more information on the **pbsudoers.so** plugin, please see "Host Aliases" on page 46.



For more information on how to edit the *sudoers* file, please see "Central Management of Sudoers Policies on Privilege Management for Unix & Linux Basic Policy Server" on page 45.

## Configure Privilege Management for Unix & Linux Basic Plugin

After installation, the configuration file **/etc/pbsudo.settings** is created with the necessary information that Privilege Management for Unix & Linux Basic needs to function properly: (for example, identify the and "logservers" on page 97).

The following keywords described below are important settings for Privilege Management for Unix & Linux Basic.

### Privilege Management for Unix & Linux Basic Required Settings

- "submitmasters" on page 81
- "enforcehighsecurity" on page 172
- "logport" on page 98
- "logservers" on page 97
- "networkencryption" on page 176
- "pbrestport" on page 238
- "restkeyencryption" on page 431
- "sharedlibcurldependencies" on page 148
- "sharedlibssldependencies" on page 218

## Other Privilege Management for Unix & Linux Basic Settings

- ["pbsudofailovertimeout" on page 242](#)
- ["pbsudorefresh" on page 242](#)
- ["sudoforceiolog" on page 99](#)

## Log Server for Privilege Management for Unix & Linux Basic

Privilege Management for Unix & Linux Basic employs one or more log servers to centrally store and manage audit data and session recordings. Establishing dedicated central log servers with data encryption capabilities and keeping them separate from hosts where privileged users run daily tasks assures the integrity of your audit trail. Privilege Management for Unix & Linux Basic hosts identify their log servers by the **logservers** keyword in the product settings file `/etc/pbsudo.settings`.

After Privilege Management for Unix & Linux Basic plugin processes a sudo command on the target host and produces either an accept or reject, it securely transmits the event log records directly to the log server for writing.



For more information, please see ["eventlog" on page 113](#).

If sudo is configured to record the user input and/or output, via **sudoforceiolog** setting or using sudoers **log\_input/ log\_output** options or **LOG\_INPUT** and **LOG\_OUTPUT** command tags, then Privilege Management for Unix & Linux Basic also sends the I/O log records to the log server for storage.



For more information, please see ["pbsudo\\_iolog" on page 240](#).

The event log and I/O log files may be encrypted for added security.



For more information, please see ["eventlogencryption" on page 178](#) and ["iologencryption" on page 179](#).

When a Privilege Management for Unix & Linux Basic log server cannot be reached, the sudo event and I/O logging mechanism is used.

With the event logs and I/O logs stored on the Privilege Management for Unix & Linux Basic log server, you can take advantage of the rich features that comes with the product.

- Replay the contents of an I/O log using **pbreplay**
- Integrate with Splunk
- Indexed I/O log for fast searches
- Specify I/O log close action
- Forward accept/reject events to BeyondInsight, if integrated, and have access to additional log reporting and analysis tools.



For more information, please see the following:

- ["pbreplay" on page 375](#)
- ["Splunk Integration" on page 35](#)
- ["Solr Indexing and Search" on page 32](#)
- ["I/O Log Close Action" on page 33](#)



- "pbsudo\_iologcloseaction" on page 160
- "Privilege Management for Unix & Linux and BeyondInsight Console" on page 30.

## Install Log Server for Privilege Management for Unix & Linux Basic

The log server is installed using the **pbinstall** program.



For more information, please see the [Privilege Management for Unix & Linux Basic Installation Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

When you run **pbinstall**, answer **yes** to the install menu:

```
Install PowerBroker Log Host?
```

## Configure Log Server for Privilege Management for Unix & Linux Basic

After the installation, the configuration file **/etc/pb.settings** is created which contains the following keywords:

### **pbsudo\_iolog**

The **pbsudo\_iolog** keyword specifies the path name where the Privilege Management for Unix & Linux Basic I/O logs from sudo clients are stored.



For more details, please see "pbsudo\_iolog" on page 240.

### **pbsudo\_iologcloseaction**

The **pbsudo\_iologcloseaction** keyword specifies an iolog close action for pbsudo iologs.



For more details, please see "pbsudo\_iologcloseaction" on page 160.

## Central Management of Sudoers Policies on Privilege Management for Unix & Linux Basic Policy Server

When sudoers policies are uploaded to a Privilege Management for Unix & Linux Basic Policy Server, they will be stored in a SQLite database in the file and directory specified by **sudoersdb** settings, and the local sudoers policies on the sudo hosts with Privilege Management for Unix & Linux Basic Policy Server are no longer used when running **sudo** commands on these hosts.

Sudoers policies can be managed from any client or server within the Privilege Management for Unix & Linux Basic enterprise. The command line utility can be used directly on a Privilege Management for Unix & Linux Basic policy server, or the user can specify the **--client** argument to the **pbdbutil --sudo** calls to remotely administer the sudo policies.

To manage the sudoers policies, you will need to export the file, modify it, and re-import it using **pbdbutil --sudo -e** and **pbdbutil --sudo -i** commands.

## Export Specified Sudoer Policy File from Database (`pbdbutil --sudo -e`)



**Note:** For export, if you use `--force` option, target directory structure will get created. If you do not want to use force, you can manually create the directories before export.

```
# pbdbutil --sudo -e sudohost.bt.com@/etc/sudoers --force
```

If there are multiple versions of a file in the database, an export with `-V` option will check out the file with specified version:

```
# pbdbutil --sudo -l -l /etc/sudoers
{"pathname":"sudohost.bt.com@/etc/sudoers","version":1,"tag":null,"deleted":0,"created":"2015-07-07 12:15:47"}
{"pathname":"sudohost.bt.com@/etc/sudoers","version":2,"tag":null,"deleted":0,"created":"2015-07-07 12:26:59"}
# pbdbutil --sudo -e -V "2" sudohost.bt.com@/etc/sudoers --force
```

## Example of Import (`pbdbutil --sudo -i`)

```
# pbdbutil --sudo -i /etc/pbsudoers/sudohost.bt.com/etc/sudoers
```



For more examples, please see **Sudo Database Options** in "`pbdbutil`" on page 319.

## Host Aliases

A Privilege Management for Unix & Linux Basic Host Alias provides a way to group several hosts that share a common set of sudoers policies. This is not the same as a Sudoers Host\_Alias, which is resolved inside a sudoers policy. Rather, a Privilege Management for Unix & Linux Basic Host Alias is used by the Privilege Management for Unix & Linux Basic Policy Server to select an appropriate policy by mapping different hostnames to the same arbitrary string.

Host Aliases are manipulated using the `pbdbutil` command on the Sudo Policy Server:

- To map host names to an alias:
  - `pbdbutil --sudo -A <ALIAS> <hostnames...>`
- To unmap host names from an alias:
  - `pbdbutil --sudo -X <ALIAS> <hostname...>`
- To list current aliases:
  - `pbdbutil --sudo -G [pattern]`

Sudo policies are stored in a database table that is keyed on path name and version. The version increments whenever a new copy is uploaded. The path name is composed of two parts:

```
<fqdn>@/<sudoers_path>
```

1. The client's fully qualified domain name
2. The client's default sudoers path (usually `/etc/sudoers`) as reported by `sudo -V`.

For example, if your Sudo Policy Server defines `sudoersdir` in `/etc/pb.settings` as `/etc/pbsudoers`, and your Linux client's name is `client0.bt.net`, then the pathname to identify its policy will be:

```
client0.bt.net@/etc/sudoers
```

By default, each new client will have its own policy uploaded to the Sudo Policy Server to a unique path during installation after client registration.



**Note:** The default sudoers path can vary by host. While it is commonly `/etc/sudoers`, third-party versions and custom builds may use different paths, like `/usr/local/etc/sudoers`. Use `sudo -V` to discover the current path. Each alias should be used only for hosts with the same sudoers path. Hosts with the same sudoers policy but a different sudoers path should use a different alias.



**Note:** The client governs the right part following the hostname or alias. The `pbsudoers.so` plugin defaults to `/etc/sudoers` on all platforms. Use the `sudoers_file` plugin argument to specify a different path.

A Privilege Management for Unix & Linux Basic Host Alias can map several hosts to the same policy by substituting an arbitrary ALIAS for the hostname:

```
<ALIAS>@/<sudoers_path>
```



Host aliases can easily be created by `pbsudoinstall` during installation on sudo hosts. For more information, please see the [Privilege Management for Unix & Linux Basic Installation Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

To implement an alias with policies outside of `pbsudoinstall`, first create a policy for the alias, then assign hosts to the alias. Do all of this on the Sudo Policy Server. This can be done before or after the clients are installed, and re-installation of the clients is not required.

1. Determine the `sudoersdir` path defined in the Sudo Policy Server's settings:

```
# pbcall -getstringsetting sudoersdir
```

For example, we will use `/etc/pbsudoers`.

2. Invent an alias name in all uppercase letters. For simplicity, we will use `ALIAS`.
3. Determine the default sudoers file path. For familiarity, we will use `/etc/sudoers`.
4. Create the policy directory and sudoers file.

```
# mkdir -p /etc/pbsudoers/ALIAS/etc
# vi /etc/pbsudoers/ALIAS/etc/sudoers
```

5. Verify the policy syntax with **visudo**, if available.

```
# visudo -c -f /etc/pbsudoers/ALIAS/etc/sudoers
```

6. Import the policy into the PBDB.

```
# pbdbutil --sudo -i /etc/pbsudoers/ALIAS/etc/sudoers
# pbdbutil --sudo -l
```

7. Map clients to the alias.

```
# pbdbutil --sudo -A ALIAS <host1> <host2> ...
# pbdbutil --sudo -G ALIAS
```

8. Adjust the **sudoers\_file** plugin argument in **sudo.conf** on all clients, especially those platforms with third-party or custom sudo. For example:

```
# grep Plugin /etc/sudo.conf
Plugin sudoers_policy /usr/lib/beyondtrust/pb/pbsudoers.so sudoers_file=/etc/sudoers
Plugin sudoers_io /usr/lib/beyondtrust/pb/pbsudoers.so
```

9. Verify the configuration on each client:

```
# sudo -V; sudo -l
```

## Multi-Byte Character Set Support

Privilege Management for Unix & Linux uses the locale settings on the host operating systems to support UTF-8 multi-byte character sets in Privilege Management for Unix & Linux policy files, I/O logs, and installation scripts. To correctly use Privilege Management for Unix & Linux in a multi-byte character set environment, you must ensure the following:

- All Privilege Management for Unix & Linux hosts (Policy Server host, Log Host, run host, submit host, and so on) have their locale settings correctly configured to the same locale.
- All processes that start at boot time or that are started by **inetd** or **xinetd** inherit the locale settings.



**Note:** UTF-8 multi-byte character sets are not yet supported in the following Privilege Management for Unix & Linux components:

- shells (**pbsh**, **pbksh**)
- utilities (**pbvi**, **pbnvi**, **pbless**, **pbgm**, **pbumacs**)
- browser interface (**pbgui**)



**Note:** If the environment variable **LANG**, or one of the environment variables **LC\_XXXX** is set to an invalid value, Privilege Management for Unix & Linux components do not error and set **LANG** to **C**. You must ensure **LANG** is correctly set, or if not set correctly, other components of Privilege Management for Unix & Linux (Policy Server, Log Server, `run host` and `submit host`, Privilege Management for Unix & Linux Basic Policy Server and client hosts) are also using **C** or single byte character set.

## PAM to RADIUS Authentication Module

Starting in V8.5, Privilege Management for Unix & Linux includes a PAM module (**pam\_radius\_auth**) to support authentication against a configured RADIUS server. The module allows Privilege Management for Unix & Linux to act as a RADIUS client for authentication and accounting requests.

You must have a RADIUS server already installed and configured before using this module. Your RADIUS server must also have the Privilege Management for Unix & Linux host requesting authentication already defined as a RADIUS client.

To configure Privilege Management for Unix & Linux to use **pam\_radius\_auth**, perform the following steps.

1. Locate the PAM to RADIUS Authentication Module:
  - Upon installation, the PAM module (**pam\_radius\_auth**) can be found in `/usr/lib/beyondtrust/pb`. It may be copied to a custom location or the system's default PAM module directory (for example, `/lib/security` or `/usr/lib/security`).
2. Set up the PAM configuration to use **pam\_radius\_auth**:
  - Set up a PAM configuration file for **pam\_radius\_auth** which would define a service stack using the **pam\_radius\_auth** module. For most Unix operating systems, it can be added in `/etc/pam.conf`. On Linux, it is a separate file in `/etc/pam.d` directory. The service name defined here may be used in the PAM-related Privilege Management for Unix & Linux settings keyword, policy functions, and variables.

### Example

```
/etc/pam.d/pbul_pam_radius:
#task control module
auth required pam_radius_auth.so
account required pam_radius_auth.so
password required pam_radius_auth.so
```

3. Create/locate the **pam\_radius\_auth** configuration file:
  - The **pam\_radius\_auth** configuration file identifies the RADIUS server(s) that will perform the authentication. By default, the **pam\_radius\_auth** configuration file is `/etc/raddb/server`. You can use a different path/filename and use the module option field in the PAM config file to specify the location:

### Example

```
/etc/pam.d/pbul_pam_radius:
auth required pam_radius_auth.so conf=<filepathname>
```

4. Set up the **pam\_radius\_auth** configuration file:
  - Edit the **pam\_radius\_auth** configuration file and add a line that represents your RADIUS server using this format:

```
server[:port] shared_secret [timeout]
```

<b>server</b>	Required. RADIUS server name or IP address.
<b>port</b>	Optional. Specify if the port name or number if different from the defined "radius" port name in <b>/etc/services</b> .
<b>shared_secret</b>	Required. The authentication key defined in the client configuration file for this host on the RADIUS server.
<b>timeout</b>	Optional. The number of seconds the module waits before deciding that the server has failed to respond. The default timeout is <b>3 seconds</b> .

### Example

```
216.27.61.130:1812 secretCnz9CkUtIeHqtCya89LzPTJEq0VnLCNA2SB9KWhIoSnC 10
```

5. Set up Privilege Management for Unix & Linux to use the **pam\_radius\_auth** module.



For more information on using the services defined here, please see "[Pluggable Authentication Modules](#)" on page 184.

## Privilege Management for Unix & Linux Component, Directory, and File Locations



For the locations of the Privilege Management for Unix & Linux components, directories, and files, along with other changes and post-installation instructions, please see the [Privilege Management for Unix & Linux Installation Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

## Settings

The Privilege Management for Unix & Linux settings file contains settings that control its operation. This section describes in detail how to configure these settings.

## Client and Server Programs

Privilege Management for Unix & Linux is a multi-level client-server application. The client programs are the programs that request services. The server programs are the programs that provide services. Any combination of client or server programs can exist on the same or different hosts.

### Privilege Management for Unix & Linux Client Programs

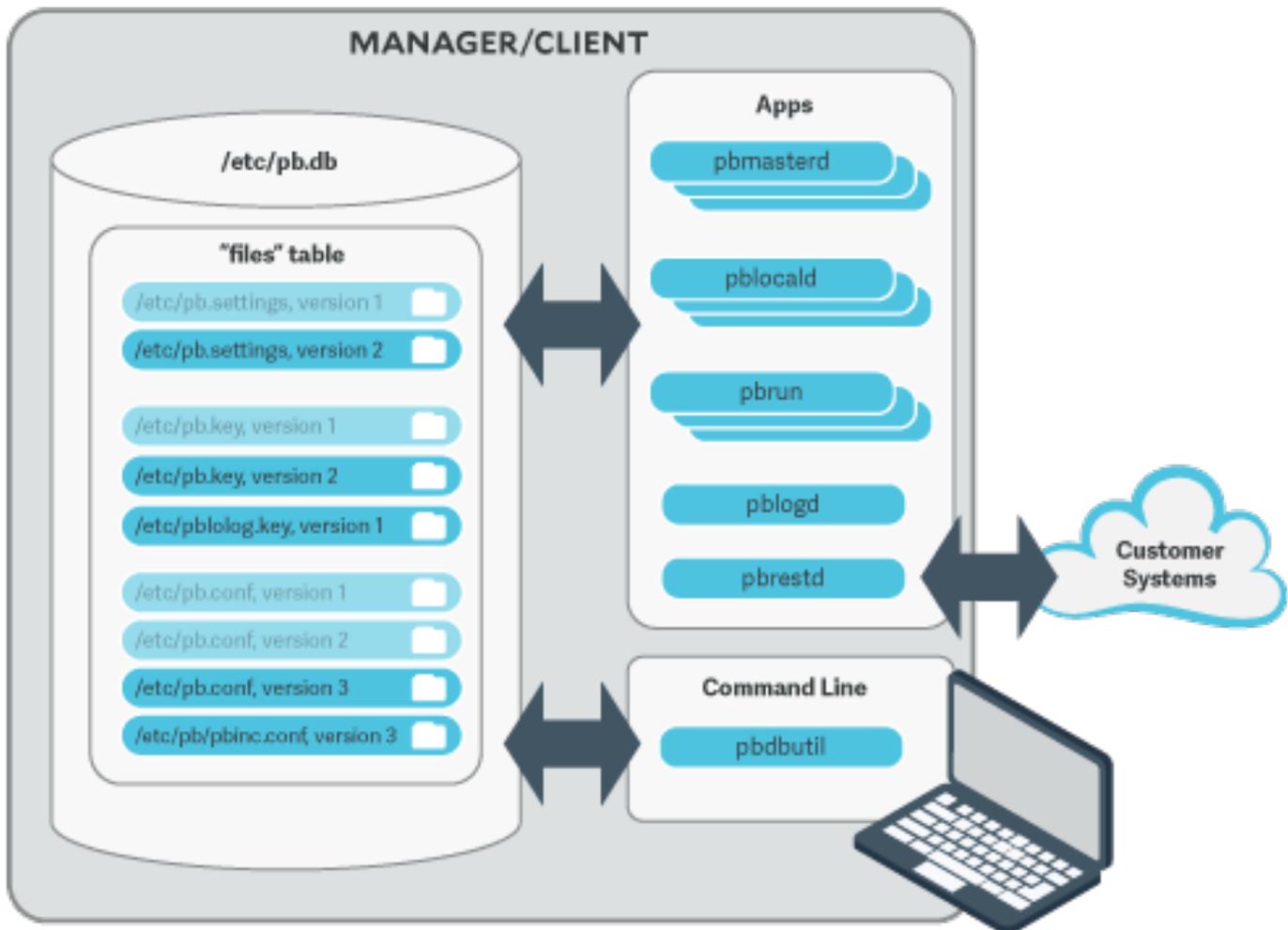
Program	Started From	Runs On
<b>pbguid</b>	browser host	Any host for settings file Policy Server host for policy editor Log host for event log and I/O log viewers (Policy Server host if no log host is used).
<b>pbksh</b>	submit host	submit host
<b>pbrun</b>	submit host	submit host
<b>pbsh</b>	submit host	submit host
<b>pbssh</b>	submit host	submit host

### Privilege Management for Unix & Linux Server Programs

Program	Started By	Runs On
<b>pblocald</b>	<b>pbmastered</b>	run host
<b>pblogd</b>	<b>pbmastered</b> <b>pblocald</b> Client programs in local mode	log host
<b>pbmastered</b>	Client programs	Policy Server host

## Configuration and Settings Database

The latest version of Privilege Management for Unix & Linux provides new facilities in the area of configuration and settings change management. To provide these facilities the existing configuration files, including the **pb.settings**, policy configuration scripts and encryption keys can now be stored within a database. The database will allow the storage of versioning information, and will allow the rollback of individual configuration files, or indeed complete sets of files from the command line.



To use the new change management facilities, simply import files into the database use the **pbdbutil**, for example:

```
# pbdbutil --cfg -i /etc/pb.settings /opt/pbul/policies/pb.conf /etc/pb.key
{"fname":"/etc/pb.settings","version":1}
```

```
# pbdbutil --cfg -i /etc/pb.settings /etc/pb.rest.key
{"fname":"/etc/pb.settings","version":1}
{"fname":"/etc/pb.rest.key","version":1}
```

As soon as the files are imported they are versioned and every Privilege Management for Unix & Linux binary will use the current database copy in preference to the existing files. The existing file is renamed and a comment inserted at the top of the file as an aide-memoire.



**Note:** Because the database now stores the imported files, we recommend the original files are moved as a backup. The backup will also serve as a reminder that these files no longer represent the current version.

To make changes to the files, export them, make the changes, and re-import the files:

```
# pbdbutil --cfg -e /etc/pb.settings
{"fname":"/etc/pb.settings","version":"#"}
# vi /etc/pb.settings
# pbdbutil --cfg -i /etc/pb.settings
{"fname":"/etc/pb.settings","version":2}
```

The version is incremented, and the current version stored.

Once the administrator is happy with a set of configuration files, these files may all be tagged together at their current version. This allows an administrator to retrieve all the tagged files at their respective versions at a later date. To tag a group of files, use **pbdbutil --cfg -t**:

```
# pbdbutil --cfg -l
{"version":1,"pathname":"/opt/pbul/policies/pb.conf","deleted":0,"created":"2018-05-21 14:26:51"}
{"version":2,"pathname":"/etc/pb.settings","deleted":0,"created":"2018-05-21 14:26:48"}

# pbdbutil --cfg -t "working" /etc/pb.settings /opt/pbul/policies/pb.conf
{"fname":"/etc/pb.settings","tag":"working","version":"#"}
{"fname":"/opt/pbul/policies/pb.conf","tag":"working","version":"#"}

```

The administrator can then export the files as a group:

```
# pbdbutil --cfg -l
{"version":1,"pathname":"/opt/pbul/policies/pb.conf","deleted":0,"created":"2018-05-21 14:26:51"}
{"version":2,"pathname":"/etc/pb.settings","deleted":0,"created":"2018-05-21 14:26:48"}

# pbdbutil --cfg -l /etc/pb.settings
{"pathname":"/etc/pb.settings","version":1,"tag":null,"deleted":0,"created ":"2018-05-21 14:26:46"}
{"pathname":"/etc/pb.settings","version":2,"tag":"working","deleted":0,"created":"2018-05-21
14:26:48"}

# pbdbutil --cfg -e -V working
{"fname":"/etc/pb.conf","version":"#"}
{"fname":"/etc/pb.settings","version":"#"}

```



For more information on other options to import, export, tag and diff database configuration files, please see **"pbdbutil"** on page 319 .

## Database Settings

### **databasedir**

- **Version 9.3.0 and earlier:** **databasedir** setting not available
- **Version 9.4.0 and later:** **databasedir** setting available

The **databasedir** setting is used to specify the default path to databases used within the product, that are specified with a relative path.

## Example

```
databasedir /opt/pbul/dbs  
servicedb pbsvc.db
```

Will configure the service database to be **/opt/pbul/dbs/pbsvc.db**. However,

```
databasedir /opt/pbul/dbs  
servicedb /etc/pbsvc.db
```

will not affect **servicedb**

## Default

```
databasedir /opt/<prefix>pbul<suffix>/dbs
```

## Used On

All hosts

## **databaselocktimeouts**

- **Version 10.0.1 and earlier:** **databaselocktimeouts** setting not available
- **Version 10.1.0 and later:** **databaselocktimeouts** setting available

The **databaselocktimeouts** setting is used to specify the database timeout values for all the various services with Privilege Management for Unix & Linux. Busy systems can sometimes produce delays in processing data because of contention for database resources. Usually a service will timeout on the specific database and return an error. However, this may not always be the best course of action.

The current list of services include:

- **license**
- **rns**
- **dbsync**
- **akapolicy**
- **iologidx**
- **restkey**
- **fim**
- **event**
- **logcache**
- **rbp**
- **sudo**
- **sched**
- **polpvar**
- **logarchive**
- **intprod**

- **clientreg**
- **pbpolicy**

There is also a default service that will be applied when a more specific setting has not been configured.

Values take the format of **service=<delay>,<retries>**, where **delay** is in microseconds.

### Example

```
databaselocktimeouts default=1000,30 fim=2000,60 rbp=500,10
```

### Default

No default value

### Used On

All hosts

### lockfileexpiry

Configuration and settings files are centrally managed by Privilege Management for Unix & Linux using a database. Administrators are allowed to lock the file(s) contained in databases to manage concurrency. The **lockfileexpiry** setting specifies the length of time (in seconds) before that file lock expires.

### Example

```
lockfileexpiry 45
```

### Default

```
0
```

### Client Registration

The Client Registration feature facilitates the installation and configuration of new Privilege Management for Unix & Linux clients into the enterprise. It consists of a centralized Registration Profile service, normally found on the Primary Server. This service is configured with customized profiles that match the settings required for the installation of hosts that provide differing roles in the organization. When new Privilege Management for Unix & Linux clients are installed these profiles are retrieved, providing the configuration required to complete the installation.

### cIntregdb

- **Version 9.3.0 and earlier:** **cIntregdb** setting not available
- **Version 9.4.0 and later:** **cIntregdb** setting available

The **cIntregdb** option specifies the path to the Client Registration database. This file is created in **basedir** by default, unless the file name starts with **/**.

## Example

```
clntregdb /etc/pbclntreg.db
```

## Default

```
clntregdb /opt/<prefix>pbul<suffix>/dbs/pbregclnt.db
```

## Used On

Primary Servers

## Example Client Registration Procedure

1. Install the primary License Server, making sure that the REST services are installed - make a note of the port number of the REST service. Also make sure that if the host has any firewalls installed, that this TCP port is unblocked.
2. After main installation is complete check that the REST service is running (**ps -ef | grep pbconfigd**), and if it isn't follow normal procedures to start the service
3. Create a REST application id and key, for example:

```
pbdbutil --rest -g appid  
{ "appkey": "934bbab5-503e-4c40-8486-90c748142431" }
```

4. Check the **pb.settings** file has all the necessary configuration, including encryption and encryption keys defined.
5. Now we are ready for a client install. Run the normal **pbinstall** on the client and when asked whether to use Client Registration, answer **yes**, and provide responses to the Client Registration configuration questions. For example:

```
Do you wish to utilize Client Registration? [yes]
```

```
Enter the Application ID generated on the Primary License Server: appid  
Enter the Application Key generated on the Primary License Server: 934bbab5-503e-4c40-8486-  
90c748142431  
Enter the Primary License Server address/domain name for registering clients:  
pbmasterhost.mydomain.com  
Enter the Primary License Server REST TCP/IP port [24351]: 24351  
Enter the Registration Client Profile name [default]: default
```

6. **pbinstall** will then default all the configuration of the install to the retrieved **pb.settings** and will transfer all the necessary keyfiles automatically

## Role Based Policy

Role Based Policy has been implemented to simplify the definition of policy for administrators. Policies are kept within structured records in a database, simplifying maintenance, decreasing system load, increasing throughput, and providing a comprehensive REST API to integrate policy management with existing customer systems and procedures, including simplified bulk import/export of

data. Once the customers' data is held within the Role Based Policy database it is much easier to provide management information, such as user entitlement reports. The policy data is grouped into users, hosts, commands, time/dates, and roles detailed in the schema below.

## Database Schema

### User Groups

User Groups define groups of users and/or wildcard patterns that match usernames:

```
CREATE TABLE usergrp ( id INTEGER PRIMARY, name TEXT UNIQUE,
description TEXT,
disabled INTEGER CHECK(disabled BETWEEN 0 AND 1), -- 0=enabled, 1=disabled
type CHAR(1) CHECK (type IN ('I','E')), -- I=Internal, E=external
single INTEGER CHECK(disabled BETWEEN 0 AND 1),
extinfo TEXT -- external lookup info
);

CREATE TABLE userlist (
id INTEGER REFERENCES usergrp(id),
user TEXT, -- "glob" wildcard
PRIMARY KEY(id,user)
);
```

Each User Group has multiple User List entries that specify names and/or wildcards that will match both submit and run user names when matched by the Role.

There is additionally a special value User List entry that allows the Role Based Policy to match on the specified submit username, that is **\$submituser\$**.

### USER GROUP

1. User Group ID (key, unique)
2. User Group Name (unique)
3. User Group Description
4. Disabled
5. Group Type (Internal/external)
6. External Group connection info (encoded - json ?)

### MEMBERSHIP LIST

1. User Group ID (foreign key)
  2. Member String (glob/regex)
- } Composite Key

### Host Groups

Host Groups define groups of hosts and/or wildcard patterns that match hostnames:

```

CREATE TABLE hostgrp ( id INTEGER PRIMARY, name TEXT UNIQUE,
description TEXT,
disabled INTEGER CHECK(disabled BETWEEN 0 AND 1), -- 0=enabled, 1=disabled
type CHAR(1) CHECK (type IN ('I','E')), -- I=Internal, E=external
extinfo TEXT -- external lookup info

CREATE TABLE hostlist (
id INTEGER REFERENCES hostgrp(id), host TEXT, -- "glob" wildcard
PRIMARY KEY(id,host)
);
    
```

Each Host Group has multiple Host List entries that specify names and/or wildcards that will match both submit and run host names when matched by the Role.

## HOST GROUP

1. Host Group ID (key, unique)
2. Host Group Name (unique)
3. Host Group Description
4. Disabled
5. Group Type (Internal/external)
6. External Group connection info (encoded - json ?)

## HOST LIST

1. Host Group ID (foreign key)
  2. Host String (glob/regex)
- } Composite Key

### Command Groups

Command Groups define groups of commands and/or wildcard patterns that match commands:

```

CREATE TABLE cmdgrp (
id INTEGER PRIMARY, name TEXT UNIQUE,
description TEXT,
disabled INTEGER CHECK(disabled BETWEEN 0 AND 1) -- 0=enabled, 1=disabled
);

CREATE TABLE cmdlist (
id INTEGER REFERENCES cmdgrp(id),
cmd TEXT, -- "glob" wildcard
rewrite TEXT, -- new command (see below)
PRIMARY KEY(id,cmd)
);
    
```

Each Command Group has multiple Command List entries that specify commands and/or wildcards that will match the submitted command name when matched by the Role, and a rewrite column to rewrite the command that will executed. The rewrite is in a

similar format to Bourne/Bash shell arguments. For example, **\$0**, **\$1**, **etc**, **\$\*** and **\$#**. Rewrite will use the original command to substitute arguments into the new rewritten command.



### Time/Date Groups

Time/Date Groups define groups of times/dates and/or wildcard patterns that match times/dates:

```
CREATE TABLE tmdategrp (
  id INTEGER PRIMARY,
  name TEXT UNIQUE,
  description TEXT,
  disabled INTEGER CHECK(disabled BETWEEN 0 AND 1) -- 0=enabled, 1=disabled

CREATE TABLE tmdatelist (
  id INTEGER REFERENCES tmdategrp(id),
  tmdate TEXT, -- json format - see below
  PRIMARY KEY(id,tmdate)
);
```

Each Time/Date Group has multiple Time/Date List entries that specify times/dates and/or wildcards that will match the submitted command name when matched by the Role, and a rewrite column to rewrite the command that will executed. Each individual time/date is specified in JSON format, and can be one of two different formats:

- **From/To specific date range:** from and to are specified in epoch seconds:

```
'{ "range" : { "from" : 1415851283, "to": 1415887283 } }'
```

- **Day of the Week:** each day is specified as an array of hours. Each hour is a number representing 15 minute intervals defined as a binary mask:

```

1 1 1 1
^ 0 to 14 minutes of the hour
^-- 15 to 29 minutes of the hour
^---- 30 to 44 minutes of the hour
^----- 45 to 59 minutes of the hour Therefore the values range from 0 to 15:

' {
"mon" : [0,0,0,0,0,0,0,15,15,15,15,15,15,15,15,15,15,15,15,3,0,0,0,0,0,0],
"tue" : [0,0,0,0,0,0,0,15,15,15,15,15,15,15,15,15,15,15,15,3,0,0,0,0,0,0],
"wed" : [0,0,0,0,0,0,0,15,15,15,15,15,15,15,15,15,15,15,15,3,0,0,0,0,0,0],
"thu" : [0,0,0,0,0,0,0,15,15,15,15,15,15,15,15,15,15,15,15,3,0,0,0,0,0,0],
"fri" : [0,0,0,0,0,0,0,15,15,15,15,15,15,15,15,15,15,15,15,3,0,0,0,0,0,0],
"sat" : [0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0],
"sun" : [0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0]
}'
    
```

## TIME/DATE GROUP

1. Time/Date Group ID (key, unique)
2. Time/Date Group Name (unique)
3. Time/Date Group Description
4. Disabled

## TIME/DATE LIST

1. Time/Date Group ID (foreign key)
  2. Time/Date/Day (json encoded)
- } Composite Key

## Roles

Roles are the entities that tie all the other entities together to define a role.

```

CREATE TABLE role (
  id INTEGER PRIMARY KEY,
  name TEXT UNIQUE,
  rorder INTEGER, -- rule order for matching
  description TEXT,
  disabled INTEGER CHECK(disabled BETWEEN 0 AND 1), -- 0=enabled, 1=disabled
  risk INTEGER CHECK(risk >= 0),
  action CHAR(1) CHECK (action IN ('A','R')), -- A=Accept, R=Reject
  iolog TEXT, -- iolog template
  script TEXT, -- pbparse script
  tag TEXT, -- Arbitrary tag that will allow grouping of roles
  comment TEXT, -- Arbitrary comment field that can contain anything
  message TEXT, -- Accept/reject message (templated)
  variables TEXT, -- Contains JSON formatted Policy Script variables to set (templated)
  varmatch TEXT, -- Contains JSON formatted Policy Script variables to match
  auth TEXT, -- Contains JSON formatted array of authentication methods (templated)
  rpt INTEGER DEFAULT 1 -- 1=on, 0=off, include Role in Entitlement Report
);
    
```

```
CREATE TABLE roleusers (
  id INTEGER REFERENCES role(id),
  users INTEGER REFERENCES usergrp(id),
  type CHAR(1) CHECK (type IN ('S','R')),           -- S=Submit, R=Run User
  PRIMARY KEY (id,users,type)
);

CREATE TABLE rolehosts (
  id INTEGER REFERENCES role(id),
  hosts INTEGER REFERENCES hostgrp(id),
  type CHAR(1) CHECK (type IN ('S','R')),           -- S=Submit, R=Run Host
  PRIMARY KEY (id,hosts,type)
);

CREATE TABLE rolecmds (
  id INTEGER REFERENCES role(id),
  cmds INTEGER REFERENCES cmdgrp(id),
  PRIMARY KEY (id,cmds)
);

CREATE TABLE roletmdates (
  id INTEGER REFERENCES role(id),
  tmdates INTEGER REFERENCES tmdategrp(id),
  PRIMARY KEY (id,tmdates)
);
```

Each role has multiple users, hosts, commands and time/dates. When the Policy Engine matches against roles, complete records are selected from the database as fully populated roles, sorted by the role attribute **rorder**. Once the first record has been matched, the attributes of the role are applied to the session, and the Policy Engine will accept or reject the session. The iolog template is the normal script format log file, for example `/var/log/io_log.XXXXXXX`. The script is a full Privilege Management for Unix & Linux script that will be called if the role has been accepted. This script can carry out extra processing to authorize the session (and can therefore override the accept/reject status with an implicit command), and can carry out extended environment configuration as would normal Privilege Management for Unix & Linux script.

## ROLE

1. Role Group ID (key, unique)
2. Role Name (unique)
3. Role Order
4. Role Description
5. Disabled
6. Risk
7. Accept/Reject
8. I/O Log Template
9. Script
10. Tg
11. Comment
12. Message Template
13. Policy Script Variables
14. Varmatch
15. Authentication Methods
16. Include In Entitlement Report

## SUBMIT/RUN USER LIST

1. Role ID (foreign key)
  2. User Group ID (foreign key)
  3. Type (submit/run)
- } Composite Key

## COMMAND LIST

1. Role ID (foreign key)
  2. Command Group ID (foreign key)
- } Composite Key

## SUBMIT/RUN HOST LIST

1. Role ID (foreign key)
  2. Host Group ID (foreign key)
  3. Type (submit/run)
- } Composite Key

## TIME/DATE LIST

1. Role ID (foreign key)
  2. Time/Date Group ID (foreign key)
- } Composite Key

### Change Management Events

There are two different approaches to maintaining the Role Based Policy database. The first, simple method is to access the tables using **pbdbutil** at the command line. Each change will be individual, instantaneous, and *live* immediately. Although for smaller organizations this will be adequate, larger organizations will be a more controlled procedural access method.

Role Based Policy database *change transactions* can be enabled using the settings **rbptransactions**. Once enabled, before changes can be made, the administrator must begin a change transaction, specifying a reason why the change is being made. This is logged and the whole Role Based Policy database is then locked for update. Only that administrator can continue to make changes. These changes will NOT be mirrored in the "live" authorization process and can continue to be made by that administrator alone, and when completed can be committed or rolled back. Once the changes are committed they are all applied to the database as one update, and a change management event is generated. If the changes are rolled back, they will be discarded and nothing will change.



**Note:** *If a change transaction is begun, and the administrator leaves it open and fails to close the transaction, any other administrator with access can force the rollback of the changes. This requires specifying a reason, and will log a change management event. The change transactions are necessary once the GUI policy updates are implemented to force database integrity.*



For more information, please see the below section for Change Transaction Command Line options.

To enable the logging of change management events, each client needs to configure the **pb.setting changemanagementevents** **yes**, log servers will need to define **eventdb <path>**, and the REST **pbconfigd** service must be running.

## Role Based Policy Settings

The following settings are used and need to be set when Role Based Policy and change management is implemented and used.

### policydb

- **Version 8.5 and earlier:** **policydb** setting not available
- **Version 9.0 and later:** **policydb** setting available

The **policydb** setting specifies the path to the Role Based Policy database. If the value is not an absolute path (does not start with "/"), the database file is created in the location provided by **datbasedir** setting.

#### Default

```
/opt/<prefix>pbul<suffix>/dbs/pbrbpolicy.db
```

#### Used On

Policy Server hosts

### rolebasedpolicy

- **Version 8.5 and earlier:** **rolebasedpolicy** setting not available
- **Version 9.0 and later:** **rolebasedpolicy** setting available

Enable or disable Role Based Policy checking. The default is no.

#### Example

```
rolebasedpolicy      yes
```

## Default

```
rolebasedpolicy      no
```

## Used On

Policy Server hosts

## rbptransactions

- **Version 8.5 and earlier:** **rbptransactions** setting not available
- **Version 9.0 and later:** **rbptransactions** setting available

Enable the use of Role Based Policy Transactions to ensure integrity.

## Example

```
rbptransactions      yes
```

## Default

```
rbptransactions      no
```

## Used On

Policy Server hosts

## changemanagementevents

- **Version 8.5 and earlier:** **changemanagementevents** setting not available
- **Version 9.0 and later:** **changemanagementevents** setting available

Enable/Disable the logging of Change Management Events when maintaining databases.

## Example

```
changemanagementevents      yes
```

## Default

```
changemanagementevents      no
```

The following settings are also used in Role Based Policy.

- **eventdb <path>**

The path to the Change Management Event Database. The default is **/opt/pbul/dbs/pbevent.db**.

- **pbresturi <string>**

The partial REST url string between the hostname and **/REST**. There is no default for this setting.

- **pbrestport <port#>**

The REST port. Default value is the **base port + 6**.

- **eventdestinations <taxonomy>=<remote>,<db>,<authevt>,<syslog>,</path/to/file>,</path/to/executable> <taxonomy>=.....**

Events can be sent to a remote host (Primary logserver), event database, syslog, a "flat file" on the file system, or a binary or script for consumption. Multiple destinations can be specified for each taxonomy with commas to separate. The default destination is "authevt=db".

- **eventformats <taxonomy>=<csv/json> <taxonomy>=....**

Specify the format of events to log (except database records which are always JSON). The default format is **JSON**

- **pbresttimeskew <num>**

The maximum time in seconds that hosts are mismatched by (it is recommended that the customer uses a time synchronization service). The default is **60 seconds**.



For more information, please see:

- "eventdb" on page 117.
- "pbresturi" on page 235.
- "pbrestport" on page 238.
- "eventdestinations" on page 117.
- "eventformats" on page 118.
- "pbresttimeskew" on page 238.

## Role Based Policy Entitlement Reports

Privilege Management for Unix & Linux v10.1.0 introduced Role Based Policy Entitlement Reports. These reports are available to the user from the **pbrun** command using **-e**, or to the administrator as an overall report using **pbdbutil --rbp -R**. To provide a comprehensive report on what users can access commands on which hosts, and when they are allowed to run them.

### pbdbutil: Role Based Policy Options

The **pbdbutil** Role Based Policy options introduced in Privilege Management for Unix & Linux v10.1.0 are described below.

```
pbdbutil --rbp [<options>] [ <file> <file> ...]
-R { json param } Report user entitlements from the database
-R Add option to display commands
-R Add option to display time/date restrictions
-R Add option to display additional role options
-E { json param } List user entitlements data from the database
where { json param } is one or more of:
"submituser" : "user1" Specify submit user or wildcard
```

```
"submithost" : "host1" Specify submit host or wildcard
"runuser" : "user1" Specify run user or wildcard
"runhost" : "host1" Specify run host or wildcard
"command" : "command" Specify command or wildcard
```

## pbrun Options

Privilege Management for Unix & Linux v10.1.0 introduced the following options that are available only when Role Based Policy is enabled:

<b>pbrun -e</b>	Will return the entitlement report for the current user at level 1
<b>pbrun -e 1</b>	Will return the entitlement report for the current user at level 1
<b>pbrun -e 4</b>	Will return the entitlement report for the current user at level 4
<b>pbrun --entitlement=4</b>	Will return the entitlement report for the current user at level 4

## Examples of Entitlement Reports

### Level 1 Report

```
=====
Privilege Management for Unix & Linux Role Based Policy Entitlement Report - Level 1
-----
Date/Time: 2018-06-18 09:07:23
User: root
Belongs to the following Roles:
Admin
=====
Role Order: 1
Name: Admin
Description: Super users and admins
Action: allowed
Tag:
Membership: Admins
Submit Host(s): Any PBUL Host
Run Host(s): Any PBUL Host
Commands may be executed as user(s): root,admin,user*
Please use the '-u' flag to select user at run time.
eg: pbrun -u runuser command [arguments]
User may request the following commands using pbrun:
/bin/find *,/usr/bin/ls,/bin/ls,/bin/cat *,/bin/ls *,/usr/bin/ls *,/usr/bin/rm *,
/usr/bin/cat *,/usr/bin/find *,/sbin/shutdown *,/bin/more *,/bin/id,/usr/bin/more *,
/usr/bin/mount *,/bin/lm *,/bin/mount *,/bin/rm *,/usr/sbin/shutdown *,
/usr/bin/lm *,/usr/bin/id,/sbin/ifconfig *,/usr/sbin/ifconfig *
```

### Level 2 Report

```
=====
Privilege Management for Unix & Linux Role Based Policy Entitlement Report - Level 2
```

```
-----
Date/Time: 2018-06-18 09:07:28
User: root
Belongs to the following Roles:
Admin
=====
Role Order: 1
Name: Admin
Description: Super users and admins
Action: allowed
Tag:
Risk: 1
Membership: Admins
Submit Host(s): Any PBUL Host
Run Host(s): Any PBUL Host
Commands may be executed as user(s): root,admin,user*
Please use the '-u' flag to select user at run time.
eg: pbrun -u runuser command [arguments]
User may request the following commands using pbrun:
Command Group: User Commands
Description: Common UNIX Commands
/bin/ls executes: /bin/ls
/bin/ls * executes: /bin/ls *
/usr/bin/ls executes: /usr/bin/ls
/usr/bin/ls * executes: /usr/bin/ls *
/bin/cat * executes: /bin/cat *
/usr/bin/cat * executes: /usr/bin/cat *
/bin/find * executes: /bin/find *
/usr/bin/find * executes: /usr/bin/find *
/bin/more * executes: /bin/more *
/usr/bin/more * executes: /usr/bin/more *
/bin/rm * executes: /bin/rm -i $*
/usr/bin/rm * executes: /usr/bin/rm -i $*
/bin/ln * executes: /bin/ln *
/usr/bin/ln * executes: /usr/bin/ln *
/bin/id executes: /bin/id
/usr/bin/id executes: /usr/bin/id
Command Group: Admin Commands
Description: Common Superuser Commands
/sbin/shutdown * executes: /sbin/shutdown *
/usr/sbin/shutdown * executes: /usr/sbin/shutdown *
/bin/mount * executes: /bin/mount *
/usr/bin/mount * executes: /usr/bin/mount *
/sbin/ifconfig * executes: /sbin/ifconfig *
/usr/sbin/ifconfig * executes: /usr/sbin/ifconfig *
```

### Level 3 report

```
=====
Privilege Management for Unix & Linux Role Based Policy Entitlement Report - Level 3
-----
```

```
Date/Time: 2018-06-18 09:07:30
User: root
Belongs to the following Roles:
```

```
Admin
=====
Role Order: 1
Name: Admin
Description: Super users and admins
Action: allowed
Tag:
Risk: 1
Membership: Admins
Submit Host(s): Any PBUL Host
Run Host(s): Any PBUL Host
Commands may be executed as user(s): root,admin,user*
Please use the '-u' flag to select user at run time.
eg: pbrun -u runuser command [arguments]
User may request the following commands using pbrun:
Command Group: User Commands
Description: Common UNIX Commands
/bin/ls executes: /bin/ls
/bin/ls * executes: /bin/ls *
/usr/bin/ls executes: /usr/bin/ls
/usr/bin/ls * executes: /usr/bin/ls *
/bin/cat * executes: /bin/cat *
/usr/bin/cat * executes: /usr/bin/cat *
/bin/find * executes: /bin/find *
/usr/bin/find * executes: /usr/bin/find *
/bin/more * executes: /bin/more *
/usr/bin/more * executes: /usr/bin/more *
/bin/rm * executes: /bin/rm -i $*
/usr/bin/rm * executes: /usr/bin/rm -i $*
/bin/ln * executes: /bin/ln *
/usr/bin/ln * executes: /usr/bin/ln *
/bin/id executes: /bin/id
/usr/bin/id executes: /usr/bin/id
Command Group: Admin Commands
Description: Common Superuser Commands
/sbin/shutdown * executes: /sbin/shutdown *
/usr/sbin/shutdown * executes: /usr/sbin/shutdown *
/bin/mount * executes: /bin/mount *
/usr/bin/mount * executes: /usr/bin/mount *
/sbin/ifconfig * executes: /sbin/ifconfig *
/usr/sbin/ifconfig * executes: /usr/sbin/ifconfig *
Date and Time restrictions for Role 'Admin':
Time/Date Group: Any Time
Description: Any Time
Monday: 01:00am to 12:14pm
Tuesday: 01:00am to 12:14pm
Wednesday: 01:00am to 12:14pm
Thursday: 01:00am to 12:14pm
Friday: 01:00am to 12:14pm
Saturday: 01:00am to 12:14pm
Sunday: 01:00am to 12:14pm
```

## Level 4 report

```
=====
Privilege Management for Unix & Linux Role Based Policy Entitlement Report - Level 4
-----
Date/Time: 2018-06-18 09:07:32
User: root
Belongs to the following Roles:
Admin
=====
Role Order: 1
Name: Admin
Description: Super users and admins
Action: allowed
Tag:
Risk: 1
Membership: Admins
Submit Host(s): Any PBUL Host
Run Host(s): Any PBUL Host
Commands may be executed as user(s): root,admin,user*
Please use the '-u' flag to select user at run time.
eg: pbrun -u runuser command [arguments]
User may request the following commands using pbrun:
Command Group: User Commands
Description: Common UNIX Commands
/bin/ls executes: /bin/ls
/bin/ls * executes: /bin/ls *
/usr/bin/ls executes: /usr/bin/ls
/usr/bin/ls * executes: /usr/bin/ls *
/bin/cat * executes: /bin/cat *
/usr/bin/cat * executes: /usr/bin/cat *
/bin/find * executes: /bin/find *
/usr/bin/find * executes: /usr/bin/find *
/bin/more * executes: /bin/more *
/usr/bin/more * executes: /usr/bin/more *
/bin/rm * executes: /bin/rm -i $*
/usr/bin/rm * executes: /usr/bin/rm -i $*
/bin/ln * executes: /bin/ln *
/usr/bin/ln * executes: /usr/bin/ln *
/bin/id executes: /bin/id
/usr/bin/id executes: /usr/bin/id
Command Group: Admin Commands
Description: Common Superuser Commands
/sbin/shutdown * executes: /sbin/shutdown *
/usr/sbin/shutdown * executes: /usr/sbin/shutdown *
/bin/mount * executes: /bin/mount *
/usr/bin/mount * executes: /usr/bin/mount *
/sbin/ifconfig * executes: /sbin/ifconfig *
/usr/sbin/ifconfig * executes: /usr/sbin/ifconfig *
Date and Time restrictions for Role 'Admin':
Time/Date Group: Any Time
Description: Any Time
Monday: 01:00am to 12:14pm
Tuesday: 01:00am to 12:14pm
Wednesday: 01:00am to 12:14pm
```

```
Thursday: 01:00am to 12:14pm
Friday: 01:00am to 12:14pm
Saturday: 01:00am to 12:14pm
Sunday: 01:00am to 12:14pm
Additional Role Options:
Additional Authentication Required: no
Session Recording Enabled: yes
Extended Script Policy: no
Custom accept/reject message: no
```

## Level 1 Report with Command Filter

```
pdbbutil -P --rbp -R '{ "command":"/usr/bin/*"}'
```

=====

Privilege Management for Unix & Linux Role Based Policy Entitlement Report - Level 1

-----

Date/Time: 2018-06-18 09:09:10  
User: \*  
Belongs to the following Roles:  
Admin,users

=====

Role Order: 1  
Name: Admin  
Description: Super users and admins  
Action: allowed  
Tag:  
Risk: 1  
Membership: Admins  
Submit Host(s): Any PBUL Host  
Run Host(s): Any PBUL Host  
Commands may be executed as user(s): root,admin,user\*  
Please use the '-u' flag to select user at run time.  
eg: pbrun -u runuser command [arguments]  
User may request the following commands using pbrun:  
/usr/bin/ls,/usr/bin/mount \*,/usr/bin/ls \*,/usr/bin/cat \*,/usr/bin/find \*,  
/usr/bin/rm \*,/usr/bin/ln \*,/usr/bin/more \*,/usr/bin/id

=====

Role Order: 4  
Name: users  
Description: Normal users  
Action: allowed  
Tag:  
Membership: Users  
Submit Host(s): nfs.company.com,build.company.com,staging.company.com  
Run Host(s): nfs.company.com,build.company.com,staging.company.com  
Commands will execute as user: user\*  
User may request the following commands using pbrun:  
/usr/bin/ls,/usr/bin/ls \*,/usr/bin/find \*,/usr/bin/cat \*,/usr/bin/ln \*,  
/usr/bin/rm \*,/usr/bin/more \*,/usr/bin/id

## Level 4 Report with Command Filter

```
=====
Privilege Management for Unix & Linux Role Based Policy Entitlement Report - Level 4
-----
Date/Time: 2018-06-18 09:09:26
User: *
Belongs to the following Roles:
Admin,users
=====
Role Order: 1
Name: Admin
Description: Super users and admins
Action: allowed
Tag:
Risk: 1
Membership: Admins
Submit Host(s): Any PBUL Host
Run Host(s): Any PBUL Host
Commands may be executed as user(s): root,admin,user*
Please use the '-u' flag to select user at run time.
eg: pbrun -u runuser command [arguments]
User may request the following commands using pbrun:
Command Group: Admin Commands
Description: Common Superuser Commands
/usr/bin/mount * executes: /usr/bin/mount *
Command Group: User Commands
Description: Common UNIX Commands
/usr/bin/ls executes: /usr/bin/ls
/usr/bin/ls * executes: /usr/bin/ls *
/usr/bin/cat * executes: /usr/bin/cat *
/usr/bin/find * executes: /usr/bin/find *
/usr/bin/more * executes: /usr/bin/more *
/usr/bin/rm * executes: /usr/bin/rm -i $*
/usr/bin/ln * executes: /usr/bin/ln *
/usr/bin/id executes: /usr/bin/id
Date and Time restrictions for Role 'Admin':
Time/Date Group: Any Time
Description: Any Time
Monday: 01:00am to 12:14pm
Tuesday: 01:00am to 12:14pm
Wednesday: 01:00am to 12:14pm
Thursday: 01:00am to 12:14pm
Friday: 01:00am to 12:14pm
Saturday: 01:00am to 12:14pm
Sunday: 01:00am to 12:14pm
Additional Role Options:
Additional Authentication Required: no
Session Recording Enabled: yes
Extended Script Policy: no
Custom accept/reject message: no
=====
Role Order: 4
Name: users
Description: Normal users
```

```

Action: allowed
Tag:
Risk: 1
Membership: Users
Submit Host(s): build.company.com,nfs.company.com,staging.company.com
Run Host(s): build.company.com,nfs.company.com,staging.company.com
Commands will execute as user: user*
User may request the following commands using pbrun:
Command Group: User Commands
Description: Common UNIX Commands
/usr/bin/ls executes: /usr/bin/ls
/usr/bin/ls * executes: /usr/bin/ls *
/usr/bin/cat * executes: /usr/bin/cat *
/usr/bin/find * executes: /usr/bin/find *
/usr/bin/more * executes: /usr/bin/more *
/usr/bin/rm * executes: /usr/bin/rm -i $*
/usr/bin/ln * executes: /usr/bin/ln *
/usr/bin/id executes: /usr/bin/id
Date and Time restrictions for Role 'users':
Time/Date Group: Working Week
Description: Working Week
Monday: 01:00am to 12:14pm
Tuesday: 01:00am to 12:14pm
Wednesday: 01:00am to 12:14pm
Thursday: 01:00am to 12:14pm
Friday: 01:00am to 12:14pm
Saturday: none
Sunday: none
Additional Role Options:
Additional Authentication Required: no
Session Recording Enabled: no
Extended Script Policy: no
Custom accept/reject message: no
    
```

## Settings and Configuration Policy File Names

It is possible for one machine to have multiple installations of Privilege Management for Unix & Linux. This can be done to balance resources or partition usage.



For a description of this feature as a prefixed and/or suffixed install, please see the [Privilege Management for Unix & Linux Installation Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

For example, if the prefix is **g** and the suffix is **7**, the **pblogd** executable is installed as **gpblogd7**. The same prefixes and/or suffixes also apply to all of the files that are used by default for Privilege Management for Unix & Linux. Continuing the example, the settings file changes from **pb.settings** to **gpb.settings7**. The same prefix and/or suffix is also prepended and/or appended to **pb.key**, **pb.conf**, and all the binary files in this installation set.

This feature can be used to allow for multiple configurations with different functionality, such as Kerberized and non-Kerberized installations on the same machine. For example, a suffix of **k** could be used for the Kerberized files.

Throughout this guide there are references to **/etc/pb.settings** and **/opt/pbul/policies/pb.conf**. This usage assumes that the default settings and configuration files are used.

Privilege Management for Unix & Linux programs recognize prefixes and/or suffixes on their names and use settings and configuration files with the same prefixes and/or suffixes. This feature allows multiple differing configurations on the same machine. This feature is consistent with the rest of the product where any number of settings files may be used. Examples of the settings and configuration file names are listed in the following table:

### Default Settings and Configuration Policy File Names

Program Name	Settings Filename	Default Policy Configuration File
pbrun	/etc/pb.settings	/opt/pbul/policies/pb.conf
pbrun_alt	/etc/pb.settings_alt	/opt/pbul_alt/policies/pb.conf_alt
my.pnrun	/etc/my.pnpb.settings	/opt/my.pnpbul/opt/my.pbpb.conf
kpbmasterd	/etc/kpb.settings	/opt/kpbul/opt/kpb.conf
kpblocald.2	/etc/kpb.settings.2	/opt/kpbul.2/opt/kpb.conf.2

If the prefix or suffix cannot be determined, then `/etc/pb.settings` and `/opt/pbul/policies/pb.conf` are used.

## File Locations

### environmentfile

- **Version 5.2 and earlier:** `environmentfile` setting not available
- **Version 6.0 and later:** `environmentfile` setting available

The `environmentfile` setting enables you to specify the absolute path and file name of an environment file. Privilege Management for Unix & Linux can incorporate the environment variables that are specified in the environment file into the run environment. These environment variables are applied on the run host after the Accept event has been logged.

The `environmentfile` setting can be overridden in the policy by setting the `runenvironmentfile` variable.



For more information, please see `runenvironmentfile` in the [Privilege Management for Unix & Linux Policy Language Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

The environment file must consist of the following:

- Comment lines, which have a `#` character in the first non-whitespace position
- Blank lines
- Bourne shell compatible environment variable setting lines with the form **NAME=VALUE**



**Note:** Each line in the file must contain less than 1024 characters. Line continuation is not supported. This file must not contain any shell commands or constructs other than the setting of environment variables. Comments must not appear on the same line as an environment variable.



**Note:** This keyword does not apply to `pbssh`. If it is present in the settings file, it does not have any effect on `pbssh` and is ignored.

## Examples

```
environmentfile "/etc/environment"  
environmentfile "/etc/environment2"
```

## Default

No default value

## Used on

Run hosts

## pbrunpath

- **Version 6.0 and earlier:** **pbrunpath** setting not available
- **Version 6.2.5 and later:** **pbrunpath** setting available

The **pbrunpath** setting specifies the absolute path to the directory that contains the **pbrun** and **pbssh** executable files on the **pbguid** host. This setting enables the Task Manager feature to work properly. For more information about the Task Manager feature, see "Using the Task Manager" in the *Privilege Management for Unix & Linux Browser Interface Guide*.

## Example

```
pbrunpath /usr/bin/
```

## Default

No default value

## Used on

- **pbguid** host
- Run hosts

## policydir and policyfile

- **Version 4.0.0 and later:** **policydir** and **policyfile** settings available

Privilege Management for Unix & Linux uses the settings file **/etc/pb.settings** (or a prefixed and/or suffixed settings file). By default, the main policy file is **/opt/pbul/policies/pb.conf** (**/etc/pb.conf** prior to v9.4.3). You can choose a different configuration policy file by using the **policydir** and **policyfile** settings.

The **policyfile** setting contains the name of a policy file. If the name is an absolute path (starting with a **/**), then that file name is used. If the **policyfile** setting does not start with a **/**, then the value of **policydir** is prepended to it.

## Examples

```
# Use /etc/my.pb.conf as the configuration policy file
policyfile /etc/my.pb.conf

# Use /usr/local/powerbroker/powerbroker.conf as the configuration
# policy file
policydir /usr/local/powerbroker
policyfile powerbroker.conf
```

**policydir** also controls include files in the configuration policy. If a file name in an include statement starts with a */*, then that file is used. However, if the file name does not start with a */*, the **policydir** setting is prepended to it. For example, if **policydir** is set to **/etc/pb.includes**:

```
include "admin.conf";
# Includes /etc/pb.includes/admin.conf
```

but

```
include "/etc/admin.conf";
# Includes /etc/admin.conf
```

## Defaults

```
policydir /opt/<prefix>pbul<suffix>/policies (/etc prior to v9.4.3)
policyfile /opt/<prefix>pbul<suffix>/policies/<prefix>pb.conf<suffix>
```

## Used on

Policy Server hosts

### polycypersistentvariabledb

- **Version 9.4.4 and earlier:** **polycypersistentvariabledb** setting not available
- **Version 9.4.5 and later:** **polycypersistentvariabledb** setting available

The **polycypersistentvariabledb** option specifies the path to the Persistent Variable database used in script policy.

## Example

```
polycypersistentvariabledb /etc/pbpersist.db
```

## Default

```
polycypersistentvariabledb /opt/<prefix>pbul<suffix>/dbs/pbpersistentvar.db
```

## Used On

Policy Servers

### tempfilepath

- **Version 10.2.0 and earlier:** **tempfilepath** setting not available
- **Version 10.3.0 and later:** **tempfilepath** setting available

The **tempfilepath** option defines a temporary path to use as the temporary filesystem for PMUL binaries. The value can be any valid directory.

## Default

```
/tmp
```

## Used On

Policy Servers

### lockfilepath

- **Version 10.2.0 and earlier:** **lockfilepath** setting not available
- **Version 10.3.0 and later:** **lockfilepath** setting available

The **lockfilepath** option defines a lock file path for PMUL binaries, when needed. The value can be any valid secure directory.

## Default

```
lockfilepath /opt/<prefix>pbul<suffix>/locks
```

## Used On

Policy Servers

### lockfiletimeout

Privilege Management for Unix & Linux uses a lockfile when it writes into flat files (e.g. policy file or settings file) on the filesystem. This prevents multiple processes overwriting each other's work. The **lockfiletimeout** setting specifies the maximum number of seconds for a process to wait for a lock to be free.

## Example

```
lockfiletimeout 45
```

## Default

```
lockfiletimeout 30
```

## Host and Port Specifications

In several settings, Privilege Management for Unix & Linux requests hosts and/or ports.

### Port Specifications

A port can consist of a file name for Unix/Linux Domain Sockets or a number or service name with an optional interface. The port numbers for Privilege Management daemons must use the non-reserved system ports. The allowed port numbers are **1024** to **65535** (inclusive).

The optional interface specification is useful on a machine that has multiple interfaces or network cards. The interface specification enables you to specify the exact interface to use.

### Format

```
[port=]<number or service name>[:interface=<host name or IP address>] [port=]<absolute file name>
```

The optional interface may be a host name or IP address. If the optional interface is specified for an incoming port, then only connections on that interface are accepted. If the optional interface is specified for an outgoing port, then only that interface is used to form the connection.

Port Format	Description	Example
[port=]<absolute file name>	A local (Unix/Linux Domain) socket	/tmp/pbport port=/tmp/pbmasterd_port
[port=]<number>	A numeric TCP/IP port	24345 port=24345
[port=]<service name>	A service name from <b>/etc/services</b> or NIS	pbmasterd port=pbmasterd
[port=]<number>: interface=<hostname>	A numeric TCP/IP port on a specific interface	24345:interface= localhost port=24345: interface= host.domain
[port=]<service name>:interface=<IP address>	A service name from <b>/etc/services</b> or NIS on a specific interface	pbmasterd: interface= 127.0.0.1 port=pbmasterd: interface= 192.168.1.1

When using a symbolic name, Privilege Management services need to be defined in **/etc/services**. Doing so enables the superdaemon, Privilege Management for Unix & Linux programs, and system utilities (such as **nslookup**) to know the symbolic names of the ports (and services) that are provided by Privilege Management.

### Host Specifications

Hosts may be a host name, an IP address, a DNS SRV lookup entry, the "\_auto" DNS SRV lookup, or a path to an external program. If appropriate, they may also be followed by a port specification.

### Format

```
<host name or IP address>
```

A valid host name can contain any letter or digit. It can also contain a hyphen. The last character must be a letter or a digit.

```
<DNS SRV lookup>
```



**Note:** *Privilege Management for Unix & Linux validates data returned from DNS SRV lookups to exclude any data that contains the following illegal characters:*

```
/'~?!@#$%^&*(){}<>=;|\\''"
```

When Privilege Management for Unix & Linux components processing the **submitmasters**, **altsubmitmasters**, **acceptmasters**, and **logservers** keywords encounter an entry that begins with an underscore (`_`) those components will perform a DNS query. That query returns a port value for the service, as well as a list of hosts providing that service. A complete DNS SRV lookup specification includes the service name, protocol (which is always `_tcp`), domain, and a port specification. The **submitmasters**, **acceptmasters**, and **logservers** keywords have the ability to specify a lookup in the format:

```
_<pbul service name>._tcp.<domain name>.[:port=<port>[:interface=<IP or hostname>]]
```

All elements are optional except the service name. If the domain name portion is missing, it is up to the resolver and its configuration to define and use a search order (for example, `/etc/resolv.confsearch` entry). If the `._tcp` portion is missing, it is added automatically. This implementation supports the SRV hostname, port and priority values, and ignores the SRV weight value.

If the port value returned in the DNS query is non-zero, it will override the corresponding port specified in **pb.settings** (for example, a DNS lookup for **submitmasters**, which returns a port `> 0`, will override any port specified in the **submitmasters** keyword and in the **masterport** keyword).

If the port specified in DNS is zero, the port specified in the corresponding **submitmasters**, **altsubmitmasters**, or **logservers** keyword (if specified there) is used. If not specified, the port specified in the corresponding **masterport**, **logport** keywords is used.

If an interface is specified in **pb.settings** (for example, specified in the **submitmasters** keyword or in the **masterport** keyword), that interface will be used even if the corresponding port is overridden by the DNS lookup.

The DNS SRV lookup can be specified in any order in the list of hosts, and will be processed in that order. For example, the **pbl.settings** entry:

```
submitmasters host1 _pbmasterd host2
```

Will result in the attempt to use `host1` as a Policy Server. Only if that fails, will DNS SRV records be queried for the `_pbmasterd._tcp` entry. Only if all hosts specified in the DNS SRV query results fail, will `host2` be contacted.

Once an SRV lookup takes place, the priority values specified in DNS will be used for those entries.



**Note:** *DNS can be configured for round-robin or randomized results for a minimal form of load balancing, if desired.*

In this case, the order of DNS results are modified by DNS and Privilege Management for Unix & Linux simply processes the SRV query results in the order received.

The **randomizesubmitmasters** keyword should not be used with the use of DNS SRV lookups. For example, if the **pb.settings** entry is:

```
submitmasters host1 _pbmasterd host2
```

The **randomizesubmitmasters** could cause `host2` to be contacted prior to performing the `_pbmasterd` service lookup, prior to `host1`. The **randomizesubmitmasters** will not affect the order of processing the SRV query results. This would conflict with the SRV priority values.



**Note:** *When a DNS SRV lookup is specified for the **acceptmasters** keyword, the SRV priority and port are irrelevant.*



**Note:** *pbsyncd* uses the **logservers** keyword to identify logservers, however this uses a different port than **pblogd**, so any DNS SRV records for host providing **pbsyncd** should have the port set to 0.

```
<_auto DNS SRV lookup>
```

The special service name **\_auto** is used to build a service name from the Privilege Management installation's prefix and suffix.

When **\_auto** is used for **submitmasters** and **acceptmasters**, the resulting service name is:

```
_<prefix>pbmasterd<suffix>
```

When **\_auto** is used for **altsubmitmasters** the resulting service name is:

```
_<prefix>altpbmasterd<suffix>
```

When **\_auto** is used for **logservers** the resulting service name is:

```
_<prefix>pblogd<suffix>
```

The full **\_auto** specification is:

```
_auto[:port=1.2.3.4[:interface=<IP or hostname>]]
```



**Note:** Use of **\_auto** for **submitmasters** and **acceptmasters** results in the same SRV lookup. Caution should be used when using **\_auto** for **altsubmitmasters**, as the runhost's **acceptmasters** list must include the hosts specified by the **altsubmitmasters** SRV lookup.

```
<`/path/to/external/program`>
```

The **submitmasters**, **altsubmitmasters**, **acceptmasters**, and **logservers** keywords support a mechanism to execute an external program that returns a single value. The external program path and filename should be contained within backticks without whitespace. Command line arguments to the external program are not supported. Redirection and backgrounding the external program are not supported.

Output of the external program should be a single valid host entry (for example, a hostname, an IP address, a file name, a netgroup, or an SRV lookup; including the optional **[:port=<port>[:interface=<interface>]]** specification) for the supported keywords, whitespace (other than a trailing newline) is only acceptable when specifying a program and its arguments such as: **/path/to/pbmasterd -ar**.



**Note:** The external program must be writable only by root. The external program must execute within 2 seconds, or the value of **masterprotocoltimeout** converted to seconds, whichever is greater. When an external program does not complete within the specified timeframe, the program may become a "zombie" process.

The optional port/interface specification can be output by the external program, or immediately following the backticks specifying the external program but not both.

Errors that occur evaluating the external program will be logged to the appropriate log file, however they will not be displayed to the **submituser**'s display. Thus submitting user will see a generic error message such as *3366 Invalid submitmasters setting*.

### Example

```
myhost.mydomain
  _auto
  _pbmasters
  _pbmasters._tcp.mydomain.
  _pbmasters._tcp.mydomain.:port=12345
  `~/bin/get_first_submitmaster`
```

## Submit Task Requests to a Policy Server Daemon

Submit hosts need to know how to connect to a Policy Server daemon and how long to wait for failovers. The connections are defined by the **submitmasters** and **masterport** settings. Connection timing is controlled by the **masterdelay** and **masterprotocoltimeout** settings.

### Policy Server Connection Settings

#### submitmasters

- **Version 4.0.0 and later:** **submitmasters** setting available

The **submitmasters** setting provides a list of outgoing connection information for submitting task requests to Privilege Management for Unix & Linux Policy Server daemons.

The list can contain:

- Host names
- A single asterisk (\*) denoting a Registry Name Service lookup
- Netgroups in the form:

```
+@name
```

- Hosts to exclude in the form:

```
-name
```

- Netgroups to exclude in the form:

```
-@name
```

- Absolute path names of a local **pbdmasterd**. If spaces are required, then the string must be enclosed in quotation marks.
- DNS SRV lookups, in the form:

```
_<pbul service name>._tcp.<domain name>.[:port=<port>[:interface=<IP or hostname>]]
```

- External Programs, in the form:

```
`/path/to/external/program`
```

The following are tried in sequence to determine the port value:

1. The non-zero port value from a DNS SRV lookup
  2. The value specified within the **submitmasters** setting
  3. The value of the **masterport** setting
  4. The **pbmasterd** entry in services
  5. Port **24345**
1. The non-zero port value from a DNS SRV lookup
  2. The value specified within the **submitmasters** setting
  3. The value of the **masterport** setting
  4. The **pbmasterd** entry in services
  5. Port **24345**

## Examples

```
submitmasters myhost.mydomain
submitmasters sparky spot submitmasters host1 host2
submitmasters +@submitmasters -@badmasters -badhost
submitmasters sparky spot "/usr/sbin/pbmasterd -ar"
submitmasters _auto
submitmasters _pbmasters
submitmasters _pbmasters._tcp.mydomain.
submitmasters _pbmasters._tcp. mydomain.:port=12345
submitmasters `/bin/get_first_submitmaster`
```

## Default

No default value

## Used on

- Submit hosts
- Privilege Management for Unix & Linux Basic client hosts

## altsubmitmasters

- **Version 6.0 and earlier:** **altsubmitmasters** setting not available
- **Version 6.2.5 and later:** **altsubmitmasters** setting available

The **altsubmitmasters** setting enables you to control which Policy Server host a request is sent to, based on the user and the command.

## Syntax

```
altnsubmitmasters user-list : command-list : host-list
```

where:

- **user-list** is a space-separated list of user names
- **command-list** is a space-separated list of commands
- **host-list** is a space-separated list of hosts that follows the same rules as the host list in the **submitmasters** setting

The lists are separated from each other by the character string " : " (that is, a space, a colon, and a space, without the quotation marks). You can specify multiple **altnsubmitmasters** statements in the same settings file.



**Note:** If you specify one or more Policy Server hosts in the **altnsubmitmasters** list, be sure to include them in the run host's **acceptmasters** list as well.



**Note:** Caution should be used when using **\_auto** for **altnsubmitmasters**, as the runhost's **acceptmasters** list must include the hosts specified by the **altnsubmitmasters** SRV lookup.

The **user-list** and **command-list** can include regular expression syntax such as \*, ?, [, and ].

## Example

```
altnsubmitmasters root : ls rm : host1 host2
altnsubmitmasters m* : p* : host3
altnsubmitmasters user1 user2: ps : host4
submitmasters host5
altnsubmitmasters user1 user2: ps : _altnmasters._tcp.mydomain.
```

In this example, the submit host sends any **ls** or **rm** requests from **root** to the hosts **host1** or **host2**, any command that starts with the letter **p** from any user name that starts with the letter **m** to the host **host3**, any **ps** command issues by users **user1** and **user2** to **host4**, and any other requests to the host **host5** (using the **submithosts** setting).

## Default

No default value

## Used On

Submit hosts

## masterport

- **Version 4.0.0 and later:** **masterport** setting available

The port numbers for Privilege Management daemons must use the non-reserved system ports. The allowed port numbers are **1024** to **65535** (inclusive).



The value for this setting follows the guidelines in "Port Specifications" on page 78.

## Examples

```
masterport 12345
masterport pbmasterd
```

## Default

```
masterport 24345
```

## Used on

- Policy Server hosts
- Submit hosts

## randomizesubmitmasters

- **Version 6.0 and earlier:** **randomizesubmitmasters** setting not available
- **Version 6.2.5 and later:** **randomizesubmitmasters** setting available

The **randomizesubmitmasters** setting forces the submit host to choose a Policy Server host at random, rather than choosing the first Policy Server host that is specified in the **submitmasters** setting. This feature balances the load among multiple Policy Server hosts. System administrators must ensure that all Policy Server hosts are using the same version of the policy.



**Note:** The **randomizesubmitmasters** keyword should not be used with the use of DNS SRV lookups.

## Example

```
randomizesubmitmasters yes
```

## Default

```
randomizesubmitmasters yes
```

## Used on

- Submit hosts
- Privilege Management for Unix & Linux Basic client hosts

## Receive Task Requests from a Policy Server Daemon

Receiving Task Requests from a Policy Server Daemon Run hosts need to know which Policy Server daemon to acknowledge. This is controlled by the **acceptmasters** settings control. Further authentication is possible using the **validatemasterhostname** setting.

### acceptmasters

- **Version 4.0.0 and later:** **acceptmasters** setting available

The **acceptmasters** setting specifies incoming connections from the Policy Server daemon that Privilege Management for Unix & Linux programs will acknowledge.



**Note:** The Policy Server hosts in the run host's **acceptmasters** list must also be specified in the submit host's **submitmasters** or **altsubmitmasters** lists.

The list can contain:

- Host names
- A single asterisk (\*)denoting a Registry Name Service lookup
- Netgroups in the form:

```
+@name
```

- Hosts to exclude in the form:

```
-name
```

- Netgroups to exclude in the form:

```
-@name
```

- DNS SRV lookups, in the form:

```
_

bul service name>._tcp.<domain name>.[:port=<port>[:interface=<IP or hostname>]]


```

- External Programs, in the form:

```
`/path/to/external/program`
```

The order of precedence for the **acceptmasters** rules is:

1. Command line for **pblocald** -m or **--accept\_masters** argument
2. Setting for **acceptmasters**
3. Netgroup for **pbacceptmasters**



**Note:** This keyword does not apply to **pbssh**. If it is present in the settings file, it does not have any effect on **pbssh** and is ignored.

## Examples

```
acceptmasters myhost.mydomain
acceptmasters sparky spot
acceptmasters +@pbacceptmasters
acceptmasters +@pbacceptmasters -@badmasters -badhost
```

## Default

No default value

## Used on

Run hosts

## allowruntimeoverride

- **Version 5.2 and earlier:** allowruntimeoverride setting not available
- **Version 6.0 and later:** allowruntimeoverride setting available

The **allowruntimeoverride** setting allows a runhost's **pb.settings** to override a **runtimeout** value set in the master policy. Each runhost wanting to take advantage of this ability would then set the **runtimeout** keyword in their own **pb.settings**. **allowruntimeoverride** must be set to **yes** to allow this override to occur.

## Example

```
allowruntimeoverride yes
```

## Default

```
allowruntimeoverride no
```

## Used on

Policy Servers

## See Also



For more information, please see **runtimeout** in the [Privilege Management for Unix & Linux Policy Language Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

## runtimeout

- **Version 4.0.0 and later:** `runtimeout` setting available

When the policy server allows `runtimeout` overrides, the `runtimeout` keyword is used to set an idle time limit for all secured tasks on this runhost. The `runtimeout` variable specifies the amount of idle time, in seconds, that the submitting user is allowed before the run host terminates the current request.



**Note:** The `runtimeout` keyword is not honored in local mode or `pbssh`.

The Policy Server's `runtimeoutoverride` keyword must be set to **yes** to allow this override to occur.

### Example

```
runtimeout 600
```

### Default

```
runtimeout 0
```

### Used on

Run hosts

### See Also



For more information, please see `runtimeout` in the [Privilege Management for Unix & Linux Policy Language Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

## Failover

Privilege Management for Unix & Linux can be configured to provide backup user request processing and activity logging. This capability is referred to as failover.

To configure backup request processing, specify the backup Policy Server hosts by using the `submitmasters` keyword in `/etc/pb.settings` on the submit host.

To configure backup logging, specify the backup log hosts by using the `logservers` keyword in `/etc/pb.settings` on the Policy Server host.



For more information on failover, please see the topics below, as well as "`submitmasters`" on page 81 and "`logservers`" on page 97.

## Fine Tuning Policy Server and Failover Connection Timing

### masterdelay

- **Version 4.0.0 and later:** **masterdelay** setting available

When a request is submitted, the Policy Server hosts that are listed in the **submitmasters** line are tried in the order they appear, from left to right. The **masterdelay** setting enables the administrator to adjust the amount of time between failover attempts.

Without a specified time-out, the client tries the first Policy Server host on the **submitmasters** line. If it does not receive a response within 500 milliseconds, then the client adds the second Policy Server host. If neither responds in the next 500 milliseconds, then the client adds the third Policy Server host, and so on. By specifying a **masterdelay**, you can change the 500 millisecond waiting period before the client goes on to the next Policy Server host.

With a **masterdelay** of 0 milliseconds, you get the fastest possible connection, but the Policy Server you connect to may not be predictable. You might also increase network traffic, depending on the number of connections that are opened.

With a larger **masterdelay**, you can increase the predictability, but you might also increase the time needed to form a failover connection. The longer the delay, the more predictable the sequence is.

### Example

```
masterdelay 200
```

### Default

```
masterdelay 500
```

### Used on

Submit hosts

### masterprotocoltimeout

- **Version 4.0.0 and later:** **masterprotocoltimeout** setting available

After a connection is established, the programs perform some protocol checks to verify a proper and working connection. Some types of protocol failures could take a long time to determine (for example, wrong service running on the Policy Server port, or mismatched encryption types/keys).

The **masterprotocoltimeout** setting enables the administrator to control the maximum time to wait for protocol completion. If a protocol step does not complete within the specified number of milliseconds, then the client continues to try the next Policy Server host in sequence. A value of **-1** indicates no protocol timeout.

### Example

```
masterprotocoltimeout 2000
```

## Default

```
masterprotocoltimeout 500
```

## Used on

- Policy Server hosts
- Run hosts
- Submit hosts

## Fine Tuning Log Servers and Failover Connection Timing

### logserverdelay

- **Version 4.0.0 and later:** **logserverdelay** setting available

When a log request is processed, the log servers that are listed in the **logservers** line are tried in the order they appear, from left to right. The **logserverdelay** setting enables the administrator to adjust the amount of time between failover attempts.

Without a specified time-out, the logging program (for example, **pbrun**, **pbrunmasterd**, **pblockd**, etc.) Privilege Management for Unix & Linux Basic tries the first log server on the **logservers** line. If it does not receive a response within 500 milliseconds, then it adds the second log host. If neither responds in the next 500 milliseconds, then it adds the third log host, and so on. By specifying a **logserverdelay**, you can change the 500 millisecond waiting period before the logging program goes on to the next log server.

With a **logserverdelay** of 0 milliseconds, you get the fastest possible connection, but the log server that you connect to may not be predictable. You might also increase network traffic, depending on the number of connections that are opened.

With a larger **logserverdelay** you can increase the predictability, but you might also increase the time needed to form a failover connection. The longer the delay, the more predictable the sequence is.

## Example

```
logserverdelay 2500
```

## Default

```
logserverdelay 500
```

## Used on

- Policy Server hosts
- Run hosts
- Submit hosts by **pbksh** and **pbsh** when a Policy Server is not available
- Privilege Management for Unix & Linux Basic client hosts

### logserverprotocoltimeout

- **Version 4.0.0 and later:** **logserverprotocoltimeout** setting available

After a connection is established, the programs perform some protocol checks to verify a proper and working connection. Some types of protocol failures can take a very long time to determine. For example, the wrong service running on the log server port, or mismatched encryption types/keys.

The **logserverprotocoltimeout** setting enables the administrator to control the maximum time to wait for protocol completion. If a protocol step does not complete within the specified number of milliseconds, then the logging program continues to try the next log server in sequence. A value of **-1** indicates no protocol timeout.

If the **iologack** setting is used, then the **logserverprotocoltimeout** setting also controls how long a submit host should wait for an acknowledgment from the log host.

### Example

```
logserverprotocoltimeout 2000
```

### Default

```
logserverprotocoltimeout 500
```

### Used on

- Log hosts
- Policy Server hosts
- Run hosts
- Submit hosts by **pbksh** and **pbsh** when a Policy Server host is not available
- Privilege Management for Unix & Linux Basic client hosts

### See Also

```
iologack
```

### randomizelogservers

- **Version 9.2.0 and earlier:** **randomizelogservers** setting not available
- **Version 9.3.0 and later:** **randomizelogservers** setting available

The **randomizelogservers** setting forces the policy server/submit host/run host to choose a Log Server host at random, rather than choosing the first available Log Server host that is specified in the **logservers** setting. This feature balances the load among multiple Log Server hosts.



**Note:** The use of **randomizelogservers** can cause **accept** and **finish** events to be located on different logservers if the logservers are configured with **eventdestinations** set to a flat file (**authevt=<file>**) or an SQLite Database (**authevt=db**). However, if **eventdestinations** is set to **authevt=<DSN>** (same ODBC Oracle or MySQL database on all the logservers), then the **accept** and **finish** events will be stored on the same Oracle or MySQL server. The default **randomizelogservers** setting is **no**.



**Note:** The `randomizelogservers` keyword should not be used with the use of DNS SRV lookups. The `randomizelogservers` keyword can result in accept and finish events logged on different logservers, causing the need to merge `iologs`.

## Example

```
randomizelogservers yes
```

## Default

```
randomizelogservers no
```

## Used on

- Submit hosts
- Run hosts
- Privilege Management for Unix & Linux Basic client hosts
- Policy Servers

## Acknowledge Failovers

### transparentfailover

- **Version 5.1.1 and earlier:** `transparentfailover` setting not available
- **Version 5.1.2 and later:** `transparentfailover` setting available

A `transparentfailover` occurs when an initial connection to a Policy Server host has failed and the program performs a failover to another available Policy Server host in the list. To acknowledge that a user failover has occurred, error messages from the failed connection are displayed to the user.

The `transparentfailover` setting enables you to suppress the following failover error messages:

- Any Kerberos initialization error
- *3084 initMangle failure during startup*
- *3089 Could not send initial protocol header to Policy Server*
- *3090 Did not receive initial protocol header from Policy Server*
- *8534 Policy Server on %s is not SSL enabled*
- *1913 Invalid Policy Server daemon on Policy Server host %s*
- Any Kerberos initialization error
- *3084 initMangle failure during startup*
- *3089 Could not send initial protocol header to Policy Server*
- *3090 Did not receive initial protocol header from Policy Server*
- *8534 Policy Server on %s is not SSL enabled*
- *1913 Invalid Policy Server daemon on Policy Server host %s*

When **transparentfailover** is set to **yes**, failover error messages listed above are suppressed. To display failover error messages, set **transparentfailover** to **no** in the **pb.settings** file.

### Example

```
transparentfailover yes
```

### Default

```
transparentfailover yes
```

### Used on

- Submit hosts
- Privilege Management for Unix & Linux Basic client hosts

## Policy Server Host Connections to pblockd

When a Policy Server host accepts a request, it tries to connect to **pblockd** on the run host. This connection is controlled by the **localport** setting for TCP/IP connections or by the **pblockdcommand** setting for local connections.

### localport

- **Version 4.0.0 and later:** **localport** setting available

The value of the **localport** setting is used in two cases:

- For a Policy Server host, this setting specifies the well-known port for **pblockd**.
- For a standalone local daemon, if the port is not specified on the command line, then the value of this setting is used.



The value of this setting follows the guidelines in "[Port Specifications](#)" on page 78.

The port numbers for Privilege Management for Unix & Linux daemons must use the non-reserved system ports. The allowed port numbers are **1024** to **65535** (inclusive).

The following order is used to determine the port for **pblockd**:

1. The value of **localport**
2. The **pblockd** entry in services
3. Port **24346**



**Note:** This keyword does not apply to **pbssh**. If it is present in the settings file, it does not have any effect on **pbssh** and is ignored.

## Examples

```
localport 12345
```

```
localport pblockald
```

## Default

```
localport 24346
```

## Used on

- Policy Server hosts
- Run hosts

## **pblockaldcommand**

- **Version 4.0.0 and later:** **pblockaldcommand** setting available

If the Policy Server host and the run host are the same machine, then you can specify the path and arguments to **pblockald**. Doing so eliminates the overhead of forming a connection between **pblockald** and **pblockald**. If the command line contains spaces, then you must enclose the entire command line in quotation marks.



**Note:** This keyword does not apply to **pbssh**. If it is present in the settings file, it does not have any effect on **pbssh** and is ignored.

## Example

```
pblockaldcommand "/usr/sbin/pblockald -s"
```

## Default

No default value

## Used on

Policy Server hosts

## Connections to SSH-Managed Devices

Using the **pbssh** program and the Privilege Management for Unix & Linux policy, you can control who can access SSH-managed devices (such as a Windows computer or certain network devices) and what commands users can execute on those devices.

The **pbssh** binary enables you to access and manage third party devices that are not accessible using the traditional **pbrun** binary. These devices can be a router, a Windows machine, a Unix/Linux server where Privilege Management is not installed, or any other appliance that can be managed by SSH.

Using the **pbssh** program and the Privilege Management for Unix & Linux policy, you can now control which users can access these SSH-managed devices and which commands the designated users can execute on these devices without having Privilege Management installed on the devices. As long as SSH is configured properly to access the device, **pbssh** will be able to access and manage the device. In addition, the logging features (I/O logging and event logging) are available for **pbssh**.

Compared to the traditional Privilege Management **pbrun** program, there are a few limitations on what **pbssh** can achieve. Because Privilege Management is not installed on the target device (**runhost**), all run variables in the Privilege Management policy are not applicable to **pbssh**. Therefore **pbssh** cannot elevate the privileges of a user on the target device. Using the function **setkeystrokeaction**, you can limit the commands that a user can execute on the target device. However, you cannot allow the user to run a command on that device that they are normally not able to run.

When invoked, the **pbssh** program connects to the target host (specified with the required field **-h**) using an existing user account (defined by the required **-u** option) on the target machine. The target host will likely require a password. If Password Safe (**pkrun**) is available and configured properly (using Privilege Management settings **pkrunfile**, **pk\_cert**, and **pk\_servers**) the password is automatically retrieved from the Password Safe server. Otherwise the user is prompted to provide the password.

The following settings govern this feature:

### pbsshlog

- **Version 6.0 and earlier:** **pbsshlog** setting not available
- **Version 6.2.5 and later:** **pbsshlog** setting available

**pbsshlog** contains the name of the **pbssh** diagnostic log file.

### Example

```
pbsshlog /var/log/pbssh.log
```

### Default

No default value

### Used on

Submit hosts

### pbsshshell

- **Version 6.0 and earlier:** **pbsshshell** setting not available
- **Version 6.2.5 and later:** **pbsshshell** setting available

The **pbsshshell** setting specifies the shell to be used while connected to an SSH-managed device. Privilege Management for Unix & Linux uses this setting to correctly perform I/O logging.

### Example

```
pbsshshell bash
```

## Default

```
pbsshshell /bin/sh
```

## Used on

Submit hosts

## pk\_cert

- **Version 6.0 and earlier:** **pk\_cert** setting not available
- **Version 6.2.5 and later:** **pk\_cert** setting available

The **pk\_cert** setting specifies the absolute path to the Password Safe certificate to use when using **pbssh**.



For more information, please see "[pbssh](#)" on page 387.

## Example

```
pk_cert /etc/mypk.cert
```

## Default

No default value

## Used on

Submit hosts

## pk\_servers

- **Version 6.0 and earlier:** **pk\_servers** setting not available
- **Version 6.2.5 and later:** **pk\_servers** setting available

The **pk\_servers** setting specifies one or more Password Safe servers (by host name or IP address) from which to obtain the password to use when logging in to an SSH-managed device.

## Example

```
pk_servers host0 192.168.1.125
```

## Default

No default value

## Used on

Submit hosts

## pkrunfile

- **Version 6.0 and earlier:** **pkrunfile** setting not available
- **Version 6.2.5 and later:** **pkrunfile** setting available

The **pkrunpath** setting specifies the absolute path and file name of the **pkrun** executable file. This setting enables you to use Password Safe when using **pbssh**.



For more information, please see "[pbssh](#)" on page 387.

## Example

```
pkrunfile /usr/bin/pkrun
```

## Default

No default value

## Used on

Submit hosts

## pktimeout

- **Version 6.0 and earlier:** **pktimeout** setting not available
- **Version 6.2.5 and later:** **pktimeout** setting available

The **pktimeout** setting specifies the amount of time (in seconds) that the **pbssh** program waits for a response from Password Safe. If you specify a value less than 60 seconds, then 60 seconds is used.

## Example

```
pktimeout 100
```

## Default

```
pktimeout 60
```

## Used on

Submit hosts

## shortnamespk

- **Version 6.0 and earlier:** **shortnamespk** setting not available
- **Version 6.2.5 and later:** **shortnamespk** setting available

The **shortnamespk** setting enables **pbssh** to connect to a Password Safe host using a short host name instead of a fully-qualified domain name. Specifying **yes** for the **shortnamespk** setting enables short host names; specifying **no** requires that host names be fully-qualified domain names.

### Example

```
shortnamespk yes
```

### Default

```
shortnamespk no
```

### Used on

Submit hosts

## Connections to Log Servers

Hosts that access Privilege Management log servers need to know how to connect to log servers and how long to wait for failovers. The connections are defined by the **logservers** and **logport** settings. These settings must be defined on the Policy Server host and, if applicable, Privilege Management for Unix & Linux Basic client hosts. Run hosts usually obtain this information from the Policy Server host's policy file and do not need these settings. Log servers need to know only the port.

Connection timing is controlled by the **logserverdelay** and **logserverprotocoltimeout** settings.

### logservers

- **Version 4.0.0 and later:** **logservers** setting available

The **logservers** setting provides a list of outgoing connection information for Privilege Management for Unix & Linux programs that use log servers.

The list can contain:

- Host names
- A single asterisk (\*)denoting a Registry Name Service lookup
- Netgroups in the form:

```
+@name
```

- Hosts to exclude in the form:

```
-name
```

- Netgroups to exclude in the form:

```
-@name
```

- Absolute path names of a local **pblogd**. If spaces are required, the string must be quoted.

- DNS SRV lookups, in the form:

```
_<pbul service name>._tcp.<domain name>.[:port=<port>[:interface=<IP or hostname>]]
```

- External Programs, in the form:

```
`/path/to/external/program`
```

The following are tried in sequence to determine the port value:

1. The non-zero port value from a DNS SRV lookup
2. The value specified within the logservers setting
3. The value of the **logport** setting
4. The **pblogd** entry in services 5.
5. Port **24347**

## Examples

```
logservers mylogserver.mydomain
logservers sparky spot
logservers loghost1 loghost2
logservers +@logservers -@badlogservers -badlogserver
logservers sparky spot "/usr/sbin/pblogd"
logservers _auto
logservers _pbmasters
logservers _pbmasters._tcp.mydomain.
logservers _pbmasters._tcp. mydomain.:port=12345
logservers `/bin/get_first_submitmaster`
```

## Default

No default value

## Used on

- Policy Server hosts
- Submit hosts by **pbksh** and **pbsb** when a Policy Server is not available
- Privilege Management for Unix & Linux Basic client hosts

## logport

- **Version 4.0.0 and later:** **logport** setting available

The port numbers for Privilege Management daemons must use the non-reserved system ports. The allowed port numbers are **1024** to **65535** (inclusive).



The value of this setting follows the guidelines in "Port Specifications" on page 78.

## Examples

```
logport 12345  
logport pblogd
```

## Default

```
logport 24347
```

## Used on

- Log hosts
- Policy Server hosts
- Run host
- Submit hosts by **pbksh** and **pbsh** when a Policy Server host is not available
- Privilege Management for Unix & Linux Basic client hosts

## sudoforceiolog

- **Version 9.2.0 and earlier:** **sudoforceiolog** setting not available
- **Version 9.3.0 and later:** **sudoforceiolog** setting available

The **sudoforceiolog** setting forces Privilege Management for Unix & Linux Basic client hosts to iolog regardless of the sudoers policy **log\_input** and **log\_output** defaults and the **LOG\_INPUT** and **LOG\_OUTPUT** command tags. The default **sudoforceiolog** setting is **no**. This requires the Privilege Management for Unix & Linux Basic **pbsudoers** plugin for I/O logging.

## Example

```
sudoforceiolog yes
```

## Default

```
sudoforceiolog no
```

## Used on

Privilege Management for Unix & Linux Basic client hosts

## Host Name Verification

### nameresolutiontimeout

- **Version 5.1.1 and earlier:** **nameresolutiontimeout** setting not available
- **Version 5.1.2 and later:** **nameresolutiontimeout** setting available

Privilege Management for Unix & Linux attempts to obtain fully qualified domain names when a **pblogd**, **pbksh**, **pbsh**, **pblocald**, **pbmasterd**, or **pbrun** session is started. The **nameresolutiontimeout** setting defines the time-out period (in seconds) to be used for the request to expire. The time-out period is an approximate time for the daemon (**pbmasterd**, **pblocald**, **pblogd**) to time out.

Setting **nameresolutiontimeout** to **0** disables this feature. The allowed time-out values range from **1** to **7200** seconds.

### Example

```
nameresolutiontimeout 30
```

### Default

```
nameresolutiontimeout 0
```

### Used on

- **pblocald**, **pbksh**, **pbsh**, **pbrun**
- **pblogd**, **pbmasterd**

### shortnamesok

- **Version 4.0.0 and later:** **shortnamesok** setting available

Privilege Management for Unix & Linux attempts to obtain fully qualified domain names for all hosts that are involved in a task request. If some of the name services return fully qualified names but others return only short names, you can instruct Privilege Management for Unix & Linux to check only the short name by setting **shortnamesok** to **yes**.



### IMPORTANT!

*This option is intended as a temporary measure for discrepancies in a system's name services. This option decreases security because it permits a partial name match (for example, two machines in different domains with the same short name would match). It is preferable to make the name services consistent whenever possible.*

### Example

```
shortnamesok yes
```

### Default

```
shortnamesok no
```

### Used on

- Log hosts
- Policy Server hosts

- Submit hosts
- Run hosts

### validatemasterhostname

- **Version 3.5 and earlier:** `validatemasterhostname` setting not available
- **Version 4.0 and later:** `validatemasterhostname` setting available

The `validatemasterhostname` setting enables the system administrator on the run host to perform an additional validation of the Policy Server host's name against the run host's name services. This action is done by looking up the connecting host's IP address and checking the run host's name services to see if it matches the `masterhost` variable that was looked up on the Policy Server host. When set to **yes**, the request is rejected if the names do not match.



**Note:** This keyword does not apply to `pbssh`. If it is present in the settings file, it does not have any effect on `pbssh` and is ignored.

### Example

```
validatemasterhostname yes
```

### Default

```
validatemasterhostname no
```

### Used on

Run hosts

### validateclienthostname

- **Version 3.5 and earlier:** `validateclienthostname` not available
- **Version 4.0 and later:** `validateclienthostname` setting available

The `validateclienthostname` setting enables the system administrator on the Policy Server host to perform an additional validation of the submit host's name against the Policy Server host's name services. This action is done by looking up the connecting host's IP address and checking the Policy Server's name services to see if it matches the `clienthost` variable that was looked up on the submit host. When set to **yes**, the request is rejected if the names do not match.

### Example

```
validateclienthostname yes
```

### Default

```
validateclienthostname no
```

## Used on

Policy Server hosts

## Control Connections

### addressfamily

- **Version 7.5 and earlier:** `addressfamily` setting not available
- **Version 8.0 and later:** `addressfamily` setting available

To support both IPv4 and IPv6 connections, Privilege Management for Unix & Linux uses protocol-independent methods for host name resolution. If Privilege Management for Unix & Linux is installed on a single stack node (ipv4-only or ipv6-only), the `addressfamily` setting may help make host name resolution more efficient by specifying which address family Privilege Management for Unix & Linux should use.

## Syntax

```
addressfamily <ipv4 | ipv6 | any>
```

## Valid Values

<code>ipv4</code>	Use IPv4 only.
<code>ipv6</code>	Use IPv6 only.
<code>any</code>	The network configuration on the host will determine the address family. On dual- or hybrid-stack implementations, IPv4 or IPv6 may be requested/used. This is the default behavior if the keyword is not specified.

## Example

```
addressfamily ipv4
```

## Default

No default value

## Used On

- Policy Server hosts
- Log hosts
- Submit hosts
- Run hosts

### allowlocalmode

- **Version 4.0.0 and later:** `allowlocalmode` setting available

Deprecated in favor of Optimized Run Mode.



For more information, please see "[Optimized Run Mode Processing](#)" on page 22.

When there is no need for ACA, or to record the finish of an event in the event logs or process keystrokes, local mode can bypass some of the overhead of using a full session. Local mode changes the way in which the Privilege Management for Unix & Linux job stream is set up. Using local mode bypasses **plocald** entirely. The submit host asks **pbrun** to run its usual policy and log the start of the event. If accepted, the target program overlays the client instead of running through **plocald**. In this case, there can be no logging of the exit status or forbidden or warning I/O sequences.

Local mode is usually started through the command line by using the **-l** option of **pbrun** (**pbrun -l command**), or by setting **runlocalmode** to **true** in the policy.

To disallow local mode, you can set **allowlocalmode** to **no** in the your settings file. In a submit host settings file, this setting disallows the use of the **-l** command line switch.

On a Policy Server host, setting **allowlocalmode** to **no** is the equivalent of:

```
runlocalmode = false;
readonly runlocalmode;
```



**Note:** This keyword does not apply to **pbssh**. If it is present in the settings file, it does not have any effect on **pbssh** and is ignored.

## Example

```
allowlocalmode no
```

## Default

```
allowlocalmode yes
```

## Used on

- Policy Server hosts
- Run hosts
- Submit hosts

## allowremotejobs

- **Version 3.5 and earlier:** **allowremotejobs** setting not available
- **Version 4.0 and later:** **allowremotejobs** setting available

Privilege Management for Unix & Linux allows commands to execute on machines other than the one that submits the request. This action can be specified, for example, through the **-h** option of **pbrun** or in the policy file. The **allowremotejobs** setting controls this feature.



**Note:** In version 7.1 and later, the **submitremotejobs** keyword also affects this feature. When the **submitremotejobs** keyword is not present, the **allowremotejobs** keyword functions exactly as prior versions functioned.

In version 7.0 and earlier, and with version 7.1 where the **submitremotejobs** keyword is not present on the submit host, setting **allowremotejobs** to **no** disables the use of the **-h** command line switch of **pbrun**.

On the run host, setting **allowremotejobs** to **no** makes **pblocald** reject all commands that did not originate on the run host.

On the Policy Server host, setting **allowremotejobs** to **no** makes **pbmasterd** reject all commands where the run host is different from the client host. In addition, runhost is set to the IP address of the submitting host and made read-only. Because the run host is resolved by IP address, this setting can be used to prevent run host spoofing in environments that do not use remote commands.



**Note:** This keyword does not apply to **pbssh**. If it is present in the settings file, it does not have any effect on **pbssh** and is ignored.

### Example

```
allowremotejobs no
```

### Default

```
allowremotejobs yes
```

### Used on

- Policy Server hosts
- Run hosts
- Submit hosts

### submitremotejobs

- **Version 7.0 and earlier:** **submitremotejobs** setting not available
- **Version 7.1 and later:** **submitremotejobs** setting available

Privilege Management for Unix & Linux allows commands to execute on machines other than the one that submits the request. This action can be specified, for example, through the **-h** option of **pbrun** or in the policy file.

On the submit host, setting **submitremotejobs** to **yes/no** enables/disables the use of the **-h** command line switch of **pbrun**. If the **submitremotejobs** keyword is not present, the **allowremotejobs** keyword is used to enable/disable this feature.

### Example

```
submitremotejobs no
```

## Default

```
submitremotejobs yes
```

## Used on

Submit hosts

## tcpkeepalive

- **Version 4.0 and later:** tcpkeepalive setting available

The **tcpkeepalive** setting enables TCP keepalive signals on all Privilege Management connections to or from the local host.

## Example

```
tcpkeepalive yes
```

## Default

```
tcpkeepalive no
```

## Used on

- Log hosts
- Policy Server hosts
- Run hosts
- Submit hosts

## Port Usage

Privilege Management for Unix & Linux uses sockets and ports for inter-program communication. These may be Unix/Linux domain socket ports or TCP/IP ports.

Privilege Management for Unix & Linux uses ports to form two types of connections:

- **Direct connection:** A request to a service on a well-known port such as:
  - **pbrun** to **pbmasterd**'s well-known port
  - **pbrun** to **pblogd**'s well-known port (local mode only)
  - **pbsh** or **pbksh** to **pbmasterd**'s well-known port
  - **pbsh** or **pbksh** to **pblogd**'s well-known port (local mode only)
  - **pbmasterd** to **pblogd**'s well-known port, if the configuration policy calls the **logmktemp()** function
  - **pbmasterd** to **pblocald**'s well-known port
  - **pblocald** to **pblogd**'s well-known port
  - A browser to **pbguid**'s well-known port
  - **pbguid** to **pbmasterd**'s well-known port
  - Privilege Management for Unix & Linux Basic to **pblogd**'s well-known port
  - REST services communicating between hosts

For TCP/IP, the **allownonreservedconnections** setting can affect this type of connection.



For more information, please see "[allownonreservedconnections](#)" on page 107

- **Dynamic connection:** This connection type is an optimization which enables two programs that are both connected to a common third program to connect directly to each other when the common program is no longer needed.

For example, **pbrun** starts **pbmasterd**, which in turn starts **pblocald**. When the **pbmasterd** work is done, it can instruct **pbrun** and **pblocald** to connect directly to each other. This action streamlines the network traffic and enables **pbmasterd** to exit without affecting the other two programs, thus saving resources.

Two dynamic connections that Privilege Management for Unix & Linux uses are:

- **pbrun** and **pblocald** when **pbmasterd** is finished. The **pbrunreconnection** variable can control the direction of the connection.
- **pblocald** and **pblogd** when **pbmasterd** is finished and the configuration policy uses the **logmktemp()** function. The direction of the connection can be controlled by the **pblogdreconnection** variable in the policy language.

For TCP/IP ports in each case, one program opens a listening port (in the range **minlisteningport** to **maxlisteningport**) then waits for the other to connect to it from an outgoing port (in the range **minoutgoingport** to **maxoutgoingport**).

For Unix/Linux Domain Sockets, temporary sockets are formed in the **localsocketdir** directory.

## TCP/IP Ports

TCP/IP uses numeric ports from **1** and **65535**. Reserved ports, which are accessible only to **root**, are in the range **1** to **1023**. Non-reserved are in the range **1024** to **65535**.

## allownonreservedconnections

- **Version 4.0.0 and later:** **allownonreservedconnections** setting available

Privilege Management programs can initiate connections using reserved ports (for example, ports 600-1023), as well as non-reserved ports. Support for non-reserved ports was introduced in v3.0.5. The default behavior is to check for connections on reserved ports. This check can be disabled by setting **allownonreservedconnections** to **yes**.

### Example

```
allownonreservedconnections yes
```

### Default

```
allownonreservedconnections yes
```

### Used on

- Log hosts
- Policy Server hosts
- Run hosts

## minlisteningport and maxlisteningport

- **Version 4.0.0 and later:** **minlisteningport** and **maxlisteningport** settings available

When a dynamic connection is needed between two Privilege Management for Unix & Linux programs, one program opens a listening port in the range between **minlisteningport** and **maxlisteningport**.

To control the range of ports that are used to listen for these dynamic connections, you can set **minlisteningport** and **maxlisteningport** to define the range of allowable ports.

### Example

```
minlisteningport 10000  
maxlisteningport 10200
```

### Default

```
minlisteningport 1024  
maxlisteningport 65535
```

### Used on

- Log hosts
- Policy Server hosts

- Run hosts
- Submit hosts

### minoutgoingport and maxoutgoingport

- **Version 4.0.0 and later:** `minoutgoingport` and `maxoutgoingport` settings available

When a Privilege Management program needs to contact another program, the program opens an outgoing port in the range between `minoutgoingport` and `maxoutgoingport`. This range is used for connections to a well-known service port and for dynamic connection.

If you want to use unreserved ports, then make sure that `allownonreservedconnections` is set to **yes** for the host that receives the connection.



For more information, please see "`allownonreservedconnections`" on page 107.

### Example

```
minoutgoingport 20000
maxoutgoingport 20200
```

### Default

```
minoutgoingport 600
maxoutgoingport 1023
```

### Used on

- Log hosts
- Policy Server hosts
- Run hosts
- Submit hosts
- Privilege Management for Unix & Linux Basic client hosts

### Program Ports

- "`localport`" on page 92
- "`logport`" on page 98
- "`masterport`" on page 83
- "`pbrestport`" on page 238
- "`guiport`" on page 147
- "`sguiport`" on page 148
- "`solrport`" on page 139
- "`syncport`" on page 153
- "`rscwebsvcport`" on page 137

## Unix/Linux Domain Sockets

Unix/Linux Domain Sockets are temporary files used for dynamic connections created in the **localsocketdir** directory.

### localsocketdir

- **Version 3.5 and earlier:** **localsocketdir** setting not available
- **Version 4.0 and later:** **localsocketdir** setting available

The **localsocketdir** setting provides the path to a directory for Unix/Linux domain socket connections used in dynamic connections. The directory should be owned by root and should be readable and writable only by root (for example, **drwx-----**).

### Example

```
localsocketdir /var/pbLocalSockets
```

### Default

No default value

### Used on

- Log hosts
- Policy Server hosts
- Run hosts
- Submit hosts

## Auditing and Logging

Privilege Management for Unix & Linux provides Event logs and Audit logs for:

- Authorization Event Logging
- Audit Events
- Change Management Events
- License Events
- File Integrity Monitor Events
- Advanced Keystroke Action Events
- Session Logging
- I/O Logging
- I/O Log Indexing and Searching
- AD Bridge Event Logging
- BeyondInsight Event and IO Logging
- Log Synchronization
- Diagnostic Logging

## Authorization Event Logging

Privilege Management for Unix & Linux records the following authorization events in the event log file on the log host or Policy Server host (if not using a log server):

- Accept and reject events (including policy variables) for all tasks
- Keystroke patterns set by **keystrokeactions** and task finish information for jobs that are not run in local mode. This file can be reviewed through the Privilege Management for Unix & Linux GUI or with the **pblog** command.

## Store Eventlog Records in a Database

### SQLite Database

Starting with v10.3.0, eventlog records are now written by default to an SQLite database. The new keyword, **eventdestinations authevt=<value>** determines the type of destination.



For more information, please see *eventdestinations* at "[Authorization Event Logging](#)" on page 110.

By default, even when upgrading from an older version of the product, **eventdestinations** defaults to **authevt=db**, which creates an SQLite database using the value of the **eventlog** variable (it suffixes **.db** to the filename, if the filename does not already include a **.db** at the end).

The database name can also be set using **eventdestinations authevt=db=</path/to/database>**. To revert to the old flat file format, **eventdestinations authevt=</path/to/filename>** needs to be used. If the **eventlog** variable is defined in the policy, the flat file format is used.

The binary pblog now defaults to reading an SQLite database, using the file specified in **eventlog**. You can also use the option **--db -f </path/to/database>** to specify a different file name. To read a flat file, use **--ff -f </path/to/filename>**.

### MySQL and Oracle Database using ODBC Connectors

Starting with v10.3.0, eventlog records can be send to an Oracle or MySQL database using the ODBC connector on the logserver.



For instructions on how to install the ODBC connectors on the logservers, please see the [Installation Guide](#) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

If **eventdestinations** is set to **authevt=odbc=<MyDSN>**, the eventlog records are logged to the ODBC DSN specified in the setting and found in the ODBC configuration files. The value of **eventlog** in **pb.settings** is ignored, and the eventlog records are written to the ODBC DSN specified in **odbc.ini** and **odbcinst.ini** in the **odbcinidir** directory (or default **/opt/pbul/etc**). If the **eventlog** variable is defined in the policy, then the eventlog records are written to both the path and file in the policy (in flat file format), and in the ODBC database. For pblog, use the option **--odbc -f <MyDSN>** to read the MySQL/Oracle database.

Event destinations can be combined, using commas, to enable logging to multiple services. For example:

```
eventdestinations authevt=db,odbc=MySQL,/var/log/eventlog.flatfile
```

The new setting **anydestinationsufficient** controls how the events are written to multiple destinations:

- If set to **no** (default), it requires that the event be written to all defined destinations (db, odbc, flat-file) before it is removed from the message queue. If one destination is down, it keeps the event on the message queue until the event is successfully written to all destinations.



**Note:** If the event was already written to a destination (in case of a flat file), the next attempt may create a duplicate record.

- If it is set to **yes**, it attempts to write each event to every destination. If any one of them fails, as long as the attempt to any destination succeeds, it will proceed to the next event.

In a BeyondInsight integrated environment, Privilege Management for Unix & Linux can optionally send the events to BeyondInsight Web Services. Events can then be viewed on BeyondInsight GUI and can also be queried using the standard BeyondInsight report plug-in.



For more information about enabling this feature, please see "[BeyondInsight Event Logging](#)" on page 136.

### eventdestinations

- **Version 9.4.1 and earlier:** **eventdestinations** setting not available
- **Version 9.4.3 and later:** **eventdestinations** setting for Audit Events available
- **Version 10.3.0 and later:** **eventdestinations** setting for Authorization Events available

### eventdestinations

- **Version 9.4.1 and earlier:** **eventdestinations** setting not available
- **Version 9.4.3 and later:** **eventdestinations** setting for Audit Events available
- **Version 10.3.0 and later:** **eventdestinations** setting for Authorization Events available

The **eventdestinations** setting allows the configuration of where events are logged. Prior to v10.3.0, this setting was only used for audit events. Starting in v10.3.0, it has been augmented to support authorization event logging using the keyword **authevt**.



For more information about configuring **eventdestinations** setting for audit events, please see "[Audit Events](#)" on page 116.

### Syntax

```
eventdestinations authvt=<destination>
```

Where destination can be one or a combination of database, syslog, flat text file, or passed into a script or binary for processing:

- **db:** Write the event log records to an SQLite database whose path is specified in the **eventlog** setting.
- **db=/path/to/database.db:** Write the event log records to the named SQLite database.
- **/path/to/flatfile:** Write the event log records to flat file.
- **odbc=DSN:** Log the event records to the configured ODBC DSN (Data Source Name).
- **syslog:** Write the event log records to the local syslog service, using the syslog configuration in **pb.settings**.
- **/path/to/script:** Will log the event to the script or binary specified.



**Note:** Within the `authvt` group, a combination of each destination type can be specified, separated by commas. If combining with Audit Events options, each new group should be delimited with a space.

## authvt Usage

<code>authvt=db</code>	<p>Default.</p> <p>The path to the default database is set using either <code>eventlog</code> setting, or it will default to <code>/var/{adm log}/pb.eventlog.db</code>.</p> <p>If the <code>eventlog</code> variable is defined in the policy, then the eventlog records are written to both the path and file in the policy (in flat file format), and the path/file defined by the <code>eventlog</code> setting (in SQLite database format).</p> <p>If <code>eventlog</code> in <code>pb.settings</code> is set to a filename without <code>.db</code> at the end, a <code>.db</code> is implicitly added. For example, if <code>eventlog</code> is set to <code>/var/log/pb_event_file</code>, the file name is changed to <code>/var/log/pb_event_file.db</code>.</p>
<code>authvt=db=/path/to/database.db</code>	<p>This option allows different database names in the <code>eventdestinations</code> setting.</p> <p>The value of <code>eventlog</code> in <code>pb.settings</code> is ignored. When writing the eventlog records the path/file is <code>/path/to/database.db</code>. If the eventlog variable is defined in the policy, then the eventlog records are written to both the path/file defined in the policy (in flat file format), and the path/file defined by this setting in SQLite database format.</p>
<code>authvt=/path/to/flatfile</code>	<p>This option logs events in the flat-file format specified in the setting.</p> <p>The value of <code>eventlog</code> in <code>pb.settings</code> is ignored, and the file name (<code>/path/to/flatfile</code>) is used when writing the eventlog records.</p> <p>If the <code>eventlog</code> variable is defined in the policy, then the flat-file event log is created using that path instead of the value (<code>/path/to/flatfile</code>) specified in this setting.</p>
<code>authvt=odbc=MyDSN</code>	<p>This option logs events to the ODBC DSN specified in the setting and found in the ODBC configuration files.</p> <p>The value of <code>eventlog</code> in <code>pb.settings</code> is ignored, and the eventlog records are written to the ODBC DSN set in <code>odbc.ini</code> and <code>odbcinst.ini</code> in the directory <code>odbcinidir</code> (or default <code>/opt/pbul/etc</code>).</p> <p>If the <code>eventlog</code> variable is defined in the policy, then the eventlog records are written to both the path/file defined in the policy (in the flat file format), and in the ODBC database.</p>
<code>authvt=syslog</code>	<p>This option logs events to the local hosts syslog service in a JSON format.</p>
<code>authvt=/path/to/script</code>	<p>This option logs events to a script or binary in JSON format.</p>

To avoid running out of resources during heavy load while support authentication events to a program (`eventdestinationsauthvt=|program`), `pblighttpd-svc` must be started with unlimited `NOFILES` and `NPROC`, at least. For example, on Linux with `systemd`.



For more information, please see "[pblighttpd Service](#)" on page 428.

## Examples

```
eventdestinations authevt=db
```

Event destinations can be combined, separated by commas, to enable logging to multiple services:

```
eventdestinations authevt=db,/var/adm/pb.eventlog.flat,odbc=MySQL,syslog
```

Authorization Event and Audit Event destinations can be combined using a space delimiter:

```
eventdestinations authevt=db chgmt=db,syslog fimrpt=|/mydir/process license=db,syslog
```

## Default

```
eventdestinations authevt=db
```

## Used On

- Log Servers
- Policy Server hosts (If a log host is not used)

## See Also

**eventdestinations** in the Audit Event section on how to configure for other types of supported events

## eventlog

- **Version 4.0.0 and later:** **eventlog** setting available
- **Version 10.3.0 and later:** **eventlog** setting usage modified

The default **eventdestinations** setting **authevt=db** configures authorization events to be written to an event log in SQLite database format. In this case, the **eventlog** setting provides the pathname of that event log (with an implicit **.db** suffix). Also, when **pblog** is invoked without a specific filename, it uses the pathname of **eventlog** (with an implicit **.db** suffix) and assumes it is SQLite database.

If the **eventdestinations** setting is anything other than the default **authevt=db**, when **pblog** is invoked with no specific filename, it will look up the value of the **eventlog** setting as is, and assume it is a SQLite database.

Any parent directory in the path will be automatically created.

## Example

```
eventlog /var/log/my.event.log
```

## Default

Depending on the operating system standards, this can be any of the following:

- `eventlog /var/log/<prefix>pb.eventlog.db<suffix>`
- `eventlog /var/adm/<prefix>pb.eventlog.db<suffix>`
- `eventlog /usr/adm/<prefix>pb.eventlog.db<suffix>`

### Used on

- Log hosts
- Policy Server hosts (If a log host is not used)

### syslog

- **Version 4.0.0 and later:** **syslog** setting available

Enables sending diagnostic messages to syslog, using the **facility** setting.



For more information, please see "[facility](#)" on page 114.

To enable syslog recording of diagnostic messages, set **syslog** to **yes**.

### Example

```
syslog yes
```

### Default

```
syslog yes
```

### Used on

- Log hosts
- Policy Server hosts
- Run hosts
- Submit hosts

### facility

- **Version 4.0.0 and later:** **facility** setting available

The messages that the Privilege Management for Unix & Linux programs transmit to the syslog facility are labeled with a syslog level. This level (as well as the severity that is specified internally to Privilege Management for Unix & Linux on a per message basis) is used by the syslog facility and handled according to the rules in the syslog configuration file (typically **/etc/syslog.conf**). If Privilege

Management for Unix & Linux messages are not appearing in syslog, then verify that **syslog.conf** is handling the facility that you are using as expected.

To specify the syslog facility for logging to the Unix/Linux syslog subsystem, set **facility** appropriately. Some commonly available facilities include:

- **LOG\_AUTH**
- **LOG\_AUTHPRIV** (Linux and macOS).
  - Only supported in Privilege Management for Unix & Linux 7.1.0 and later.
- **LOG\_USER**
- **LOG\_MAIL**
- **LOG\_DAEMON**
- **LOG\_LPR**
- **LOG\_NEWS**
- **LOG\_UUCP**
- **LOG\_CRON**
- **LOG\_LOCAL0** through **LOG\_LOCAL7**

#### Example

```
facility LOG_DAEMON
```

#### Default

```
facility LOG_AUTH
```

#### Example

```
facility LOG_DAEMON
```

#### Default

```
facility LOG_AUTH
```

#### Used on

- Log hosts
- Policy Server hosts if a log host is not used

#### **anydestinationsufficient**

- **Version 10.2.0 and earlier:** **anydestinationsufficient** setting not available
- **Version 10.3.0 and later:** **anydestinationsufficient** setting available

This setting controls how the events are written to multiple destinations.

When set to **no**, **anydestinationsufficient** writes an event to all defined destinations (db, odbc, flat file). All destinations must be up and running. If one destination is down, the event will be retained in the message router write queue until it is successfully written to all eventlog destinations. This is the default behavior.

When set to **yes**, **anydestinationsufficient** writes the event to one destination at a time. If one destination is down, and the event was already written to at least one database (db, odbc, flat file), then it will skip that destination for that event, and move on to the next event. The database that is down will not have all the events. However, **pblog** can be used to get the events from one destination and write it to another.

### Example

```
anydestinationsufficient yes
```

### Default

no

### Used On

Log Servers

### odbcinidir

- **Version 10.2.0 and earlier:** **odbcinidir** setting not available
- **Version 10.3.0 and later:** **odbcinidir** setting available

The **odbcinidir** setting provides the path where **odbc.ini** and **odbcinst.ini** are read from when **eventdestinations** is set to **authvt=odbc=<DSN>**.

- **odbc.ini:** Provides authentication details for the ODBC database.
- **odbcinst.ini:** Includes driver details where shared libraries reside.

### Example

```
odbcinidir /etc/odbc
```

### Default

```
odbcinidir /opt/<prefix>pbul<suffix>/etc
```

## Audit Events

There are various audit events that can be enabled and stored within Privilege Management for Unix & Linux. These include Configuration Change Management, File Integrity Monitoring Events, Advanced Keystroke Action Events, and License Events. These events are enabled on clients and servers, and will be logged on the Log Server. Each type of event has a taxonomy to distinguish the type of data that it contains. There are various settings that affect the audit event log.

## eventdb

- **Version 8.5.0 and earlier:** `eventdb` setting not available
- **Version 9.0.0 and later:** `eventdb` setting available

The `eventdb` setting details where Audit Events are stored on the Log Server if there is no specific configuration using the `eventdestinations` setting. If a relative path is specified, the `basedir` setting will be used to derive the full path.

### Example

```
eventdb /mypath/pbevent.db
```

### Default

```
eventdb /opt/<prefix>pbul<suffix>/dbs/pbevent.db
```

### Used On

All hosts

## eventdestinations

- **Version 9.4.1 and earlier:** `eventdestinations` setting not available
- **Version 9.4.3 and later:** `eventdestinations` setting for Audit Events available
- **Version 10.3.0 and later:** `eventdestinations` setting for Authorization Events available

The `eventdestinations` setting allows the configuration of where each taxonomy of audit events is logged. Starting in v10.3.0, this setting can also be used to configure destinations for authorization events.



For more information, please see `eventdestinations` setting description in "Authorization Event Logging" on page 110.

### Syntax

```
eventdestinations <taxonomy>=<destination> ...
```

Taxonomy	Event Type
chgmt	Configuration Change Management
client	Client Registration
fimrpt	File Integrity Monitoring
errlog	Miscellaneous Error Logging via REST (including ACA and user-defined errors)
aka	Advanced Keystroke Action
license	License Events
policydbg	Policy Language Debugging

The destination can be one or more database, syslog, flat text file, or passed into a script or binary for processing:

- **db=/path:** Will output the event to a database
- **db:** Will output the event to the database specified in the eventdb setting
- **syslog:** Will output the event to the local syslog service, using the syslog configuration in the pb.settings
- **/directory/file:** An absolute path to a file which will be appended with the event in text in the specified format
- **/directory/script:** Will pass the event on standard input into the script or binary specified



**Note:** Within each taxonomy, one or more destinations can be specified, separated by commas. If specifying more than one taxonomy or combining with Authorization Event Logging **eventdestinations** option, each group should be delimited with a space.

### Example

```
eventdestinations chgmt=db
```

Event destinations can be combined, separated by commas, to enable logging to multiple services:

```
eventdestinations chgmt=db,syslog,/var/adm/pbchgmt.log
```

Multiple Audit Event and Authorization Event destinations can be combined using a space delimiter:

```
eventdestinations chgmt=db,syslog fimrpt=|/mydir/process license=db,syslog
```

```
eventdestinations authevt=db chgmt=db,syslog fimrpt=|/mydir/process license=db,syslog
```

### Default

By default, all events will be logged to the database specified by **eventdb**.

### Used On

Log Servers

### See Also

**eventdestinations** in the Authorization Event Logging section on how to configure for authorization events

### eventformats

- **Version 9.3.3 and earlier:** **eventformats** setting not available
- **Version 9.4.4 and later:** **eventformats** setting available

Events that are not logged into a database can be logged in two different formats:

- Labeled Comma Separated Values, where values take the form **<attribute\_name>=<value>**,...
- JSON format

### Example

```
eventformats    chgmt=json license=csv
```

### Default

By default, all events are logged in JSON format.

### Used On

Log Servers

## Message Router

With the introduction of Privilege Management for Unix & Linux v10.1.0, a Fast Message Router was developed to better cope with high volumes of event and log information. The Log Server will communicate all of its updates to the Message Router, which will then log the audit and log information to the appropriate places, including the Event Log, the BeyondInsight Event queues, and the SOLR **/logcloseaction** queues. The **pbhttpd** service, which previously started the REST and Scheduler services, will now also start the Message Router services. If the Message Router is down, the Log Server will store all of its data in a temporary queue until the Message Router service is available again.

### messageroutersocketpath

- **Version 10.0.1 and earlier:** **messageroutersocketpath** setting not available
- **Version 10.1.0 and later:** **messageroutersocketpath** setting available

This setting defines the absolute path to the Message Router work area, where sockets and temporary files are stored while the Message Router is unavailable.

### Example

```
messageroutersocketpath /opt/pb/pb_msgrouter
```

### Default

```
messageroutersocketpath /opt/<prefix>pbul<suffix>/msgrouter
```

### Used On

- Policy Servers
- Log Servers

### messengerouterqueuesize

- **Version 10.0.1 and earlier:** **messengerouterqueuesize** setting not available
- **Version 10.1.0 and later:** **messengerouterqueuesize** setting available

This setting specifies the number of temporary queue entries should the Message Router become available. Generally the default will be acceptable, however, in large installations with thousands of events logged per second, it may need to be increased. The maximum value is 4095.

### Example

```
messengerouterqueuesize 1000
```

### Default

```
messengerouterqueuesize 800
```

### Used On

- Policy Servers
- Log Servers

### messengerouterclosewait

- **Version 10.0.1 and earlier:** **messengerouterclosewait** setting not available
- **Version 10.1.0 and later:** **messengerouterclosewait** setting available

This setting specifies the maximum time a Policy or Log Server will wait, in seconds, for the Messenger Router to become available. If it cannot contact the Message Router after this duration, it will write the entries to temporary queues for later processing.

### Example

```
messengerouterclosewait 120
```

### Default

```
messengerouterclosewait 30
```

### Used On

- Policy Servers
- Log Servers

### writequeue timeouts

- **Version 10.0.1 and earlier:** **writequeue timeouts** setting not available
- **Version 10.1.0 and later:** **writequeue timeouts** setting available

This setting specifies the timeouts for various actions for write queue operation. Although it is not recommended that these are changed in most instances, there may be scenarios, usually when hosts experience high load levels, that configuration of these timeouts will improve performance. The timeout operations include:

- openread
- openwrite
- write
- lock

Each timeout has three elements:

- The maximum timeout in milliseconds
- The incremental delay each time the operation is blocked
- A backoff component that can be used to increase the delay time each time the operation blocks

### Example

```
writequeuetimeouts openread=1000,20,1.2 openwrite=5000,20,1.2 write=2000,10,1.0 lock=30000,50,2.0
```

### Default

No default value

### Used On

- Policy Servers
- Log Servers

### writequeuepath

- **Version 10.0.1 and earlier:** `writequeuepath` setting not available
- **Version 10.1.0 and later:** `writequeuepath` setting available

The `writequeuepath` is the absolute path to a directory that will hold all the temporary write queues. This path should have enough disk space to cope with high volumes of data should the message router become unavailable.

### Example

```
writequeuepath /opt/pbul/msgqueue
```

### Default

```
writequeuepath /opt/<prefix>pbul<suffix>/msgrouter
```

### Used On

- Policy Servers
- Log Servers

## writequeueenum

- **Version 10.0.1 and earlier:** `writequeueenum` setting not available
- **Version 10.1.0 and later:** `writequeueenum` setting available

The `writequeueenum` setting allows the configuration of the maximum number of write queues that can be stored in the event of the Message Router becoming unavailable.



**Note:** This setting should only be increased in the event of contention due to very high load.

## Example

```
writequeueenum 10000
```

## Default

```
writequeueenum 999
```

## Used On

- Policy Servers
- Log Servers

## Change Management Events

Change Management Events are configured on the client by enabling `changemanagementevents` in the `pb.settings`, and on the Primary logserver by specifying the `eventdb` setting. This will log all changes made to the Configuration and Settings, and the Role Based Policy databases. When the setting is enabled all changes will require a message, which is logged alongside the `username`, `date/time` and the details of the actual change. The events are sent to the logserver defined in the `pb.settings` and can be retrieved via REST or locally on the logserver with the `pbdbutil --evt` option. For example, the administrator changes the `pb.settings` file and re-imports it:

```
# pbdbutil --cfg -m "Change to pb.settings" -i /etc/pb.settings
{"fname":"/etc/pb.settings","version":4}
```

Then the administrator adds a new Role into the Role Based Policy database:

```
# pbdbutil --rbp -m "New role" -u '{ "role" : {"id":2,"name":"new
role","rorder":2,"description":"new role for
admin","disabled":0,"risk":0,"action":"A","iolog":null,"script":null}}'
```

The Change Management Events can be accessed on the Primary logserver:

```
# pbdbutil --evt -s chgmt
{
  "hostname": "pbuild", "evtname": "file_import", "service": "pbdbutil9.0.0-
```

```

14", "who": "admin1", "severity": 16, "utc": "2015-05-21 11:53:07",
"programe": "pbdbutil9.0.0-14 ", "version": "9.0.0-14 ", "arch": "x86_
64_linuxA",
"data": {
"fname": "/etc/pb.settings", "version": 4, "msg": "Change to pb.settings",
"sid": 33235, "pid": 34378, "uid": 0
}
}
{
"hostname": "pbuild", "evtname": "put", "service": "pbdbutil9.0.0-14",
"who": "admin1", "severity": 16, "utc": "2015-05-21 11:56:35", "programe":
"pbdbutil9.0.0-14 ", "version": "9.0.0-14_debug", "arch": "x86_64_
linuxA",
"data": {
"id": 2, "description": "new role for admin", "risk": 0, "action": "A",
"name": "new role", "rorder": 2, "disabled": 0, "iolog": null, "script":
null, "sid": 33235, "pid": 34423, "uid": 0
}
}
}
    
```



For more information, please see ["pbdbutil" on page 319](#).

## License Events

The Licensing system introduced in version 10.0.1 will allow the logging of all License History Events. This will produce an event for every license check, and as such can impose an increased load on all server components. When it is enabled, each Policy Server, File Integrity Server, Advanced Keystroke Action Server, etc, will send an event to the Log Server to be logged as specified in the eventdestinations.

### licensehistory

This setting enables the production of License History Events on all servers. The setting is synchronized from the Primary License Server across the whole Privilege Management for Unix & Linux installation.

#### Example

```
licensehistory yes
```

#### Default

```
licensehistory no
```

#### Used On

All Servers

## File Integrity Monitor Events

The File Integrity Monitor component can be configured to send summary events from reports as an Audit Event. The **eventdestinations** setting details how these events are processed, and can be used to monitor the status of the service. This setting should be specified on all the File Integrity Monitor policy servers.

### fileintegrityevents

- **Version 9.3.0 and earlier:** **fileintegrityevents** setting not available
- **Version 9.4.0 and later:** **fileintegrityevents** setting available

This setting enables the production of File Integrity Report events, which are logged to the Log Server.

#### Example

```
fileintegrityevents    yes
```

#### Default

```
fileintegrityevents    no
```

#### Used On

All File Integrity Servers

## Advanced Keystroke Action

The Advanced Keystroke Action component can be configured to send events for every successful session, and command run on a remote server or network appliance.

### advkeystrokeactionevents

- **Version 9.3.3 and earlier:** **advkeystrokeactionevents** setting not available
- **Version 9.4.4 and later:** **advkeystrokeactionevents** setting available

The **advkeystrokeactionevents** setting enables the production of Advanced Keystroke Action events, which are logged to the Log Server.

#### Example

```
advkeystrokeactionevents    yes
```

#### Default

```
advkeystrokeactionevents    no
```

## Used On

All Advanced Keystroke Action Servers

### advkeystrokeactionpolicydb

- **Version 9.4.1 and earlier:** **advkeystrokeactionpolicydb** setting not available
- **Version 9.4.3 and later:** **advkeystrokeactionpolicydb** setting available

The **advkeystrokeactionpolicydb** setting defines the path to the Advanced Keystroke Action policy database which stores all the AKA policies.

This file is created in **databasedir** by default, unless the file name starts with *.*



For more information, please see "[databasedir](#)" on page 54

## Example

```
advkeystrokeactionpolicydb      /etc/pbakapolicy.db
```

## Default

```
advkeystrokeactionpolicydb /opt/<prefix>pbul<suffix>/dbs/pbadvkeystrokeactionpolicy.db
```

## Used On

Advanced Keystroke Action Policy Servers

### advkeystrokeactioncachedb

- **Version 9.4.1 and earlier:** **advkeystrokeactioncachedb** setting not available
- **Version 9.4.3 and later:** **advkeystrokeactioncachedb** setting available

The **advkeystrokeactioncachedb** setting defines the path to the Advanced Keystroke Action profile cache database that is kept on the client so that it always has access to the latest AKA profiles.

## Example

```
advkeystrokeactioncachedb      /etc/pbakacache.db
```

## Default

```
advkeystrokeactioncachedb      /opt/<prefix>pbul<suffix>/dbs/pbadvkeystrokeactioncache.db
```

## Used On

Advanced Keystroke Action clients

## advkeystrokeactionlog

- **Version 9.4.1 and earlier:** `advkeystrokeactionlog` setting not available
- **Version 9.4.3 and later:** `advkeystrokeactionlog` setting available

The `advkeystrokeactionlog` contains the path name of the Advanced Keystroke Action diagnostic log file.

### Example

```
advkeystrokeactionlog /var/log/pbakapolicy.log
```

### Default

No default value

### Used on

Advanced Keystroke Action Policy Servers

## Session Logging

Privilege Management for Unix & Linux records the start of all commands and the finish of all commands not run in local mode. The session start and finish events can also be logged by using the following:

- System `wtmp` or `wtmpx` files (`recordunixptysessions`)
- Syslog system (`syslogsessions`)
- PAM system (`pamsessionsservice`)

## recordunixptysessions

- **Version 3.5 and earlier:** `recordunixptysessions` setting not available
- **Version 4.0 and later:** `recordunixptysessions` setting available

The `recordunixptysessions` setting controls whether command start and finish events are logged to the run host `utmp` or `utmpx` files. When set to **yes**, the events are logged.



**Note:** This keyword does not apply to `pbssh`. If it is present in the settings file, it does not have any effect on `pbssh` and is ignored.

### Example

```
recordunixptysessions no
```

### Default

```
recordunixptysessions yes
```

## Used on

Run hosts



**Note:** If you are using **pamsessionsservice**, then you might need to set **recordunixptysystems** to **no** to avoid duplicate entries in your **utmp** or **utmpx** files.



**Note:** When the login shell is a Privilege Management shell and I/O logging is on, an additional pty is created, which will be logged to the run host's utmp log. Note that the **ut\_host** field is set to the run host value, not the remote host, because this pty originated on the run host.

## syslogsessions

- **Version 4.0.0 and later:** **syslogsessions** setting available

The **syslogsessions** setting controls whether command start and finish events are logged to the run host syslog system. When set to **yes**, the events are logged.



**Note:** This keyword does not apply to **pbssh**. If it is present in the settings file, it does not have any effect on **pbssh** and is ignored.

## Example

```
syslogsessions yes
```

## Default

```
syslogsessions no
```

## Used on

Run hosts



**Note:** If you are using **pamsessionsservice**, then you might need to set **syslogsessions** to **no** to avoid duplicate syslog entries.

## I/O Logging

Privilege Management can maintain I/O logs of sessions under control of the configuration policy language. The **passwordlogging** and **rootshelldefaultiolog** settings provide additional system-wide control of the I/O logs. On Policy Server hosts and log hosts, you can control how much file system space is used with the **logreservedfilesystems** and **logreservedblocks** settings.

Privilege Management records I/O logs in log files on the log host or Policy Server host (if not using a log server).

## I/O Log Indexing and Searching

In a BeyondInsight integrated environment, using Solr servers, each logserver and Policy Server host can communicate with a Solr Server, submitting Privilege Management for Unix & Linux IO log output data for indexing.

BeyondInsight provides a search GUI, allowing users to search indexed IO logs.



For more information about enabling this feature, please see "[BeyondInsight I/O Log Indexing and Searching](#)" on page 139.

### iologack

- **Version 6.0 and earlier:** **iologack** setting not available
- **Version 6.2.5 and later:** **iologack** setting available

The **iologack** setting enables a log host to send an **acknowledgement** to the submit host after the log host writes each I/O log data segment. Using this setting can prevent data integrity problems and prevent the submit host from hanging when there are network interruptions or if the log host becomes unavailable during an I/O logging session. However, enabling **acknowledgements** can increase network traffic and degrade system performance.

The submit host waits for **acknowledgement** for a period of time that is determined by the **logserverprotocoltimeout** setting. If **logserverprotocoltimeout** is set to a value other than **-1**, then the timeout period is 10 seconds. Otherwise, the timeout period is the value of **logserverprotocoltimeout**.

For **acknowledgements** to be sent, the **iologack** setting on the submit host and the log host must both be set to **yes**.

### Example

```
iologack yes
```

### Default

```
iologack no
```

### Used on

- Submit hosts
- Log hosts

### See Also

```
logserverprotocoltimeout
```

### passwordlogging

- **Version 4.0.0 and later:** **passwordlogging** setting available

It might be desirable to control whether passwords can be logged to a greater extent than using the variable **lognpassword** alone. Setting **passwordlogging** to **never** suppresses all text portions of the input stream that are not echoed in the output stream. This action also sets the configuration policy language variable **lognpassword** to **never** and makes it read-only.



For more information about the **lognpassword** variable, please see the [Privilege Management for Unix & Linux Policy Language Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

### Valid Values

- **allow**
- **never**

### Example

```
passwordlogging allow
```

### Default

```
passwordlogging never
```

### Used on

- Policy Server hosts
- Run hosts
- Submit hosts

### rootshelldefaultiolog

- **Version 4.0.0 and later:** **rootshelldefaultiolog** setting available

When root runs a Privilege Management for Unix & Linux Shell (for example, **pbsh** or **pbksh**), and a Policy Server daemon cannot be reached, that shell records an I/O log for the root session. Because no Policy Server can be reached, **rootshelldefaultiolog** provides a default emergency I/O log. If the file name is not unique, then Privilege Management for Unix & Linux adds a unique 6-character suffix to the name.

### Example

```
rootshelldefaultiolog /var/logs/root.default.iolog
```

### Default

```
rootshelldefaultiolog /pbshell.iolog
```

### Used on

Submit hosts by **pbksh** and **pbsh** when a Policy Server host is not available

## logreservedfilesystems and logreservedblocks

- **Version 4.0.0 and later:** `logreservedfilesystems` and `logreservedblocks` settings available

The `logreservedfilesystems` and `logreservedblocks` settings enable the administrator to control free space on the `logreservedfilesystems` file systems, and cause an immediate failover if the log host's free space falls below `logreservedblocks`.

If the number of free 1-KB blocks falls below `logreservedblocks` on any of the file systems that are specified in any of the `logreservedfilesystems` on the log host, then the log daemon immediately refuses any new requests, causing an immediate failover. The same happens on the Policy Server host if you are not using a log server.

If the free space in any of the file systems containing `/var/log` or `/usr/log` falls below 10,000 blocks, then new requests are rejected. Requests that are already in progress are allowed to continue.

### Example

```
logreservedfilesystems /var /usr/log
logreservedblocks 2000
```

### Default

```
logreservedblocks 0
```

No default value for `logreservedfilesystems`

### Used on

- Log hosts
- Policy Server hosts if a log host is not used

## Customized Syslog Formatting

For syslog logging, you can specify the format and select specific fields to be written to the syslog file for accept, reject, and session syslog messages. This feature simplifies integration with Security Information and Event Management (SIEM) systems that typically rely on the standard syslog format to aggregate event data across many different devices. The settings in this section enable and configure this feature.

For all of these settings, the argument is either **none** or a text string that includes references to event log variables. If the argument is **none**, then the corresponding event record is not written to the syslog file. This feature enables you to use the `syslog()` procedure in the policy without sending duplicate records to the syslog files. If the setting is not included in the `pb.settings` file, then Privilege Management for Unix & Linux performs syslog logging with hard-coded accept, reject, and session messages.



The syslog logging feature must be enabled for customized syslog formatting to work. For more information, please see the following to enable syslog logging:

- ["syslog" on page 114](#)
- ["facility" on page 114](#)
- ["syslogsessions" on page 127](#)
- ["pbmasterd" on page 367 \(-a and -r options\)](#)



- "pblogd" on page 365 (-a and -r options)
- "pblocald" on page 358 (-a option)

To define a string to write to the syslog file, the entire text string must be enclosed in double quotation marks (""). An event log variable must be enclosed in percent character (%). A literal percent or double quotation mark character must be preceded by a back slash (for example, \\" and \%). A particular item in a list variable can be referenced with the index number for that list (for example, %argv [1]).



**Note:** This feature extends to one level of lists only; multi-level lists are not handled.

When an event that is recognized by one of these settings occurs, the text string is written to the syslog file, and the event log variable references are replaced with the values of those variables for that event. A variable reference that is not recognized is replaced with the string <variable\_name:undefined> (<variable\_name [n]:undefined> for unrecognized or nonexistent list items).



For a list of event log variables, please see the [Privilege Management for Unix & Linux Language Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.



**Note:** Customized Syslog Formatting messages over 1,024 characters are truncated.



**Note:** When Privilege Management is installed, if a previous **pb.settings** file exists without the customized syslog formatting settings specified, then Privilege Management adds sample customized syslog formatting settings as comments. You can un-comment and remove the string **SAMPLE**, and then modify these sample settings.

## syslog\_accept\_format

- **Version 6.2 and earlier:** `syslog_accept_format` setting not available
- **Version 7.0 and later:** `syslog_accept_format` setting available

The `syslog_accept_format` setting defines the format of the record to be written to the syslog file for accept events.

### Example

```
syslog_accept_format "Privilege Management for Unix & Linux Master accepted
    %command% on %date% at %hour%:%minute%. The command was submitted by
    %user% on %submithost% and run by %runuser% on %runhost%"
```

### Default

No default value

### Used On

Policy Server hosts

### syslog\_reject\_format

- **Version 6.2 and earlier:** `syslog_reject_format` setting not available
- **Version 7.0 and later:** `syslog_reject_format` setting available

The `syslog_reject_format` setting defines the format of the record to be written to the syslog file for reject events.

#### Example

```
syslog_reject_format "Privilege Management for Unix & Linux Master reject %command% on %date% at %hour%:%minute%. The command was submitted by %user% on %submitthost%"
```

#### Default

No default value

#### Used On

Policy Server hosts

### syslogsession\_start\_format

- **Version 6.2 and earlier:** `syslogsession_start_format` setting not available
- **Version 7.0 and later:** `syslogsession_start_format` setting available

The `syslogsession_start_format` setting defines the format of the record to be written to the syslog file for session start events.

#### Example

```
syslog_accept_format "Privilege Management for Unix & Linux session started on %date% at %hour%:%minute%. The session was started by %user%"
```

#### Default

No default value

#### Used On

Run hosts

### syslogsession\_start\_fail\_format

- **Version 6.2 and earlier:** `syslogsession_start_fail_format` setting not available
- **Version 7.0 and later:** `syslogsession_start_fail_format` setting available

The `syslogsession_start_fail_format` setting defines the format of the record to be written to the syslog file for session failed to start events.

## Example

```
syslogsession_start_fail_format "Privilege Management for Unix & Linux session failed to start on %date% at %hour%:%minute%. User %user% attempted to start this session."
```

## Default

No default value

## Used On

Run hosts

## syslogsession\_finished\_format

- **Version 6.2 and earlier:** `syslogsession_finished_format` setting not available
- **Version 7.0 and later:** `syslogsession_finished_format` setting available

The `syslogsession_finished_format` setting defines the format of the record to be written to the syslog file for session finished events.

## Example

```
syslogsession_finished_format "Privilege Management for Unix & Linux session finished on %date% at %hour%:%minute%. The session was started by %user%"
```

## Default

No default value

## Used On

Run hosts

## syslogsession\_finished\_format\_logserver

- **Version 10.0.1 and later:** `syslogsession_finished_format_logserver` setting available

The `syslogsession_finished_format_logserver` setting defines the format of the record to be written to the syslog file for Finish events, from the logserver.

## Example

```
syslogsession_finished_format "Task: '%runcommand%' finished at %exitdate% %exittime% as %runuser% on %runhost% with status %exitstatus%"
```

## Default

No default value

## Used On

Log Servers

## AD Bridge Event Logging

The BeyondTrust AD Bridge product enables you to attach Unix and Linux computers to a Microsoft Active Directory domain and manage them using Group Policies. Privilege Management for Unix & Linux can send information about certain events to AD Bridge for logging and reporting purposes. The settings in this section enable and configure the sending of event information to AD Bridge.

### loadpbislibs

- **Version 6.2 and earlier:** `loadpbislibs` setting not available
- **Version 7.0 and later:** `loadpbislibs` setting available

The `loadpbislibs` setting loads the shared AD Bridge library at runtime, regardless of the value of the `pbis_event_logging` setting, provided that the `sharedlibpbisdependencies` setting is set with valid values and not set to `none`.

### Example

```
loadpbislibs yes
```

### Default

```
loadpbislibs no
```

## Used On

- Submit hosts
- Run hosts
- Policy Server hosts
- Log hosts

### pbis\_event\_logging

- **Version 6.2 and earlier:** `pbis_event_logging` setting not available
- **Version 7.0 and later:** `pbis_event_logging` setting available

The `pbis_event_logging` setting controls the writing of Privilege Management for Unix & Linux events (accept, reject, finish, and keystroke action) to the AD Bridge event log database. A value of `yes` enables sending event information to AD Bridge and a value of `no` disables sending event information to AD Bridge. For this setting to have any effect, the `sharedlibpbisdependencies` setting must be set with valid values and not set to `none`.

### Example

```
pbis_event_logging yes
```

## Default

```
pbis_event_logging no
```

## Used On

- Policy Server hosts
- Log hosts

## pbis\_log\_connect\_success

- **Version 6.2 and earlier:** **pbis\_log\_connect\_success** setting not available
- **Version 7.0 and later:** **pbis\_log\_connect\_success** setting available

The **pbis\_log\_connect\_success** setting enables the sending of successful-connection events (to log hosts and Policy Server hosts) to the AD Bridge event log database. It also controls the posting of an event to AD Bridge if the Policy Server host is able to connect to the run host. For this setting to have any effect, the **sharedlibpbisdependencies** setting must be set with valid values and not set to **none**.

## Example

```
pbis_log_connect_success yes
```

## Default

```
pbis_log_connect_success no
```

## Used On

- Policy Server hosts
- Submit hosts
- Run hosts

## pbis\_log\_failover

- **Version 6.2 and earlier:** **pbis\_log\_failover** setting not available
- **Version 7.0 and later:** **pbis\_log\_failover** setting available

The **pbis\_log\_failover** setting enables the sending of Policy Server host and log host failover events to the AD Bridge event log database. It also controls the posting of an event to AD Bridge if the Policy Server host finds the run host unresponsive. For this setting to have any effect, the **sharedlibpbisdependencies** setting must be set with valid values and not set to **none**.

## Example

```
pbis_log_failover yes
```

## Default

```
pbis_log_failover no
```

## Used On

- Policy Server hosts
- Submit hosts
- Run hosts

## sharedlibpbisdependencies

- **Version 6.2 and earlier:** `sharedlibpbisdependencies` setting not available
- **Version 7.0 and later:** `sharedlibpbisdependencies` setting available

The `sharedlibpbisdependencies` setting specifies the shared libraries that are used to send event information to the AD Bridge event log. When set to **none** or when not set at all, no event information is sent to AD Bridge. If libraries are specified but they fail to load properly, Privilege Management for Unix & Linux records an error message and continues to operate without sending event information to AD Bridge.

## Example

```
sharedlibpbisdependencies  
/opt/pbis/lib/libeventlog_norpc.so.0.0.0 /opt/pbis/lib/liblwbase_nothr.so.0.0.0
```

## Default

The default value depends on the Privilege Management for Unix & Linux flavor and is determined at installation. You can change the value of this setting while running the Privilege Management for Unix & Linux installer or by modifying the `pb.settings` file after installation.

## Used On

- Policy Server hosts
- Log hosts
- Submit hosts
- Run hosts

## BeyondInsight Event Logging

The BeyondTrust BeyondInsight product enables you to capture and report on privilege and vulnerability data across the entire IT stack (server, desktop, cloud, mobile, and virtualized environments).

Starting with version 7.5, Privilege Management for Unix & Linux can send information about certain events to BeyondInsight for logging and reporting purposes.

The settings in this section enable and configure the sending of event information to BeyondInsight.



For more information, please see "[BeyondInsight Event and I/O Logging Common Settings](#)" on page 147.

## rcshost

- **Version 7.1 and earlier:** `rcshost` setting not available
- **Version 7.5 and later:** `rcshost` setting available

The hostname of the Windows machine where BeyondInsight is installed. This keyword will not support the Privilege Management for Unix & Linux extended settings such as **interface**.

### Example

```
rcshost W7-RETINACS-01
```

### Default

No default value

### Used On

- Policy Server hosts
- Log hosts

## rwebsvcport

- **Version 7.1 and earlier:** `rwebsvcport` setting not available
- **Version 7.5 and later:** `rwebsvcport` setting available

The port number used to communicate with BeyondInsight Web Services on **rcshost**.

### Example

```
rwebsvcport 443
```

### Default

```
rwebsvcport 443
```

### Used On

- Policy Server hosts
- Log hosts

### rscworkgroup

- **Version 7.5 and earlier:** rscworkgroup setting not available
- **Version 8.0 and later:** rscworkgroup setting available

A label which helps BeyondInsight identify and sort data sent from Privilege Management for Unix & Linux.

#### Example

```
rscworkgroup PMULMasterBeyondTrustWorkgroup
```

#### Default

```
rscworkgroup "BeyondTrust Workgroup"
```

#### Used On

Policy Server hosts

### sslrcscertfile

- **Version 7.1 and earlier:** sslrcscertfile setting not available
- **Version 7.5 and later:** sslrcscertfile setting available

BeyondInsight Client Certificate File in PEM format. Used to authenticate Privilege Management to BeyondInsight when sending eventlog records.

#### Example

```
sslrcscertfile /etc/retinacs-01_eEyeEmsClient.pem
```

#### Default

No default value

#### Used On

- Policy Server hosts
- Log hosts

### sslrcscafile

- **Version 7.1 and earlier:** sslrcscafile setting not available
- **Version 7.5 and later:** sslrcscafile setting available

BeyondInsight server-bound Certificate Authority File in PEM format. Used to authenticate the BeyondInsight when sending eventlog records.

### Example

```
sslrcscafile /etc/retinacs-01_eEyeEmsCA.pem
```

### Default

No default value

### Used On

- Policy Server hosts
- Log hosts

## BeyondInsight I/O Log Indexing and Searching

Starting with version 7.5, Privilege Management can index IO log files for an improved search capability using BeyondInsight Search GUI. Each logserver and Policy Server host can communicate with a Solr server, submitting IO log output data for indexing.

BeyondInsight provides a search GUI, allowing users to search indexed IO logs.

The settings in this section enable and configure the indexing of IO Log files with Solr.



For more information, please see "[BeyondInsight Event and I/O Logging Common Settings](#)" on page 147.

### solrhost

- **Version 7.1 and earlier:** **solrhost** setting not available
- **Version 7.5 and later:** **solrhost** setting available

The hostname where the Solr server is installed. This keyword will not support the Privilege Management for Unix & Linux extended settings such as **interface**.

### Example

```
solrhost mysolrhost.mydomain
```

### Default

No default value

### solrport

- **Version 7.1 and earlier:** **solrport** setting not available
- **Version 7.5 and later:** **solrport** setting available

The port number used to communicate with the Solr server.

### Example

```
solrport 8443
```

### Default

```
solrport 8443
```

### Used On

- Policy Server hosts
- Log hosts

### solrvariables

- **Version 7.1 and earlier:** **solrvariables** setting not available
- **Version 7.5 and later:** **solrvariables** setting available

A list of Privilege Management for Unix & Linux Policy variables, ending in **\_pbul** that will be used as stored data in Solr.

### Example

```
solrvariables role_pbul list_pbul ticket_pbul
```

### Default

No default value

### Used On

- Policy Server hosts
- Log hosts

### solrclientkeyfile

- **Version 7.1 and earlier:** **solrclientkeyfile** setting not available
- **Version 7.5 and later:** **solrclientkeyfile** setting available

Specifies a PEM format file containing the private key for a Solr client. The Solr server must be configured to have its Java keystore contain the Certificate Authority Certificate (CA cert) that signed the client's public certificate.

### Example

```
solrclientkeyfile /etc/solr.myhost.client.key.pem
```

**Default**

No default value

**Used On**

- Policy Server hosts
- Log hosts

**solrclientcertfile**

- **Version 7.1 and earlier:** **solrclientcertfile** setting not available
- **Version 7.5 and later:** **solrclientcertfile** setting available

Specifies a PEM format file containing the public certificate for the Solr client private key. The Solr server must be configured to have its Java keystore contain the Certificate Authority Certificate (CA cert) that signed the client's public certificate.

**Example**

```
solrclientcertfile /etc/solr.myhost.client.cert.pem
```

**Default**

No default value

**Used On**

- Policy Server hosts
- Log hosts

**solrcafile**

- **Version 7.1 and earlier:** **solrcafile** setting not available
- **Version 7.5 and later:** **solrcafile** setting available

Specifies a PEM format file containing the Certificate Authority Certificate (CA cert) for the CA that signed the Solr server's SSL certificate. If this keyword is specified in **pb.settings**, **pbreplay** will initiate an SSL connection to the Solr server. The **solrport** keyword must be set to a port that Solr is using for HTTPS/SSL traffic.

**Example**

```
solrcafile /etc/solr.myhost.ca.pem
```

**Default**

No default value

### Used On

- Policy Server hosts
- Log hosts

### **iologactiondb**

- **Version 9.4.5 and earlier:** **iologactiondb** setting not available
- **Version 10.0 and later:** **iologactiondb** setting available

Optionally specifies the path and file name of a database used internally to schedule iolog indexing. This prevents too many **pbpreplay** processes from overloading the system. If not specified, the default **pbiologaction.db** in the database directory is used.

### Example

```
iologactiondb/opt/pbul/dbs/action.db
```

### Default

```
iologactiondb/opt/<prefix>pbul<suffix>/dbs/pbiologaction.db
```

### Used On

- Policy Server hosts
- Log hosts

### **iologactioninterval**

- **Version 10.0.0 and earlier:** **iologactioninterval** not available
- **Version 10.0.1 and later:** **iologactioninterval** available

Optionally specifies the interval at which the scheduler checks to see if iologs need to be processed for Solr or **iologcloseactions**. The default is **60** seconds, and the minimum is **30** seconds.

### Example

```
iologactioninterval 120
```

### Default

```
iologactioninterval 60
```

### Used On

- Policy Server hosts
- Log hosts

## iologactionmaxprocs

- **Version 9.4.5 and earlier:** `iologactionmaxprocs` not available
- **Version 10.0 and later:** `iologactionmaxprocs` available

Optionally specifies a limit to the number of simultaneous `pbreplay` processes that can be indexing iologs to Solr. This prevents too many `pbreplay` processes from overloading the system. If not specified, the default `pbiologaction.db` in the database directory is used.

### Example

```
iologactionmaxprocs 120
```

### Default

```
iologactionmaxprocs 4
```

### Used On

- Policy Server hosts
- Log hosts

## iologactionqueuetimelimit

- **Version 10.0.0 and earlier:** `iologactionqueuetimelimit` not available
- **Version 10.0.1 and later:** `iologactionqueuetimelimit` available

Optionally specifies the time limit, in minutes, that an iolog can be held in the processing queue without a heartbeat from `pblogd`, before that iolog is marked as ready for Solr or `iologcloseaction`. The default is **720** minutes (12 hours).

### Example

```
iologactionqueuetimelimit 300
```

### Default

```
iologactionqueuetimelimit 720
```

### Used On

- Policy Server hosts
- Log hosts

## iologactionqueuetimeouts

- **Version 9.4.5 and earlier:** `iologactionqueuetimeouts` available
- **Version 10.0 and later:** `iologactionqueuetimeouts` available

The timeout values specified include:

- **[openread=timeout,delta,backoff]:** The overall timeout, the spin wait delta and the backoff modifier for the open for processing of `pblicense` write queues.
- **[openwrite=timeout,delta,backoff]:** The overall timeout, the spin wait delta and the backoff modifier for the open by clients to log transaction.
- **[write=timeout,delta,backoff]:** The overall timeout, the spin wait delta and the backoff modifier for waiting to write to the write queue.
- **[lock=timeout,delta,backoff]:** The overall timeout, the spin wait delta and the backoff modifier for waiting for exclusive lock when processing the `pblicense` write queues.

### Example

```
iologactionqueuetimeouts openread=1000,10,2.0 openwrite=30000,5,1.2 write=30000,5,1.2  
lock=30000,5,1.2
```

### Default

No default value

### Used On

- Policy Server hosts
- Log hosts

## iologactionretry

- **Version 10.0.0 and earlier:** `iologactionretry` not available
- **Version 10.1.0 and later:** `iologactionretry` available

Optionally specifies the interval, in minutes, that an iolog must wait for a Solr or `iologcloseaction` retry. A solr attempt will be requeued in certain recoverable cases, such as unable to reach the host. An `iologcloseaction` attempt will be requeued if the `iologcloseaction` script returns `-1`. This delay allows time for the issue to be potentially resolved before the next attempt. The minimum is **5** minutes and the maximum is **2880** (48 hours).

### Example

```
iologactionretry 300
```

### Default

```
iologactionretry 20
```

### Used On

- Policy Server hosts
- Log hosts

### indexcommandtimestamps

- **Version 7.1 and earlier:** `indexcommandtimestamps` setting not available
- **Version 7.5 and later:** `indexcommandtimestamps` setting available

Used to disable command timestamps in the Solr index. Command timestamps in the Solr index can be used to search for commands that happened near a time. These timestamps are enabled by default.

### Example

```
indexcommandtimestamps no
```

### Default

```
indexcommandtimestamps yes
```

### Used On

- Policy Server hosts
- Log hosts

### indexlogsize-limit

- **Version 9.4.5 and earlier:** `indexlogsize-limit` setting not available
- **Version 10.0 and later:** `indexlogsize-limit` setting available

Used to set a size limit for iologs that can be indexed. The `indexlogsize-limit` keyword is an integer optionally followed by `k|K|m|M|g|G`. Any additional characters are ignored.

### Example

```
indexlogsize-limit 60M
```

### Default

No default value

### Used On

- Policy Server hosts
- Log hosts

## pbreplaylog

- **Version 7.1 and earlier:** `pbreplaylog` setting not available
- **Version 7.5 and later:** `pbreplaylog` setting available

`pbreplaylog` contains the name for `pbreplay`'s diagnostic log file.

### Example

```
pbreplaylog /var/log/pbreplay.log
```

### Default

During the install, depending on the operating system standards, this can be any of the following:

- `pbreplaylog /var/log/pbreplay.log`
- `pbreplaylog /usr/log/pbreplay.log`
- `pbreplaylog /var/adm/pbreplay.log`
- `pbreplaylog /usr/adm/pbreplay.log`

### Used On

- Policy Server hosts
- Log hosts
- GUI hosts

## solrindextimeout

- **Version 9.4.5 and earlier:** `solrindextimeout` setting not available
- **Version 10.0 and later:** `solrindextimeout` setting available

Used to set a time limit for iologs being indexed. If Solr indexing exceeds the specified time limit, indexing the current iolog is terminated. The time limit, specified in seconds, takes place for both the connection phase and the sending of each 5MB chunk to Solr. For example, if `solrindextimeout` is set to 15, an iolog with 10MB `stdout` data might take up to 60 seconds connecting and talking to Solr before timing out. If `solrindextimeout` is not set, or is set to `-1`, there is no timeout.

### Example

```
solrindextimeout 120
```

### Default

```
solrindextimeout -1
```

## Used On

- Policy Server hosts
- Log hosts

## BeyondInsight Event and I/O Logging Common Settings



The settings in this section must be set, in addition to the settings described in "BeyondInsight Event Logging" on page 136 and "BeyondInsight I/O Log Indexing and Searching" on page 139.

### **pbadmopath**

- **Version 7.1 and earlier:** **pbadmopath** setting not available
- **Version 7.5 and later:** **pbadmopath** setting available

The path where admin binaries reside. This is used by **pbmastord** and **pblogd** to forward events and iologs via **pbreplay**.

### Example

```
pbadmopath /usr/sbin/
```

### Default

No default value

## Used On

- Policy Server hosts
- Log hosts
- GUI hosts

### **guiport**

- **Version 7.1 and earlier:** **guiport** setting not available
- **Version 7.5 and later:** **guiport** setting available

Defines the TCP port number that is used for PBGUID. The port numbers for Privilege Management daemons must use the non-reserved system ports. The allowed port numbers are **1024** to **65535** (inclusive).

In a BeyondInsight integrated environment, this port number is used by the BeyondInsight Console to replay IO logs.

### Example

```
guiport 24348
```

## Default

```
guiport 24348
```

## Used On

- Policy Server hosts
- Log hosts
- GUI hosts

## sguiport

- **Version 7.1 and earlier:** **sguiport** setting not available
- **Version 7.5 and later:** **sguiport** setting available

Defines the TCP port number that is used for the secure PBSGUID. The port numbers for Privilege Management daemons must use the non-reserved system ports. The allowed port numbers are **1024** to **65535** (inclusive).

In a BeyondInsight integrated and SSL-enabled environment, this secure port number is used by the BeyondInsight Console to replay IO logs.

## Example

```
sguiport 24349
```

## Default

```
sguiport 24349
```

## Used On

- Policy Server hosts
- Log hosts
- GUI hosts

## sharedlibcurldependencies

- **Version 7.1 and earlier:** **sharedlibcurldependencies** setting not available
- **Version 7.5 and later:** **sharedlibcurldependencies** setting available

Defines the path and file name for libcurl used by the binaries to communicate with Solr server and/or BeyondInsight server. Setting **sharedlibcurldependencies** requires **sharedlibkrb5dependencies** and **sharedlibssldependencies** to be set.



**Note:** The certificates used for BeyondInsight by Privilege Management for Unix & Linux need support for SHA-256 algorithm which was introduced in SSL v0.9.8. Therefore starting with V7.5, the SSL libraries shipped with Privilege Management for Unix & Linux Shared Libraries are SSL libraries v0.9.8. When installing or upgrading, **sharedlibssldependencies** need to be set to:

```
/usr/lib/symark/pb/libcrypto.so.0.9.8 /usr/lib/symark/pb/libssl.so.0.9.8
```

### Example

```
sharedlibcurldependencies /usr/lib/symark/pb/libcurl.so.4.3.0
```

### Default

- **AIX:** /usr/lib/symark/pb/libcurl.a(libcurl.so.4)
- **HPUX PA-RISC:** /usr/lib/symark/pb/libcurl.sl.7.0
- **HPUX Itanium:** /usr/lib/symark/pb/libcurl.so.7.0
- **Linux, Solaris:** /usr/lib/symark/pb/libcurl.so.4.3.0
- **Mac OS:** Not applicable (static library).

### Used On

- Policy Server hosts
- Log hosts

### loadcurllibs

- **Version 7.5 and earlier:** **loadcurllibs** setting not available
- **Version 7.5 and later:** **loadcurllibs** setting available

Forces the loading of libcurl libraries defined in **sharelibcurldependencies**.

### Example

```
loadcurllibs yes
```

### Default

```
loadcurllibs no
```

### Used On

- Policy Server hosts
- Log hosts

## Event Queueing of Integrated Products

Privilege Management for Unix & Linux sends its events to other products, such as BeyondTrustBeyondInsight, for additional processing to provide added value to users. Starting with v10.1.0, a message router and event scheduler is used to manage the transmission of event data to the integrated products. This architecture comes with additional configuration settings.

### integratedproductsqueuedb

- **Version 10.0.0 and earlier:** `integratedproductsqueuedb` setting not available
- **Version 10.1.0 and later:** `integratedproductsqueuedb` setting available

The `integratedproductsqueuedb` setting specifies the path to the event queue database that will hold the event data to be forwarded by the scheduler to the integrated product(s). If a relative path is specified, the `basedir` setting will be used to derive the full path.

### Example

```
integratedproductsqueuedb /mypath/pbipevent.db
```

### Default

```
integratedproductsqueuedb /opt/<prefix>pbul<suffix>/dbs/pbintprodq.db
```

### Used On

- Log hosts
- Policy Server hosts

### See Also

```
basedir, autofwdtime
```

### autofwdtime

- **Version 7.1 and earlier:** `autofwdtime` setting not available
- **Version 7.5 and later:** `autofwdtime` setting available
- **Version 10.1.0 and later:** `autofwdtime` setting available, but usage modified

The interval (in minutes) that defines how often the scheduler will process the queued Events to be forwarded to integrated products (for example, BeyondInsight). If this keyword does not exist in the settings file, it will default to **20** minutes.

### Example

```
autofwdtime 4
```

## Default

```
autofwdtime 20
```

## Used On

- Policy Server hosts
- Log hosts

## Log Synchronization

Beginning with V5.0, Privilege Management for Unix & Linux can consolidate and merge the logs from the log server and the secondary server following a log server failover and log server recovery. The log synchronization feature is controlled by the **logresynctimermin**, **pbsyncdlog**, **pbsynclog**, and **syncport** settings. The client also uses log servers and event logs.

### logresynctimermin

- **Version 4.0 and earlier:** **logresynctimermin** setting not available
- **Version 5.0 and later:** **logresynctimermin** setting available

When **pbsync** is started in daemon mode, this variable defines how often the client attempts to resynchronize the files. The time is defined in minutes and can be 5 minutes or greater.

## Example

```
logresynctimermin 15
```

## Default

```
logresynctimermin 16
```

## Used on

- Log hosts
- Synchronization clients

### pbsyncdlog

- **Version 4.0 and earlier:** **pbsyncdlog** setting not available
- **Version 5.0 and later:** **pbsyncdlog** setting available

There will be a unique file to keep track of server transactions. This variable refers to the path and file name for this feature's log, typically:

```
/path_to_logs/pbsyncd.log
```

## Example

```
pbsyncdlog /var/log/pbsyncd.log
```

## Default

During the install, depending on the operating system standards, this can be any of the following:

- `pbsyncdlog /var/log/pbsyncd.log`
- `pbsyncdlog /usr/log/pbsyncd.log`
- `pbsyncdlog /var/adm/pbsyncd.log`
- `pbsyncdlog /usr/adm/pbsyncd.log`

## Used on

- Log hosts
- Synchronization clients

## **pbsynclog**

- **Version 4.0 and earlier:** **pbsynclog** setting not available
- **Version 5.0 and later:** **pbsynclog** setting available

There will be a unique file to keep track of client transactions. **pbsynclog** refers to the path and file name for this feature's log, typically:

```
/path_to_logs/pbsync.log
```

## Example

```
pbsynclog /var/log/pbsync.log
```

## Default

During the install, depending on the operating system standards, this can be any of the following:

- `pbsynclog /var/log/pbsync.log`
- `pbsynclog /usr/log/pbsync.log`
- `pbsynclog /var/adm/pbsync.log`
- `pbsynclog /usr/adm/pbsync.log`

## Used on

- Log hosts
- Synchronization clients

## syncport

- **Version 4.0 and earlier:** `syncport` setting not available
- **Version 5.0 and later:** `syncport` setting available

`syncport` defines the TCP port number that is used for log synchronization. The port numbers for Privilege Management daemons must use the non-reserved system ports. The allowed port numbers are **1024** to **65535** (inclusive).

### Example

```
syncport 24350
```

### Default

```
syncport 24350
```

### Used on

- Log hosts
- Synchronization clients

## syncprotocoltimeout

- **Version 5.2 and earlier:** `syncprotocoltimeout` setting not available
- **Version 6.0 and later:** `syncprotocoltimeout` setting available

After a connection is established between a log synchronization client (`pbsync`) and server (`pbsyncd`), the programs perform protocol checks to verify a proper connection. Some types of protocol failures could take a long time to determine (for example., wrong service running on the Policy Server port, or mismatched encryption types/keys).

The `syncprotocoltimeout` setting determines the maximum time to wait for protocol completion. If a protocol step does not complete within the specified number of milliseconds, then `pbsync` stops with an error. A value of **-1** indicates no protocol timeout.

### Example

```
syncprotocoltimeout 2000
```

### Default

```
syncprotocoltimeout -1
```

### Used on

- Log hosts
- Log synchronization hosts

## Diagnostic Logging

**pblogd**, **pbrun**, **pbmasterd**, **pblocald**, **pblogd**, **pbksh**, **pbsb**, **pbguid**, and **pbsudo** can produce diagnostic messages that can be stored in individual files.

### kshlog

- **Version 3.5 and earlier:** **kshlog** setting not available
- **Version 4.0 and later:** **kshlog** setting available

**kshlog** contains the name of the **pbksh** diagnostic log file.

### Example

```
kshlog /var/log/pbksh.log
```

### Default

During the install, depending on the operating system standards, this can be any of the following:

- `kshlog /var/log/pbksh.log`
- `kshlog /usr/log/pbksh.log`
- `kshlog /var/adm/pbksh.log`
- `kshlog /usr/adm/pbksh.log`

### Used on

Submit hosts

### pbguidlog

- **Version 4.0.0 and later:** **pbguidlog** setting available

**pbguidlog** contains the name of the **pbguid** diagnostic log file.

### Example

```
pbguidlog /var/log/pbguid.log
```

### Default

During the install, depending on the operating system standards, this can be any of the following:

- `pbguidlog /var/log/pbguid.log`
- `pbguidlog /usr/log/pbguid.log`
- `pbguidlog /var/adm/pbguid.log`
- `pbguidlog /usr/adm/pbguid.log`

## Used on

GUI hosts

## pblocaldlog

- **Version 4.0.0 and later:** **pblocaldlog** setting available

**pblocaldlog** contains the name of the **pblocald** diagnostic log file.



**Note:** This keyword does not apply to **pbssh**. If it is present in the settings file, it does not have any effect on **pbssh** and is ignored.

## Example

```
pblocaldlog /var/log/pblocald.log
```

## Default

During the install, depending on the operating system standards, this can be any of the following:

- `pblocaldlog /var/log/pblocald.log`
- `pblocaldlog /usr/log/pblocald.log`
- `pblocaldlog /var/adm/pblocald.log`
- `pblocaldlog /usr/adm/pblocald.log`

## Used on

Run hosts

## pblogdlog

- **Version 4.0.0 and later:** **pblogdlog** setting available

**pblogdlog** contains the name of the **pblogd** diagnostic log file.

## Example

```
pblogdlog /var/log/pblogd.log
```

## Default

During the install, depending on the operating system standards, this can be any of the following:

- `pblogdlog /var/log/pblogd.log`
- `pblogdlog /usr/log/pblogd.log`
- `pblogdlog /var/adm/pblogd.log`
- `pblogdlog /usr/adm/pblogd.log`

**Used on**

Log hosts

**pbmasterdlog**

- **Version 4.0.0 and later:** **pbmasterdlog** setting available

**pbmasterdlog** contains the name of the **pbmasterd** diagnostic log file.

**Example**

```
pbmasterdlog /var/log/pbmasterd.log
```

**Default**

During the install, depending on the operating system standards, this can be any of the following:

- `pbmasterdlog /var/log/pbmasterd.log`
- `pbmasterdlog /usr/log/pbmasterd.log`
- `pbmasterdlog /var/adm/pbmasterd.log`
- `pbmasterdlog /usr/adm/pbmasterd.log`

**Used on**

Policy Server hosts

**pbrunlog**

- **Version 4.0.0 and later:** **pbrunlog** setting available

**pbrunlog** contains the name of the **pbrun** diagnostic log file.

**Example**

```
pbrunlog /var/log/pbrun.log
```

**Default**

No default value

**Used on**

Submit hosts

**pbpinglog**

- **Version 6.2 and earlier:** **pbpinglog** setting not available
- **Version 7.0 and later:** **pbpinglog** setting available

**pbpinglog** contains the name of the **pbping** diagnostic log file.

#### Example

```
pbpinglog /var/log/pbping.log
```

#### Default

No default value

#### Used on

Policy Server hosts

#### shlog

- **Version 3.5 and earlier:** **shlog** setting not available
- **Version 4.0 and later:** **shlog** setting available

**shlog** contains the name of the **pbsh** diagnostic log file.

#### Example

```
shlog /var/log/pbsh.log
```

#### Default

During the install, depending on the operating system standards, this can be any of the following:

- `shlog /var/log/pbsh.log`
- `shlog /usr/log/pbsh.log`
- `shlog /var/adm/pbsh.log`
- `shlog /usr/adm/pbsh.log`

#### Used on

Submit hosts

#### pbsudolog

- **Version 8.5 and earlier:** **pbsudolog** setting not available
- **Version 9.0 and later:** **pbsudolog** setting available

**pbsudolog** contains the absolute path name of the Privilege Management for Unix & Linux Basic diagnostic log file.

#### Example

```
pbsudolog /var/log/pbsudo.log
```

**Default**

No default value

**Used on**

Privilege Management for Unix & Linux Basic client hosts

## I/O Log Action

**iologactionwq**

- The **iologactionwq** setting is available only in versions **10.0.0** and **10.0.1**.

The **iologactionwq** keyword defines the initial name of the write queue files for **iologcloseaction** and Solr. This file is created in **databasedir** by default, unless the file name starts with '/

**Example**

```
iologactionwq "pbiologaction.wq"
```

**Default**

No default value

**Used On**

- Log Servers
- Policy Servers

**iologactionwqnum**

- The **iologactionwqnum** setting is available only in versions **10.0.0** and **10.0.1**.

The **iologactionwqnum** keyword defines the number of write queue files for **iologcloseaction** and Solr. Generally, the more files allowed, the fewer file locks will be encountered and thus increase speed. The maximum value is **999**.

**Example**

```
iologactionwqnum 99
```

**Default**

```
iologactionwqnum 10
```

## Used On

- Log Servers
- Policy Servers

## **iologactiondb**

- **Version 10.0.1 and later:** **iologactiondb** setting available

The **iologactiondb** keyword specifies the database filename for the **iologcloseaction** and Solr queue. This file is created in **databasedir** by default, unless the file name starts with '/'.

```
iologactiondb pbiologaction.db
```

## Default

```
iologactiondb /opt/<prefix>pbul<suffix>/dbs/pbiologaction.db
```

## Used On

- Log Servers
- Policy Servers

## Example

### **iologactiondbdelay**

- **Version 10.0.1 and later:** **iologactiondbdelay** available

When opening the iologaction database, the **iologactiondbdelay** keyword specifies the number of milliseconds to wait when the iologaction database is locked.

## Example

```
iologactiondbdelay 100000
```

## Default

```
iologactiondbdelay 10000
```

## Used On

- Log Servers
- Policy Servers

## iologactionmaxprocs

- **Version 10.0.1 and later:** `iologactionmaxprocs` setting available

The `iologactionmaxprocs` keyword specifies the maximum number of `pbreplay` processes used to process Solr indexing and `iologcloseaction` actions. Limiting the maximum number of processes reduces CPU load used for Solr indexing and `iologcloseaction` at any given time.

### Example

```
iologactionmaxprocs 20
```

### Default

```
iologactionmaxprocs 4
```

### Used On

- Log Servers
- Policy Servers

## iologactionretry

- **Version 10.0.1 and later:** `iologactionretry` setting available

The `iologactionretry` keyword specifies the time, in minutes, before it a requeued task is processed. The minimum value allowed is **5**, the maximum is **2880** (48 hours).

### Example

```
iologactionretry 60
```

### Default

```
iologactionretry 20
```

### Used On

- Log Servers
- Policy Servers

## pbsudo\_iologcloseaction

- **Version 10.0.1 and later:** `pbsudo_iologcloseaction` setting available

The **pbsudo\_iologcloseaction** keyword specifies an iolog close action for Privilege Management iologs. This keyword setting is global to a logserver. If set, all Privilege Management iologs are processed by the specified close action program.



**Note:** Privilege Management iologs do not contain ACA data, and as such the `/opt/pbul/scripts/closeactionsplunk.pl` perl script will not be of use for Privilege Management iologs.

### Example

```
pbsudo_iologcloseaction /usr/local/bin/iolog_process_script
```

### Default

none

### Used On

Log Servers

## Log Archiving

Beginning with v9.0, Privilege Management for Unix & Linux provides a logfile tracking and archiving mechanism for I/O logs and eventlogs.



**Note:** REST Services and Log Archiving are not fully supported on Mac OS X.

### enablelogtrackingdb

- **Version 8.5 and earlier:** **enablelogtrackingdb** setting not available
- **Version 9.0 and later:** **enablelogtrackingdb** setting available

For use on Log hosts and Policy Server hosts. If set, the Privilege Management for Unix & Linux component creating the eventlog or I/O log will send the location information to the centralized tracking database to be recorded. This setting requires a configured REST service on the designated Log Archiver Database Server, and needs **logarchivedbhost** and **pbrestport** settings in order to update the database. To disable the feature, set this to **no**, and the log writer will not send the logfile location to the log tracking database. It is enabled by default.

### Example

Enable tracking of logfile location:

```
enablelogtrackingdb yes
```

Disable tracking of logfile location:

```
enablelogtrackingdb no
```

## Default

```
enablelogtrackingdb no
```

## Used on

- Log hosts
- Policy Server hosts if a log host is not used

## logarchivehost

- **Version 8.5 and earlier:** `logarchivehost` setting not available
- **Version 9.0 and later:** `logarchivehost` setting available

For use on Log Servers where the logfile originates. It is the name of the default destination host that will receive the archived log files. It must have a valid Privilege Management installation with the REST service configured.

## Example

```
logarchivehost host
```

where **host** is the hostname or IP address of the archive host.

## Default

No default value

## Used on

- Log hosts
- Policy Server hosts if a log host is not used

## logarchivedbhost

- **Version 8.5 and earlier:** `logarchivedbhost` setting not available
- **Version 9.0 and later:** `logarchivedbhost` setting available

For use on Log Servers where the logfile originates. It is the name or the IP address of the host where the log tracking database is created and maintained.



**Note:** The host specified must have a valid Privilege Management installation with the REST service configured.

## Example

```
logarchivedbhost logarchdbhost1  
logarchivedbhost 192.10.42.235
```

## Default

No default value

## Used on

- Log hosts
- Policy Server hosts if a log host is not used

## logarchivedir

- **Version 8.5 and earlier:** `logarchivedir` setting not available
- **Version 9.0 and later:** `logarchivedir` setting available

It defines the main destination path for the log files on the Log Archive Storage Server host. Under this main directory, the logfiles will be organized appropriately in their subdirectories:

- **Eventlogs:** `<logarchivedir>/eventlog/<origlogservername>`
- **IOLogs:** `<logarchivedir>/iolog/<submithost>/submituser/<date>`



**Note:** If the directory does not yet exist, it will be created and made secure (readable and writable by root only).

## Example

```
logarchivedir /pbul/pbarchive
```

## Default

During the install, depending on the operating system standards, this can be any of the following:

- `logarchivedir /var/log/pblogarchive`
- `logarchivedir /usr/log/pblogarchive`
- `logarchivedir /var/adm/pblogarchive`
- `logarchivedir /usr/adm/pblogarchive`

## Used on

Log hosts designated as Log Archive Storage Server

## logarchivedb

- **Version 8.5 and earlier:** `logarchivedb` setting not available
- **Version 9.0 and later:** `logarchivedb` setting available

The absolute path of the SQLite log tracking database file on the Log Archiver Database Server. If the file does not yet exist, it will be created when the first row is inserted.

### Example

```
logarchivedb /var/log/pblogtrack.db
```

### Default

```
logarchivedb /opt/<prefix>dbs<suffix>/dbs/pblogarchive.db
```

### Used on

Log hosts designated as Log Archiver Database Server

### logarchivedb\_delay

- **Version 9.4.0 and earlier:** logarchivedb\_delay setting not available
- **Version 9.4.1 and later:** logarchivedb\_delay setting available

Maximum accumulated time in milliseconds that the Log Host busy handler will sleep during the retry cycle when it encounters a locked log tracking database. If not specified, the default value is **100,000** milliseconds. The valid range is **0 - 1,200,000** milliseconds. A **0** value means no retries are attempted and a *database locked* error is logged immediately. Increase the value if there is a high demand on updating the log tracking database and there are too many database locked errors reported. A higher value, however, may affect the performance of the Log Host.



**Note:** SQLite may decide not to invoke the busy handler if it determines the possibility of a deadlock.

### Example

```
logarchivedb_delay 200000
```

### Default

```
logarchivedb_delay 10000
```

### Used on

Log hosts designated as Log Archiver Database Server

## Logfile Name Caching

Beginning with v9.4.0, if you are integrating with the BeyondInsight for Unix & Linux, you can enable the caching of logfile names. The logfile names, creation/access time, and run host association will be saved in SQLite databases for better console experience and functionality.

## enablelogcaching

- **Version 10.3.0 and earlier:** `enablelogcaching` setting not available
- **Version 10.3.1 and later:** `enablelogcaching` setting available

When set to **yes**, log file name caching is enabled and the Privilege Management for Unix & Linux services will refer to **logcachedb** and **iologcachedb** settings keywords for the appropriate database paths. Set to **no** to disable log file name caching feature. Default value is **yes** (if commented out or omitted from the settings file).

## logcachedb

- **Version 9.3 and earlier:** `logcachedb` setting not available
- **Version 9.4 and later:** `logcachedb` setting available, with the following behavior:

This setting holds the absolute path of the SQLite database file which stores information on the eventlog and IO log file pathnames on the Log Host. If the database file does not yet exist, it will be created when the first row is inserted.



**Note:** If this setting does not exist in the `pb.settings` file, it disables the log file name caching feature.

- **Version 10.3.1 and later:** `logcachedb` setting available, with the following behavior:

Starting in v10.3.1, this setting holds the absolute path of the SQLite database file which stores information only on Privilege Management for Unix & Linux eventlog file pathnames on the Log Host. If the database file does not yet exist, it will be created when the first row is inserted.



**Note:** Commenting out this setting does not disable log file name caching feature. To enable/disable log file name caching feature, use the **enablelogcaching** setting.

## Example

```
logcachedb /var/log/pblogcache.db
```

## Default

```
logcachedb /opt/<prefix>pbul<suffix>/dbs/pblogcache.db
```

## Used on

Log hosts

## logcachedb\_delay

- **Version 9.4.0 and earlier:** `logcachedb_delay` setting not available
- **Version 9.4.1 and later:** `logcachedb_delay` setting available

Maximum accumulated time in milliseconds that the Log Host busy handler will sleep during the retry cycles when it encounters a locked **logcachedb** database. If not specified, the default value is **100,000** milliseconds. The valid range is **0 - 1,200,000**

milliseconds. A **0** value means no retries are attempted and a *database locked* error is logged immediately. Increase the value if there is a high demand on updating the log file name caching database and there are too many database locked errors reported. A higher value, however, may affect the performance of the Log Host.



**Note:** SQLite may decide not to invoke the busy handler if it determines the possibility of a deadlock.

### Example

```
logcachedb_delay 200000
```

### Default

```
logcachedb_delay 10000
```

### Used on

Log hosts

### iologcachedb

- **Version 10.3.0 and earlier:** **iologcachedb** setting not available
- **Version 10.3.1 and later:** **iologcachedb** setting available

This setting holds the absolute path of the SQLite database file which stores information only on Privilege Management for Unix & Linux IO log file pathnames on the Log Host. If the database file does not yet exist, it will be created when the first row is inserted.



**Note:** Commenting out this setting does not disable the log file name caching feature. To enable/disable the log file name caching feature, use the **enablelogcaching** setting.

### Example

```
iologcachedb /var/log/pbiologcache.db
```

### Default

```
iologcachedb /opt/<prefix>pbul<suffix>/dbs/pbiologcache.db
```

### Used on

Log hosts

### iologcachedb\_delay

- **Version 10.3.0 and earlier:** **iologcachedb\_delay** setting not available
- **Version 10.3.1 and later:** **iologcachedb\_delay** setting available

Maximum accumulated time in milliseconds that the Log Host busy handler will sleep during the retry cycles when it encounters a locked **iologcachedb** database. If not specified, the default value is **100,000** milliseconds. The valid range is **0 - 1,200,000** milliseconds. A **0** value means no retries are attempted and a database locked error is logged immediately. Increase the value if there is a high demand on updating the log file name caching database and there are too many database locked errors reported. A higher value, however, may affect the performance of the Log Host.



**Note:** *SQLite may decide not to invoke the busy handler if it determines the possibility of a deadlock.*

### Example

```
iologcachedb_delay 20000
```

### Default

```
iologcachedb_delay 10000
```

### Used on

Log hosts

## Network Traffic and File Encryption

Privilege Management for Unix & Linux can encrypt network traffic, event logs, I/O logs, policy files, and its own settings file. The following table lists the available encryption algorithms. If you are using SSL, then it supersedes the network traffic encryption algorithms after the start-up protocol is complete.

### Encryption Algorithms

Settings String	Block Size (bytes)	Key Size (bytes)	Comments
3des	8	24	Old style Triple DES. This algorithm is deprecated in favor of the new style Triple DES and will be removed in a future release.
aes-16-16 (or aes-128)	16	16	AES
aes-16-24 (or aes-192)	16	24	" "
aes-16-32 (or aes-256)	16	32	" "
aes-24-16	24	16	" "
aes-24-24	24	24	" "
aes-24-32	24	32	" "
aes-32-16	32	16	" "
aes-32-24	32	24	" "
aes-32-32	32	32	" "
blowfish	8	56	Blowfish
cast128	8	16	Cast-128
des	8	8	DES
gost	8	32	Gost
loki97	16	32	Loki97
none	0	0	No encryption.
old	stream	1024	A proprietary algorithm, maintained for backward compatibility only.  <b>Note:</b> This algorithm is deprecated and will be removed in a future release.

Settings String	Block Size (bytes)	Key Size (bytes)	Comments
saferplus-16	16	16	SaferPlus
saferplus-24	16	24	" "
saferplus-32	16	32	" "
serpent-16	16	16	Serpent
serpent-24	16	24	" "
serpent-32	16	32	" "
threeway	12	12	Threeway
tiny	8	16	Tiny
tripleDES	8	16	New style Triple DES
twofish-16	16	16	Twofish
twofish-24	16	24	" "
twofish-32	16	32	" "

## Enhanced Encryption

To enable compliance with US government regulations, and specifically FIPS 140-2, encryption has been updated. Many of the older less secure encryption algorithms have been deprecated, and when high security is enforced, they are disabled completely.

When new clients are installed, **enforcehighsecurity** and **ssl** are both enabled in **pb.settings**. This switches Privilege Management for Unix & Linux into FIPS 140-2 mode. All encryption algorithms are FIPS 140-2 compliant, and it will not communicate, encrypt or decrypt any data that isn't encrypted in AES-128, AES-192, AES-256 or TripleDes (3DES).



**Note:** If a customer is installing version 9 of Privilege Management for Unix & Linux from scratch, high security mode is recommended.

For existing customers who are upgrading their enterprise to version 9, the upgrade script will automatically add the AES-256 encryption algorithm onto the iolog and event log encryption configuration, leaving the existing encryption algorithms at the end of the configuration. This will ensure that new iologs and event logs are encrypted using modern secure algorithms, but allowing existing iologs and event logs that are encrypted in less secure algorithms to be decrypted and retrieved. Although existing network encryption can continue to use deprecated encryption algorithms, because the data is transient, more permanent data such as iologs and event logs can only be encrypted in FIPS 140-2 compatible algorithms.



**Note:** Customers who have an existing infrastructure, and would like to be FIPS 140-2 compliant will have to upgrade all Privilege Management for Unix & Linux Servers and Clients to the latest version. If there are existing iologs and event logs that are encrypted using less secure algorithms you will require a specially configured host that will be dedicated to reading these older logs.

To accomplish this task, you can use the new Client Registration feature to copy new **pb.settings** configuration, keys and certificates, or you can configure each installation by hand and copy the files manually.

## Use Client Registration

1. Follow the upgrade guide to update the Primary Policy Server to the latest version.
2. Create a new-style encryption key to be used across the enterprise:

```
pbkey -F /etc/pbfips.key
```

3. Create a suitable client **pb.settings** file, for example **/etc/pb-client.settings**, and configure the new encryption settings. For example:

```
enforcehighsecurity yes
ssl yes
ssloptions requiressl sslfirst sslverbose
sslservercertfile /etc/pbmasterhost.crt
sslserverkeyfile /etc/pbmasterhost.pem
networkencryption aes-256:keyfile=/etc/pbfips.key
iologencryption aes-256:keyfile=/etc/pbfips.key
eventlogencryption aes-256:keyfile=/etc/pbfips.key
submitmasters pbmasterhost.org.com
logservers pbloghost.org.com
```

4. Follow the Client Registration guide to enable the service and configure an appropriate client profile. For example, on the Primary Policy Server run:

```
pbdbutil --reg -n
pbdbutil --reg -u '{"name":"client-prof","data":
[{"type":"settings","fname":"/etc/pb-client.settings"},
{"type":"certificate","to":"/etc/${prefix}pbrest.pem${suffix}"},
{"type":"save","sname":"networkencryption"},
{"type":"save","sname":"iologencryption"},
{"type":"save","sname":"eventlogencryption"},
{"type":"save","sname":"restkeyencryption"},
{"type":"save","sname":"sslservercertfile"},
{"type":"save","sname":"sslserverkeyfile"}]}'
```

5. Create similar profiles for your secondary Policy Servers, log servers, etc.
6. Create a REST application ID and Key to authenticate your Client Registration requests. For example, on the Primary Policy Server run:

```
pbdbutil --rest -g clientreg
{"appkey":"cbbclaab-6f2b-40d0-b611-060bff0aaafa"}
```

7. Now follow the upgrade guide to upgrade each client and server, using Client Registration when prompted. Run the normal **pbinstall** on the client and when asked whether to use Client Registration, answer **yes**, and provide responses to the Client Registration configuration questions. For example:

```
Do you wish to utilize Client Registration? [yes]?
Enter the Application ID generated on the Primary License Server: clientreg
Enter the Application Key generated on the Primary License Server: cbbclaab-
```

```
6f2b-40d0-b611-060bff0aaafa
Enter the Primary License Server address/domain name for registering
clients: pbmasterhost.org.com
Enter the Primary License Server REST TCP/IP port [24351]: 24351
Enter the Registration Client Profile name [default]: client-prof
```

Using the profile appropriate to the installation type. All the necessary **pb.settings**, keys and certificates will be automatically copied to the upgrade installation making upgrade simple.

Alternatively, these Client Registrations options can be specified on the **pbinstall** command line for automation. For example:

```
pbinstall -A clientreg -K cbbc1aab-6f2b-40d0-b611-060bff0aaafa -D
pbmasterhost.org.com -N client-prof
```

## Without Using Client Registration

1. Follow the upgrade guide to update the Primary Policy Server to the latest version.
2. Create a new-style encryption key to be used across the enterprise:

```
pbkey -F /etc/pbfips.key
```

3. For each upgrade you will need to copy the new key, the Primary Policy Manger certificate and the Primary Policy Server key to each host.
4. During upgrade you will need to change settings to enable high security mode:

```
Enforce High Security Encryption? yes Use SSL? yes
SSL Configuration? requiressl sslfirst sslverbose
SSLServer Certificate File? <path to Primary Policy Server certificate file>
SSL Server Private Key File? <path to Primary Policy Server key file>
PowerBroker network encryption options aes-256:keyfile=/etc/pbfips.key
PowerBroker event log encryption options aes-256:keyfile=/etc/pbfips.key
PowerBroker I/O log encryption options aes-256:keyfile=/etc/pbfips.key
```

To configure a dedicated host to read older iologs and event logs encrypted with deprecated encryption algorithms, the following configuration is required to ensure that it can communicate with the new FIPS 140-2 compliant installations, but allowing it to read the older logs. Follow the above installation procedures, but change the **pb.setting** configuration:

```
enforcehighsecurity no
ssl yes
ssloptions requiressl sslfirst sslverbose
sslservercertfile /etc/pbmasterhost.crt
sslserverkeyfile /etc/pbmasterhost.pem
networkencryption aes-256:keyfile=/etc/pbfips.key
iologencryption aes-256:keyfile=/etc/pbfips.key des:keyfile=/etc/oldpb.key
eventlogencryption aes-256:keyfile=/etc/pbfips.key
des:keyfile=/etc/oldpb.key
```

High security mode is not enabled, allowing the installation to read deprecated logs. SSL is enabled, with the correct configuration to allow the installation to communicate with the Policy Servers. The iolog and event log encryption must have FIPS 140-2 compatible algorithm specified if new logs are to be written. However this can be left out if the sole purpose of the installation is to read older logs.

Appended to the end of the iolog and event log encryption configuration are the details of the customers' existing encryption used when the logs were encrypted. Privilege Management for Unix & Linux will select the relevant algorithm when the logs are replayed.

## Set the Encryption Algorithm and Key

Starting with v8.0, the default encryption method is AES-256. If the encryption setting is commented out in the settings file, AES-256 encryption is used. Prior to v8.0, the default encryption method was DES.

Two parameters to consider when selecting an encryption algorithm are the block and key sizes. The larger an algorithm's block size, the more efficient it is. If an algorithm has multiple key sizes, then the larger the key, the more secure the algorithm.

A key must be generated for the use of encryption. The key must be the same on all the machines that are using the encryption. If the key is changed, then all of the encrypted files are no longer readable. Likewise, if the encryption algorithm is changed, any encrypted files are no longer readable.

As computing power and mathematical and algorithmic knowledge improves, so must encryption standards improve to keep data secure. Starting with v8.5, to move forward with new encryption standards, and to give the customer better control over their encryption standards, new configuration has been added. These improvements are the first phase of enhancements designed to ultimately make Privilege Management for Unix & Linux compliant with new government encryption standards such as FIPS 140-2.

Starting with v8.5, the settings file has been enhanced to incorporate the new keyword **enforcehighsecurity**<yes/no>.



For more information, please see the setting "**enforcehighsecurity**" on page 172.

The **iolog** and **eventlog** files are encrypted by their writers and are decrypted by their readers. Policy files must be encrypted manually and are decrypted by their readers. The default is **none** (no files encrypted).



**Note:** *The settings files must be encrypted manually. An unencrypted copy of the settings file should be kept offline because Privilege Management for Unix & Linux does not provide a decryption program for the settings file. The installation suite will not work correctly if the settings file is encrypted. The unencrypted file will have to be restored before performing an upgrade, or running **pemakeremotetar** or **pbuninstall**.*



For information about file encryption, please see "**pbencode**" on page 352 and "**pbkey**" on page 356.

### enforcehighsecurity

- **Version 8.0 and earlier:** **enforcehighsecurity** setting not available
- **Version 8.5 and later:** **enforcehighsecurity** setting available

This will enforce the use of more secure configuration, including using SSL for communications, FIPS 140-2 compliant symmetric encryption algorithms, an enhanced Pseudo Random Number Generator, and the use of the enhanced **pb.key** format.



**Note:** *Only encryption algorithms that are accredited by FIPS 140-2 can be used for network and file encryption (for example, **aes-128**, **aes-192**, **aes-256** and **tripleDES**). All others are deprecated.*

Once this has been enabled the following **pb.settings** need to be configured:

- `ssl yes`
- `ssloptions requiressl sslfirst sslverbose`

- `sslengine`
- `sslservercertfile /etc/pbssl.pem`
- `sslcountrycode US`
- `sslprovince AZ`
- `ssllocality Phoenix`
- `sslorgunit Security`
- `sslorganization BeyondTrust`

You will also need to generate a new key using **pbkey -F**.



For more information, please see ["pbkey" on page 356](#).

### Example

```
enforcehighsecurity yes
```

### Default

```
enforcehighsecurity yes
```

### Used on

- Policy Server hosts
- Submit hosts
- Run hosts
- Privilege Management for Unix & Linux Basic client hosts

### See also

`pbkey`, `ssl`, `ssloptions`, `sslservercertfile`, `sslserverkeyfile`, `sslcountrycode`, `sslprovince`, `ssllocality`, `sslorgunit`, `sslorganization`, `sslpruncipherlist`, `sslservercipherlist`

### sslcountrycode

- **Version 8.5.0 and earlier:** `sslcountrycode` setting not available
- **Version 9.0.0 and later:** `sslcountrycode` setting available

Country code to use when creating x509 SSL client certificates. Used by Client Registration

### Example

```
sslcountrycode US
```

### Default

```
sslcountrycode US
```

### Used on

All hosts

### See also

```
ssl, sslprovince, ssllocality, sslorgunit, sslorganization, sslpbruncipherlist, sslservercipherlist
```

### sslprovince

- **Version 8.5.0 and earlier:** **sslprovince** setting not available
- **Version 9.0.0 and later:** **sslprovince** setting available

Province to use when creating x509 SSL client certificates. Used by Client Registration

### Example

```
sslprovince AZ
```

### Default

```
sslprovince AZ
```

### Used on

All hosts

### See also

```
ssl, sslcountrycode, ssllocality, sslorgunit, sslorganization, sslpbruncipherlist, sslservercipherlist
```

### ssllocality

- **Version 8.5.0 and earlier:** **ssllocality** setting not available
- **Version 9.0.0 and later:** **ssllocality** setting available

Locality to use when creating x509 SSL client certificates. Used by Client Registration

### Example

```
ssllocality Phoenix
```

## Default

```
ssllocality Phoenix
```

## Used on

All hosts

## See also

```
ssl, sslcountrycode, sslprovince, sslorgunit, sslorganization, sslpbruncipherlist,  
sslservercipherlist
```

## sslorgunit

- **Version 8.5.0 and earlier:** `sslorgunit` setting not available
- **Version 9.0.0 and later:** `sslorgunit` setting available

Organization unit to use when creating x509 SSL client certificates. Used by Client Registration

## Example

```
sslorgunit Security
```

## Default

```
sslorgunit Security
```

## Used on

All hosts

## See also

```
ssl, sslcountrycode, sslprovince, ssllocality, sslorganization, sslpbruncipherlist,  
sslservercipherlist
```

## sslorganization

- **Version 8.5.0 and earlier:** `sslorganization` setting not available
- **Version 9.0.0 and later:** `sslorganization` setting available

Organization to use when creating x509 SSL client certificates. Used by Client Registration.

## Example

```
sslorgunit BeyondTrust
```

## Default

```
sslorgunit BeyondTrust
```

## Used on

All hosts

## See also

```
ssl, sslcountrycode, sslprovince, ssllocality, sslorgaunit, sslpbruncipherlist, sslservercipherlist
```

## networkencryption

- **Version 5.1 and earlier:** **networkencryption** setting not available
- **Version 5.2 and later:** **networkencryption** setting available

The **networkencryption** setting specifies one or more encryption settings for encrypting network traffic between hosts. The **networkencryption** setting uses the following syntax:

```
networkencryption <algorithm-1>:<keyfile=/fullpath/data-file-1>  
[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>]  
<algorithm-2>:<keyfile=/fullpath/data-file-2>  
[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>] ...
```

where:

- **algorithm-n** is the name of the algorithm type
- **/fullpath/data-file** (optional) specifies the full path and file name of the data file, which is used to dynamically derive the encryption key
- **startdate=yyyy/mm/dd** specifies the earliest date that this algorithm is to be used
- **enddate=yyyy/mm/dd** specifies the latest date that this algorithm is to be used

Within each encryption setting, each component is separated by a colon (:). Multiple encryption settings are separated by a space.

For successful communications between Privilege Management hosts, each host must use the same encryption algorithm and data file, from which the encryption key is generated. To prevent service interruptions, you can specify multiple algorithms and keys on each host. The hosts resolve discrepancies as follows:

When one Privilege Management program attempts to communicate with another, it uses the first valid algorithm/key pair (encryption algorithm type and encryption key derived from the data file) in the **networkencryption** setting. The receiving host then attempts to find the correct algorithm/key pair from its **networkencryption** setting.

Servers attempt to connect the first valid algorithm/data-file pair and, if that fails, the servers then attempt to use other valid algorithm/data-file pairs that are defined in the **networkencryption** entry in the settings file. It is strongly recommended to place the

best and newest algorithm/data-file pair as the first entry in the settings file in all servers. Also, the algorithm/data-file pairs must be listed in the same order for all servers.

A client that is not upgraded to the newest algorithm/data-file pair continues to be supported by the Policy Server host as long as the client's algorithm/data-file pair is listed as a valid entry in the **networkencryption** setting. These clients continue to use the settings that are defined by the encryption keyword in the settings file, and the same initial algorithm/data-file pair is used during the initial connection between the two hosts.

If an algorithm/data-file pair is deprecated in the Policy Server host and it is the first item in the clients' list of supported algorithm/data-file pairs, then the new clients recognize this change and respond by automatically updating their setting files and backing up the previous settings files. Then the new clients reconnect to the Policy Server host using an algorithm/data-file pair that is common to both the Policy Server host and the client. However, if an algorithm/data-file pair is deprecated in the Policy Server host and the encryption that is used by the Policy Server host is not supported by the client, then the client's list must be manually upgraded or the initial connection will fail.

The starting date and ending dates are optional and are applied as follows:

- If the optional dates are used, then the algorithm/data-file pair is valid only during the specified time period.
- If a starting date is specified, then the algorithm/data-file pair takes effect at the start of that day; otherwise, the algorithm/data-file pair is active immediately.
- If an ending date is specified, the algorithm/data-file pair becomes inactive at the end of that date; otherwise, the algorithm/data-file pair never expires. The starting and ending dates are determined using Universal Coordinated Time (UTC) to eliminate ambiguity when the machines involved are in different time zones.
- If the optional dates are used, then the algorithm/data-file pair is valid only during the specified time period.
- If a starting date is specified, then the algorithm/data-file pair takes effect at the start of that day; otherwise, the algorithm/data-file pair is active immediately.
- If an ending date is specified, the algorithm/data-file pair becomes inactive at the end of that date; otherwise, the algorithm/data-file pair never expires. The starting and ending dates are determined using Universal Coordinated Time (UTC) to eliminate ambiguity when the machines involved are in different time zones.



### IMPORTANT!

*If the start and/or end date option is used, administrators must ensure that all hosts use the same validity period. Failure to do so will result in the hosts being unable to communicate with each other, or the hosts using other less desirable algorithm/data-file pairs that are common to both hosts, and the hosts must be synchronized. If all listed algorithms have expired (they have an end date and the end date has expired), then the default network algorithm (DES) is used unless one of the network encryptions is listed or the keyword **none** is specified with no end date.*

This keyword supersedes the older encryption, keyfile, and encrypt keywords. The older settings are converted to the new standard when an upgrade installation occurs.

### Example

```
networkencryption des:keyfile=/etc/pb.key:enddate=2008/05/31 aes-256:keyfile=/etc/pb.key.aes
```

This example setting directs the new client to use the DES encryption algorithm with the data file **/etc/pb.key** until May 31, 2008 (UTC). After that date, the new client is to use the AES-256 encryption algorithm with the data file **/etc/pb.key.aes**.

### Default

The default encryption algorithm type is AES-256 and the default data file is typically **/etc/pb.key**.

## Used on

- Policy Server hosts
- Submit hosts
- Run hosts
- Log hosts
- Log synchronization hosts
- Privilege Management for Unix & Linux Basic client hosts

## eventlogencryption

- **Version 5.1 and earlier:** **eventlogencryption** setting not available
- **Version 5.2 and later:** **eventlogencryption** setting available

The **eventlogencryption** setting specifies one or more encryption settings for encrypting event logs. The **eventlogencryption** setting uses the following syntax:

```
eventencryption <algorithm-1>:<keyfile=/fullpath/data-file-1>
[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>]
<algorithm-2>:<keyfile=/fullpath/data-file-2>
[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>] ...
```

where:

- **algorithm-n** is the name of the algorithm type
- **/fullpath/data-file** (optional) specifies the full path and file name of the data file, which is used to dynamically derive the encryption key
- **startdate=yyyy/mm/dd** specifies the earliest date that this algorithm is to be used
- **enddate=yyyy/mm/dd** specifies the latest date that this algorithm is to be used

Within each encryption setting, each component is separated by a colon (:). Multiple encryption settings are separated by a space.



### IMPORTANT!

*When using multiple log servers, all log servers must use the same encryption algorithm and key. Otherwise, they cannot communicate with each other.*

When a Privilege Management program attempts to write to an event log, it checks to determine if the event log uses the same algorithm/key pair (encryption algorithm and encryption key derived from the data file) as when the event log was created. If so, the event is written to the event log; otherwise, the old event log is archived and a new event log is started using the first available algorithm/key pair in the **eventlogencryption** setting. Algorithm/key pairs that are not active can still be used to read existing files.

The starting date and ending dates are optional and are applied as follows:

- If the optional dates are used, then the algorithm/data-file pair is valid only for writing to files during the specified time period.
- If a starting date is specified, then the algorithm/data-file pair takes effect at the start of that day; otherwise, the algorithm/data-file pair is active immediately.

- If an ending date is specified, then the algorithm/data-file pair becomes inactive at the end of that date, otherwise, the algorithm/data-file pair never expires. The starting and ending dates are determined using Universal Coordinated Time (UTC) to eliminate ambiguity when the machines involved are in different time zones.



**Note:** This keyword supersedes the older encryption, keyfile, and encrypts keywords. The older settings are converted to the new standard when an upgrade installation occurs.

### Example

```
eventlogencryption aes-256:keyfile=/etc/pb.key
```

This example uses AES-256 encryption algorithm type with the encryption data file that is located in **/etc/pb.key**.

### Default

The default is no encryption.

### Used on

Log hosts

### iologencryption

- **Version 5.1 and earlier:** **iologencryption** setting not available
- **Version 5.2 and later:** **iologencryption** setting available

The **iologencryption** setting specifies one or more encryption settings for encrypting I/O logs. The **iologencryption** setting uses the following syntax:

```
iologencryption <algorithm-1>:<keyfile=/fullpath/data-file-1>
[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>]
<algorithm-2>:<keyfile=/fullpath/data-file-2>
[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>] ...
```

where:

- **algorithm-n** is the name of the algorithm type
- **/fullpath/data-file** (optional) specifies the full path and file name of the data file, which is used to dynamically derive the encryption key
- **startdate=yyyy/mm/dd** specifies the earliest date that this algorithm is to be used
- **enddate=yyyy/mm/dd** specifies the latest date that this algorithm is to be used

Within each encryption setting, each component is separated by a colon (:). Multiple encryption settings are separated by a space.


**IMPORTANT!**

**Caution!** When using multiple log servers, all log servers must use the same encryption algorithm and key. Otherwise, they cannot communicate with each other, and **pbsync** cannot merge partial I/O logs.

When a Privilege Management program tries to write to an I/O log, it uses the first valid algorithm/key pair (encryption algorithm type and encryption key derived from the data file) in the **iologencryption** setting.

However, if the end date is reached and a session is still in place, the same algorithm/key pair is used until the end of the I/O log. If a session is abruptly terminated, then any new partial I/O log that is started will use a new algorithm/key pair. Algorithm/key pairs that are not active can still be used to read existing files.

The starting date and ending dates are optional and are applied as follows:

- If the optional dates are used, then the algorithm/data-file pair is only valid for writing to files during the specified time period.
- If a starting date is specified, then the algorithm/data-file pair takes effect at the start of that day; otherwise, the algorithm/data-file pair is active immediately.
- If an ending date is specified, then the algorithm becomes inactive at the end of that date, otherwise, the algorithm/data-file pair never expires.

The starting and ending dates are determined using Universal Coordinated Time (UTC). This eliminates ambiguity when the machines involved are in different time zones.



**Note:** This keyword supersedes the older *encryption*, *keyfile*, and *encrypts* keywords. The older settings are converted to the new standard when an upgrade installation occurs.

When a Privilege Management program attempts to read an I/O log, it searches the list of algorithm/key pairs to find the one that corresponds to the target file.

## Example

```
iologencryption des:keyfile=/etc/pb.key/des
```

## Default

The default is no encryption.

## Used on

Log hosts

## reportencryption

- **Version 5.1 and earlier:** **reportencryption** setting not available
- **Version 5.2 and later:** **reportencryption** setting available

The **reportencryption** setting specifies one or more encryption settings for encrypting event log report control files. Each encryption setting consists of the encryption algorithm name, optional key file, optional starting date, and optional ending date using the following syntax:

```
reportencryption <algorithm-1>:<keyfile=/fullpath/data-file-1>
[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>]
<algorithm-2>:<keyfile=/fullpath/data-file-2>
[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>] ...
```

where:

- **algorithm-n** is the name of the algorithm type
- **/fullpath/data-file** (optional) specifies the full path and file name of the data file, which is used to dynamically derive the encryption key
- **startdate=yyyy/mm/dd** specifies the earliest date that this algorithm is to be used
- **enddate=yyyy/mm/dd** specifies the latest date that this algorithm is to be used

Within each encryption setting, each component is separated by a colon (:). Multiple encryption settings are separated by a space.

When **pbguid** tries to write to a report control file it uses the first valid algorithm/key pair (encryption algorithm type and encryption key derived from the data file) in the **reportencryption** setting. When a Privilege Management for Unix & Linux program attempts to read a report control file it searches the list of algorithm/key pairs to find the one corresponding to the target file.

A list of algorithm/key pairs can be provided, but only the first valid entry is used for encryption purposes; all other entries are used as historical references to decrypt the report file. Algorithm/key pairs that are not active can still be used to read existing files.

The starting date and ending dates are optional and are applied as follows:

- If the optional dates are used, then the algorithm/data-file pair is only valid for writing to files during the specified time period.
- If a starting date is specified, then the algorithm/key data-file takes effect at the start of that day; otherwise, the algorithm/key data-file is active immediately.
- If an ending date is specified, then the algorithm becomes inactive at the end of that date; otherwise, the algorithm/key data-file never expires.

The starting and ending dates are reckoned using Universal Coordinated Time (UTC). Doing so eliminates ambiguity when the machines are in different time zones.



**Note:** This keyword supersedes the older *encryption*, *keyfile*, and *encrypts* keywords. The older settings are converted to the new standard when an upgrade installation occurs.

## Example

```
reportencryption saferplus-32:keyfile=/etc/pb.key.sp32
```

## Default

The default is no encryption.

## Used on

Log hosts

## policyencryption

- **Version 5.1 and earlier:** **policyencryption** setting not available
- **Version 5.2 and later:** **policyencryption** setting available

The **policyencryption** setting specifies one or more encryption settings for encrypting policy files. Each encryption setting consists of the encryption algorithm name, optional key file, optional starting date, and optional ending date using the following syntax:

```
policyencryption <algorithm>:<keyfile=/fullpath/data-file>
```

where:

- **algorithm** is the name of the algorithm type
- **/fullpath/data-file** (optional) specifies the full path and file name of the data file, which is used to dynamically derive the encryption key

When **pbencode** or **pbguid** attempts to write to a policy file, it uses the algorithm/key pair (encryption algorithm type and encryption key derived from the data file) in the **policyencryption** setting. When a Privilege Management program attempts to read a policy file, it also uses the algorithm/key pair in the **policyencryption** setting.



**Note:** This keyword supersedes the older **encryption**, **keyfile**, and **encrypts** keywords. The older settings are converted to the new standard when an upgrade installation occurs.

## Example

```
policyencryption tripledес:keyfile=/etc/pb.key.3des
```

We recommend that you keep an unencrypted, offline copy of the policy file in the event you need to manually modify the file.

## Default

The default is no encryption.

## Used on

Policy Server hosts

## settingsencryptiontype

- **Version 5.1 and earlier:** **settingsencryptiontype** setting not available
- **Version 5.2 and later:** **settingsencryptiontype** setting available

The **pb.settings** file can be encrypted using the encryption algorithm type that is specified in the **settingsencryptiontype** keyword in the **pb.settings** file, using the following syntax:

```
settingsencryptiontype <algorithm>
```

The settings file is encrypted and decrypted using the default encryption key which is derived from the data file that is located in **/etc/<prefix>pb<suffix>.key**, and the encryption algorithm type that is defined in the **settingsencryption** keyword.


**IMPORTANT!**

We recommend you keep an unencrypted copy of the settings file in a secure location.



**Note:** This keyword supersedes the older encryption, *keyfile*, and *encrypts keywords*. The older settings are converted to the new standard when an upgrade installation occurs.

### Example

```
settingsencryptiontype des
```

In this example, DES is the encryption algorithm type to be used to encrypt the **pb.settings** file.

### Default

The default is no encryption.

### Used on

- Policy Server hosts
- Submit hosts
- Run hosts
- Log hosts

### dbencryption

- **Version 8.5 and earlier:** **dbencryption** setting not available
- **Version 9.0 and later:** **dbencryption** setting available

The **dbencryption** setting specifies the encryption for databases created by Privilege Management for Unix & Linux (e.g. **clntregdb**, **eventdb**, **svccachedb**, **logarchivedb**, et. al).

The dbencryption setting uses the following syntax:

```
dbencryption <algorithm-1>:<keyfile=/fullpath/data-file-1>
[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>]
<algorithm-2>:<keyfile=/fullpath/data-file-2>[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>] ...
```

where:

- **algorithm-n** is the name of the algorithm type
- **/fullpath/data-file** (optional) specifies the full path and file name of the data file, which is used to dynamically derive the encryption key
- **startdate=yyyy/mm/dd** specifies the earliest date that this algorithm is to be used
- **enddate=yyyy/mm/dd** specifies the latest date that this algorithm is to be used

Within each encryption setting, each component is separated by a colon (:). Multiple encryption settings are separated by a space.

### Default

none

### Used On

All hosts

## Pluggable Authentication Modules

Privilege Management for Unix & Linux can use Pluggable Authentication Modules (PAM) on systems where it is available. Privilege Management for Unix & Linux invokes password authentication services, account management services, and session start/end services.



**Note:** For Mac OS X, PAM must be configured. Otherwise, the Privilege Management for Unix & Linux user and password policy functions will not work. These functions are listed in "User and Password Functions" in the Privilege Management for Unix & Linux Policy Language Guide.

### pam

- **Version 3.5 and earlier:** pam setting not available
- **Version 4.0 and later:** pam setting available

The **pam** setting enables the use of PAM if set to **yes**, or disables it if set to **no**.

### Example

```
pam yes
```

### Default

```
pam no
```

### Used on

- Policy Server hosts
- Submit hosts
- Run hosts

### libpam

- **Version 5.1.1 and earlier:** libpam setting not available
- **Version 5.2 and later:** libpam setting available

**libpam** is a user-defined PAM library that Privilege Management for Unix & Linux uses as a first option in case the system does not use the standard default PAM libraries. The notation used for AIX to specify the OS-provided PAM library is the following:

```
/usr/lib/libpam.a (shr.o)
```

### Example

```
libpam /lib/libpam.so.1
```

### Default

No default value

### Used on

- Policy Server hosts
- Submit hosts
- Run hosts

### pampasswordservice

- **Version 3.5 and earlier:** **pampasswordservice** setting not available
- **Version 4.0 and later:** **pampasswordservice** setting available

If you want Privilege Management for Unix & Linux to use PAM password authentication and account management for password authentication, set **pampasswordservice** to the name of the PAM service that you want to use.

- On a Policy Server host, PAM password authentication is used for the **getuserpasswd()** function.
- On a submit host, PAM password authentication is used when the **submitconfirmuser()** function is invoked by the Policy Server host's policy.
- On a run host, PAM password authentication is used when **runconfirmuser** is invoked by the Policy Server host's policy.



Privilege Management for Unix & Linux does not use the environment variables that are set by **pam\_env**. Privilege Management for Unix & Linux can read environment variables from **/etc/environment** or some other file.

For more information, please see "[environmentfile](#)" on page 74, and **runenvironmentfile** in the [Privilege Management for Unix & Linux Policy Language Guide](#) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

### Example

```
pampasswordservice login
```

### Default

No default value

### Used on

- Policy Server hosts
- Submit hosts

- Run hosts



**Note:** Many Privilege Management for Unix & Linux programs run as **root**. If you use a PAM service that allows root to bypass passwords (for example, **su** or anything containing **rootok**), then Privilege Management for Unix & Linux may also skip the password check.

## pamsessionsservice

- **Version 3.5 and earlier:** **pamsessionsservice** setting not available
- **Version 4.0 and later:** **pamsessionsservice** setting available

If you want PAM to perform account management and session start and end services to manage task requests on a run host, then set **pamsessionsservice** to the name of the service that you want to use. **pblocald** invokes the account management and session start portions when the requested task starts, and invokes session end services when the requested task finishes.

For local mode, the client invokes the account management module when the **runuser** is different than the submitting user (**user**). Unless I/O logging is active, session start and end services are skipped.

In version 6.0 and later, Privilege Management for Unix & Linux uses **ulimits** that are set by **pam\_limits** during PAM session start. If you do not want to honor the **ulimits** that are set by PAM, use the **pam\_session\_prepb6** setting.



For more information, please see "[pam\\_session\\_prepb6](#)" on page 187.



**Note:** Privilege Management for Unix & Linux does not use the environment variables that are set by **pam\_env**.



Privilege Management for Unix & Linux can read environment variables from **/etc/environment** or some other file.

For more information, please see "[environmentfile](#)" on page 74, and **runenvironmentfile** in the [Privilege Management for Unix & Linux Policy Language Guide](#) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

## Example

```
pamsessionsservice su
```

## Default

No default value



**Note:** Some PAM services may update the **syslog** and the **utmp** or **utmpx** files. To avoid duplicate entries, you might need to set **recordunixptysessions** and **syslogsessions** to **no**.

## Used on

- Run hosts
- Submit hosts by **pbksh** and **pbsh**

## pamsuppresspbpasswordprompt

- **Version 5.1.1 and earlier:** `pamsuppresspbpasswordprompt` setting not available
- **Version 5.1.2 and later:** `pamsuppresspbpasswordprompt` setting available

If you want to suppress the Privilege Management for Unix & Linux password prompt when PAM authentication is enabled, then set `pamsuppresspbpasswordprompt` to `yes`. Otherwise, if the Privilege Management for Unix & Linux password prompt is required, then set `pamsuppresspbpasswordprompt` to `no`.



**Note:** If the values of the `user` and `runuser` variables are different, the Privilege Management for Unix & Linux password prompt is always enabled, even if `pamsuppresspbpasswordprompt` is set to `yes`.

### Example

```
pamsuppresspbpasswordprompt yes
```

### Default

```
pamsuppresspbpasswordprompt yes
```

### Used on

- Policy Server hosts
- Submit hosts
- Run hosts

## pam\_session\_prepb6

- **Version 5.2 and earlier:** `pam_session_prepb6` setting not available
- **Version 6.0 and later:** `pam_session_prepb6` setting available

Prior to Privilege Management for Unix & Linux version 6, the PAM session was called by the parent Privilege Management for Unix & Linux process. In version 6, this behavior was corrected so that the PAM session is called from the child process that runs the secured task. By setting `pam_session_prepb6` to `yes`, you can revert Privilege Management for Unix & Linux to the old behavior.

### Example

```
pam_session_prepb6 yes
```

### Default

```
pam_session_prepb6 no
```

### Used on

Run hosts

## pamsetcred

- **Version 6.0 and earlier:** **pamsetcred** setting not available
- **Version 6.1 and later:** **pamsetcred** setting available

The **pamsetcred** keyword enables the **pam\_setcred()** function, which is used to establish possible additional credentials of a user.



**Note:** This keyword does not apply to **pbssh**. If it is present in the settings file, it does not have any effect on **pbssh** and is ignored.

For Solaris Projects, this sets the Project ID to the default Project, or to a specified Project. Other scenarios are possible depending on the OS PAM implementation and configuration.



**Note:** The use of **pam\_setcred** currently will not delete credentials after a session.

### Example

```
pamsetcred yes
```

### Default

```
pamsetcred no
```

### Used on

Run hosts

## Secure Socket Layers and Public Key Infrastructure

Secure Socket Layers (SSL) enables the use of digital certificates, certificate authorities, extensive network encryption, and checksums for all network packets.

Starting with V3.0, Privilege Management supports Public Key Infrastructure (PKI) through (SSL). This feature enables the use of Privacy Enhanced Mail (PEM) format certificates, private keys, and certificate authority files. The SSL features are controlled through the **ssl** setting, the **ssloptions** setting, and the client and server settings.

Many of the SSL settings enable token expansion for some useful strings. These are summarized in the following table.

### SSL Parameter Substitutions

Symbol	Replacement
%%	A % character.
%g	User's group ID
%G	User's group ID number

Symbol	Replacement
%h	Local host name. The unqualified name of the current machine.
%H	Remote host name of the current machine in Fully Qualified Domain Name (FQDN) format (if available from <b>uname</b> )
%l	Unqualified local host name as determined by the network interface
%L	Local host interface name. The local host name, as determined by the network interface, in FQDN format (if available)
%n	Program name with neither a prefix or suffix
%N	Program name with a prefix and suffix
%p	Program prefix
%r	Unqualified host name, as determined by the network interface
%R	Remote host interface name. The remote host name, as determined by the network interface, in FQDN format
%s	Program suffix
%u	User's login ID
%U	User's UID

## ssl

When set to **yes**, the **ssl** setting enables the use of Privilege Management for Unix & Linux SSL features. When set to **no**, the **ssl** setting disables the use of these features.

### Example

```
ssl yes
```

### Default

```
ssl yes
```

### Used on

- Log hosts
- Policy Server hosts
- Submit hosts
- Run hosts
- Privilege Management for Unix & Linux Basic client hosts

## restssloptions

- **Version 10.1.0 and earlier:** **restssloptions** setting not available
- **Version 10.2.0 and later:** **restssloptions** setting available

The current **restssloptions** include: **TLSTMinV1**, **TLSTMinV1.1**, **TLSTMinV1.2**, **MinHMACMD5**, and **MinHMACSHA512**.

For FIPS compliance, all Privilege Management for Unix & Linux hosts must add **MinHMACSHA512** to the **restssloptions** setting.

## ssloptions

- **Version 4.0.0 and later:** **ssloptions** setting available

The **ssloptions** setting controls the following system-wide options:

Option	Description
ClientCertificates	To require certificates on the client side, add <b>ClientCertificates</b> to the <b>ssloptions</b> line.
AllowNonSSL	To communicate with older, non-SSL versions of Privilege Management for Unix & Linux, add <b>AllowNonSSL</b> to your <b>ssloptions</b> line. Doing so allows SSL-enabled versions to communicate with non-SSL versions.  If a Privilege Management for Unix & Linux client is SSL-enabled and the Policy Server host specifies <b>AllowNonSSL</b> , but not <b>ClientCertificates</b> , then the communications will not use SSL.
TLSTMinV1.0, TLSTMinV1.1, TLSTMinV1.2	When SSL is enabled, this option allows you to set the minimum SSL/TLS value to use in the protocol.
TLSTMaxV1.0, TLSTMaxV1.1, TLSTMaxV1.2	When SSL is enabled, this option allows you to set the maximum SSL/TLS value to use in the protocol.
RequireSSL	To require SSL communications between Privilege Management components without requiring Privilege Management for Unix & Linux client certificates, then add <b>RequireSSL</b> to your <b>ssloptions</b> line.  This option is not compatible with the <b>AllowNonSSL</b> option. If you specify both <b>AllowNonSSL</b> and <b>RequireSSL</b> , then the last one that is specified takes precedence.
SSLFirst	If the <b>SSLFirst</b> option is selected, this option forces the SSL handshake to happen before the Privilege Management for Unix & Linux handshake.  The <b>SSLFirst</b> option must be set on every Privilege Management for Unix & Linux host including clients and servers.  Starting in version 10.3.2, on new installs the option <b>SSLFirst</b> is turned on by default.
sslverbose	If the <b>sslverbose</b> option is selected, server components log informational messages that are sent to error logs, detailing connections, SSL/TLS protocols, and the encryption ciphers used to communicate. This is a debugging and diagnostic option
validateClient	The option <b>validateClient</b> enables Privilege Management for Unix & Linux servers ( <b>pbmasterd</b> , <b>pblocald</b> , <b>pblogd</b> ) to use SSL <b>verifypeer</b> and <b>verifyhost</b> features to validate the connected client host. Note that <b>pbmasterd</b> is also a client to <b>pblocald</b> , and both <b>pbmasterd</b> and <b>pblocald</b> are clients to <b>pblogd</b> .

Option	Description
	<p>This can be used when the client hosts have certificates installed, and the servers' <b>ssloptions</b> includes the <b>ClientCertificates</b> option (<b>validateClient</b> forces <b>ClientCertificates</b>).</p> <p>Enabling the <b>validateClient</b> ssloption on the server requires that <b>pb.settings</b> on the server includes the <b>sslservercafile</b> keyword, specifying the CA that signed the client's certificate. The <b>pb.settings</b> file on the client must include the <b>sslpbbruncertfile</b> and <b>sslpbbrunkeyfile</b> keywords, specifying the client's certificate and key. This feature alternatively uses the <b>sslpbbruncertdir</b>, <b>sslpbbrunkeydir</b>, and <b>sslservercadir</b> keywords.</p> <p>The <b>pb.settings</b> file on <b>pbmasterd</b> and <b>pblocald</b> must include <b>sslservercertfile</b> and <b>sslserverkeyfile</b> keywords, specifying the client's certificate and key. This feature alternatively uses the <b>sslservercertdir</b> and <b>sslserverkeydir</b> keywords.</p> <p>Enabling the <b>AllowNonSSL</b> with <b>validateClient</b> results in an error. Non-SSL connections are not allowed with <b>validateClient</b>.</p> <p>The client host's hostname should be listed in the Subject Alternative Name (SAN) field of the certificate.</p>
validateServer	<p>The option <b>validateServer</b> enables Privilege Management for Unix &amp; Linux SSL clients to verify the server with the SSL <b>verifypeer</b> and <b>verifyhost</b> features. Note that <b>pbmasterd</b> is a client to <b>pblocald</b>, and both <b>pbmasterd</b> and <b>pblocald</b> are clients to <b>pblogd</b>.</p> <p>Enabling the <b>validateServer</b> on the client requires that <b>pb.settings</b> on the client includes the <b>sslpbbruncafile</b> keyword (<b>sslpbservercafile</b> keyword on <b>pbmasterd</b> and <b>pblocald</b>), specifying the CA that signed the server's certificate. The <b>pb.settings</b> file on the server must include the <b>sslservercertfile</b> and <b>sslserverkeyfile</b> keywords, specifying the server's certificate and key. This feature alternatively uses the <b>sslservercertdir</b>, <b>sslserverkeydir</b>, and <b>sslpbbruncadir</b> keywords.</p> <p>Enabling the <b>AllowNonSSL</b> with <b>validateServer</b> results in an error. Non-SSL connections are not allowed with <b>validateServer</b>.</p> <p>The hostname should be listed in the Subject Alternative Name (SAN) field of the certificate.</p>



**Note:** The program will terminate if invalid values are provided for **ssloptions**.

### Example

```
ssloptions AllowNonSSL
ssloptions requiressl sslfirst
ssloptions ClientCertificates
ssloptions AllowNonSSL ClientCertificates
```

### Default

```
requiressl
```

## Used on

- Log hosts
- Policy Server hosts
- Submit hosts
- Run hosts
- Privilege Management for Unix & Linux Basic client hosts

## Server-Side SSL

For client hosts where optimized run mode is always used (the submit host is always the run host), a server-side SSL scenario can be set up where the client machine does not need a server key/certificate pair or a client key/certificate pair.

The **sslpruncafile** keyword is optional. If **sslpruncafile** is specified, **sslpruncafile** is the certificate authority (CA) that signed the server's certificate. If **sslpruncafile** is not specified, then the server's certificate authenticity is not verified.



**Note:** If the submit host is not the same host as the run host or if a log server is not used, then the **pblocald** server is used to execute the secured task. **pblocald** is an SSL server and requires the **sslservercafile**, **sslservercertfile**, and **sslserverkeyfile** settings.

## SSL Client Settings

The SSL client settings configure SSL for Privilege Management for Unix & Linux client programs.

### sslpruncafile and sslpruncafile

- **Version 4.0.0 and later:** **sslpruncafile** and **sslpruncafile** settings available

These settings specify the path to a certificate authority directory or file.

A certificate authority file is a PEM-formatted file that contains one or more PEM-formatted signature certificates. The programs **pbrun**, **pbksh**, and **pbsh** use these certificate authority files to validate certificates from **pbmasterd** and **pblocald**. This file should not contain private keys.

If **sslpruncafile** contains an absolute path, then that file is used as the certificate authority file. If **sslpruncafile** contains a relative path, then the value of the **sslpruncafile** setting is prepended to form an absolute path. The **pbrun** certificate authority file and certificate authority directory must be owned by root and no one else should have write permission.



These settings enable the parameter substitutions shown in "SSL Parameter Substitutions" on page 188.

## Examples

```
sslpruncafile /secure/ca/pbrun/OurAuthority.pem
sslpruncafile /secure/ca/pbrun
sslpruncafile OurAuthority.pem
sslpruncafile /secure/ca/pbrun sslpruncafile %N.pem
```

## Default

No default value

## Used on

Submit hosts

## sslpbruncertdir and sslpbruncertfile

- **Version 4.0.0 and later:** **sslpbruncertdir** and **sslpbruncertfile** settings available

The **sslpbruncertdir** and **sslpbruncertfile** settings specify the path of a Privacy Enhanced Mail (PEM) format certificate file for clients to communicate with **pbmasterd** and **pblocald**.

If a full absolute path is provided for **sslpbruncertfile**, then it is used. If a relative path is provided for **sslpbruncertfile**, then the directory specified in the **sslpbruncertdir** setting is prepended to form the certificate file path.

**root** or the submitting user must own the **pbrun** certificate file and certificate directory. No one else should have write permission.



These settings allow the parameter substitutions that are shown in "[SSL Parameter Substitutions](#)" on page 188.

## Examples

```
sslpbruncertfile /secure/certificates/pbrun/pbrun.pem
sslpbruncertdir /secure/certificates/pbrun
sslpbruncertfile pbrun.pem
sslpbruncertdir /home/%u/certificates
sslpbruncertfile %u.pem
```

## Defaults

No default value

## Used on

Submit hosts

## sslpbruncipherlist

- **Version 4.0.0 and later:** **sslpbruncertdir** setting available

OpenSSL provides a variety of algorithms that can be used for encryption. The **sslpbruncipherlist** setting enables the administrator to restrict or promote the set of encryption algorithms that are used by Privilege Management clients to communicate with SSL enabled server services.

These ciphers are limited to the set of ciphers available in the given version of OpenSSL used by the Privilege Management installation.



For more information, please see the [release notes](#) at <https://www.beyondtrust.com/support/changelog>.

## Valid Values

Refer to the following table for the valid values for the `sslpbruncipherlist`. To specify more than one cipher set, separate the values with colons.

### SSL Cipher List Values

OpenSSL Cipher Set	Setting Value
SSL_RSA_WITH_NULL_MD5	NULL-MD5
SSL_RSA_WITH_NULL_SHA	NULL-SHA
SSL_RSA_EXPORT_WITH_RC4_40_MD5	EXP-RC4-MD5
SSL_RSA_WITH_RC4_128_MD5	RC4-MD5
SSL_RSA_WITH_RC4_128_SHA	RC4-SHA
SSL_RSA_EXPORT_WITH_RC2_CBC_40_MD5	EXP-RC2-CBC-MD5
SSL_RSA_EXPORT_WITH_DES40_CBC_SHA	EXP-DES-CBC-SHA
SSL_RSA_WITH_DES_CBC_SHA	DES-CBC3-SHA
SSL_DHE_DSS_EXPORT_WITH_DES40_CBC_SHA	EXP-EDH-DSS-DES-CBC-SHA
SSL_DHE_DSS_WITH_DES_CBC_SHA	EDH-DSS-CBC-SHA
SSL_DHE_DSS_WITH_3DES_EDE_CBC_SHA	EDH-DSS-DES-CBC3-SHA
SSL_DHE_RSA_EXPORT_WITH_DES40_CBC_SHA	EXP-EDH-RSA-DES-CBC-SHA
SSL_DHE_RSA_WITH_DES_CBC_SHA	EDH-RSA-DES-CBC-SHA
SSL_DHE_RSA_WITH_3DES_EDE_CBC_SHA	EDH-RSA-DES-CBC3-SHA

### Example

```
sslpbruncipherlist NULL-MD5:EDH-DSS-CBC-SHA
```

### Default

```
HIGH:!SSLv2:!3DES:!MD5:@STRENGTH
```

### Used on

- Submit hosts
- Privilege Management for Unix & Linux Basic client hosts

## ssl Brunkeydir and ssl Brunkeyfile

- **Version 4.0.0 and later:** `ssl Brunkeydir` and `ssl Brunkeyfile` settings available

The `ssl Brunkeyfile` and `ssl Brunkeydir` settings enable you to specify the location of a PEM-formatted private key for the client certificate file that is used to communicate with `pbrunmasterd` and `pbrunlocald`.

If `ssl Brunkeyfile` is a full path name, then it is used for the private key. If `ssl Brunkeyfile` does not contain an absolute path, then `ssl Brunkeydir` is prepended to it.

The clients are usually interactive, so the private keys can be encrypted. The clients prompt for the passphrase when needed. If you are invoking a client non-interactively (for example, from `cron`), then the private key should not be encrypted.

`root` or the submitting user must own the private key file and the private key directory. No one else should have read or write permission.

If the key file and directory are not set, then the client looks in the certificate file to see if the key is there. In this case, the certificate file and directory must be read-only and owned by `root` or the submitting user. No one else should have read or write permission.



These settings enable the parameter substitutions that are shown in "SSL Parameter Substitutions" on page 188.

## Examples

```
ssl Brunkeyfile /secure/privatekeys/pbrun.pem
ssl Brunkeydir /secure/privatekeys/
ssl Brunkeyfile %u.pem
ssl Brunkeydir /home/%u/privatekeys
ssl Brunkeyfile %u.pem
```

## Defaults

No default value

## Used on

Submit hosts

## ssl Brunverifysubject

- **Version 4.0.0 and later:** `ssl Brunverifysubject` setting available

`ssl Brunverifysubject` contains a series of regular expressions to check against the Policy Server's certificate subject line. If the subject line matches all patterns, then the connection is allowed to proceed. If any of the patterns do not match, then the connection fails.

## Examples

This example verifies that the **CN** attribute (common name) matches the host name of the remote machine:

```
ssl Brunverifysubject /CN=%R/
```

This example verifies that the **O** attribute equals **Company Name** and that the **OU** attribute starts with **Technology**:

```
sslbrunverifysubject '/O=Company Name/' /OU=Technology
```



**Note:** Single quotation marks should surround the attribute if there are embedded spaces.

### Default

No default value

### Used on

Submit hosts

### SSL Server Settings

The SSL server settings configure SSL for Privilege Management for Unix & Linux server programs.

#### sslservercadir and sslservercafile

- **Version 4.0.0 and later:** **sslservercadir** and **sslservercafile** settings available

The **sslservercadir** and **sslservercafile** settings specify the path to a certificate authority directory or file. A certificate authority file is a PEM-formatted file that contains one or more PEM-formatted signature certificates that are used to validate server certificates. This file should not contain private keys.

If **sslservercafile** contains an absolute path, then that file is used as the certificate authority file. If **sslservercafile** contains a relative path, then the value of the **sslservercadir** setting is prepended to form an absolute path.

The server certificate authority file and certificate authority directory must be owned by root and no one else should have write permission.



These settings allow the parameter substitutions that are shown in "SSL Parameter Substitutions" on page 188.

### Examples

```
sslservercafile /secure/ca/servers/OurAuthority.pem
sslservercadir /secure/ca/servers
sslservercafile OurAuthority.pem
sslservercadir /secure/ca/servers sslservercafile %h.pem
```

### Defaults

```
/etc/<prefix>pbssl.pem<suffix>
```

### Used on

- GUI hosts
- Log hosts

- Policy Server hosts
- Run hosts

### sslservercertdir and sslservercertfile

- **Version 4.0.0 and later:** `sslservercertdir` and `sslservercertfile` settings available

The `sslservercertdir` and `sslservercertfile` settings specify the path of a Privacy Enhanced Mail (PEM) format certificate file for `pbmasterd`, `pblocald`, `pblogd`, and `pbguid` to communicate with each other or with client programs. If a full absolute path is provided for `sslservercertfile`, then it is used as specified. If a relative path is provided for `sslservercertfile`, then the directory that is specified in the `sslservercertdir` setting is prepended to form the certificate file path.

The server certificate file and certificate directory must be owned by root and no one else should have write permission.



These settings allow the parameter substitutions that are shown in "SSL Parameter Substitutions" on page 188.

### Examples

```
sslservercertfile /secure/certificates/servers/pbmasterd.pem
sslservercertdir /secure/certificates/servers
sslservercertfile pbmasterd.pem
sslservercertdir /secure/certificates/servers
sslservercertfile %N.pem
```

### Defaults

/etc/pbssl.pem

### Used on

- GUI hosts
- Log hosts
- Policy Server hosts
- Run hosts

### sslservercipherlist

- **Version 4.0.0 and later:** `sslservercipherlist` setting available

OpenSSL provides a variety of algorithms that can be used for encryption. The `sslservercipherlist` setting enables the administrator to restrict or promote the set of encryption algorithms that are used by Privilege Management servers when they receive communications from SSL enabled clients.

These ciphers are limited to the set of ciphers available in the given version of OpenSSL used by the Privilege Management installation.



For more information, please see the [release notes](https://www.beyondtrust.com/support/changelog) at <https://www.beyondtrust.com/support/changelog>.

## Valid Values

To specify more than one cipher set, separate the values with colons.



For more information on valid **sslservercipherlist** values, please see "SSL Cipher List Values" on page 194.

## Examples

```
sslservercipherlist NULL-MD5:EDH-DSS-CBC-SHA
```

## Default

```
sslservercipherlist HIGH:!SSLv2:!3DES:!MD5:@STRENGTH
```

## Used on

- GUI hosts
- Log hosts
- Policy Server hosts
- Run hosts

## sslserverkeydir and sslserverkeyfile

- **Version 4.0.0 and later:** **sslserverkeydir** and **sslserverkeyfile** settings available

The **sslserverkeyfile** and **sslserverkeydir** settings enable you to specify the location of a PEM- formatted private key for the server certificate file that is used by **pbmasterd**, **pblocald**, **pblogd**, and **pbguid** to communicate with each other or with client programs.

If **sslserverkeyfile** is a full path name, then it is used for the private key. If **sslserverkeyfile** does not contain an absolute path, then **sslserverkeydir** is prepended to it.

The servers are not interactive, so the private keys should not be encrypted.

The private key file and the private key directory must be owned by **root** and no one else should have read or write permission.

If the key file and directory are not set, then the daemons look in the certificate file to see if the key is there. In this case, the certificate file and directory must be read-only and owned by **root**. No one else should have read or write permission.



These settings allow the parameter substitutions that are shown in "SSL Parameter Substitutions" on page 188.

## Examples

```
sslserverkeyfile /secure/certificates/serverkeys/pbmasterd.pem  
sslserverkeydir /secure/certificates/serverkeys  
sslserverkeyfile pbmasterd.pem  
sslserverkeydir /secure/certificates/serverkeys  
sslserverkeyfile %N.pem
```

## Defaults

```
/etc/<prefix>pbssl.pem<suffix>
```

## Used on

- GUI hosts
- Log hosts
- Policy Server hosts
- Run hosts

## sslserververifysubject

- **Version 4.0.0 and later:** `sslserververifysubject` setting available

`sslserververifysubject` contains a series of regular expressions to check against the client's or other server's certificates subject line. If the subject line matches all patterns, then the connection is allowed to proceed. If any of the patterns do not match, then the connection fails.

## Examples

This example verifies that the **CN** attribute (common name) matches the host name of the remote machine:

```
sslserververifysubject /CN=%R/
```

This example verifies that the **O** attribute equals **Company Name** and the **OU** attribute starts with **Technology**:

```
sslserververifysubject '/O=Company Name/' /OU=Technology
```



**Note:** Single quotation marks should surround the attribute if there are embedded spaces.

## Default

No default value

## Used on

- GUI hosts
- Log hosts
- Policy Server hosts
- Run hosts

## Additional Configuration to Improve PMUL Security

Privilege Management for Unix & Linux does not contain a Certificate Authority (CA), therefore certificates generated during install are self-signed, and cannot be used to properly identify the host. Creating and deploying proper x509 certificates, with hostname

information in the Subject Alternative Name field, allows Privilege Management for Unix & Linux hosts to properly identify hosts. TLS clients can verify the server's certificate and hostname by adding the **validateServer** option to the **ssloptions** keyword in **/etc/pb.settings**. For TLS, **pbmasterd** and **pblocald** are clients to **pblogd**. Additionally, servers can validate the certificates and hostnames of the client hosts by adding the **validateClient** option to the **ssloptions** keyword in **/etc/pb.settings**.

Configure Privilege Management for Unix & Linux to use the **SSLFirst** keyword in **/etc/pb.settings**. This keyword must have the same value on all hosts in the PMUL domain. The **SSLFirst** keyword results in SSL/TLS occurring prior to any Privilege Management for Unix & Linux proprietary protocol negotiations that use symmetric keys, reducing any issue with compromised symmetric networkencryption keys.

The TLS ciphers should be changed to disallow anonymous ciphers.

Edit the **sslpruncipherlist** and **sslservercipherlist** entries in **/etc/pb.settings**:

```
sslpruncipherlist      TLSv1.2:!SSLv2:!3DES:!MD5:!ADH:!AECDH:!DHE:!eNULL:@STRENGTH
```

```
sslservercipherlist   TLSv1.2:!SSLv2:!3DES:!MD5:!ADH:!AECDH:!DHE:!eNULL:@STRENGTH
```

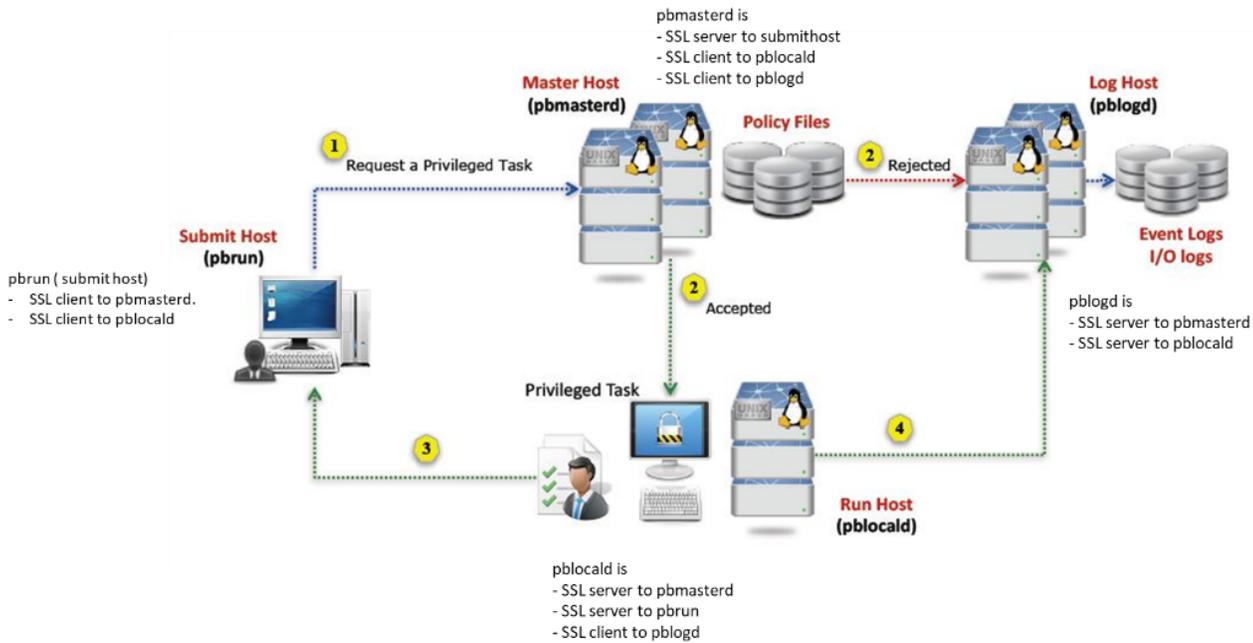
Edit the **ssl.cipher-list** entry in **/usr/lib/beyondtrust/pb/rest/etc/pblighttpd.conf**:

```
ssl.cipher-list       = " TLSv1.2:!SSLv2:!3DES:!MD5:!ADH:!AECDH:!DHE:!eNULL:@STRENGTH"
```

In the following sections the diagram shows the SSL server and SSL client connections between **pbmasterd**, **pblocald**, **pblogd** and **pbbrun** and the table shows the required certificate keywords in **pb.settings** file on each host when **validateServer** or **validateClient** is added to **ssloptions**.

### SSL Connections in Default Architecture: Classic pbrun

PMUL SSL connections in default architecture: Classic pbrun



On Submithost (pbrun)		On Masterhost (pbmasterd)		On Loghost (pblogd)		On Runhost (pblocald) (submit host != runhost) or (pbrun --di) or (pbmasterd --disable_optimized_runmode)	
ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required
validateServer	*sslpbruncafile		sslservercertfile sslserverkeyfile		-		sslservercertfile sslserverkeyfile
	-	validateServer (pbmasterd is client to pblocald, pblogd)	sslservercafile		sslservercertfile sslserverkeyfile		sslservercertfile sslserverkeyfile
	-		-	validateServer	- (pblogd is not an SSL client to any host)		-
	-		-		sslservercertfile sslserverkeyfile	validateServer	sslservercafile

On Submithost (pbrun)		On Masterhost (pbmasterd)		On Loghost (pblogd)		On Runhost (pblocald) (submithost != runhost) or (pbrun --di) or (pbmasterd --disable_optimized_runmode)	
ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required
validateClient	-  (pbrun is not an SSL server at any point, also refer to *)		-		-		-
	sslpbbruncertfile sslpbbrunkeyfile	validateClient	sslservercafile		**sslservercertfile sslserverkeyfile		**sslservercertfile sslserverkeyfile
	-		sslservercertfile sslserverkeyfile	validateClient	sslservercafile		sslservercertfile sslserverkeyfile ***sslpbbruncertfile sslpbbrunkeyfile
	sslpbbruncertfile sslpbbrunkeyfile		sslservercertfile sslserverkeyfile		**sslservercertfile sslserverkeyfile	validateClient	sslservercafile

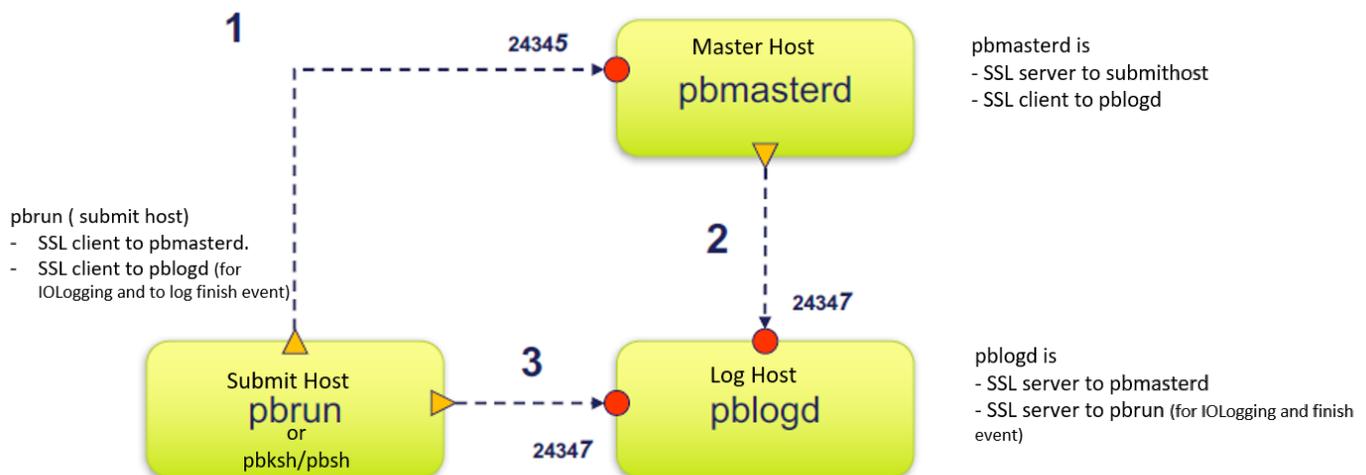
\* mentioning sslpbbruncertfile with or without validateServer and validateClient options requires pbmasterd and pblocald certificates

\*\* mentioning sslservercafile on a SSL client (pbmasterd and pblocald) with or without validateServer and validateClient options always requires certificates from its immediate SSL server/s.

\*\*\* pblocald needs sslpbbruncertfile and sslpbbrunkeyfile to log finish event

### SSL Connections in Optimized Runmode

#### PMUL SSL connections in optimized runmode



On Submithost (pbrun)		On Masterhost (pbmasterd)		On Loghost (pblogd)	
<i>ssloptions</i>	<i>SSL cert/CA file required</i>	<i>ssloptions</i>	<i>SSL cert/CA file required</i>	<i>ssloptions</i>	<i>SSL cert/CA file required</i>
<b>validateServer</b>	*sslbruncafile		sslservercertfile sslserverkeyfile		sslservercertfile sslserverkeyfile (for IOLogging and finish event)
-		<b>validateServer</b> (pbmasterd is client to pblogd)	sslservercafile		sslservercertfile sslserverkeyfile
-			-	<b>validateServer</b>	- (pblogd is not an SSL client to any host)
<b>validateClient</b>	- (pbrun is not an SSL server at any point, also refer to *)		-		-
	sslbruncertfile sslbrunkeyfile	<b>validateClient</b>	sslservercafile		**sslservercertfile sslbrunkeyfile
	sslbruncertfile sslbrunkeyfile (for IOLogging and to log finish event)		sslservercertfile sslserverkeyfile	<b>validateClient</b>	sslservercafile

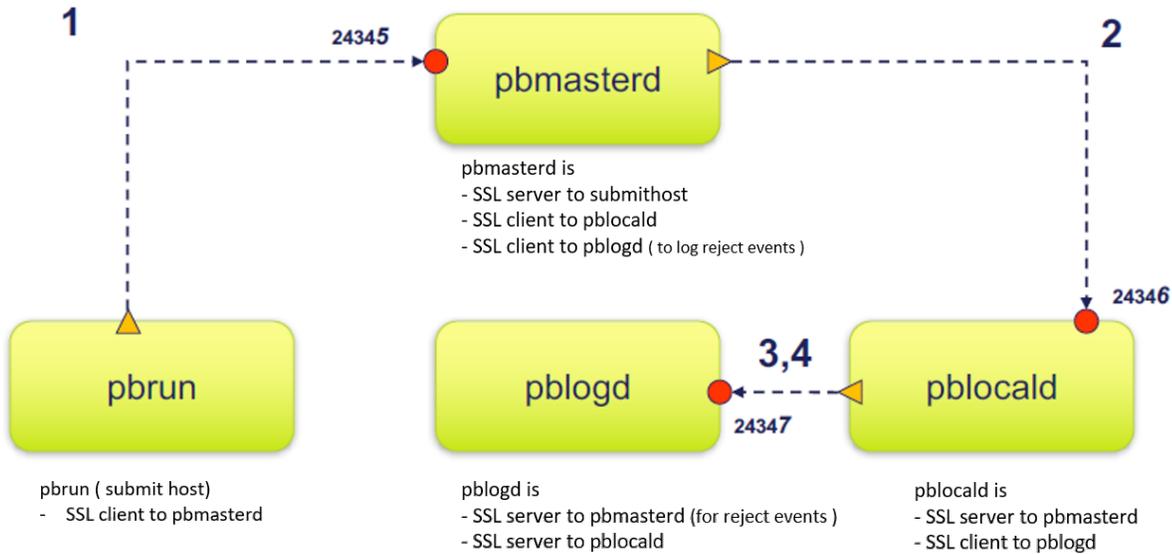
\* mentioning sslbruncafile with or without validateServer and validateClient options requires pbmasterd and pblogd certificates

\*\* mentioning sslservercafile on pbmasterd with or without validateServer and validateClient options always requires certificates from pblogd

### SSL Connections with noreconnect=1 in the Policy

- noreconnect=1 : pbrun does not connect to pblogd directly

### PMUL SSL connections with noreconnect=1 in the policy



\* noreconnect=1 : pbrun does not connect to pblockd directly

On Submithost (pbrun)		On Masterhost (pbmasterd) noreconnect=1 in the policy		On Loghost (pblogd)		On Runhost (pblockd) (submithost != runhost) or (pbrun --di) or (pbmasterd --disable_optimized_runmode)	
ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required
validateServer	*sslpbruncafile		sslservercertfile sslserverkeyfile		-		-
-	-	validateServer (pbmasterd is client to pblockd, pblogd)	sslservercafile		sslservercertfile sslserverkeyfile		sslservercertfile sslserverkeyfile
-	-		-	validateServer	- (pblogd is not an SSL client to any host)		-
-	-		-		sslservercertfile sslserverkeyfile	validateServer	sslservercafile

On Submithost (pbrun)		On Masterhost (pbmasterd) noreconnect=1 in the policy		On Loghost (pblogd)		On Runhost (pblocald) (submithost != runhost) or (pbrun --di) or (pbmasterd --disable_optimized_runmode)	
ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required
<b>validateClient</b>	-  (pbrun is not an SSL server at any point, also refer to *)		-		-		-
	sslpbbruncertfile sslpbbrunkeyfile	<b>validateClient</b>	sslservercafile		**sslservercertfile sslserverkeyfile		**sslservercertfile sslserverkeyfile
	-		sslservercertfile sslserverkeyfile	<b>validateClient</b>	sslservercafile		sslservercertfile sslserverkeyfile ***sslpbbruncertfile sslpbbrunkeyfile
	-		sslservercertfile sslserverkeyfile		**sslservercertfile sslserverkeyfile	<b>validateClient</b>	sslservercafile

\* mentioning sslpbbruncafile with or without validateserver and validateclient options requires pbmasterd certificates

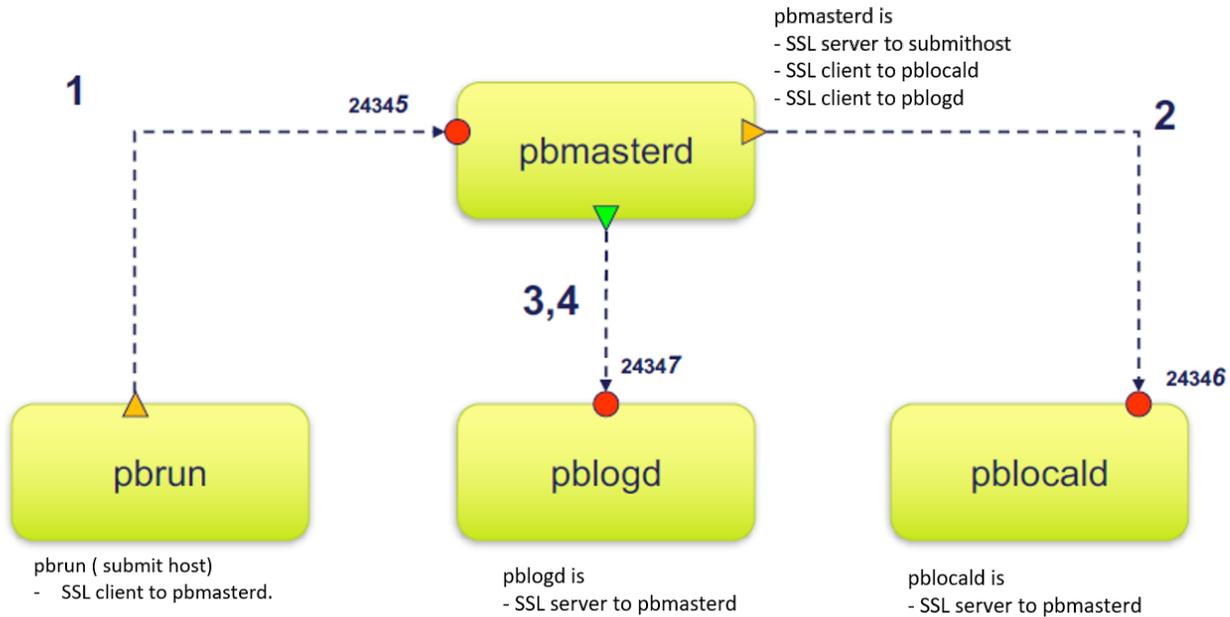
\*\* mentioning sslservercafile on a SSL client (pbmasterd and pblocald) with or without validateserver and validateclient options always requires certificates from its immediate SSL server/s.

\*\*\* pblocald needs sslpbbruncertfile and sslpbbrunkeyfile to log finish event

### SSL Connections with lognoreconnect=1 in the Policy

- lognoreconnect=1 : pblocald does not connect to pblogd directly and pbrun does not connect to pblocald directly

### PMUL SSL connections with lognoreconnect=1 in the policy



\* lognoreconnect=1 : pblockd does not connect to pblogd directly and pbrun does not connect to pblockd directly

On Submithost (pbrun)		On Masterhost (pbmasterd) lognoreconnect=1 in the policy		On Loghost (pblogd)		On Runhost (pblockd) (submithost != runhost) or (pbrun --di) or (pbmasterd --disable_optimized_runmode)	
ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required
validateServer	*sslpbruncafile		sslservercertfile sslserverkeyfile		-		-
	-	validateServer  (pbmasterd is client to pblockd, pblogd)	sslservercafile		sslservercertfile sslserverkeyfile		sslservercertfile sslserverkeyfile
	-		-	validateServer	-  (pblogd is not an SSL client to any host)		-

On Submithost (pbrun)		On Masterhost (pbmasterd) logignoreconnect=1 in the policy		On Loghost (pblogd)		On Runhost (pblocald) (submithost != runhost) or (pbrun --di) or (pbmasterd --disable_optimized_runmode)	
<i>ssloptions</i>	<i>SSL cert/CA file required</i>	<i>ssloptions</i>	<i>SSL cert/CA file required</i>	<i>ssloptions</i>	<i>SSL cert/CA file required</i>	<i>ssloptions</i>	<i>SSL cert/CA file required</i>
	-		-		-	<b>validateServer</b>	-  (pblocald is not a SSL client/server to pblogd as logignoreconnect=1)
<b>validateClient</b>	-  (pbrun is not an SSL server at any point, also refer to *)		-		-		-
	sslpbruncertfile sslpbrunkeyfile	<b>validateClient</b>	sslservercafile		**sslservercertfile sslserverkeyfile		**sslservercertfile sslserverkeyfile
	-		sslservercertfile sslserverkeyfile	<b>validateClient</b>	sslservercafile		-
	-  (No direct connection between pbrun and pblocald when logignoreconnect=1)		sslservercertfile sslserverkeyfile		-	<b>validateClient</b>	sslservercafile

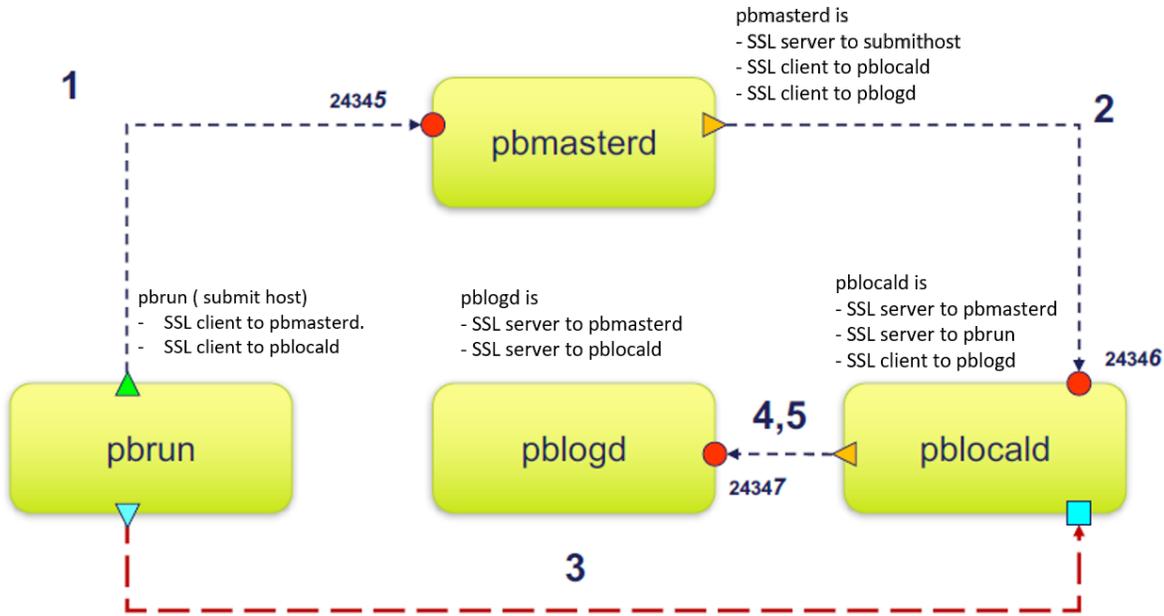
\* mentioning sslpbruncafile with or without validateServer and validateClient options requires pbmasterd certificates

\*\* mentioning sslservercafile on pbmasterd with or without validateserver and validateclient options always requires certificates from pblocald and pblogd

### SSL Connections with pbrunreconnection=1 in the Policy

- pbrunreconnection=1 : pblocald listens for the connections that are initiated by pbrun under the control of pbmasterd.
- pbrunreconnection=0 : pbrun listens for the connections that are initiated by pblocald under the control of pbmasterd. This value is the default.

### PMUL SSL connections with pbrunreconnection=1 in the policy



\* pbrunreconnection=1 : pblocald listens for the connections that are initiated by pbrun under the control of pbmasterd  
pbrunreconnection=0 : pbrun listens for the connections that are initiated by pblocald under the control of pbmasterd. This value is the default.

On Submithost (pbrun)		On Masterhost (pbmasterd) pbrunreconnection=1 in the policy		On Loghost (pblogd)		On Runhost (pblocald) (submithost != runhost) or (pbrun --di) or (pbmasterd --disable_optimized_runmode)	
ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required
validateServer	*sslpbruncafile		sslservercertfile sslserverkeyfile		-		sslservercertfile sslserverkeyfile
-	-	validateServer (pbmasterd is client to pblocald, pblogd)	sslservercafile		sslservercertfile sslserverkeyfile		sslservercertfile sslserverkeyfile
-	-		-	validateServer	- (pblogd is not an SSL client to any host)		-
-	-		-		sslservercertfile sslserverkeyfile	validateServer	sslservercafile

On Submithost (pbrun)		On Masterhost (pbmasterd) pbrunreconnection=1 in the policy		On Loghost (pblogd)		On Runhost (pblocald) (submithost != runhost) or (pbrun --di) or (pbmasterd --disable_optimized_runmode)	
ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required
<b>validateClient</b>	-  (pbrun is not an SSL server at any point, also refer to *)		-		-		-
	sslpbbruncertfile sslpbbrunkeyfile	<b>validateClient</b>	sslservercafile		**sslservercertfile sslserverkeyfile		**sslservercertfile sslserverkeyfile
	-		sslservercertfile sslserverkeyfile	<b>validateClient</b>	sslservercafile		sslservercertfile sslserverkeyfile ***sslpbbruncertfile sslpbbrunkeyfile
	sslpbbruncertfile sslpbbrunkeyfile		sslservercertfile sslserverkeyfile		**sslservercertfile sslserverkeyfile	<b>validateClient</b>	sslservercafile

\* mentioning sslpbbruncertfile with or without validateserver and validateclient options requires pbmasterd and pblocald certificates

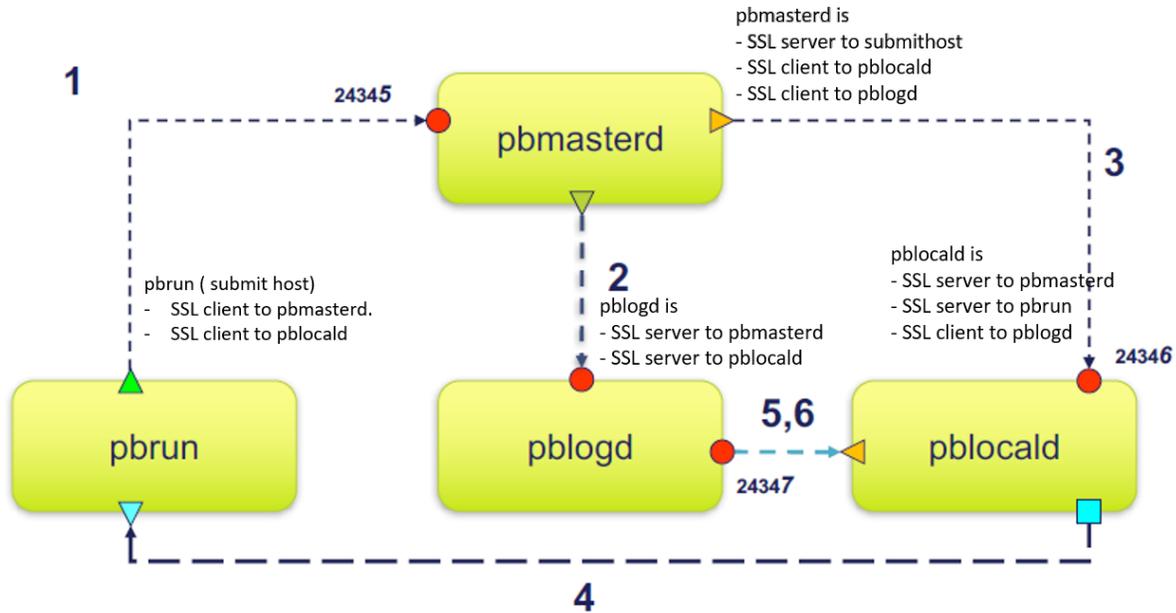
\*\* mentioning sslservercafile on a SSL client (pbmasterd and pblocald) with or without validateserver and validateclient options always requires certificates from its immediate SSL server/s.

\*\*\* pblocald needs sslpbbruncertfile and sslpbbrunkeyfile to log finish event

### SSL Connections with pblogdreconnection=1 in the Policy

- pblogdreconnection=1 : pblocald listens for the connections that are initiated by pblogd under the control of pbmasterd
- pblogdreconnection=0 : pblogd listens for the connections that are initiated by pblocald under the control of pbmasterd. This value is the default.

### PMUL SSL connections with pblogdreconnection=1 in the policy



\* pblogdreconnection=1 : pblockd listens for the connections that are initiated by pblogd under the control of pbmasterd  
 pblogdreconnection=0 : pblogd listens for the connections that are initiated by pblockd under the control of pbmasterd. This value is the default.

On Submithost (pbrun)		On Masterhost (pbmasterd) pblogdreconnection=1 in the policy		On Loghost (pblogd)		On Runhost (pblockd) (submithost != runhost) or (pbrun --di) or (pbmasterd --disable_optimized_runmode)	
ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required
validateServer	*sslpbruncafile		sslservercertfile sslserverkeyfile		-		sslservercertfile sslserverkeyfile
	-	validateServer (pbmasterd is client to pblockd, pblogd)	sslservercafile		sslservercertfile sslserverkeyfile		sslservercertfile sslserverkeyfile
	-		-	validateServer	- (pblogd is not an SSL client to any host)		-
	-		-		sslservercertfile sslserverkeyfile	validateServer	sslservercafile

On Submithost (pbrun)		On Masterhost (pbmasterd) pblogdreconnection=1 in the policy		On Loghost (pblogd)		On Runhost (pblocald) (submithost != runhost) or (pbrun --di) or (pbmasterd --disable_optimized_runmode)	
ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required	ssloptions	SSL cert/CA file required
validateClient	- <small>(pbrun is not an SSL server at any point, also refer to *)</small>		-		-		-
	sslpbbruncertfile sslpbbrunkeyfile	validateClient	sslservercafile		**sslservercertfile sslserverkeyfile		**sslservercertfile sslserverkeyfile
	-		sslservercertfile sslserverkeyfile	validateClient	sslservercafile		sslservercertfile sslserverkeyfile ***sslpbbruncertfile sslpbbrunkeyfile
	sslpbbruncertfile sslpbbrunkeyfile		sslservercertfile sslserverkeyfile		**sslservercertfile sslserverkeyfile	validateClient	sslservercafile

\* mentioning sslpbbruncertfile with or without validateServer and validateClient options requires pbmasterd and pblocald certificates

\*\* mentioning sslservercafile on a SSL client (pbmasterd and pblocald) with or without validateserver and validateclient options always requires certificates from its immediate SSL server/s.

\*\*\* pblocald needs sslpbbruncertfile and sslpbbrunkeyfile to log finish event

## Kerberos Version 5

Privilege Management for Unix & Linux can use Kerberos V5 to authenticate its various parts and to exchange encryption key information.

To use Kerberos with Privilege Management for Unix & Linux, you must register **pbmasterd**, **pblocald**, and **pblogd** as Kerberos principals. The principals should look like this (substitute your own host and **pblogd** principal names):

- **pbmasterd/kerberizedmachine.your\_realm.com**
- **pblocald/kerberizedmachine.your\_realm.com**
- **pblogd/kerberizedmachine.your\_realm.com**

These principals must be added to the **keytab** file. Users also need to be principals and need a target.

The default principals are **pbmasterd**, **pblocald**, and **pblogd**. These can be overridden by the **mprincipal**, **lprincipal**, and **gprincipal** settings in the settings file.

All Privilege Management for Unix & Linux client and server programs can use Kerberos Version 5 for authentication and session encryption keys.

Privilege Management for Unix & Linux clients request verification to use **pbmasterd** by checking the submitting user ticket cache or obtaining a ticket for **pbmasterd** with the principal in **mprincipal**.

Privilege Management for Unix & Linux daemons request verification to access other daemons by checking the services' principals for both daemons, as listed in the following table.

## Kerberos Principal Usage

From	Principal	Connection Type	To	Principal
pbrun pbksh pbsh pbguid	user@realm	Direct	pbmasterd	mprincipal/ masterhost@real m
pbrun pbksh pbsh	user@realm	Dynamic	pblocald	lprincipal/ runhost@realm
pbrun pbksh pbsh pblocald	principal/ runhost@realm	Direct or dynamic	pblogd	gprincipal/ loghost@realm
pbmasterd	mprincipal/ masterhost@real m	Direct	pblocald	lprincipal/ loghost@realm
pbmasterd	mprincipal/ masterhost@real m	Direct	pblogd	gprincipal/ loghost@realm

## kerberos

- **Version 4.0.0 and later:** **kerberos** setting available

When set to **yes**, the **kerberos** setting enables the use of the Privilege Management for Unix & Linux Kerberos Version 5 features. When set to **no**, the **kerberos** setting disables the use of these features.

### Example

```
kerberos yes
```

### Default

```
kerberos no
```

### Used on

- Log hosts
- Policy Server hosts
- Submit hosts
- Run hosts

## keytab

**Version 4.0.0 and later:** **keytab** setting availableThe **keytab** setting contains the name of the Kerberos 5 Key Table. Newer versions of Kerberos discourage setting the key tab in this fashion and favor using the **krb5.conf** file or the **KRB5\_KTNAME** environment variable. Using the **keytab** setting should be avoided.

## keytabencryption

- **Version 8.0.0 and earlier:** **keytabencryption** setting not available
- **Version 8.0.1 and later:** **keytabencryption** setting available

The **keytabencryption** setting specifies which cipher all Privilege Management for Unix & Linux components will use for Kerberos negotiations. The algorithm must match the default algorithm used by the Kerberos server. Supported values include **des-hmac**, **des3-hmac** and **arcfour-hmac**. As of this writing, the AES algorithms are not supported, which effectively limits using Active Directory as a Kerberos server. This keyword is mandatory to support more recent, non-DES Kerberos implementations because Privilege Management for Unix & Linux cannot automatically determine the best cipher.

## Example

```
keytabencryption arcfour-hmac
```

## Default

```
keytabencryption des-hmac
```

## Used on

- Log hosts
- Policy Server hosts
- Submit hosts
- Run hosts

## gprincipal

- **Version 4.0.0 and later:** **gprincipal** setting available

The **gprincipal** setting contains the principal that the Policy Server daemon (**pbmasterd**), the local daemon (**pblocald**) and clients that are running in local mode (for example, **pbrun -l ...**) use to verify access to the log server daemon (**pblogd**). The host name and realm are appended to form the full principal.

## Example

```
gprincipal pblogd_principal
```

## Default

```
gprincipal pblogd
```

### Used on

- Log hosts
- Policy Server hosts
- Submit hosts
- Run hosts

### lprincipal

- **Version 4.0.0 and later:** **lprincipal** setting available

The **lprincipal** setting contains the principal that the Policy Server daemon (**pbmasterd**) and client programs use to verify access to the local daemon (**pblockald**). The host name and realm are appended to form the full principal.

### Example

```
lprincipal pblockald_principal
```

### Default

```
lprincipal pblockald
```

### Used on

- Log hosts
- Policy Server hosts
- Run hosts
- Submit hosts

### mprincipal

- **Version 4.0.0 and later:** **mprincipal** setting available

The **mprincipal** setting contains the principal that the Privilege Management for Unix & Linux clients use to verify access to the Policy Server daemon (**pbmasterd**). The host name and realm are appended to form the full principal.

### Example

```
mprincipal pbmasterd_principal
```

### Default

```
mprincipal pbmasterd
```

### Used on

- Policy Server hosts
- Submit hosts

### sprincipal

- **Version 5.2 and earlier:** **sprincipal** setting not available
- **Version 6.0 and later:** **sprincipal** setting available

The **sprincipal** setting contains the principal that the Privilege Management for Unix & Linux **pbsync** client uses to verify access to the log synchronization daemon (**pbsyncd**). The host name and realm are appended to form the full principal.

### Example

```
sprincipal pbsync_principal
```

### Default

```
sprincipal pbsyncd
```

### Used on

- Log hosts
- Policy Server hosts
- Sync hosts

### kerberosvalidatecacheuser

- **Version 4.0 and later:** **kerberosvalidatecacheuser** setting available

If set to “yes”, compares current user’s Unix/Linux username with the Kerberos client name. If they do not match, it invalidates the cache and new credentials have to be provided.

### Default

```
kerberosvalidatecacheuser no
```

## Privilege Management for Unix & Linux Shared Libraries

When configured with Kerberos, SSL, LDAP, or PAM, Privilege Management for Unix & Linux requires the appropriate third-party libraries. The installation provides Kerberos, SSL, LDAP, and PAM libraries that are designed to work with Privilege Management for Unix & Linux. We recommend you install these third-party libraries.



**Note:** The shared libraries for the following operating systems are not currently supported:

- NCR
- IRIX
- OSF
- QNX
- Mac OS X

## Shared Libraries for Kerberos

These settings are related to the shared libraries that are needed for Kerberos in Privilege Management for Unix & Linux.

### sharedlibkrb5dependencies

- **Version 5.0.4 and earlier:** **sharedlibkrb5dependencies** setting not available
- **Version 5.1.0 and later:** **sharedlibkrb5dependencies** setting available

The libraries are listed in the order they will be loaded (dependencies first). This setting should be used in either of the following circumstances:

- The **kerberos** setting is set to **yes**, the **pam** setting is set to **yes**, and PAM uses Kerberos
- The **ssl** setting is set to **yes** and the SSL libraries that are listed in the **sharedlibssldependencies** setting are dependent on the Kerberos libraries

By default, the shared libraries that are listed for this setting are the ones that are shipped with Privilege Management for Unix & Linux. However, you can replace them with libraries that are used by the PAM or SSL services that are installed on the Privilege Management for Unix & Linux host computer.

### Example

```
sharedlibkrb5dependencies /usr/lib/symark/pb/libcom_err.so.3  
/usr/lib/symark/pb/libk5crypto.so.3 /usr/lib/symark/pb/libkrb5.so.3  
/usr/lib/symark/pb/libgssapi_krb5.so.2
```

### Default

No default value

### Used on

- Log hosts
- Policy Server hosts
- Submit hosts
- Run hosts

## loadkrb5libs

- **Version 5.2 and earlier:** `loadkrb5libs` setting not available
- **Version 6.0 and later:** `loadkrb5libs` setting available

The `loadkrb5libs` setting determines whether the libraries that are listed in the `sharedlibkrb5dependencies` setting are loaded at runtime even if the value of the `kerberos` setting is `no`. This setting is ignored when `kerberos` is set to `yes`. This setting is useful in certain cases where the operating system is configured to use Kerberos and the Privilege Management for Unix & Linux `submitconfirmuser()` function returns false even when the correct Kerberos password is supplied.

### Example

```
loadkrb5libs yes
```

### Default

```
loadkrb5libs no
```

### Used on

- Log hosts
- Policy Server hosts
- Submit hosts
- Run hosts

## Shared Libraries for SSL

The following setting is related to the shared libraries needed for SSL use.

## loadssllibs

- **Version 6.2.5 and earlier:** `loadssllibs` setting not available
- **Version 6.2.6 and later:** `loadssllibs` setting available

The `loadssllibs` setting determines whether the libraries that are listed in the `sharedlibssldependencies` setting are loaded at runtime even if the value of the `ssl` setting is `no`. This setting is ignored when `ssl` is set to `yes`. This setting is useful in certain cases where the operating system is configured to use SSL and we need to force Privilege Management for Unix & Linux to load the SSL libraries.

### Example

```
loadssllibs yes
```

### Default

```
loadssllibs no
```

## Used on

- Log hosts
- Policy Server hosts
- Submit hosts
- Run hosts

## sharedlibssldependencies

- **Version 5.0.4 and earlier:** **sharedlibssldependencies** setting not available
- **Version 5.1.0 and later:** **sharedlibssldependencies** setting available

The libraries are listed in the order they will be loaded (dependencies first). This setting should be used in either of the following circumstances:

- The **ssl** setting is set to **yes**
- LDAP is used in the policy or by PAM and the LDAP libraries that are listed in the **sharedlibldapdependencies** setting are dependent on the SSL libraries

By default, the shared libraries listed for this setting are shipped with Privilege Management for Unix & Linux. However, you can replace them with libraries that are used by the SSL service that is installed on the Privilege Management for Unix & Linux host computer.

## Example

```
sharedlibssldependencies /usr/lib/symark/pb/libcrypto.so.0.9.7 /usr/lib/symark/pb/libssl.so.0.9.7
```

## Default

No default value

## Used on

- Log hosts
- Policy Server hosts
- Submit hosts
- Run hosts

## Shared Libraries for LDAP

The following setting is related to the shared libraries that are needed for LDAP use.

## loadldaplibs

- **Version 6.2.5 and earlier:** **loadldaplibs** setting not available
- **Version 6.2.6 and later:** **loadldaplibs** setting available

The **loadldaplibs** setting determines whether the libraries that are listed in the **sharedlibldapdependencies** setting are loaded at runtime even if Policy LDAP functions are not used. This setting is useful in certain cases where the operating system is configured to use LDAP and we need to force Privilege Management for Unix & Linux to load the LDAP libraries.

### Example

```
loadldaplibs yes
```

### Default

```
loadldaplibs no
```

### Used on

- Log hosts
- Policy Server hosts
- Submit hosts
- Run hosts

### sharedlibldapdependencies

- **Version 5.0.4 and earlier:** **sharedlibldapdependencies** setting not available
- **Version 5.1.0 and later:** **sharedlibldapdependencies** setting available

The libraries are listed in the order they will be loaded (dependencies first). This setting should be used in either of the following circumstances:

- LDAP is used in the Privilege Management for Unix & Linux policy
- The **pam** setting is set to **yes** and PAM is using LDAP

By default, the shared libraries that are listed for this setting are shipped with Privilege Management for Unix & Linux. However, you can replace them with libraries that are used by the LDAP service that is installed on the Privilege Management for Unix & Linux host computer.

### Example

```
sharedlibldapdependencies /usr/lib/symark/pb/liblber-2.3.so.0 /usr/lib/symark/pb/libldap-2.3.so.0
```

### Default

No default value

### Used on

- Log hosts
- Policy Server hosts

- Submit hosts
- Run hosts

### Shared Library Directory Location for AIX and HP (PA RISC)

For AIX and HP (PA-RISC), the directory for installing third-party libraries must be in one of the following locations:

- `/usr/lib/symark/pb`
- `/usr/lib`
- `/lib`
- `/usr/local/lib`

If any other directory is specified, then it is rejected with an error message stating that you must use one of these four directory locations.

### Shared Library File Name for AIX

The notation that is used on AIX to specify some libraries (Kerberos and LDAP) is different from other platforms. On AIX for third-party libraries that are archives, you also need to specify the shared object that is a member of the archive and add it to the file name. For example, if `libcom_err.a.3.0` is an archive and `shr.0.3.0` is the actual shared object, then the file specification for the member of the archive is:

```
libcom_err.a.3.0(shr.0.3.0)
```



**Note:** For SSL, because the library is not an archive, it is not necessary to alter the file name.

### Shared Libraries for PAM

The following are the shared libraries needed for PAM use.

#### libpam

- **Version 5.2 and earlier:** `libpam` setting not available
- **Version 6.0 and later:** `libpam` setting available

`libpam` is a user-defined PAM library that Privilege Management for Unix & Linux uses as a first option in case the system does not use the standard default PAM libraries. The notation used for AIX to specify the OS-provided PAM library is the following:

```
/usr/lib/libpam.a(shr.o)
```

#### Example

```
libpam /lib/libpam.so.1
```

#### Default

No default value

## Used on

- Policy Server hosts
- Submit hosts
- Run hosts
- Policy Server hosts
- Submit hosts
- Run hosts

## Hardware Security Module (HSM)

Privilege Management for Unix & Linux, through its integration with the SafeNet Luna SA Hardware Security Module (HSM), provides the first privileged user management solution to use FIPS 140-2 Security Level 2-validated key storage services to achieve compliance with the most strict key storage requirements and standards. Privilege Management for Unix & Linux supports the configuration of an SSL engine. An SSL engine is a plug-in mechanism for third parties to add extra cryptographic capabilities to SSL. The SSL engine must be properly configured according to the engine provider's instructions. The SSL library that is shipped with Privilege Management for Unix & Linux does not support the use of SSL engines. Therefore, to use an SSL engine, you must build your own set of SSL libraries to support the SSL engine. If you use Kerberos or LDAP, then you must also build your own set of those libraries. The file name of the SSL engine shared object should be appended to the **sharedlibssldependencies** setting, and the engine ID should be specified using the **sslengine** keyword.

### sslengine

- **Version 5.0.4 and earlier:** **sslengine** setting not available
- **Version 5.1.0 and later:** **sslengine** setting available

The **sslengine** setting specifies the SSL engine ID to be used with the HSM. The value is case-sensitive.

## Example

The following is an example **pb.settings** configuration when using the SafeNet Luna SA Hardware Security Module:

```
sharedlibkrb5dependencies none
sharedlibldapdependencies none
sharedlibssldependencies /usr/local/lunassl/lib/libcrypto.so.0.9.8
/usr/local/lunassl/lib/libssl.so.0.9.8
/usr/local/lunassl/lib/engines/liblunaca3.so

ssl yes
sslservercertfile /etc/pb/CERTS/safenet.crt
sslserverkeyfile /etc/pb/CERTS/safenet.key

sslengine LunaCA3
```

In the example, new SSL libraries with engine support are built and installed in the **/usr/local/lunassl** directory. Kerberos and LDAP are not in use. The engine ID is **LunaCA3**. The key file value is a name that is interpreted by the engine to access the private key on the HSM.

## Default

No default value

### Used on

- Policy Server hosts
- Log hosts

## GUI Configuration

These settings control where the Privilege Management for Unix & Linux GUI looks for its help files and user default settings.

### builderdir

- **Version 4.0.0 and later:** **builderdir** setting available

The **builderdir** setting specifies where **pbguid** looks for its help files.

### Example

```
builderdir /usr/local/pbguid/help_files
```

### Default

```
builderdir /usr/local/lib/<prefix>pbbuilder<suffix>
```

### Used on

GUI hosts

### guidefaults

- **Version 4.0.0 and later:** **guidefaults** setting available

**Pbguid** maintains a file of user defaults, which include the starting directory for logs, screen colors, etc. The location of this file is specified in the **guidefaults** setting.

### Example

```
/pbguid.defaults
```

### Default

No default value

### Used on

GUI hosts

## guireplaytimelimit

- **Version 9.4.1 and earlier:** `guireplaytimelimit` setting not available
- **Version 9.4.3 and later:** `guireplaytimelimit` setting available

If an IO log was archived from the original location on the Log Host using the log archiving feature of Privilege Management for Unix & Linux, PMUL GUI on that logserver can still replay the IO log. REST API is used by `pbguid` to retrieve a temporary copy from the archive server which is then read for replay. For security purposes, the copy of the log is only available for the time defined (in minutes) by `guireplaytimelimit`.

### Example

```
guireplaytimelimit 20
```

### Default

```
guireplaytimelimit 30
```

### Used On

GUI hosts

## Other Security Issues

### runsecurecommand

- **Version 4.0.0 and later:** `runsecurecommand` setting available

The `runsecurecommand` setting enables the administrator to perform an extra check on the security of the requested command. This check helps to ensure that someone other than `root` or the `runuser` (for example, `sys` or `oracle`) could not have compromised the command.

When set to `yes`, the `runcommand` and all directories above it are checked to determine if anyone other than `root` or the `runuser` has write permission. If the command file or any of the directories above it are writable by anyone other than `root` or the `runuser`, then the run host refuses to run the command. The policy language variable `runsecurecommand` can be set to `true` by the configuration policy on the Policy Server host for the same effect.



**Note:** This keyword does not apply to `pbssh`. If it is present in the settings file, it does not have any effect on `pbssh` and is ignored.

### Example

```
runsecurecommand yes
```

### Default

```
runsecurecommand no
```

## Used on

- Run hosts
- Submit hosts, when using local mode

## rejectnullpasswords

- **Version 4.0.0 and later:** `rejectnullpasswords` setting available

Some systems allow the use of null passwords in their password databases. When null passwords are allowed, a carriage-return at a password prompt matches that null password. If you want to always reject attempts to enter a password for an account with a null password, you can set `rejectnullpasswords` to **yes**.

## Example

```
rejectnullpasswords yes
```

## Default

```
rejectnullpasswords no
```

## Used on

- Policy Server hosts
- Submit hosts
- Run hosts

## enforceRunCwd

- **Version 5.0.2 and earlier:** `enforceRunCwd` setting not available
- **Version 5.0.3 and later:** `enforceRunCwd` setting available

The `enforceRunCwd` setting enforces the `runcwd` when set to **yes** or when it is not set. When set to **yes** and the user does not have permission for the `runcwd`, the task is rejected. When the secured task cannot change to the `runcwd` directory (because of bad permissions, or because the directory does not exist), then the `enforceRunCwd` setting determines whether the secured task should be run from `/tmp`, or whether it should be denied.



**Note:** This keyword does not apply to `pbssh`. If it is present in the settings file, it does not have any effect on `pbssh` and is ignored.

## Syntax

```
enforceRunCwd <yes|no>
```

## Valid Values

- **yes**: Enforce the **runcwd** and do not run the command in **/tmp**.
- **no**: Revert to the old behavior and run the command in **/tmp**.

## Example

```
enforceRunCwd yes
```

## Default

```
enforceRunCwd yes
```

## Used on

Run hosts

## warnuseronerror

- **Version 4.0.0 and later**: **warnuseronerror** setting available

Privilege Management programs, such as **pbrun**, **pblogd**, and **pbmasterd**, can produce diagnostic message about security problems. These messages include file systems that are writable, the **pb.conf** file being writable, and so forth.

Because a user might be able to use that information to damage a system, the full diagnostic messages are recorded only in the log files. The user sees the generic message, *Security error, please see your administrator*.

To enable the user see the full diagnostic messages, set **warnuseronerror** to **yes**.



**Note:** *There is a limitation to this setting. When an error about the security of the settings file occurs, the user is never notified.*

## Example

```
warnuseronerror yes
```

## Default

```
warnuseronerror no
```

## Used on

- Policy Server hosts
- Run hosts
- Submit hosts

## See Also

```
showunsecurewarnings
```

### showunsecurewarnings

- **Version 5.1.1 and earlier:** `showunsecurewarnings` setting not available
- **Version 5.1.2 and later:** `showunsecurewarnings` setting available

Privilege Management programs, such as `pbrun` and `pbmaterd`, can produce diagnostic message about security problems. These messages include information about licensing files and expiration.

This setting supersedes the value of `warnuseronerror` only if the messages do not pose a security risk. When `showunsecurewarnings` is enabled, all messages that can safely be displayed on the client system are displayed. Display of secure messages still depends on the value of `warnuseronerror`.

To allow the user to see the `unsecure` diagnostic messages, set `showunsecurewarnings` to `yes`.

## Example

```
showunsecurewarnings yes
```

## Default

No default value

## Used on

- Policy Server hosts
- Run hosts
- Submit hosts

## See Also

```
warnuseronerror
```

### clientdisableoptimizedrunmode

- **Version 5.2 and earlier:** `clientdisableoptimizedrunmode` setting not available
- **Version 6.0 and later:** `clientdisableoptimizedrunmode` setting available

Privilege Management for Unix & Linux optimized run mode feature enables a task to be run on the submit host after being validated by the Policy Server host, without invoking `pblocald`.



For more information, please see "[Optimized Run Mode Processing](#)" on page 22.

When set to **yes**, the **clientdisableoptimizedrunmode** setting disables optimized run mode for all **pbrun** invocations on the affected host. This setting is equivalent to invoking **pbrun** with the **--disable\_optimized\_runmode** command line option.



For more information, please see "[pbrun](#)" on page 384.

### Example

```
clientdisableoptimizedrunmode yes
```

### Default

```
clientdisableoptimizedrunmode no
```

### Used on

Submit hosts

### See Also

```
masterdisableoptimizedrunmode
```

### masterdisableoptimizedrunmode

- **Version 5.2 and earlier:** **masterdisableoptimizedrunmode** setting not available
- **Version 6.0 and later:** **masterdisableoptimizedrunmode** setting available

Privilege Management for Unix & Linux optimized run mode feature enables a task to be run on the submit host after being validated by the Policy Server host, without invoking **pblocald**.



For more information, please see "[Optimized Run Mode Processing](#)" on page 22.

When set to **yes**, the **clientdisableoptimizedrunmode** setting disables optimized run mode for all **pbrun** invocations that are accepted by the affected Policy Server host. This setting is equivalent to invoking **pbmasterd** with the **--disable\_optimized\_runmode** command line option.



For more information, please see "[pbmasterd](#)" on page 367.

### Example

```
masterdisableoptimizedrunmode yes
```

## Default

```
masterdisableoptimizedrunmode no
```

## Used On

Policy Server hosts

## See Also

```
clientdisableoptimizedrunmode
```

## execute\_via\_su

- **Version 7.0 and earlier:** `execute_via_su` setting not available
- **Version 7.1.0 and later:** `execute_via_su` setting available

The run environment for the secured task is normally dictated by the Policy Server policy. It may be desirable to have the runhost dictate the run environment for the secured task. Privilege Management for Unix & Linux v7.1 and above can use the `su -` command to create a login shell for the secured task, thus allowing the login mechanism to setup the run environment. The Policy Server host keyword `execute_via_su` in `/etc/pb.settings` will globally enable using `su -` to execute the secured task.

This keyword can be overridden by the policy variable with the same name `execute_via_su`. The `execute_via_su` variable's initial value is based on the keyword setting's value. When `execute_via_su` is used, any run environment setup in the policy will affect the execution of `su -` rather than the execution of the secured task. This includes the use of `runcwd`, `setenv()`, `keepenv()`, etc as well as `!g!`, `!G!`, etc. Entitlement reports will not indicate that `su -` is used, however the Accept events in the event log will show that `su -` was used to invoke the secured task.



**Note:** This feature will not work for `runusers` whose login is disabled (for example, via `/sbin/nologin` or `/bin/false`).



**Note:** On some operating systems, the `su` program does not pass the `tty` through to the command executed. The `execute_via_su` feature should not be used with secured tasks that require a `tty` on those operating systems.

## Keyword/Policy Variable Hierarchy

Settings Keyword	Policy Variable	Result uses su -?
unset	unset	no
unset	TRUE	YES
unset	FALSE	no
No	unset	no
No	TRUE	YES
No	FALSE	no

Settings Keyword	Policy Variable	Result uses su -?
Yes	unset	YES
Yes	TRUE	YES
Yes	FALSE	no

### Example

```
execute_via_su yes
```

### Default

```
execute_via_su no
```

### Used On

Policy Server hosts

### credentialtimeout

Use the command **pbadmin --auth --login** to cache credentials to facilitate working with remote services. The **credentialtimeout** setting is the maximum length of time (in seconds) that the authentication credential will be cached.

### Example

```
credentialtimeout 900
```

### Default

```
credentialtimeout 1800
```



For more information, please see "[Authentication Credential Cache Options](#)" on page 326 .

### logfilepermissions

The **logfilepermissions** setting specifies the permissions that Privilege Management for Unix & Linux uses when creating certain files such as generated pbreport files, IO logs, and flat file event logs. The default permission is **600** and you can not specify permission less secure than **644**.

### Default

```
logfilepermissions 600
```

## Used On

All Servers

## Licensing

Each time a user submits a request using **pbrun**, or initiates a **pseudo** session, or an administrator runs the File Integrity Monitor, Privilege Management for Unix & Linux will check with the License Services that a valid license is present. Without a valid license, Privilege Management for Unix & Linux will not accept requests from users.



**Note:** As of version 10.0, a License String consists of a JSON (JavaScript Object Notation) string that details expiry, facilities, and services.

There are two types of licenses:

- **Temporary:** The **HostId** attribute set to **temporary** and is installed automatically to allow customers to evaluate Privilege Management for Unix & Linux.
- **Standard:** Supplied by BeyondTrust once a customer has purchased the product. A standard license has a **HostId** attribute that associates the license with the Primary License Server of the Privilege Management for Unix & Linux installation.

### Example of a Temporary License String

```
{ "PBULPolClnts":20, "SudoPolClnts":20, "RBPClnts":20, "ACAClnts":1, "AKAClnts":20, "FIMClnts":20,
  "SOLRClnts":1, "Owner":"Temporary License", "Comment":"Temporary License", "AutoRetire":7,
  "Recycle":7, "Expires":"2018-03-11 00:00:00", "Terminates":"2018-04-10 00:00:00",
  "HostId":"temporary", "HMAC":"UtGE3tD6qK2UwutY3GFOqodjdq30pEDAW2cKb5/OaMc=" }
```

A temporary license will be installed automatically if a standard license is not provided when the Primary License Server is installed. It will enable **20** client seats for all services and enable all facilities. The license will be valid for **60** days.



**Note:** To request a standard license you will be asked to provide the output of **pbadm --info --uid** from the host that will run the Primary License Service. This will display the **UUID (Universal Unique Identifier)** that identifies the host. From this, BeyondTrust can generate a license that is associated directly to the host, with the appropriate facilities and services. This can then be imported into the Primary License Server.

### Example of "pbadm --info --uid" Output

```
7faf7681-4d42-4b69-00bf-dad93b4a3dfb
```

### Example of a Standard License String

```
{ "PBULPolClnts":200, "SudoPolClnts":200, "RBPClnts":200, "ACAClnts":1, "AKAClnts":0, "FIMClnts":0,
  "SOLRClnts":1, "Owner":"My Company Corp", "Comment":"Standard License for My Company",
  "AutoRetire":7, "Recycle":7, "Expires":"2018-03-01 00:00:00", "Terminates":"2019-03-01 00:00:00",
  "HostId":"7faf7681-4d42-4b69-00bf-dad93b4a3dfb",
  "HMAC":"UtGE3tD6qK2UwutY3GFOqodjdq30pEDAW2cKb5/OaMc=" }
```

## pblicenserefresh

- **Version 9.3.0 and earlier:** **pblicenserefresh** setting not available
- **Version 9.4.0 and later:** **pblicenserefresh** setting available

The command line administration tool provides methods to update the License string, to list summary statistics and to retire clients to free up licenses.

### Examples

All of the commands that list statistics can be run from any server that provides a service. All commands that update the database, such as updating the License itself or retiring clients, should be run on the Primary License Server:

```
pbadmin --lic -u '{ "PBULPolClnts":200, "SudoPolClnts":200, "RBPClnts":200, "ACAClnts":1,
"AKAClnts":0, "FIMClnts":0, "SOLRClnts":1, "Owner":"My Company Corp", "Comment":"Standard License
for My Company", "AutoRetire":7, "Recycle":7, "Expires":"2018-03-01 00:00:00", "Terminates":"2019-
03-01 00:00:00", "HostId":"7faf7681-4d42-4b69-00bfdad93b4a3dfb",
"HMAC":"UtGE3tD6qK2UwutY3GFOqodjdq30pEDAW2cKb5/OaMc="}'
```

This command will update the installation with the License string provided by BeyondTrust to a standard license.

<b>pbadmin --lic -G</b>	Will retrieve the full License string, detailing the entitlements and expiry of the license.
<b>pbadmin --lic -l</b>	Will list all of the clients that are currently licensed throughout the installation.
<b>pbadmin --lic -L</b>	Will list the summary statistics referenced by the Privilege Management for Unix & Linux Service type.
<b>pbadmin --lic -l '{ "retired": true }'</b>	Will list all of the clients that are currently manually retired
<b>pbadmin --lic -l '{ "fqdn": "*.mydom.com" }'</b>	Will list all of the clients that have been licensed are in the <b>mydom.com</b> domain.
<b>pbadmin --lic -l '{ "updated_older": "2018-01-01" }'</b>	Will list all of the clients that were last updated before the 1st of January 2018.
<b>pbadmin --lic -l '{ "updated_older": { "months": 6 } }'</b>	Will list all of the clients that were last updated 6 months or more ago.
<b>pbadmin --lic -r '{ "uuid": "7faf7681-4d42-4b69-00bfdad93b4a3dfc" }' --force</b>	Will manually retire a client specified by its unique id
<b>pbadmin --lic -r '{ "updated_older": { "days": 120 } }' --force</b>	Will manually retire all clients that have not been updated in the last 120 days.

The **pblicenserefresh** option defines the interval in seconds between servers requesting license updates from the Primary License Server.

### Example

```
pblicenserefresh      86400
```

## Default

```
pblicenserefresh      300
```

## Used On

All Primary Policy Servers when Registry Name Server is enabled

## pblicenseretireafter

- **Version 9.3.0 and earlier:** **pblicenseretireafter** setting not available
- **Version 9.4.0 and later:** **pblicenseretireafter** setting available

The **pblicenseretireafter** option defines the interval in days after which clients who have not connected will be retired.

The host license string provides the **AutoRetire** attribute which details the minimum value for this setting. The **pblicenseretireafter** allows the configuration, in days, of values greater than this.

## Example

```
pblicenseretireafter  90
```

## Default

```
pblicenseretireafter 0
```

## Used On

All Policy Servers

## licensehistory

- **Version 9.4.6 and earlier:** **licensehistory** setting not available
- **Version 10.0.0 and later:** **licensehistory** setting available

The **licensehistory** setting is configured on the Primary License Server, and is synchronized to all hosts that provide a service. If it is enabled, every license event is logged to the Primary Log Server for detailed license information.

## Example

```
licensehistory yes
```

## Default

```
licensehistory no
```

## Used On

All Servers

## licenseservers

- **Version 9.4.6 and earlier:** **licenseservers** setting not available
- **Version 10.0.0 and later:** **licenseservers** setting available

The **licenseservers** setting details those hosts that are License Servers. The Primary License Server is first in the list, with subsequent Secondary License Servers listed, in order of failover, afterwards. If Registry Name Service is configured this value should be \* denoting that the value is held within the Service database. This setting should be consistent across the Privilege Management for Unix & Linux enterprise, and is synchronized from the Primary License Server to other servers.

## Example

```
licenseservers myhost1 myhost2
```

## Default

No default value

## Used On

All Servers

## licensestatsdb

- **Version 9.4.6 and earlier:** **licensestatsdb** setting not available
- **Version 10.0.0 and later:** **licensestatsdb** setting available

The **licensestatsdb** allows the specification of a absolute or relative path to the License Database on Server installations. If the path is relative, the absolute path is calculated using the **basedir** setting. All of the License information, including the license itself, and Client and Service statistics, are stored in the database.

## Example

```
licensestatsdb /mypath/pblicense.db
```

## Default

```
licensestatsdb /opt/<prefix>pbul<suffix>/dbs/pblicense.db
```

## Used On

All Servers

## licensestatswq

- **Version 9.4.6 and earlier:** `licensestatswq` setting not available
- **Version 10.0.0 and later:** `licensestatswq` setting available

Whilst processing License statistics or logging license events temporary files are created to increase performance. These files will be created with names derived from the `licensestatswq` setting.

### Example

```
licensestatswq /mypath/pblicense_wq
```

### Default

```
licensestatswq /opt/<prefix>pbul<suffix>/dbs/pblicense_wq
```

### Used on

All Servers

## licensestatswqnum

- **Version 9.4.6 and earlier:** `licensestatswqnum` setting not available
- **Version 10.0.0 and later:** `licensestatswqnum` setting available

Whilst processing License statistics or logging license events temporary files are created to increase performance. This setting specifies how many temporary files will be created. Generally, unless performance issues are experienced it is recommended that this is kept to its default value.

### Example

```
licensestatswqnum 100
```

### Default

```
licensestatswqnum 10
```

### Used On

All Servers

## pblicensedblocktimeout

- **Version 9.4.6 and earlier:** `pblicensedblocktimeout` setting not available
- **Version 10.0.0 and later:** `pblicensedblocktimeout` setting available

This setting details the maximum delay, in milliseconds, that the database will wait to attempt writing to the database. Generally, unless performance issues are experienced it is recommended that this is kept to its default value.

### Example

```
pblicensedblocktimeout 60000
```

### Default

```
pblicensedblocktimeout 10000
```

### Used On

All Servers

### pblicensequeue timeouts

- **Version 9.4.6 and earlier:** **pblicensequeue timeouts** setting not available
- **Version 10.0.0 and later:** **pblicensequeue timeouts** setting available

This setting details various performance timeout values for use in the License statistics processing. Generally, unless performance issues are experienced it is recommended that this is kept to its default value.



If performance issues are experienced please contact BeyondTrust Technical Support for more details on configuring this setting. For more information, please see [www.beyondtrust.com/support](http://www.beyondtrust.com/support).

### Example

```
pblicensequeue timeouts openread=10000,200,1.0 openwrite=10000,200,1.0 write=10000,200,1.0  
lock=10000,200,1.0
```

### Default

No default value

### Used On

All Servers

## REST Services

### pbresturi

- **Version 8.5.0 and earlier:** **pbresturi** setting not available
- **Version 9.0.0 and later:** **pbresturi** setting available

The **pbresturi** setting is to allow the configuration of non-default REST Uniform Resource Locator paths for the **pblighttpd** service. This setting is primarily for diagnosis and it is not recommended to be changed in a normal installation.

### Example

```
pbresturi      URLSTRING
```

### Default

No default value

### Used On

All hosts

### pbrestlog

- **Version 8.0 and earlier:** **pbrestlog** setting not available
- **Version 8.1.0 and later:** **pbrestlog** setting available

The **pbrestlog** setting defines the path to the REST services log.

### Example

Depending on the operating system standards, this can be any of the following:

- **/var/log/pbrest.log**
- **/var/adm/pbrest.log**
- **/usr/adm/pbrest.log**

### Default

```
pbrestlog      /var/log/pbrest.log
```

### Used On

All hosts

### pbrestdir

- **Version 8.5.0 and earlier:** **pbrestdir** setting not available
- **Version 9.0.0 and later:** **pbrestdir** setting available

The **pbrestdir** setting specifies the directory for the installation of the REST services (including **pblighttpd**).

### Example

```
pbrestdir      /mypath/rest
```

## Default

```
pbrestdir      /usr/lib/beyondtrust/pb/<prefix>rest<suffix>
```

## Used On

All hosts

## pbrestkeyfile

- **Version 8.0 and earlier:** **pbrestkeyfile** setting not available
- **Version 8.1.0 and later:** **pbrestkeyfile** setting available

REST services are authenticated using Application Id's and Application Keys. These pre-shared keys are kept in a database. The **pbrestkeyfile** details the location of this database, and, similarly to all other databases can either be an absolute path, or a path relative to the **basedir** setting.

## Example

```
pbrestkeyfile  /mypath/pbrestkeyfile.db
```

## Default

```
pbrestkeyfile  /opt/<prefix>pbul<suffix>/dbs/pbrstkeys.db
```

## Used On

All hosts

## pbresttimeout

- **Version 8.0 and earlier:** **pbresttimeout** setting not available
- **Version 8.1.0 and later:** **pbresttimeout** setting available

Many internal services in Privilege Management for Unix & Linux are provided by the REST services. The **pbresttimeout** provides a setting to set the maximum amount of time a service will wait until it times out.

## Example

```
pbresttimeout      120
```

## Default

No default value

## Used On

All hosts

## pbrestport

- **Version 8.5.0 and earlier:** **pbrestport** setting not available
- **Version 9.0.0 and later:** **pbrestport** setting available

The **pbrestport** setting details the TCP/IP port that REST services use to communicate to remote hosts. This should be consistent across the enterprise installation.

### Example

```
pbrestport 3000
```

### Default:

```
pbrestport 24351
```

### Used On

All hosts

## pbresttimeskew

REST services use cryptographic methods to communicate, which are relatively time sensitive to provide extra security. It is recommended that hosts have their time set precisely or use a suitable protocol implementation such as NTP. If this is not possible, the **pbresttimeskew** details the maximum time difference in seconds between two hosts.

### Example

```
pbresttimeskew 120
```

### Default

```
pbresttimeskew 60
```

### Used On

All hosts

## Scheduling Service

### schedulingservice

- **Version 9.3.0 and earlier:** **schedulingservice** setting not available
- **Version 9.4.0 and later:** **schedulingservice** setting available

The **schedulingservice** option enables the use of the Scheduler, which is required for asynchronous tasks in Privilege Management for Unix & Linux. It is required for Registry Name Service and Database Synchronization amongst others.

### Example

```
schedulingservice    no
```

### Default

```
schedulingservice    yes
```

### Used On

All Servers

### schedulingservicedb

- **Version 10.0.1 and earlier:** **schedulingservicedb** setting not available
- **Version 10.1.0 and later:** **schedulingservicedb** setting available

The **schedulingservicedb** option enables the specification of the path to the scheduling service database. It follows similar rules to other database settings in that if it is a relative file it will be appended to the **basedir** setting to get an absolute path.

### Example

```
schedulingservicedb  /opt/pbul/dbs/pbsched.db
```

### Default

```
schedulingservicedb  /opt/<prefix>pbul<suffix>/dbs/pbsched.db
```

### Used On

All Servers

## Sudo Integration

### sudoersdb

- **Version 8.5.0 and earlier:** **sudoersdb** setting not available
- **Version 9.0.0 and later:** **sudoersdb** setting available

If you answered **yes** to the installer question *Install PBSUDO Policy Server?*, that means you are setting up the host as a Privilege Management for Unix & Linux Basic Policy Server, and the **sudoersdb** keyword becomes mandatory. It defines the file name and location of the SQLite database where the sudoers files are stored. This file is created in **basedir** by default, unless the file name starts with '/', indicating an absolute path. The client's sudoers files stored in the database are identified by the client's hostname. This

can be changed by adding an alias and assigning one or more hosts to the alias. The alias mechanism allows many hosts to share a single sudoers policy (for example, group DEV hosts with a common policy; group QA hosts with a different common policy).

### Example

```
sudoersdb /opt/pbul/dbs/pbulsudo1.db
```

### Defaults

```
sudoersdb /opt/<prefix>pbul<suffix>/dbs/pbsudo.db
```

### Used on

Privilege Management for Unix & Linux Basic Policy Server

### sudoersdir

- **Version 8.5.0 and earlier:** `sudoersdir` setting not available
- **Version 9.0.0 and later:** `sudoersdir` setting available

The `sudoersdir` setting is the location where sudoers files can be checked out for editing.



Sudoers and included files can be checked out, edited, and checked in using the existing mechanism in `pbdbutil`, within the `--sudo` option. For more information, please see "[pbdbutil](#)" on page 319

### Example

```
sudoersdir /opt/pbsudo/sudoersdir001
```

### Defaults

```
sudoersdir /opt/<prefix>pbul<suffix>/sudoersdir
```

### Used on

Privilege Management for Unix & Linux Basic Policy Server

### pbsudo\_iolog

- **Version 8.5.0 and earlier:** `pbsudo_iolog` setting not available
- **Version 9.0.0 and later:** `pbsudo_iolog` setting available

This optional keyword specifies the full /path/filename of the I/O logs from sudo clients. This keyword allows variable substitution using the `%variable%` syntax. The list of variables that can be used are:

- **basename\_command**
- **clienthost**
- **clienthost\_uuid**
- **day**
- **dayname**
- **group**
- **host**
- **hour**
- **i18n\_day**
- **i18n\_dayname**
- **i18n\_hour**
- **i18n\_minute**
- **i18n\_month**
- **i18n\_time**
- **i18n\_year**
- **masterhost**
- **masterhostip**
- **minute**
- **month**
- **pbmasterdnodename**
- **pid**
- **requestuser**
- **rungroup**
- **runhost**
- **runuser**
- **status**
- **submithost**
- **submitpid**
- **time**
- **uniqueid**
- **unixtimestamp**
- **user**
- **year**

### Example

```
pbsudo_iolog "/var/log/pbsudo/%host%/pbsudo.iolog.XXXXXX"
```

### Defaults

No default value

## Used on

Log Server

### **pbsudorefresh**

- **Version 9.3.0 and earlier:** **pbsudorefresh** setting not available
- **Version 9.4.0 and later:** **pbsudorefresh** setting available

Privilege Management for Unix & Linux Basic maintains a cached copy of the sudoers file on the target host which it updates periodically. The **pbsudorefresh** setting is the time in seconds that a client's sudoers cache is valid. After that time, it contacts the Policy Server to refresh the cache.

## Example

```
pbsudorefresh 120
```

## Default

```
pbsudorefresh 30
```

## Used On

pbsudo client (stored in profile on Policy Server)

### **pbsudofailovertimeout**

- **Version 9.3.0 and earlier:** **pbsudofailovertimeout** setting not available
- **Version 9.4.0 and later:** **pbsudofailovertimeout** setting available

When multiple Privilege Management for Unix & Linux Basic policy servers are configured in **/etc/pbsudo.settings** on sudo clients, they will automatically try to retrieve their policy from each server in turn, providing failover. The **pbsudofailovertimeout** setting specifies how long it will take to timeout and try the next host in the list.



For more information, please see ["submitmasters"](#) on page 81.

## Example

```
pbsudofailovertimeout 60
```

## Default

```
pbsudofailovertimeout 30
```

## Used On

Privilege Management for Unix & Linux Basic client hosts

## File Integrity Monitoring

### fileintegritydb

- **Version 9.3.0 and earlier:** `fileintegritydb` setting not available
- **Version 9.4.0 and later:** `fileintegritydb` setting available

The `fileintegritydb` option specifies the path to the File Integrity Monitoring database. This file is created in `datbasedir` by default, unless the file name starts with '/

### Example

```
fileintegritydb /etc/pbfim.db
```

### Default

```
fileintegritydb /opt/<prefix>pbul<suffix>/dbs/pbfim.db
```

## Used On

All Hosts

### fileintegritysignaturesdb

- **Version 9.4.1 and earlier:** `fileintegritysignaturesdb` setting not available
- **Version 9.4.3 and later:** `fileintegritysignaturesdb` setting available

The `fileintegritysignaturesdb` option specifies the path to the local clients File Integrity Signature database.

### Example

```
fileintegritysignaturedb /etc/pbfimsigs.db
```

### Default

```
fileintegritydb /opt/<prefix>pbul<suffix>/dbs/pbfimsignatures.db
```

## Used On

Clients

## fileintegritydblocktimeout

- **Version 9.4.4 and earlier:** `fileintegritydblocktimeout` setting not available
- **Version 9.4.5 and later:** `fileintegritydblocktimeout` setting available

The `fileintegritydblocktimeout` option specifies in milliseconds the maximum time that the FIM server (`pbconfigd`) will wait to acquire a lock on the database. This may be useful when multiple clients send FIM reports at roughly the same time. The lowest useful value is **1000** and the highest is **1200000** (twenty minutes).

### Example

```
fileintegritydblocktimeout 120000
```

### Default

```
fileintegritydblocktimeout 10000
```

### Used On

FIM Servers

## fileintegrityevents

- **Version 9.3.0 and earlier:** `fileintegrityevents` setting not available
- **Version 9.4.0 and later:** `fileintegrityevents` setting available

The `fileintegrityevents` option enables the generation of File Integrity Monitoring events for Change Management and Alerting.

### Example

```
fileintegrityevents    yes
```

### Default

```
fileintegrityevents    no
```

### Used On

All Hosts

## Solaris Projects

Solaris 9 introduced the concept of a Project, which associates a running process with a Project ID. Administrators can configure resource accounting and resource limitations for the Projects.

Solaris administrators can now configure Privilege Management for Unix & Linux secured tasks to be associated with the Solaris Project mechanism, and thus take advantage of the Project accounting and Project resource limits.

Privilege Management for Unix & Linux secured tasks will honor those limitations by not executing when a limit has been reached, and are subject to signals configured for Project resource limits.

Privilege Management for Unix & Linux secured tasks can be associated with a Solaris Project in one of two ways: with the **PAM pam\_setcred()** function or with the **projects.so** library. Privilege Management for Unix & Linux secured tasks are associated with a Project that the runuser belongs to.

A Solaris Project can be specified on the **pbrun** commandline, or specified in the policy (overrides the commandline), or when not specified, Privilege Management for Unix & Linux 6.1 and 7.0 secured tasks and shells inherit the project from the initiating process (if it has a Solaris Project, and the runuser is a member of that Project). If the Project is not specified and cannot be inherited, the Solaris default project for the runuser is assigned. When a project is not specified, **pbrun** 6.2.6 and 7.0.1+ will normally assign the runuser's default project to the secured task. The new keyword **usesubmituserproject** (which defaults to **no**), when set to **yes** will enable the Privilege Management for Unix & Linux 6.1 behavior of inheriting the submituser's project if possible.



**Note:** The default to **no** changes the default behavior between Privilege Management for Unix & Linux releases. This is a conscious decision to make the "better" behavior the default behavior.

Privilege Management for Unix & Linux shells inherit the Project from the previous shell (or assume the default Project when used as a login shell).



**Note:** This behavior can be changed by setting **runsolarisproject** in the policy when (**pbclientmode == "shell start"**). When **iologging** is enabled when **pbclientmode == "shell start"**, the **iologging** parent Privilege Management for Unix & Linux shell runs associated with the user's default Project regardless of the setting for **runsolarisproject**.

The Project (and runuser) can be changed for subtasks by setting **runsolarisproject** in the policy when (**pbclientmode == "shell command"**). The Privilege Management for Unix & Linux shells require the keyword **enablesolarisprojects** set to **yes** (regardless of the **pamsetcred** setting).

If the Privilege Management for Unix & Linux usage of Solaris Projects needs to be disabled on the runhost, set the keyword **pam\_setcred()** to **no**, and the keyword **enablesolarisprojects** to **no** on the run host.

Privilege Management for Unix & Linux shells have a safety feature to allow them to operate if Solaris Projects are incorrectly configured. If the library specified by the **sharedlibsolarisprojects** keyword cannot be loaded (or is set to none), or if **enablesolarisprojects** is not set to **yes**, Privilege Management for Unix & Linux shell commands will function; however, they may operate associated with an incorrect Project (the behavior reverts to that in Privilege Management for Unix & Linux V6.0). Errors will be logged, but will not be displayed to the user.



**Note:** PAM errors (including Solaris Project **pam\_setcred()** failures) will result in the Privilege Management for Unix & Linux servers shell failing.

## sharedlibsolarisprojects

- **Version 6.0 and earlier:** **sharedlibsolarisprojects** setting not available
- **Version 6.1 and later:** **sharedlibsolarisprojects** setting available

The **sharedlibsolarisprojects** keyword specifies the location of the Solaris **projects.so** library file on runhosts. The **sharedlibsolarisprojects** keyword is required to function properly whether using the **pamsetcred** keyword, the **enablesolarisprojects** keyword, or both.



**Note:** This keyword does not apply to **pbssh**. If it is present in the settings file, it does not have any effect on **pbssh** and is ignored.

### Example

```
sharedlibsolarisprojects /usr/lib/libproject.so.1
```

### Default

No default value

### Used on

Run hosts

### See Also

```
enablesolarisprojects, usesubmituserproject, pbrun
```

## enablesolarisprojects

- **Version 6.0 and earlier:** **enablesolarisprojects** setting not available
- **Version 6.1 and later:** **enablesolarisprojects** setting available

On Solaris 9 and 10 runhosts, when Solaris Projects are used without using PAM support (**pam**, **pamsessionsservice**, and **pam\_setcred**), enable non-PAM support by setting the **enablesolarisprojects** keyword to **yes**. For Solaris 9, PAM is not able to set a Project other than the default Project. For Solaris 9 runhosts, to allow a Project specified on the **pbrun** command line or the Privilege Management for Unix & Linux policy, set the **enablesolarisprojects** keyword to **yes** (regardless of the PAM settings).



**Note:** This keyword does not apply to **pbssh**. If it is present in the settings file, it does not have any effect on **pbssh** and is ignored.

### Example

```
enablesolarisprojects yes
```

### Default

```
enablesolarisprojects no
```

### Used on

Run hosts

## See Also

```
pbrun, sharedlibsolarisprojects, usesubmituserproject
```

## usesubmituserproject

- **Version 6.2.5 and earlier, 7.0 and earlier:** `usesubmituserproject` setting not available
- **Version 6.2.6 and later, 7.0.1 and later:** `usesubmituserproject` setting available

The `usesubmituserproject` keyword, when set to **yes**, indicates that when a Solaris Project is not specified, the secured task is associated with the submituser's current project if possible. When set to **no** and a Solaris Project is not specified, or if inheriting the submituser's project is not possible, the secured task is associated with the runuser's default project. This keyword is only effective on Solaris run hosts.



**Note:** This keyword does not apply to `pbssh`. If it is present in the settings file, it does not have any effect on `pbssh` and is ignored.

## Example

```
usesubmituserproject yes
```

## Default

```
usesubmituserproject no
```

## Used on

Run hosts

## See Also

```
enablesolarisprojects, sharedlibsolarisprojects, pbrun, pblockd
```

## Daemon Mode

### daemonfork

- **Version 9.3.0 and earlier:** `daemonfork` setting not available
- **Version 9.4.0 and later:** `daemonfork` setting available

The `daemonfork` keyword controls whether Privilege Management daemons make a second fork when run in daemon mode.

When the `daemonfork` keyword is set to **yes**, Privilege Management daemons (in daemon mode) will fork after the `setsid()` call, meaning that they are no longer process group leaders or session leaders (for example, an "old-style" true "daemon"). Some init mechanisms (for example, `upstart`) lose track of the daemon's pid when this is set to **yes**.

## Example

```
daemonfork yes
```

## Default

```
daemonfork no
```

## Used On

- Policy Servers
- Log Servers
- Run Hosts

## pidfilepath

- **Version 9.3.0 and earlier:** `pidfilepath` setting not available
- **Version 9.4.0 and later:** `pidfilepath` setting available

`pidfilepath`, when specified, is the path for Privilege Management daemon pid files, named `<pidfilepath>/<prefix><daemonname><suffix>.pid`. when run in daemon mode and not foreground mode, the `pbmasterd`, `pblocald`, `pblogd`, and `pbsyncd` daemons write the pid of the daemon after any forks.

## Example

```
pidfilepath /var/run/
```

## Default

```
none
```

## Used On

- Policy Servers
- Log Servers
- Run Hosts

## Reporting

### replaytimeformat

- **Version 9.3.0 and earlier:** `replaytimeformat` setting not available
- **Version 9.4.0 and later:** `replaytimeformat` setting available

The `pbreplay --timestamp (-t)` option that can be used to specify the time format, using the format sequences that the `date` command uses.

Starting with version 9.4, the **replaytimeformat** keyword in **pb.settings** can be used to permanently specify a time format. The commandline option overrides the keyword. If the keyword is not specified, behavior is the same as pre v.9.4.

**pbinstall** creates the **replaytimeformat** with the default value **%a %b %d %Y %r**, resulting in date/time displayed in weekday month day year 12 hour AM/PM format. For example:

```
Tue Aug 09 2016 04:52:44 PM
```



For a list of format sequences, please see **man date**.

### Default

**%a %b %d %Y %r** (via **pbinstall**)

### Used On

- Policy Servers
- Log Servers

## Manage and Test System Configuration

Privilege Management for Unix & Linux system administration sometimes involves validating or troubleshooting an installation. These tasks are performed using the Privilege Management for Unix & Linux **pbbench** and **pbcheck** utilities.

### pbbench

The **pbbench** program provides useful information for solving configuration, file permission, and network problems. It reads the Privilege Management for Unix & Linux settings file on the local machine and uses system information, such as that found in **/etc/services** and **/etc/hosts** or NIS, to verify the information in the settings file.

If **pbbench** detects an error, then an error message is displayed. Output consists of information about the tests that were performed, the results of the tests, and any errors that were encountered. By default, this output goes to standard error. If no errors are detected, then **pbbench** returns silently.

**pbbench** checks for very old versions of Privilege Management for Unix & Linux (pre-2.0) by looking for **/etc/pb.ports** and **/etc/pb.masters** and reports a warning if these are found. The HTML GUI version of **pbbench** does not check for the Privilege Management for Unix & Linux pre-V2 files.

**pbbench** is treated as a user program and can be run by root and non-root users. However, some non-root user queries might fail for lack of permissions. The location of **pbbench** can be set during Privilege Management for Unix & Linux installation. The default location of **pbbench** is **/usr/local/bin**.

To run **pbbench** and redirect the output to a file rather than to standard error, use the command:

```
pbbench > filename
```

Example:

```
pbbench > pbbench.output
```



For additional information, please see "[pbbench](#)" on page 309.

Privilege Management for Unix & Linux expects to find some file permissions and network configurations in a certain condition. Privilege Management for Unix & Linux might or might not run depending on these conditions. **pbbench** generates **INFO**, **WARNING**, and **ERROR** messages to report its findings. Some of the findings are merely informational, but some need to be heeded.

### Example

This example shows a verbose **pbbench** run on a sparc\_solarisC flavor system with ports in **pb.settings** that do not match the ports in **/etc/services** with an **inetd** superdaemon.



**Note:** In this example, line numbers were added to the **pbbench** output for easy reference.

### Directory and File Permissions

The directory and file permissions are:

```
drwxr-xr-x 57 root sys 8192 Aug 23 23:29 /etc
-rw----- 1 root other 43 Aug 18 14:34 /opt/pbul/policies/pb.conf
-rw----- 1 root other 1026 Aug 15 16:07 /etc/pb.key
-rw----- 1 root other 3365 Aug 27 09:59 /etc/pb.settings
drwxrwxr-x 9 root sys 53248 Aug 26 03:10 /var/adm
-rw----- 1 root other 274694 Aug 27 09:53 /var/adm/pb.eventlog
-rw----- 1 root other 80 Aug 19 09:19 /var/adm/pbguid.log
-rw----- 1 root other 0 Aug 15 16:07 /var/adm/pblocald.log
-rw----- 1 root other 0 Aug 15 16:07 /var/adm/pblogd.log
-rw----- 1 root other 7103 Aug 18 14:14 /var/adm/pbmasterd.log
```

### pb.settings File

The **pb.settings** file contains the following:

```
# Installation date: Mon Aug 24 15:54:10 PDT 2009 # Location of:
# user programs: /usr/local/bin
# admin programs: /usr/sbin
# daemons: /usr/sbin
# pbininstall: /opt/beyondtrust/powerbroker/v6.0/ pbsparc_solarisC-6.0.0-11/install/pbininstall
# TMPDIR: /tmp
kerberos no
#mprincipal pbmasterd
#lprincipal pblocald
#gprincipal pblogd
#sprincipal pbsyncd
#keytab /etc/krb5.keytab
#shortnamesok no
#allownonreservedconnections no
#minlisteningport 1025
#maxlisteningport 65535
#minoutgoingport 600
#maxoutgoingport 1023
pblocaldlog /var/adm/pblocald.log pblogdlog /var/adm/pblogd.log pbmasterdlog /var/adm/pbmasterd.log
pbguidlog /var/adm/pbguid.log eventlog /var/adm/pb.eventlog syslog yes
pbrunlog /var/adm/pbrun.log facility LOG_AUTH policyfile /opt/pbul/policies/pb.conf passwordlogging
never
#encrypt none encryption none policydir /etc warnuseronerror no
#showunsecurewarnings yes
#keyfile /dev/null masterport 64345
localport 64346
logport 64347 submitmasters thrasher acceptmasters thrasher
#masterdelay 500
#logserverdelay 500
logserverprotocoltimeout 2000 rejectnullpasswords no allowlocalmode yes
logservers thrasher syncport 64350
#logresyncntimermin 15 pbsyncdlog /var/adm/pbsyncd.log pbsynclog /var/adm/pbsync.log
#ssl no
#tcpkeepalive no
kshlog /var/adm/pbksh.log shlog /var/adm/pbsh.log
#validateclienthostname no
#validatemasterhostname no
#allowremotejobs yes
#pam no
```

```
#pampasswordservice none
#pamsessionsservice none
#pamsuppresspbpasswprompt yes
#recordunixptysessions yes
#syslogsessions no
#guidefaults none
#pblocaldcommand none rootshelldefaultiolog /pbshell.iolog
#localsocketdir none
#runsecurecommand no transparentfailover yes
sharedlibkrb5dependencies /usr/lib/symark/pb/libcom_err.so.3 /usr/lib/symark/pb/libk5crypto.so.3
/usr/lib/symark/pb/libkrb5.so.3 /usr/lib/symark/pb/libgssapi_krb5.so.2
sharedlibssldependencies /usr/lib/symark/pb/libcrypto.so.0.9.7 /usr/lib/symark/pb/libssl.so.0.9.7
sharedlibldapdependencies /usr/lib/symark/pb/liblber-2.3.so.0 /usr/lib/symark/pb/libldap-2.3.so.0
#validation 059ceal3 cdf4acd0 d535e636 a44346a0 # 2158115500 Expires 2010/10/28 validation 6bc7aed7
c84cc4a2 00ed3c14

c49c35b9 # Expires 2010/12/31
builderdir /usr/local/lib/pbbuilder
nameresolutiontimeout 0
```

## Output

The **pbbench** output from this system is as follows:

```
pbbench Version 6.0.0-11 sparc_solarisC Starting at Mon Aug 24 16:00:34 2009 on host thrasher
Checking Settings from /etc/pb.settings ...
Version 6.0.0-11 licensed until Fri Dec 31 00:00:00 2010 for unlimited clients
CHECK SETTINGS: No Problems Detected

Checking NIS ...
Relevant line in /etc/nsswitch.conf:
hosts: dns files
Relevant line in /etc/nsswitch.conf:
services: files nis
NIS is configured to serve services.
NIS is not configured to serve hosts.
CHECK NIS: Warnings Detected

Checking Services ...
NIS is configured to serve services.
Local services file is configured to serve services.
Relevant line in /etc/nsswitch.conf:
services: files nis
Query for service pbmasterd returned port 24345.
(1)
WARNING: Conflicting pbmasterd service port values:
'masterport' setting = 64345
service query = 24345
WARNING: Query for port 64345 returned 64345 instead of pbmasterd!
Query for service pblocald returned port 24346.
WARNING: Conflicting pblocald service port values:
'localport' setting = 64346
```

```
service query = 24346
WARNING: Query for port 64346 returned 64346 instead of pblogd!
Query for service pblogd returned port 24347.
WARNING: Conflicting pblogd service port values:
'logport' setting = 64347
service query = 24347
WARNING: Query for port 64347 returned 64347 instead of pblogd!
Query for service pbguid returned port 24348.
Query for port 24348 returned service pbguid. (good)
Query for service pbsguid returned port 24349.
Query for port 24349 returned service pbsguid. (good)
Query for service pbsyncd returned port 24350.
WARNING: Conflicting pbsyncd service port values:
'syncport' setting = 64350
service query = 24350
WARNING: Query for port 64350 returned 64350 instead of pbsyncd!
```

```
CHECK SERVICES: Warnings Detected
Checking Key ...
The keyfile setting is set to '/etc/pb.key' but encryption is 'none'.
The checksum for /etc/pb.key is B4E12C.
This should be the same on all machines using
pbrun, pbmasterd, pblogd, pbguid, and pblogd.
```

```
CHECK KEY: No Problems Detected
Checking Super-Daemons ...Active Super-Daemon: inetd
Checking '/etc/inet/inetd.conf' ...
/etc/inet/inetd.conf: found PowerBroker service 'pbmasterd'
/etc/inet/inetd.conf: found PowerBroker service 'pblogd'
/etc/inet/inetd.conf: found PowerBroker service 'pbguid'
/etc/inet/inetd.conf: option -S not supplied for pbguid (good)
/etc/inet/inetd.conf: found PowerBroker service 'pbsguid'
/etc/inet/inetd.conf: option -S supplied for pbsguid (good)
/etc/inet/inetd.conf: found PowerBroker service 'pblogd'
/etc/inet/inetd.conf: found PowerBroker service 'pbsyncd' CHECK SUPER-DAEMONS: No Problems Detected
Checking for root policy file ...
This host appears to be a master.
Root policy dir is '/opt/pbul/policies'
Root policy file is '/opt/pbul/policies/pb.conf'
NOTE: pbbench does not check the contents of /opt/pbul/policies/pb.conf.
Use pbcheck to perform further checking of policy files.
```

```
CHECK POLICY: No Problems Detected
Checking Syslog...
Syslog support enabled.
Relevant /etc/syslog.conf line 13 is:
*.err;kern.notice;auth.notice /dev/sysmsg
```

```
CHECK SYSLOG: No Problems Detected
Checking for constructs from older versions of PowerBroker ...
Old constructs not detected. (good)
```

```
CHECK OLD CONSTRUCTS: No Problems Detected
```

```
Checking for pbrun in PATH...
pbrun found at /usr/bin/pbrun.
WARNING: pbrun: /usr/bin/pbrun not in root filesystem.
It may not be accessible in single user mode.
```

```
CHECK pbrun: Warnings Detected
```

```
Checking for pbsh in PATH...
pbsh found at /usr/bin/pbsh.
WARNING: pbsh: /usr/bin/pbsh not in root filesystem.
It may not be accessible in single user mode.
```

```
CHECK pbsh: Warnings Detected
```

```
Checking for pbksh in PATH...
pbksh found at /usr/bin/pbksh.
WARNING: pbksh: /usr/bin/pbksh not in root filesystem.
It may not be accessible in single user mode.
```

```
CHECK pbksh: Warnings Detected
```

```
Checking /etc/shells...
Root's login shell is /bin/sh
```

```
CHECK /etc/shells: No Problems Detected
```

```
Checking pbguid...
pbguid appears to be enabled.
pbsguid appears to be enabled.
guidefaults: site defaults file not specified.
```

```
CHECK PBGUID: No Problems Detected
```

```
Checking pbsyncd...
```

```
CHECK PBSYNCD: No Problems Detected
```

```
Checking DNS ...
DNS/Bind is configured to serve hosts.
NIS is not configured to serve hosts.
Local hosts file is configured to serve hosts.
Relevant line in /etc/nsswitch.conf:
hosts: dns files
```

```
gethostname() returned a short name:
thrasher
Query for 'thrasher' returned the fully qualified name:
thrasher.mycompany.com (192.168.20.90)
Query for '192.168.20.90' returned the fully qualified name:
thrasher.mycompany.com (192.168.20.90)
```

```
CHECK DNS: No Problems Detected
Checking Kerberos V5 ...
Kerberos support disabled.
```

```
CHECK KERBEROS: No Problems Detected
Checking SSL settings ...
SSL support disabled.
```

```
CHECK SSL: No Problems Detected
Pre-Connection Checks...
Submit Masters:
thrasher
Accept Masters:
thrasher
Log Servers:
thrasher
Sync Servers:
thrasher
```

```
CHECK PRE-CONNECTION: No Problems Detected
```

```
Checking Logs ...
Event Log is /var/adm/pb.eventlog
pbmasterd Log is /var/adm/pbmasterd.log
pblocald Log is /var/adm/pblocald.log
pblogd Log is /var/adm/pblogd.log
pbguid Log is /var/adm/pbguid.log
pbsguid Log is /var/adm/pbsguid.log
pbrun Log is /var/adm/pbrun.log
pbsh Log is /var/adm/pbsh.log
pbksh Log is /var/adm/pbksh.log
pbsyncd Log is /var/adm/pbsyncd.log
pbsync Log is /var/adm/pbsync.log
```

```
CHECK LOGS: No Problems Detected
```

```
ATTENTION: Warnings have been detected.
The connection tests may be adversely affected.
```

```
Checking Connection to Master(s) ...
Master delay set to 500 msec
```

```
Testing connection to master 'thrasher' ...
Query for 'thrasher.mycompany.com' returned the fully qualified name:
thrasher.mycompany.com (192.168.20.90)
Query for '192.168.20.90' returned the fully qualified name:
thrasher.mycompany.com (192.168.20.90)
Connecting to 'thrasher.mycompany.com:port=64345'
pbbench5.1.2-05[6272]: 3003 Could not connect to a master daemon
ERROR: Could not connect thrasher.mycompany.com:port=64345:
Try checking the master and encryption settings in/etc/pb.settings, the checksum of /etc/pb.key as
```

```
well as the configuration of master 'thrasher'.
```

```
CHECK MASTER: Errors Detected
Checking Connection to Log Server(s) ...
Log Server delay set to 500 msec
```

```
Testing connection to log server 'thrasher' ...
Query for 'thrasher.mycompany.com' returned the fully qualified name:
thrasher.mycompany.com (192.168.20.90)
Query for '192.168.20.90' returned the fully qualified name:
thrasher.mycompany.com (192.168.20.90)
Connecting to 'thrasher.mycompany.com:port=64347'
pbbench5.1.2-05[6272]: Could not connect to a log server daemon
ERROR: Could not connect thrasher.mycompany.com:port=64347:
Try checking the master and encryption settings in
/etc/pb.settings, the checksum of /etc/pb.key as well as
the configuration of log server 'thrasher'.
```

```
CHECK LOG SERVER: Errors Detected
Checking Connection to Local Server(s) ...
Local Server delay set to 500 msec
```

```
Testing connection to local server 'thrasher' ...
Query for 'thrasher.mycompany.com' returned the fully qualified name:
thrasher.mycompany.com (192.168.20.90)
Query for '192.168.20.90' returned the fully qualified name:
thrasher.mycompany.com (192.168.20.90)
Connecting to 'thrasher.mycompany.com:port=64346'
pbbench5.1.2-05[6272]: Could not connect to a local server daemon
ERROR: Could not connect thrasher.mycompany.com:port=64346:
Try checking the master and encryption settings in /etc/pb.settings, the checksum of /etc/pb.key as
well as the configuration of local server 'thrasher'.
CHECK LOCAL SERVER: Errors Detected
```

```
Checking Connection to Sync Server(s) ...
Sync Server delay set to 500 msec
```

```
Testing connection to Sync server 'thrasher' ...
Query for 'thrasher.mycompany.com' returned the fully qualified name:
thrasher.mycompany.com (192.168.20.90)
Query for '192.168.20.90' returned the fully qualified name:
thrasher.mycompany.com (192.168.20.90)
Connecting to 'thrasher.mycompany.com:port=64350'pbbench5.1.2-05[6272]: Could not connect to a Sync
server daemon
ERROR: Could not connect thrasher.mycompany.com:port=64350:

Try checking the master and encryption settings in/etc/pb.settings, the checksum of /etc/pb.key as
well as the configuration of Sync server 'thrasher'.
```

```
CHECK SYNC SERVER: Errors Detected
```

```
Checking Logs ...
```

```
Event Log is /var/adm/pb.eventlog
pbmasterd Log is /var/adm/pbmasterd.log
pblocald Log is /var/adm/pblocald.log
pblogd Log is /var/adm/pblogd.log
pbguid Log is /var/adm/pbguid.log
pbsguid Log is /var/adm/pbguid.log
pbrun Log is /var/adm/pbrun.log
pbsh Log is /var/adm/pbsh.log
pbksh Log is /var/adm/pbksh.log
pbsyncd Log is /var/adm/pbsyncd.log
pbsync Log is /var/adm/pbsync.log
```

```
CHECK LOGS: No Problems Detected
```

```
PBBENCH TESTS COMPLETE: Errors Detected
```

## Output Explanation

Of particular interest in this listing is the following line:

(1)

This line shows a mismatch in the port number for the **pbmasterd** service between the **/etc/pb.settings** and **/etc/services** files. At best, this is confusing.

## pbcheck

The Privilege Management for Unix & Linux **pbcheck** utility provides the capability to test the policy file and also to produce data that describes which commands can run under what conditions.



For detailed information on this utility, please see "[pbcheck](#)" on page 312.

## Testing Policies

**pbcheck** can perform syntax, type, and other checks on a policy file. A common use for this utility is to test a new policy for errors before installing it on a live system. To test a new policy, enter the following:

```
pbcheck -f filename
```

or

```
pbcheck --file= filename
```

Another typical use for **pbcheck** is to check the syntax in an existing policy file without executing a function or procedure. This action is done with the following command:

```
pbcheck -s
```

or

```
pbcheck --syntax
```

With no options, **pbcheck** performs a run-check on the configuration policy file that is specified in your settings file.

### Entitlement Reporting

- **Version 4.0 and earlier:** entitlement reporting not available
- **Version 5.0 and later:** entitlement reporting available

Entitlement reporting is an essential element of audit control (for example, for Sarbanes-Oxley compliance in the U.S.). Beginning with Privilege Management for Unix & Linux V5.0, **pbcheck** can use the Privilege Management for Unix & Linux parser to emulate simple policies and produce data that describes which commands can run under what conditions.

The resulting data is presented as comma-separated values that can be fed to the Privilege Management for Unix & Linux report writer to produce a full entitlement report, or exported to other programs.



**Note:** To get better performance while running entitlement reports, review "Privilege Management for Unix & Linux> Unix+Linux Edition Entitlement Reporting Best Practices". This document can be found in the Knowledge Base in the Support section of the BeyondTrust website, [beyondtrust.com](https://www.beyondtrust.com).

Because the Privilege Management for Unix & Linux policy language is so extensive, entitlement reporting has two important limitations:

1. Policies can use external data sources and programs. Privilege Management for Unix & Linux can base entitlement decisions on these external sources. However, these external sources can produce different results without the policy ever changing.
2. Policies can be quite complex. As a result, a complex policy could produce an incomplete report.



For more information about additional limitations of entitlement reporting, please see "**pbcheck**" on page 312.

## License Management

Each time a user submits a request using **pbrun** or initiates a Privilege Management for Unix & Linux Basic session, or when an administrator runs the File Integrity Monitor, there is a check with the License Services that a valid license is present. Without a valid license, Privilege Management for Unix & Linux will not accept requests from users. Introduced in version 10.0, a License String consists of a JSON (JavaScript Object Notation) string that details expiry, facilities, and services.

There are two types of licenses:

- **Temporary:** The **HostId** attribute is set to **temporary** and is installed automatically to allow customers to evaluate Privilege Management for Unix & Linux.
- **Standard:** Supplied by BeyondTrust once a customer has purchased the product. A standard license has a **HostId** attribute that associates the license with the Primary License Server of the Privilege Management for Unix & Linux installation.

### Example of a Temporary License String

```
{ "PBULPolClnts":20, "SudoPolClnts":20, "RBPClnts":20, "ACAClnts":1, "AKAClnts":20, "FIMClnts":20, "SOLRClnts":1, "Owner":"Temporary License", "Comment":"Temporary License", "AutoRetire":7, "Recycle":7, "Expires":"2018-03-11 00:00:00", "Terminates":"2018-04-10 00:00:00", "HostId":"temporary", "HMAC":"UtGE3tD6qK2UwutY3GFOqodjdq30pEDAW2cKb5/OaMc=" }
```

A temporary license will be installed automatically if a standard license is not provided when the Primary License Server is installed. It will enable 20 client seats for all services and enable all facilities. The license will be valid for 60 days.

To request a standard license you will be asked to provide the output of **pbadm --info --uid** from the host that will run the Primary License Service. This will display the UUID (Universal Unique Identifier) that identifies the host. From this, BeyondTrust can generate a license that is associated directly to the host, with the appropriate facilities and services. This can then be imported into the Primary License Server.

### Example of "pbadm --info --uid" Output

```
7faf7681-4d42-4b69-00bf-dad93b4a3dfb
```

### Example of a Permanent License String

```
{ "PBULPolClnts":200, "SudoPolClnts":200, "RBPClnts":200, "ACAClnts":1, "AKAClnts":0, "FIMClnts":0, "SOLRClnts":1, "Owner":"My Company Corp", "Comment":"Standard License for My Company", "AutoRetire":7, "Recycle":7, "Expires":"2018-03-01 00:00:00", "Terminates":"2019-03-01 00:00:00", "HostId":"7faf7681-4d42-4b69-00bf-dad93b4a3dfb", "HMAC":"UtGE3tD6qK2UwutY3GFOqodjdq30pEDAW2cKb5/OaMc=" }
```

The License String introduced in version 10.0 of Privilege Management for Unix & Linux consists of a list of attributes that are human-readable and detail the entitlement of the license. These attributes are:

<b>SudoPolClnts: &lt;num&gt;</b>	Details the maximum number of clients that are licensed to use functionality. A value of <b>0</b> means there is no entitlement. A value of <b>-1</b> means unlimited clients.
<b>RBPClnts: &lt;num&gt;</b>	Details the maximum number of clients that are licensed to use Privilege Management for Unix & Linux Role-Based Policy. A value of <b>0</b> means there is no entitlement. A value of <b>-1</b> means unlimited clients.

<b>AKACInts: &lt;num&gt;</b>	Details the maximum number of clients that are licensed to use Privilege Management for Unix & Linux Advanced Keystroke Action functionality. A value of <b>0</b> means there is no entitlement. A value of <b>-1</b> means unlimited clients.
<b>FIMInts: &lt;num&gt;</b>	Details the maximum number of clients that are licensed to use Privilege Management for Unix & Linux File Integrity Monitor. A value of <b>0</b> means there is no entitlement. A value of <b>-1</b> means unlimited clients.
<b>ACACInts: &lt;0 1&gt;</b>	Details whether the license allows the use of Advanced Control & Audit.
<b>SOLRCInts: &lt;0 1&gt;</b>	Details whether the license allows the use of SOLR Indexing functionality.
<b>Owner: &lt;name&gt;</b>	Details the owner of the license.
<b>Comment: &lt;string&gt;</b>	A simple string that can be updated to include any further information you wish to include.
<b>AutoRetire: &lt;num&gt;</b>	Details the minimum duration in days after which a license is automatically retired due to client inactivity, allowing the license to be used by another client.
<b>Recycle: &lt;num&gt;</b>	Details the minimum number of days after a client has been manually retired before it can be used again.
<b>Expires: &lt;date&gt;</b>	Details when the license runs out, after which messages will be displayed within the log files, and eventually to the end users, to remind the administrator to renew the license. The product will continue to run without otherwise affecting functionality.
<b>Terminates: &lt;date&gt;</b>	The cut off date for the product, after which it will cease to function.
<b>HostId: &lt;string&gt;</b>	Details the host UUID designated to the Primary License Server.
<b>HMAC: &lt;string&gt;</b>	Provides security to the license and customer to ensure that the license is authentic and correct, and has not been corrupted or altered.

The License Server hosts manage licensing information by storing the client's host id in the Privilege Management centralized license database to keep track of client connections. Licensing management is provided by the **pbadm** tool, using the **--lic** options. The first installation of License Server will be the Primary License Server. This will install a temporary license if no standard license is provided. Any machine that runs a client component consumes a Privilege Management for Unix & Linux license, even if the machine is also a Policy Server host or Log host.



### IMPORTANT!

*Every client that connects to a Policy Server permanently uses one slot in the licensing database; even if that client never attempts a connection again.*

Beginning with version 7.1, Privilege Management for Unix & Linux can optionally track the last access date and node name of the clients.

Prior to version 8.5, Policy Servers used the connecting client's IP address as the identifier to differentiate it from other client hosts. However, IP addresses could not always assure client host uniqueness.

For instance, a host with multiple network interface cards (NICs) can have multiple IP addresses. The IP address of a client host that previously connected to a Policy Server could be changed.

Starting with version 8.5, Privilege Management for Unix & Linux uses UUIDs (universally unique identifiers) instead of IP addresses to identify and track connected clients. The UUID is derived from operating system calls and is unique to that host.

Starting with version 10.0, licenses are synchronized across all servers in the Privilege Management enterprise installation. This makes licensing administration easier by giving a single pool of licenses available to the whole application, which can be managed from a single host.

## Client Limit Enforcement

Starting with version 8.5, Policy Server softens enforcement of its license limit to give customers time to contact BeyondTrust and adjust their license.

Privilege Management for Unix & Linux clients up to 10% over the license client limit will be allowed to connect to the Policy Server without producing any error.

If the Policy Server receives client connections between 11%-20% over the license limit, a warning will be written in syslog and the policy server diagnostic log file. If the Policy Server receives client connections between 21%-50% over the license limit, the initiating client program will also receive a warning message. When a new client connection exceeds the license limit by more than 50%, an error will display, and the Policy Server will reject any new connection requests at that point.

## Command Line Management

Licenses are managed on the Primary License Server using the program **pbadmin**. Only the root user can run **pbadmin**.

### Usage

```
pbadmin --lic [<options>] [ <file> <file>...]
```

<b>-u '{ param }'</b>	Update Primary License Server License where the <b>{ param }</b> argument is the supplied JSON formatted license.
<b>-u &lt;path&gt;</b> <b>--force</b>	Update Primary License Server License from file. Force the License update on Secondary License Server.
<b>-G</b>	Retrieve License string and attributes.
<b>-l [&lt;wildcard(s)&gt;]</b>	List client License Usage summary.
<b>-l</b>	Add an extra <b>-l</b> to list client usage detail.
<b>-l</b> [{ ["fqdn" : "<wildcard>"], ["retired" : <true false>], ["updated_older" : <epoch>],[ ["updated_newer" : <epoch>], ["updated_older" : { "years" : n, "months" : n, "days" : n, "hours" : n } ["updated_newer" : { "years" : n, "months" : n, "days" : n, "hours" : n } }]	List Clients with attributes.
<b>-s &lt;[- +]attribute&gt;</b>	Sort the list of records by attribute name (ascending/descending).
<b>-L [&lt;service&gt;]</b>	List client Service License Usage summary.

<b>-L</b>	Add an extra <b>-L</b> to list all client Service details.
<b>-r {"uuid" : "&lt;uuid wildcard&gt;"}</b> <b>-r {"uuid" : ["&lt;uuid wildcard&gt;", "uuid", ...]}</b> <b>-r {"fqdn" : "&lt;fqdn wildcard&gt;"}</b> <b>-r {"fqdn" : ["&lt;fqdn wildcard&gt;", "fqdn", ...]}</b>	Retire clients to free up licenses based upon UUID, FQDN, or wildcard.
<b>-R</b>	Refresh License statistics from the Primary License Server.

## License Management

**pbadmin** is used to import standard licenses using the **-u** option. It can be used to list client and service statistics, and it can be used to retire old client licenses.

### Listing Clients

To view a list of client hosts that are using the license on a License Server, use the **pbadmin --lic -l** command option. Doing so produces a list similar to the following:

```
# pbadmin -P --lic -l
{
  "uuid": "7faf7681-4d42-4b69-00bf-dad93b4a3dfb",
  "fqdn": "pbuild",
  "addr": "[{"family":4,"port":0,"addr":"192.168.16.138"}]",
  "lastupdated": "2018-01-17 09:31:37",
  "retired": "never",
  "recycle": "never"
}
{
  "uuid": "e5368b17-e78b-416c-ae1a-14c6273cccb6",
  "fqdn": "host2",
  "addr": "[{"family":4,"port":0,"addr":"192.168.16.140"}]",
  "lastupdated": "2018-01-17 09:31:40",
  "retired": "2018-01-17 09:31:40",
  "recycle": "never"
}
{
  "uuid": "f5d5edd2-2ed0-4fe3-bbb5-46e6ce295b22",
  "fqdn": "host3",
  "addr": "[{"family":4,"port":0,"addr":"192.168.16.141"}]",
  "lastupdated": "2018-01-17 09:26:40",
  "retired": "never",
  "recycle": "never"
}
```

Notice the retired license in the list.

### Retiring Clients

If a client is removed from the network, then its slot in the license database remains active. To retire a client host from the license database, specify the **-r** command option for **pbadmin**.

**For example, to retire one client:**

```
# pbadmin --lic -r '{ "uuid" : "2ddf83e6-aabf-4dbe-a70e-f73a3d73aea6" }'  
*** WARNING ***  
You have elected to retire clients from.  
Clients which are retires will be usable to reconnect to the application  
For a period of 7 days, regardless of the number of unused licenses remaining.  
If you are sure you want to do this, please specify the '--force' option  
# pbadmin --lic -r '{ "uuid" : "2ddf83e6-aabf-4dbe-a70e-f73a3d73aea6" }' --force
```

**To retire multiple clients, use:**

```
# pbadmin --lic -r '{ "uuid" : ["2ddf83e6-aabf-4dbe-a70e-f73a3d73aea6","..."] }' --force
```

This example demonstrates the retirement of a client host with 2ddf83e6-aabf-4dbe-a70e-f73a3d73aea6 UUID from the active licenses. This action frees up one license slot for another.

**License Settings**

For the list and description of settings related to license management, please see "[Licensing](#)" on page 230.

## Registry Name Service and Database Synchronization

Privilege Management for Unix & Linux has historically required manual or customer-developed processes to copy policy over from one Policy Server to another to make sure that failover and load-balancing were addressed. Hostnames or IP addresses were hard-coded into the settings file on every client and server to detail which servers provide services for each client. Although the use of DNS could mitigate some of these issues, day-to-day maintenance of these settings and policy configuration across multiple hosts remains arduous and open to user error.

As a solution to these problems, a flexible and powerful Registry Name Service incorporating Database Synchronization has been developed and integrated into Privilege Management to provide advanced failover and load-balancing automatically, centralized role based management, and the ability to form groups of clients that share configuration or policy based on role or business organization.

### Service Groups and Planning

The Registry Name Service provides the product with a method of addressing and locating other components of the BeyondInsight product within the enterprise. Each category of service, including Privilege Management for Unix & Linux Policy Authorization, Sudo Policy Authorization, Logging Services, and the Registry Name Service itself, have distinct groups which are comprised of a single Primary Server and zero or more Secondary Servers.

The Primary host will accept all the configuration changes within that specified Service Group and will automatically synchronize these changes out to the Secondary service hosts. Other functions, such as Authorization or data retrieval, will be available from any of the Secondary hosts within the Service Group, providing effective load balancing for clients.

Each host that makes up the Service Group is defined in the Registry Name Service database, including Primary and Secondary Servers and Clients. This allows every host within the BeyondInsight enterprise to identify every machine that will make up its Service Group. This will also allow a more fine-grained control of licenses within the product.

When upgrading or installing a new BeyondInsight enterprise and incorporating the Registry Name Service, the first server installed will become the Primary Registry Name Server. This creates a repository with the default groups of **registry\_name\_service**, **dflt\_pbpolicy\_service**, **dflt\_log\_service**, **dflt\_sudopolicy\_service**, **dflt\_logarch\_service**, and **dflt\_fim\_service**.

Once the Primary Registry Name Server has been installed, the administrator is free to define more Service Groups to allow multiple areas of the enterprise to work and be administered autonomously. Then, for each Service Group, the administrator can start installing the Primary Servers, Secondary Servers, and finally the clients. As soon as a host is added to a Service Group and its Role within the Group is defined, it will be available to use. Secondary Servers will be provided with configuration from the Primary, and Clients will be aware of Service providers immediately.



**Note:** *There can only be one Registry Name Service group.*

Hosts will be members of one instance of each type of Service Group that is available. For example, a typical BeyondInsight policy client will be a member of a single BeyondInsight Policy Service Group and a single Privilege Management Log Services Group. Within each of these groups the Primary and Secondary Servers will provide the load-balancing and failover required by mission-critical environments.

### Command Line Configuration

The configuration of the Registry Name Service is provided through the enhanced **pbdbutil** command line utility. New categories have been added.

**--svc** is used on the Primary Registry Name Server to configure the Registry Name Service Groups:

```
Usage pbdbutil --svc [<options>] [ <file> <file> ...]
```

<code>-u '{"svcgname": "name", params...}'</code>	Create/Update Registry Name Service Group
<code>-u '{"cn": "hname", params...}'</code>	Create/Update Registry Name Service Host
<code>-u '{"cn": "hname", "uuid": "", params...}'</code>	Create/Update external Host in Registry Name Service
<code>-u '{"svcgname": "name", "cn": "hname", params...}'</code>	Add/Update Registry Name Service Host to Service Group
<code>-g '{"svcgname": "name"}</code>	Retrieve Registry Name Service Group information
<code>-g '{"primary": "name"}</code>	Lookup the Primary Server within the Registry Name Service Group
<code>-g '{"cn": "name"}</code>	Retrieve Registry Name Service Host information by host common name
<code>-g '{"uuid": "name"}</code>	Retrieve Registry Name Service Host information by UUID
<code>-d '{"svcgname": "name"}</code>	Delete Registry Name Service Group
<code>-d '{"svcgname": "name", "cn": "name"}</code>	Remove a host from Registry Name Service Group
<code>-d '{"cn": "name"}</code>	Delete Registry Name Service Host by host common name
<code>-z &lt;oldgrp&gt; &lt;newgrp&gt;</code>	Rename Registry Name Service Group
<code>-l [&lt;wildcard(s)&gt;]</code>	List all the Registry Name Service Groups that match wildcards
<code>-l</code>	Add an extra <code>-l</code> to list Servers in the Registry Name Service Groups
<code>-l</code>	Add a third <code>-l</code> to list all hosts in the Registry Name Service Groups
<code>-L [&lt;wildcard(s)&gt;]</code>	List all the Hosts that match wildcards
<code>-L</code>	Add an extra <code>-L</code> to list Service Group membership and Role
<code>-p &lt;svcgrp&gt; &lt;host&gt;</code>	Promote host to Primary Service within the specified Registry Name Service Group
<code>-N [[&lt;cn&gt; [&lt;port&gt;]]</code>	Create and initialize Primary Registry Name Service database
<code>-n</code>	Create new Registry Name Service database

**--scache** is used on all hosts that are subscribed to the Registry Name Service and enables the interrogation of the local host Registry Name Service cache:

```
Usage pbdbutil --scache [<options>] [ <file> <file> ...]
```

<code>--cn</code>	Retrieve Common Name from the Registry Name Service
<code>-w</code>	Retrieve my Registry Name Service information
<code>-l</code>	List all the locally cached Registry Name Service entries

<b>-s &lt;[- +]attribute&gt;</b>	Sort the list of records by attribute name (ascending/descending)
<b>-R</b>	Refresh the local Registry Name Service cache
<b>-N { param }</b>	<p>Create and initialize the Primary Registry Name cache database where the { param } argument is formatted JSON with parameters:</p> <ul style="list-style-type: none"> <li>• <b>"hostname" : "host1"</b>: Hostname of the Registry Manager REST service</li> <li>• <b>"port" : 24351</b>: Port of the Registry Manager REST service</li> <li>• <b>"appid" : "appid"</b>: App ID of the Registry Manager REST service</li> <li>• <b>"appkey" : "xxx-xxx-xxx"</b>: App key of the Registry Manager REST service</li> </ul>
<b>-m &lt;msg&gt;</b>	Specify message (required when change management enabled)

**--dbsync** provides information regarding the status of Database Synchronization on Primary Servers:

```
Usage pbdbutil --dbsync [<options>] [ <file> <file> ...]
```

<b>-l</b>	List Database Synchronization history.
<b>-l [&lt;dbfile(s)&gt;]</b>	List outstanding Database Synchronization entries.
<b>-c &lt;dbfile(s)&gt;</b>	Clear the outstanding synchronization entries from database.
<b>-R &lt;svc&gt; [&lt;cn&gt;]</b>	Resynchronize database for specified service. Starting with v10.3.0, issuing a <b>pbdbutil --dbsync -R</b> initiates a database synchronization immediately, instead of waiting for the next <b>dbsyncrefresh</b> time (as it was done prior to 10.3.0).
<b>-A &lt;svcgname&gt; &lt;...&gt;</b>	Set databases in Service Group(s) as being automatically synchronized.
<b>-X &lt;svcgname&gt; &lt;...&gt;</b>	Unset databases in Service Group(s) as being automatically synchronized

## Settings and Configuration

### Prerequisites

The BeyondInsight install process will configure individual hosts appropriately to use the Registry Name Service from the outset. However, if BeyondInsight is upgraded or configured manually to use the Registry Name Service there are a number of settings and commands that will need to be run to successfully utilize the service.

**pb.settings:**

<b>"registrynameservice yes"</b>	Required in every host that utilizes Registry Name Service.
<b>submitmasters, acceptmasters, logservers</b>	To lookup servers in the Registry Name Service a single asterisk is used. Each of these settings can be set and migrated individually and can be used with hostnames or IP addresses appended if hard-coded failover servers are desired.
<b>servicedb</b>	This is required on Primary and Secondary Name Servers to specify the path to the Registry Name Service database.
<b>svccachedb</b>	This is required on all hosts to specify the path to the Registry Name Service Cache

	database.
<b>dbsyncdb</b>	This is required on all Primary hosts to specify the path to the Database Synchronization database.

We recommend that you apply these settings initially to the Primary Registry Name Server and then, as hosts are added, into the Registry Name Service.

### registrynameservice

- **Version 9.3.0 and earlier:** **registrynameservice** setting not available
- **Version 9.4.0 and later:** **registrynameservice** setting available

The **registrynameservice** option provides a global switch on each host to turn Registry Name Services on or off. Once it is turned on, individual settings such as **submitmaster**, **acceptmaster**, and **logservers** must be configured with a single asterisk to enable each setting to look up information in the Registry Name Service.

#### Example

```
registrynameservice    yes
```

#### Default

```
registrynameservice    no
```

#### Used On

All hosts

### rnsoptions

- **Version 10.2.0 and earlier:** **rnsoptions** setting not available
- **Version 10.3.0 and later:** **rnsoptions** settings available

```
rnsoptions [UseFQDN|UseAllIPs]
```

If set to **UseFQDN**, RNS will only use the first IP address in the RNS address list to contact a host.

When set to **UseAllIPs**, it will use all IP addresses held within RNS to contact a host.

These are mutually exclusive.

#### Example

```
rnsoptions UseAllIPs
```

#### Default

No default value

### Used On

All RNS hosts

### servicedb

- **Version 9.3.0 and earlier:** **servicedb** setting not available
- **Version 9.4.0 and later:** **servicedb** setting available

The **servicedb** option specifies the path to the Registry Name Service Database. This file is created in **datbasedir** by default, unless the file name starts with a slash (/).

### Example

```
servicedb /etc/pbsvc.db
```

### Default

```
servicedb /opt/<prefix>pbul<suffix>/dbs/pbsvc.db
```

### Used On

Registry Name Server

### svccachedb

- **Version 9.3.0 and earlier:** **svccachedb** setting not available
- **Version 9.4.0 and later:** **svccachedb** setting available

The **svccachedb** option defines the path to the Service Cache Database. This file is created in **datbasedir** by default, unless the file name starts with a slash (/).

### Example

```
svccachedb /etc/svccache.db
```

### Default

```
svccachedb /opt/<prefix>pbul<suffix>/dbs/pbsvccache.db
```

### Used On

All hosts, when Registry Name Service is enabled

### svccacherefresh

- **Version 9.3.0 and earlier:** `svccacherefresh` setting not available
- **Version 9.4.0 and later:** `svccacherefresh` setting available

The `svccacherefresh` option defines how often the Registry Name Service Cache Database is checked against the Registry Name Server for updates. Smaller values will allow clients to retrieve changes in configuration in the Registry Name Service more quickly, but will produce more network and load on the Registry Name Servers.

#### Example

```
svccacherefresh 120
```

#### Default

```
svccacherefresh 110
```

#### Used On

All hosts, when Registry Name Service is enabled

### warnusersvccache

- **Version 10.2.0 and earlier:** `warnusersvccache` setting not available
- **Version 10.3.0 and later:** `warnusersvccache` setting available

The `warnusersvccache` option displays RNS Service Cache out of date message to pbrun user.

#### Example

```
warnusersvccache yes
```

#### Default

```
warnusersvccache no
```

#### Used On

All hosts, when Registry Name Service is enabled

## Primary Registry Name Server Configuration

To create and initialize the Registry Name Service on the Primary Registry Name Server, use:

```
# pbdbutil --svc -N --force
```

Several items will be created:

- The database
- The default Service Groups
- A host record for the Primary Server, with:
  - The appropriate Common Name set to the local hostname
  - A Fully Qualified Domain Name
  - A role configured as Primary Registry Name Server in the Registry Name Service Group.

This can be checked using:

```
# pbdbutil -P --svc -l -l
{
  "svcgid": 1,
  "svcgname": "registry_name_service",
  "svc": "registry",
  "updated_usec": "2016-11-10 11:12:20",
  "deleted": false,
  "svcs": [
    {
      "svcgid": 1,
      "hostid": 1,
      "role": "primary",
      "sorder": 1,
      "created_usec": "2016-11-10 11:12:20",
      "updated_usec": "2016-11-10 11:12:20",
      "cn": "pbulprimrns",
      "uuid": "3d13a9eb-7340-4199-aa47-1570941bd50f",
      "fqdn": "pbulprimrns.org.com",
      "addrs": [
        {
          "family": 4,
          "port": 24351,
          "addr": "192.168.1.1"
        }
      ],
      "tnlzone": 0,
      "deleted": 0
    }
  ],
  {
    "svcgid": 2,
    "svcgname": "dflt_pbpolicy_service",
    "svc": "pbpolicy",
    "updated_usec": "2016-11-10 11:12:20",
    "deleted": false
  },
  {
    "svcgid": 3,
    "svcgname": "dflt_log_service",
    "svc": "logsvr",
    "updated_usec": "2016-11-10 11:12:20",
    "deleted": false
  }
}
```

```
{
  "svcgid": 4,
  "svcgname": "dflt_sudopolicy_service",
  "svc": "sudopolicy",
  "updated_usec": "2016-11-10 11:12:20",
  "deleted": false
}
{
  "svcgid": 5,
  "svcgname": "dflt_solr_service",
  "svc": "solr",
  "updated_usec": "2016-11-10 11:12:20",
  "deleted": false
}
{
  "svcgid": 6,
  "svcgname": "dflt_logarch_service",
  "svc": "logarchive",
  "updated_usec": "2016-11-10 11:12:20",
  "deleted": false
}
{
  "svcgid": 7,
  "svcgname": "dflt_beyondinsight_service",
  "svc": "beyondinsight",
  "updated_usec": "2016-11-10 11:12:20",
  "deleted": false
}
{
  "svcgid": 8,
  "svcgname": "dflt_fim_service",
  "svc": "fim",
  "updated_usec": "2016-11-10 11:12:20",
  "deleted": false
}
```

Please note the use of **-P** to print the output in a pretty format to make it easier to read.

### Add Further Hosts Into the Enterprise

Further hosts can be added into the Registry Name Service in two ways. New hosts can be added on installation by using the Client Registration option in **pbinstall**. If this is selected and a suitable Client Registration profile is used, detailing default Registry Name Service Groups, the host will automatically be added into the default Service Groups as a client depending upon the host function selected at install time.

However, if automatic registration is not used the host can be manually added into the Registry Name Service.

Firstly the hosts unique **uuid** is required. On the host run:

```
# pbdbutil --info --uuid 969ecab2-93d8-4322-a8cf-6314457053bf
```

Then use this to add the host on the Primary Registry Name Server:

```
# pbdbutil --svc -u '{"cn":"pbtest","fqdn":"pbtest.org.com","uuid":"969ecab2-93d8-4322-a8cf-6314457053bf" }'
```

The Fully Qualified Domain Name (**fqdn**) is used to lookup the hosts address in the local Name Service. If the **fqdn** is not supplied the Common Name (**cn**) is used instead.

Once the host has been added, it can added into the specified Service Group as a particular role:

```
# pbdbutil --svc -u '{ "svcgname" : "test_pbpolicy", "cn" : "pbtest", "role" : "client" }'
```

If the host is added as a Secondary Server into a Service Group that already has a Primary Server, it will start receiving configuration automatically from the Database Synchronization. The license database is synchronized on the server when the role changes from client to primary license server.

## Routine Configuration Examples

A list of hosts contained with the Registry Name Service is retrieved using:

```
# pbdbutil -P --svc -L
{
  "hostid": 1,
  "cn": "pbulprimrns",
  "uuid": "3d13a9eb-7340-4199-aa47-1570941bd50f",
  "fqdn": "pbulprimrns.org.com",
  "addrs": [
    {
      "family": 4,
      "port": 24351,
      "addr": "192.168.1.1"
    }
  ],
  "tnlzone": 0,
  "updated_usec": "2016-11-10 11:12:20",
  "deleted": false
}
```

## Add New Service Groups

```
# pbdbutil --svc -u '{ "svcgname" : "test_pbpolicy", "svc" : "pbpolicy" }'
# pbdbutil --svc -l
{"svcgid":1,"svcgname":"registry_name_service","svc":"registry","updated_usec":"2016-11-10 11:12:20","deleted":false}
{"svcgid":2,"svcgname":"dflt_pbpolicy_service","svc":"pbpolicy","updated_usec":"2016-11-10 11:12:20","deleted":false}
{"svcgid":3,"svcgname":"dflt_log_service","svc":"logsvr","updated_usec":"2016-11-10 11:12:20","deleted":false}
{"svcgid":4,"svcgname":"dflt_sudopolicy_service","svc":"sudopolicy","updated_usec":"2016-11-10 11:12:20","deleted":false}
{"svcgid":5,"svcgname":"dflt_solr_service","svc":"solr","updated_usec":"2016-11-10 11:12:20","deleted":false}
```

```
{"svcgid":6,"svcgname":"dflt_logarch_service","svc":"logarchive","updated_usec":"2016-11-10
11:12:20","deleted":false}
{"svcgid":7,"svcgname":"dflt_beyondinsight_service","svc":"beyondinsight","updated_usec":"2016-11-10
11:12:20","deleted":false}
{"svcgid":8,"svcgname":"dflt_fim_service","svc":"fim","updated_usec":"2016-11-10
11:12:20","deleted":false}
{"svcgid":100,"svcgname":"test_pbpolicy","svc":"pbpolicy","updated_usec":"2016-11-10
11:32:42","deleted":false}
```

The default groups have Service Group ID's less than 100 and cannot be removed.

### Retrieve Specified Service Group Information

```
# pbdbutil --svc -g '{ "svcgname" : "test_pbpolicy" }'
{"svcgid":100,"svcgname":"test_pbpolicy","svc":"pbpolicy","updated_usec":"2016-11-10
11:32:42","deleted":false}
```

### Retrieve Specified Host by Common Name

```
# pbdbutil --svc -g '{ "cn" : "pbulprimrns" }'
{"cn":"pbulprimrns","uuid":"3d13a9eb-7340-4199-aa47-
1570941bd50f","fqdn":"pbulprimrns.org.com","addrs":[{"family":4,"addr":"192.168.1.1","port":24351}]}
```

### Retrieve Specified Host UUID

```
# pbdbutil --svc -g '{ "uuid" : "3d13a9eb-7340-4199-aa47-1570941bd50f" }'
{"cn":"pbulprimrns","uuid":"3d13a9eb-7340-4199-aa47-1570941bd50f",
"fqdn":"pbulprimrns.org.com","addrs":[{"family":4,"addr":"192.168.1.1","port":24351}]}
```

### Retrieve the Primary Server for the Specified Service Group

```
# pbdbutil --svc -g '{ "primary" : "registry_name_service" }'
{"svcgid":1,"svcgname":"registry_name_service","svc":"registry","updated_usec":"2016-11-10
11:12:20","deleted":false,"hostid":1,"role":"primary","sorder":1,"created_usec":"2016-11-10
11:12:20","cn":"pbulprimrns","uuid":"3d13a9eb-7340-4199-aa47-
1570941bd50f","fqdn":"pbulprimrns.org.com","addrs":
[{"family":4,"port":24351,"addr":"192.168.1.1"}],"tnlzone":0}
```

### Retrieve the Current Hosts Information from the Registry Name Service Cache

```
pbdbutil --scache -w
{"fqdn":"pbulprimrns.org.com","cn":"pbulprimrns","uuid":"969ecab2-93d8-4322-a8cf-
6314457053bb","addrs":[{"addr":"192.168.16.138","family":4,"port":24351}]}
```

## Retrieve the Complete List of Service Groups and Hosts

```
# pbdbutil -P --svc -l -l -l
{
  "svcgid": 1,
  "svcgname": "registry_name_svc",
  "svc": "registry",
  "updated": "2016-06-14 10:43:14",
  "deleted": 0,
  "svcs": [
    {
      "svcgid": 1,
      "hostid": 1,
      "role": "primary",
      "created": "2016-06-14 10:43:14",
      "updated": "2016-06-14 09:43:14",
      "deleted": 0,
      "cn": "pbulprimrns",
      "uuid": "969ecab2-93d8-4322-a8cf-6314457053bb",
      "fqdn": "pbulprimrns.org.com",
      "addrs": [
        {
          "family": 4,
          "port": 24351,
          "addr": "192.168.1.1"
        }
      ],
      "tnlzone": 0
    }
  ]
}
.
.
.
{
  "svcgid": 100,
  "svcgname": "test_pbpolicy",
  "svc": "pbpolicy",
  "updated": "2016-06-14 09:52:17",
  "deleted": 0,
  "svcs": [
    {
      "svcgid": 100,
      "hostid": 4,
      "role": "client",
      "created": "2016-06-14 11:06:46",
      "updated": "2016-06-14 10:05:03",
      "deleted": 0,
      "cn": "pbtest",
      "uuid": "969ecab2-93d8-4322-a8cf-6314457053bf",
      "fqdn": "pbtest",
      "addrs": [
        {
          "family": 4,
          "port": 24351,
```

```

        "addr": "192.168.1.5"
        }
    ],
    "tnlzone": 0
}
]
}

```

### Delete the Host

```
# pbdbutil --svc -d '{ "cn" : "pbtest" }'
```

### Add the New Host as a Primary Server

```
# pbdbutil --svc -u '{ "svcname" : "test_pbpolicy", "cn" : "pbtest", "role" : "primary" }'
```

### Delete the Host Again

```
# pbdbutil --svc -d '{ "cn" : "pbtest" }'
6024 Host is a primary server - please reassign before deleting the host
```

### Delete the Service Group

```
# pbdbutil -svc -d '{ "svcname" : "test_pbpolicy" }' --force
```

## Synchronize Policy Configuration and Other Configuration Files

All configuration databases are automatically synchronized across the Service Group. Other files, such as policy scripts and encryption keys, are not similarly treated and must be manually set-up for synchronization. Only files that are kept within the standard configuration database `/etc/pb.db` on a Primary Server can be synchronized, so they need to be imported, and then synchronization configured.

The `pbdbutil` utility has been enhanced to provide the new synchronization options:

### Usage

```
pbdbutil --cfg [<options>] [ <file> <file> ...]
```

<b>-A &lt;file&gt; &lt;svcname&gt; &lt;...&gt;</b>	Set file as being automatically synchronized within Service Group
<b>-X &lt;file&gt; &lt;svcname&gt; &lt;...&gt;</b>	Unset file as being automatically synchronized within Service Group

-L	List synchronization configuration for cfg files in the database
----	--

## Synchronize Privilege Management for Unix & Linux REST appkeys

Privilege Management for Unix & Linux REST appkeys are often required to authenticate users and services on remote servers, and are specific to each host. However, to provide Role based access to servers across a Service Group, REST appkeys can now be marked as synchronized across the Service Group. Please note the host must be the Primary of the specified Service Group to synchronize the appkeys.

### Usage

```
pbdbutil --rest [<options>] [ <file> <file> ...]
```

-g <appid> [--svcname <name>] [<acl> ...]	Create new Application key with ACLs Specify <b>svcname</b> to sync key across Service Group
---	---

## Database Synchronization

### dbsyncdb

- **Version 9.3.0 and earlier:** **dbsyncdb** setting not available
- **Version 9.4.0 and later:** **dbsyncdb** setting available

The **dbsyncdb** option specifies the full path to the Database Synchronization Summary Database. This file is created in **basedir** by default, unless the file name starts with '/'.

### Example

```
dbsyncdb      /etc/pbdbsync.db
```

### Default

```
dbsyncdb      /opt/<prefix>bul<suffix>/db/dbsync.db
```

### Used On

All Primary Servers when Registry Name Server is enabled

### dbsyncrefresh

- **Version 9.3.0 and earlier:** **dbsyncrefresh** setting not available
- **Version 9.4.0 and later:** **dbsyncrefresh** setting available

The **dbsyncrefresh** option defines the interval in seconds between database synchronization tasks. Increasing this value will lower the load on Primary Servers, but will increase the time before configurational changes are applied to Secondary Servers.

### Example

```
dbsyncrefresh 360
```

### Default

```
dbsyncrefresh 3600
```

### Used On

All Primary Servers when Registry Name Server is enabled

### dbsyncloginterval

- **Version 9.3.0 and earlier:** `dbsyncloginterval` setting not available
- **Version 9.4.0 and later:** `dbsyncloginterval` setting available

The `dbsyncloginterval` option defines the interval in seconds between logging synchronization success and failure messages. Increasing this time will make the REST log smaller, but will provide slower feedback on current status of the Database Synchronization on any given host.

### Example

```
dbsyncloginterval 360
```

### Default

```
dbsyncloginterval 720
```

### Used On

All Primary Servers when Registry Name Server is enabled

## Troubleshoot Registry Name Service and Database Synchronization Issues

The Registry Name Service and Database Synchronization are complex and there are many factors that can affect the smooth running of the service. Every host, including the Primary Registry Name Server, has a Registry Name Service Cache, which they use to look up all Service Group information that are applicable to them.

All of the servers that provide these services are implemented using the REST services (clients may or may not have REST services installed, but this should not be relevant to the overall service), and as such, one of the first checks is to make sure the relevant REST services are running. Use an appropriate `ps` (man1) command to show the process information:

```
# ps -ef | egrep "pblight|pbconfig"
root 124824 1 0 12:12 pts/1 00:00:00 /usr/lib/beyondtrust/pb/rest/sbin/pblighttpd-svc -d -i #mon
(wait)
root 124825 124824 0 12:12 pts/1 00:00:01 /usr/lib/beyondtrust/pb/rest/sbin/pblighttpd-svc -d -i
```

```
#sched (sleep)
pblight 124826 124824 0 12:12 pts/1 00:00:00 pblighttpd -D -m /usr/lib/beyondtrust/pb/rest/lib -f
/usr/lib/beyondtrust/pb/rest/etc/pblighttpd.conf
root 124827 124826 0 12:12 pts/1 00:00:00 /usr/lib/beyondtrust/pb/rest/sbin/pbconfigd
root 124828 124826 0 12:12 pts/1 00:00:00 /usr/lib/beyondtrust/pb/rest/sbin/pbconfigd
```

The number of **pbconfigd** processes running will differ according to the host role within the enterprise.

If these services are not running, check the corresponding system logs and **pblighttpd/REST** logs for errors, and use the platform specific method of restarting the services.

Next, check that the host has the correct Service Group information.

Find out which Service Groups the host is a member of on the Primary Registry Name Server:

```
# pbdbutil -P --svc -L -L pbulprimrns
{
  "hostid": 1,
  "cn": "pbulprimrns",
  "uuid": "3d13a9eb-7340-4199-aa47-1570941bd50f",
  "fqdn": "pbulprimrns.org.com",
  "addrs": [
    {
      "family": 4,
      "addr": "192.168.1.1",
      "port": 24351
    }
  ],
  "tnlzone": 0,
  "updated_usec": "2016-11-11 12:03:47",
  "deleted": false,
  "svcs": [
    {
      "svcgid": 1,
      "hostid": 1,
      "role": "primary",
      "sorder": 1,
      "created_usec": "2016-11-11 12:03:47",
      "updated_usec": "2016-11-11 12:03:47",
      "svcgname": "registry_name_service",
      "svc": "registry",
      "deleted": 0
    },
    {
      "svcgid": 4,
      "hostid": 1,
      "role": "secondary",
      "sorder": 2,
      "created_usec": "2016-11-11 12:04:35",
      "updated_usec": "2016-11-11 12:03:47",
      "svcgname": "dflt_sudopolicy_service",
      "svc": "sudopolicy",
      "deleted": 0
    }
  ]
}
```

```
    ]  
}
```

### Check the IP Addresses and List of Service Groups

Then check on the host to make sure the Registry Name Service Cache shows corresponding information:

```
# pbdbutil -P --scache -l  
{  
  "svcname": "registry_name_service",  
  "svc": "registry",  
  "sorder": 1,  
  "cn": "pbulprimrns",  
  "uuid": "3d13a9eb-7340-4199-aa47-1570941bd50f",  
  "fqdn": "pbulprimrns.org.com",  
  "addrs": [  
    {  
      "family": 4,  
      "addr": "192.168.1.1",  
      "port": 24351  
    }  
  ],  
  "role": "primary",  
  "lastupdated_usec": "2016-11-11 12:03:47"  
}  
{  
  "svcname": "dflt_sudopolicy_service",  
  "svc": "sudopolicy",  
  "sorder": 1,  
  "cn": "pbtest",  
  "uuid": "12345676789",  
  "fqdn": "pbtest",  
  "addrs": [  
    {  
      "family": 4,  
      "addr": "192.168.1.5",  
      "port": 24351  
    }  
  ],  
  "role": "primary",  
  "lastupdated_usec": "2016-11-11 12:04:23"  
}  
{  
  "svcname": "dflt_sudopolicy_service",  
  "svc": "sudopolicy",  
  "sorder": 2,  
  "cn": "pbulprimrns",  
  "uuid": "3d13a9eb-7340-4199-aa47-1570941bd50f",  
  "fqdn": "pbulprimrns.org.com",  
  "addrs": [  
    {  
      "family": 4,  
      "addr": "192.168.1.1",  
      "port": 24351  
    }  
  ]  
}
```

```

    },
    ],
    "role": "secondary",
    "lastupdated_usec": "2016-11-11 12:04:35"
}

```

If this information differs, and the **lastupdated** times are significantly different, try to refresh the cache:

```
# pbdbutil --scache -R
```

If this produces an error, then try to re-initialize the Registry Name Service Cache on the host using:

```
# pbdbutil --scache -N '{"hostname" : "<primaryRNS>", "appid": "<appid>": "appkey" : "<appkeys>"}' --force
```

This will clear the existing Registry Name Service Cache database and will re-load it from the Primary Registry Name Server.

If databases are not correctly synchronizing across servers within the Service Group, firstly identify the Primary Server within that Service Group:

```
# pbdbutil -P --svc -g '{ "primary" : "registry_name_service" }'
{
  "svcgid": 1,
  "svcgname": "registry_name_service",
  "svc": "registry",
  "updated_usec": "2016-11-11 12:03:47",
  "deleted": false,
  "hostid": 1,
  "role": "primary",
  "sorder": 1,
  "created_usec": "2016-11-11 12:03:47",
  "cn": "pbulprimrns",
  "uuid": "3d13a9eb-7340-4199-aa47-1570941bd50f",
  "fqdn": "pbulprimrns.org.com",
  "adrs": [
    {
      "family": 4,
      "addr": "192.168.1.1",
      "port": 24351
    }
  ],
  "tnlzone": 0
}

```

Next, on that host list the contents of the Database Synchronization Summary Database:

```
pbdbutil --dbsync -l
{"cn":"pbtest","svc":"registry","dbid":1,"dbname":"/etc/pb.db","dbuuid":"9b332c26-b8bb-4546-9ed2-bf93146dd08c","lastupdated":"2016-11-11 15:10:44","lasttid":0}
```

```
{ "cn": "pbtest", "svc": "registry", "dbid": 2, "dbname": "/opt/pbul/dbs/pbrstkeys.db", "dbuuid": "a22e8a75-  
fc6c-4f0e-ae9-b0d764c7e820", "lastupdated": "2016-11-11 15:10:44", "lasttid": 0 }  
{ "cn": "pbtest", "svc": "registry", "dbid": 257, "dbname": "/opt/pbul/dbs/pbsvc.db", "dbuuid": "97423b4f-  
2c5e-42c2-a87a-ae9-826c5b", "lastupdated": "2016-11-11 15:12:14", "lasttid": 40 }  
  
{ "cn": "pbtest", "svc": "registry", "dbid": 258, "dbname": "/opt/pbul/dbs/pbregclnt.db", "dbuuid": "f08b8679-  
8bc5-4f7d-b431-1bbab688e0c1", "lastupdated": "2016-11-11 15:12:14", "lasttid": 0 }
```

And then for each individual database check for outstanding transactions:

```
# pbdbutil --dbsync -l /opt/pbul/dbs/pbsvc.db  
    { "path": "/opt/pbul/dbs/pbsvc.db", "sz": 0 }
```

If necessary reset the Summary Database information and force a re-synchronization:

```
# pbdbutil --dbsync -R registry
```

Lastly check that the Scheduling Service is running, and has recently run. This service provides the regular Registry Name Service Cache and Database Synchronization updates:

```
# pbdbutil --info --sched  
{ "id": "svccache_update", "grp": "system", "epoch": "2016-11-11  
14:36:57", "reoccurs": 110, "retry": 0, "backoff": 0, "retried": 0 }  
{ "id": "database_sync", "grp": "system", "epoch": "2016-11-11  
14:35:37", "reoccurs": 30, "retry": 0, "backoff": 0, "retried": 0 }
```

## Logging

Privilege Management for Unix & Linux has a flexible logging capability that enables you to control what is logged, when, and where. There are four types of logs:

- Event logs
- I/O logs (sometimes called session logs)
- Diagnostic logs
- Debug trace logs

## Event Logs

Event logs are produced by default and record the following information:

- Accept and reject status
- The user's **pbrun** environment when an attempt is made to run **pbrun**
- Keystroke action events
- Task status (if task finished successfully or unsuccessfully)

Starting with v10.3.0, the event log can be a flat file, a local SQLite database, or sent to an external Oracle or MySQL database.



For more information, please see "[Auditing and Logging](#)" on page 109.

## Example of Event Log Entries

The output from a **pblog** session that simply reads the event log is:

```
Accept 2018/09/20 11:37:57 chris@sparky -> chris@sparky
kill -9 570
Command finished with exit status 0
Accept 2018/09/20 11:38:09 chris@sparky -> chris@sparky
ls /export/home
Command finished with exit status 0
Reject 2018/09/20 11:37:39 chris@sparky
umount
```

## Read Verbose Event Log Entries

Given the following simple policy:

```
/* This is a test */
if (user == "sandy")
reject;
```

The output when **pblog -l** is run is as follows:

```
Reject 2010/06/23 11:33:34 sandy@octopus.company.com by root@octopus.company.com
ls
Request rejected by pbmasterd on octopus.company.com.

argc = 1
argv = {"ls"} bkgd = 0
clienthost = "octopus.company.com"
command = "ls"
cwd = "/var/log"
date = "2010/06/23"

day = 23 dayname = "Wed"
env = {"LANG=C", "PATH=./usr/local/bin", "EDITOR=vi", "LOGNAME=sandy", "MAIL=/var/mail/sandy",
"TERM=dtterm", "USER=sandy"}
event = "Reject"
eventlog = "/var/log/pb.eventlog"
exitstatus = "Request rejected by pbmasterd on octopus.company.com.[a]" false = 0
group = "uts" groups = {"uts"}
host = "octopus.company.com" hour = 11
i18n_date = "06/23/10" i18n_day = "23"
i18n_dayname = "Wed" i18n_hour = "11"
i18n_minute = "33"
i18n_month = "06"
i18n_time = "11:33:34"
i18n_year = "2010" iolog = ""
lineinfile = "/opt/pbul/policies/pb.conf"
linenum = "1"
localmode = 0
lognopassword = 1
logport = "32224" logservers = {"sandy"}
logstderr = 1
logstdin = 1
logstdout = 1
masterhost = "octopus.company.com"
masterlocale = "C"
minute = 33
month = 6
nice = 0 optarg = ""
opterr = 1
optimizedrunmode = 1
optind = 1
optopt = ""
optreset = 1
optstrictparameters = 1
pbclientmode = "run"
pbclientname = "pbrun"
pblogdmachine = "i686"
pblogdnodename = "sandy"
pblogdrelease = "2.6.22.5-31-default"
pblogdsysname = "Linux"
pblogdversion = "#1 SMP 2007/09/21 22:29:00 UTC"
pbmasterdmachine = "i686"
pbmasterdnodename = "sandy"
pbmasterdrelease = "2.6.22.5-31-default"
pbmasterdsysname = "Linux"
```

```
pbmasterdversion = "#1 SMP 2007/09/21 22:29:00 UTC"
pbrunmachine = "i686"
pbrunnodename = "sandy"
pbrunrelease = "2.6.22.5-31-default"
pbrunsysname = "Linux"
pbrunversion = "#1 SMP 2007/09/21 22:29:00 UTC"
pbversion = "6.1.0-15"
pid = 18511
psmcmapid = "7f0000024c22537e484D"
ptyflags = 7
rejectnullpasswords = 0 requestuser = "sandy" rlimit_as = -977616896
rlimit_core = 0
rlimit_cpu = -1
rlimit_data = -1
rlimit_fsize = -1
rlimit_locks = -1
rlimit_memlock = 32768
rlimit_nofile = 1024
rlimit_nproc = 15349
rlimit_rss = 1692928000
rlimit_stack = 8388608
runargv = {"ls"}
runbkgd = 0
runcommand = "ls"
runcwd = "/var/log"
runenablerlimits = 0
runenv = {"LANG=C", "PATH=./usr/local/bin", "EDITOR=vi", "LOGNAME=sandy", "MAIL=/var/mail/sandy",
"TERM=dtterm", "USER=sandy"}
rungroup = "sandy"
rungroups = {"sandy", "amanda"}
runhost = "octopus.company.com"
runlocalmode = 0
runnice = 0
runoptimizedrunmode = 1
runptyflags = 7
runrlimit_as = -977616896
runrlimit_core = 0
runrlimit_cpu = -1
runrlimit_data = -1
runrlimit_fsize = -1
runrlimit_locks = -1
runrlimit_memlock = 32768
runrlimit_nofile = 1024
runrlimit_nproc = 15349
runrlimit_rss = 1692928000
runrlimit_stack = 8388608
runsolarisproject = ""
runtimeout = 0
runtimeoutoverride = 0
runumask = 18 runuser = "sandy"
solarisproject = "" status = 0
submithost = "octopus.company.com"
submithostip = "127.0.0.2"
submitlocale = "en_US.UTF-8" submitpid = 18509
subprocuser = "sandy" time = "11:33:34"
```

```
timezone = "PDT" true = 1
ttyname = "/dev/pts/20"
umask = 18
uniqueid = "7f0000024c22537e484F"
user = "sandy"
year = 2010
```

This log can be read as the request was rejected. The **reject** statement was on line 3 (**linenum**) in the file **/opt/pbul/policies/pb.conf** (**lineinfile**).

Given a policy where an accept can happen:

```
/* Another test policy */
adminusers = {"sandy", "happy"};
okcommands = {"ls", "mount"};
if ((user in adminusers) && (command in okcommands))
{
  runuser = "root"; accept;
}
```

**sandy** executes the command:

```
pbrun ls
```

The event log from a **pblog -l** would be similar to:

```
Accept 2010/06/23 11:43:44 sandy@octopus.company.com -> root@octopus.company.com by
octopus.company.com ls
Command finished with exit status 0 argc = 1
argv = {"ls"} bkgd = 0
clienthost = "octopus.company.com"
command = "ls"
cwd = "/tmp"
date = "2010/06/23" day = 23
dayname = "Wed"
env = {"LANG=C", "PATH=./usr/local/bin", "EDITOR=vi", "LOGNAME=sandy", "MAIL=/var/mail/sandy",
"TERM=dtterm", "USER=sandy"}
event = "Accept"
eventlog = "/var/log/pb.eventlog"
exitdate = "2010/06/23"
exitstatus = "Command finished with exit status 0"
exittime = "11:43:45"
false = 0 group = "uts"
groups = {"uts"}
host = "octopus.company.com"
hour = 11
i18n_date = "06/23/10" i18n_day = "23"
i18n_dayname = "Wed"
i18n_exitdate = "06/23/10"
i18n_exittime = "11:43:45"
i18n_hour = "11"
i18n_minute = "43"
```

```
il8n_month = "06"
il8n_time = "11:43:44"
il8n_year = "2010" iolog = ""
lineinfile = "/opt/pbul/policies/pb.conf"
linenum = "1"
localmode = 0
lognopassword = 1
logpid = 18829
logport = "32224" logservers = {"octopus"}
logstderr = 1
logstdin = 1
logstdout = 1
masterhost = "octopus.company.com"
masterlocale = "C"
minute = 43
month = 6
nice = 0
optarg = ""
opterr = 1
optimizedrunmode = 1
optind = 1
optopt = ""
optreset = 1
optstrictparameters = 1
pbclientmode = "run"
pbclientname = "pbrun"
pblogdmachine = "i686"
pblogdnodename = "octopus"
pblogdrelease = "2.6.22.5-31-default"
pblogdsysname = "Linux"
pblogdversion = "#1 SMP 2007/09/21 22:29:00 UTC"
pbmasterdmachine = "i686"
pbmasterdnodename = "octopus"
pbmasterdrelease = "2.6.22.5-31-default"
pbmasterdsysname = "Linux"
pbmasterdversion = "#1 SMP 2007/09/21 22:29:00 UTC"
pbrunmachine = "i686"
pbrunnodename = "octopus"
pbrunrelease = "2.6.22.5-31-default"
pbrunsysname = "Linux"
pbrunversion = "#1 SMP 2007/09/21 22:29:00 UTC"
pbversion = "6.1.0-15"
pid = 18824
psmcmapid = "7f0000024c2255e04986"

ptyflags = 7
rejectnullpasswords = 0 requestuser = "sandy"
rlimit_as = -977616896
rlimit_core = 0
rlimit_cpu = -1
rlimit_data = -1
rlimit_fsize = -1
rlimit_locks = -1
rlimit_memlock = 32768
rlimit_nofile = 1024
```

```
rlimit_nproc = 15349
rlimit_rss = 1692928000
rlimit_stack = 8388608
runargv = {"ls"} runbkgd = 0
runcommand = "ls"
runcwd = "/tmp"
runenablerlimits = 0
runenv = {"LANG=C", "PATH=./usr/local/bin", "EDITOR=vi", "LOGNAME=sandy", "MAIL=/var/mail/sandy",
"TERM=dtterm", "USER=sandy"}
rungroup = "uts"
rungroups = {"uts"}
runhost = "octopus.company.com"
runlocalmode = 0
runnice = 0
runoptimizedrunmode = 1
runpid = 18822
runptyflags = 7
runrlimit_as = -977616896
runrlimit_core = 0
runrlimit_cpu = -1
runrlimit_data = -1
runrlimit_fsize = -1
runrlimit_locks = -1
runrlimit_memlock = 32768
runrlimit_nofile = 1024
runrlimit_nproc = 15349
runrlimit_rss = 1692928000
runrlimit_stack = 8388608
runsolarisproject = ""
runtimeout = 0
runtimeoutoverride = 0
runumask = 18
runuser = "sandy"
solarisproject = ""
status = 0
submithost = "octopus.company.com"
submithostip = "127.0.0.2"
submitlocale = "en_US.UTF-8"
submitpid = 18822
subprocuser = "root"
time = "11:43:44"
timezone = "PDT" true = 1
ttyname = "/dev/pts/20"
umask = 18
uniqueid = "7f0000024c2255e04988"
user = "sandy"
year = 2010
```

The major differences between the output of this **pblog -v** example and the previous one are:

- The inclusion of the run variables (**runcommand**, **runuser**, **rungroup**, and so forth)
- The inclusion of the exit variables (**exittime**, **exitdate**, and an updated **exitstatus**)
- The user-defined variables **adminusers** and **okcommands**

By looking at the values in this output, you can determine the following:

- When a user ran a command (**time** and **date**)
- Where a user ran the command (**ttynname** and **submithost**)
- The command that the user requested (**command**)
- Which command was actually run (**runcommand**)
- What user the command was run as (**runuser**)
- How it terminated (**exitstatus**)
- The value of locale settings (values of **LC\_xxxx** environment variables) on the submithost and Policy Server host (**submitlocale** and **masterlocale**).



**Note:** The value listed for these variables can differ depending on the platform, and also whether the **LC\_xxxx** variables are all set to the same value.

For example, on a Linux platform when all **LC\_xxxx** (**LC\_CTYPE**, **LC\_MONETARY**, **LC\_TIME**, etc.) variables are set to the same value, **submitlocale** displays as "**C**"; however, on an HP or AIX platform, it displays as "**C C C C C**".

In addition on the same Linux platform where **LC\_CTYPE** is set to "**POSIX**" for example and everything else is set to "**C**", then **submitlocale** displays as follows:

```
LC_CTYPE=POSIX;LC_NUMERIC=C;LC_TIME=C;LC_COLLATE=C;LC_MONETARY=C;LC_MESSAGES=C;LC_PAPER=C;LC_NAME=C;LC_ADDRESS=C;LC_TELEPHONE=C;LC_MEASUREMENT=C;LC_IDENTIFICATION=C
```

On HP with those same settings, **submitlocale** displays as "**C POSIX C C C C**".

## Accept/Reject Logging

Privilege Management for Unix & Linux also generates an event log entry that notes when a job is accepted or rejected and when an accepted job finishes running. The **pblog** program enables you to selectively choose and display log entries in a file that is specified by **eventlog**. The variable **event** is set to the event type (accept, reject or finish). **pblog**'s options enable you to specify only certain entries to print, set the output, and specify the format for each event type, or print all of the variables that are stored with each entry. When a job finishes running, the variable **exitstatus** describes how it finished; **exitdate** and **exittime** specify when it finished running.



**Note:** If the **exitstatus** is undefined, then the **exittime** is not logged to the event log. It thus becomes unavailable for the event on which the **exitstatus** is undefined.

Whenever an attempt is made to run a command through **pbun**, the attempt is appended to the event log. The default location of the event log is usually **/var/adm/pb.eventlog**, **/usr/adm/pb.eventlog**, or **/var/log/pb.eventlog**, depending on your operating system. The location of this log file can be changed by setting the **eventlog** setting in the settings file or by using the **eventlog** variable in a policy file. The event log is a data file and any attempt to edit the file or it might corrupt it. To read the contents of an event log, execute the **pblog** command.

## Keystroke Action Events

Privilege Management for Unix & Linux also records various keystroke action events in the event log. The administrator can specify that various words or patterns, when typed in to a secured task, be logged to the event log and optionally terminate the job. To enable keystroke action events, see the **setkeystrokeaction** procedure in the *Privilege Management for Unix & Linux Policy Language Guide*.

The easiest way to see the logged or rejected keystrokes in a session is to execute:

```
pblog
```

## Reporting and Data Extraction

Privilege Management for Unix & Linux provides the ability to extract keyword data from the event log. This data can be displayed or used by other programs (for example, database import programs, spreadsheets, and report writers).

Use the **pblog -c** option to extract the required data and/or use various Unix/Linux search tools (**grep**, **awk**, **sed**) to extract and redirect the data to a file. Here is a shell script to format **pblog** output:

```
#!/usr/bin/sh
NOTE: only root can run pblog echo " "
echo " "
echo " "
echo "Report: Successful Root-Level Events "
echo "-----"
echo " "
echo " "
echo "Submitted from: User Command"
pblog -c 'event=="Accept"' -a 'submithost + " " + user + " " + runcommand' echo " "
echo " "
echo " "
echo "Report: Unsuccessful Attempts "
echo "-----"
echo " "
echo " "
pblog -c 'event=="Reject"'
```

Here is a sample report:

```
Report: Successful Root-Level Events
-----
Submitted from: User Command
sparky.company.com chris kill
sparky.company.com chris csh
sparky.company.com chris csh

Report: Unsuccessful Attempts
-----
Reject 1999/07/31 10:40:50 chris@sparky.company.com
kill -9 396
Reject 1999/07/31 10:44:10 chris@sparky.company.com
mount /dev/rmt01 /mnt
```

## Merge Multiple Event Logs

If event logs are kept on different machines, then they can be merged into a single log by using the **pbsync -L** command. This feature is useful if there are separate dedicated log servers or if a secondary log server was used because of a log server failover.

## Advanced Reporting

Privilege Management for Unix & Linux provides advanced event log reporting using the **pbreport** utility. After this utility is configured using the Privilege Management for Unix & Linux browser, it allows the system administrator to perform advanced reporting tasks such as extracting selected fields and designing customized reports.



For more information on this utility, please see "pbreport" on page 383 and the [Privilege Management for Unix & Linux Browser Interface Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

## Event Log Rotation

Both **pbmasterd** and **pblogd** have the ability to rotate the event log. The current event log will be renamed with a **date/time** tag, and a new event log will be created with the specified event log name.

### Event Log Rotation Based On Size

The **eventlogrotate** keyword specifies a rotate size and an optional path for the resulting rotated file. The size may include a **k**, **m**, or **g** indicating the specified number is multiplied by **1024**, **1048576**, or **1073741824** respectively. This mechanism rotates the event log only during accept and reject events. The optional path will specify a new path only (not the file name portion). The rotated event log will have the file name format **pb.eventlog\_YYYYMMDD\_HHMMSS**.

### Example

```
eventlogrotate size=8k,path=/somewhere/else/
```

If the optional path is specified, the event log will be renamed to the new file name (on the original file system) while the eventlog lock is held, then after the lock is released, the old renamed event log will be moved to the optional path (possibly on a different file system). If the specified path does not exist, it will be created.

This mechanism works with the eventlog **/path/filename** specified in the **pb.settings** file, or as changed via policy.

### Variable Substitution in the Path

The path portion of the **eventlogrotate** keyword supports variable substitution. This is most useful to rotate to directories based on hostname or date. This mechanism works only when rotating by size during an accept or reject event. When rotating via command line (or cron), no policy variables are available. Variables used in the path portion of the **eventlogrotate** keyword must be variables that exist in every accept and reject event.



**Note:** The date variable results in a **yyyy/mm/dd** format, which includes subdirectories. For a **yyymmdd** format without subdirectories, use **%year%%i18n\_month%%i18n\_day%**.

### Example

```
eventlogrotate "size=8k, path=/var/log/pb/eventlogs/%masterhost%/%date%/"
```

## Manual Event Log Rotation

The `--rotate` option (`-R`) for both `pbmasterd` and `pblogd`, allows manual rotation, or rotation via cron, for the event log `/path/filename` specified in `pb.settings`. The `--rotate` option does not operate on eventlog `/path/filenames` changed via policy. The file name of a specific eventlog to rotate can be specified as an optional argument to the `--rotate` (`-R`) option. This mechanism will use the path element of the `eventlogrotate` keyword (ignoring any size specification).

### Examples

```
pbmasterd --rotate
```

```
pbmasterd --rotate /var/log/pbeventlogA
```

```
pblogd --rotate
```

```
pblogd --rotate /var/log/pbeventlogA
```

## Event Log Rotation Based On Age

Cron can be configured to execute either `pbmasterd` or `pblogd` with the `--rotate` option, to periodically rotate the event log.



For more information, please see the [Privilege Management for Unix & Linux Installation Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

## I/O Logs

Privilege Management for Unix & Linux provides the ability to log any input to, or output from, a secured job. This feature tracks everything that a user does in a Unix/Linux shell or terminal session, including the standard input, standard output, and standard error streams.



**Note:** Prior to v8.5, applications that use their own non-standard file descriptors, such as X-Windows applications, cannot be logged through the I/O logs. With 8.5.0, a new feature has been added to capture X11 applications. For more information, please see "X Window System Session Capturing" on page 470.

The contents of the I/O log file can also be limited to specific streams. The policy writer can also limit the amount of data that is recorded from each of these streams.

I/O logging is configured in the policy file. Set the variable `iolog` to the name of a unique log file. If you want to turn off any of the standard streams, then you can set the variables `logstdin`, `logstdout`, and `logstderr` to `false`, as appropriate. After the command has started, you can use the `pbreplay` command to replay whatever was logged to that point in time, even if the session is still in progress.

In the following example, the policy file settings were modified to ensure that all input and output is logged in `logtoday` when the `aduser` program is run through Privilege Management for Unix & Linux:

```
if (command=="adduser") {
iolog=logmktmp ("/var/log/pb.logs/adduser.XXXXXX");
}
```

Use of a hard-coded file name is not recommended, because I/O logs are not overwritten. An attempt to write to an existing I/O log file will result in an error.

The function **logmktmp()** is useful for generating unique file names for log files. Like the Unix/Linux **mktemp** library call, this function takes a template pattern as its argument and returns a string with the filled template, creating a unique file name. The following example sets the file name for recording input and output to a uniquely named file in **/usr/adm**. The file name begins with **pboutput** and ends with a unique number that **logmktmp** substitutes for the X characters:

```
iolog=logmktmp ("/usr/adm/pboutputXXXXXX");
```

Different machines might have different file system structures, so when using a log server, you should specify log files using the log server's file system. Environment variables are recorded in the I/O log file. If you want to suppress the logging of some of those environment variables, then use the **logomit** list. This variable is a list that contains the names of variables to omit from the log file. This feature is used when there is either no need to log certain variables or it is wasteful to do so.

The **lognopassword** variable enables the security administrator to control the logging of non-echoed text (which is traditionally used for passwords) so that no one can see what is typed. If **lognopassword** is set to **true**, then only echoed text is logged. If **lognopassword** is set to **false**, then everything a user types is logged.

Some commands generate a large amount of output. Two examples are a tar of a complete file system or a daemon that sends output to **stdout**. It may be useful to limit the amount of output that is recorded in an I/O log for each command so that the logs do not get too large.

The number of characters that are logged from the **stdin**, **stdout**, and **stderr** streams can be limited. For example,

```
logstdinlimit=150;
```

```
logstdoutlimit=200;
```

```
logstderrlimit=4096;
```

limits the I/O log to 150 characters for standard input, 200 characters for standard output, and 4096 characters for standard error.

If the command is interactive, such as a shell, then the characters come from **stdin**, **stdout**, and possibly **stderr**. Each time the output stream changes, **stdout** to **stdin** or **stdout** to **stderr**, the amount that is logged goes back to 0 (unlimited).



## IMPORTANT!

*To prevent file corruption, do not attempt to edit an I/O log file.*

## Password Logging



To control password logging, please see "[passwordlogging](#)" on page 128.

## Display I/O Logs

**pbreplay** is the command that shows the contents of an I/O log. **pbreplay** has two modes:

- Interactive
- Batch

Interactive mode displays the **stdout** and **stderr** of any session. Batch mode can show the **stderr**, **stdout**, or **stdin** of a session. In batch mode it is also possible to specify a switch so that end-of-line characters are displayed as usual rather than just a carriage return, thereby preventing the output from overwriting itself.

The nature of I/O logging means that when a user has certain options enabled in some shells (**set -o vi** in the Korn shell, for example), the input keys are escape sequences. The shells interpret these and the output is displayed on **stdout** for a given input. Privilege Management does not interpret these input keystrokes. To determine what command is being entered, look at the **stdout** (**pbreplay -o**) and extract when a command is run.

## I/O Logging and System Crashes

Machines and networks sometimes crash. If a log server should crash or should you lose your network connection to the log server, then Privilege Management for Unix & Linux attempts to fail over to an alternative log server. In this case, the start and end events for a task might be stored on two or more different machines. If you need to consolidate the event logs, then you can use.



For more information, please see ["pbsyncd" on page 393](#).

Additionally, an I/O log could be split between two or more machines. I/O logs can be merged with **pbsync**.

## Diagnostic Logging

Diagnostic messages can be logged in syslog and into Privilege Management for Unix & Linux diagnostic log files. The log files are specified by the settings keywords.



For more information, please see ["Diagnostic Logging" on page 154](#).

## Debug Trace Logging

If you encounter difficulties or problems with Privilege Management for Unix & Linux, you can enable certain components to produce trace logs associated with each secured task processing. A non-zero debug level from **1** (lowest) to **9** (highest) controls the depth and detail of the debug trace messages that will be logged. A zero debug level means no tracing will be performed. Currently, this feature is available in **pbrun**, **pbsh**, **pbksh**, **pbmaterd**, **pblocald**, and **pblogd**.

The resulting trace log file names will have the format:

```
<prefix><PBUL_program_name><suffix>.<version>.debug.<PID>
```

and will be created in the same location as the corresponding diagnostics log.



For more information about the diagnostics log settings, please see ["Diagnostic Logging" on page 154](#).

To ensure security, the debug trace logs will only be generated if the parent directories specified in the relevant diagnostics log settings **pbrunlog**, **pbkshlog**, **pbsolog**, **pbmasterdlog**, **pblogdlog**, and **pblocaldlog** are owned and writable only by root.

When debug tracing the clients **pbrun**, **pbksh**, and **pbs**, if the corresponding diagnostic keywords **pbrunlog**, **kshlog**, and **shlog** are not present in the settings file, Privilege Management for Unix & Linux will try to use the directory location specified in **pblocaldlog** or **pbmasterdlog**.

When on-demand tracing is enabled from the clients (**pbrun**, **pbksh**, **pbs**), the client and any associated daemon that participates in the secured task processing will produce a trace log for that session.

The daemons, on the other hand, can be set up to always start in a trace-enabled state on a host using one of the following methods:

- Use the debug option of the server program for daemons that are either stand-alone or started by a superdaemon.
- Manually create a hidden file containing a numeric debug level (1-9) in specific locations:
  - **pbmasterd**: `/etc/.<prefix>pbmasterd<suffix>.debug.setting`
  - **pblogd**: `/etc/.<prefix>pblogd<suffix>.debug.setting`
  - **pblocald**: `/etc/.<prefix>pblocald<suffix>.debug.setting`
- If running **pbrun** as root, use options in **pbrun** to enable tracing for the appropriate daemon. To initiate and permanently turn on tracing for **pbmasterd**, **pblocald**, and **pblogd**, use **pbrun**'s **-d mlog**, **-d llog**, and **-d glog**, respectively. The appropriate `/etc/.*debug.setting` file will be created.

To disable debug trace logging for the server programs, locate and delete the hidden debug setting files created from one of the steps mentioned above:

- **pbmasterd**: `/etc/.<prefix>pbmasterd<suffix>.debug.setting`
- **pblogd**: `/etc/.<prefix>pblogd<suffix>.debug.setting`
- **pblocald**: `/etc/.<prefix>pblocald<suffix>.debug.setting`



For more information, please see the syntax information of the specific Privilege Management for Unix & Linux program to learn how to turn on debug tracing:

- ["pbrun" on page 384](#)
- ["Enable Debug Trace Logging for pbs and pbksh" on page 306](#)
- ["pbmasterd" on page 367](#)
- ["pblocald" on page 358](#)
- ["pblogd" on page 365](#)

## Log Synchronization

Privilege Management for Unix & Linux supports redundant servers to allow for the continuity of the security rules in the event the Policy Server host becomes unavailable. In such an environment, the log file is created on the primary log server.

If the primary log server becomes unavailable, then transactions are no longer recorded on the primary log server, and the secondary server takes over to continue to log events and I/O streams.

When the network is restored, the primary Policy Server resumes logging to the destination system. Network administrators, who want to monitor an I/O log or an event log, would have to manually collect the logs from the primary and secondary servers, determine which occurred first, and finally merge and synchronize the logs.

The log synchronization feature reduces the workload for system administrators by providing automated log consolidation and merging of logs across the network using a single command.



For more information, please see the following:

- ["Log Synchronization" on page 151](#)
- ["pbsync" on page 390](#)
- ["pbsyncd" on page 393](#)

## Log Cleanup and Rotation

The required retention period for log files varies from organization to organization. The log files are invaluable as security audit trails and system administration history logs.

The event log grows in length and contains more data than you see when executing a simple **pblog** command. Execute **pblog -l** and you will see a list of the variables. It is suggested that a nightly Unix/Linux **cron** (or similar) job be run to rename the event log.

### Examples

```
mv pb.eventlog pb.eventlog.prev
```

or

```
mv pb.eventlog pb.eventlog(datestamp)
```

The I/O log files increase in number rather than length. Their number should also be controlled using Unix/Linux **cron**. For example, you might want to keep two weeks of I/O logs before removing them from the system.

## Log Host File System Space

If left unchecked, log files consume an increasing amount of disk space on the log host. This degrades log host performance and results in the loss of log files if space runs out. The file system space on the log host can be controlled and the system can be configured to fail over to the next log server with the **logreservedfilesystems** and **logreservedblocks** settings.



For more information, please see ["logreservedfilesystems and logreservedblocks" on page 130](#).

## Log Archiving

Beginning with version 9.0, Privilege Management provides a logfile tracking and archiving mechanism for I/O logs and eventlogs. Each logfile created can have its location recorded in a centralized database for future searches. Log files can be archived off from the original Logserver hosts, for the purpose of freeing up space on the Logservers or for consolidating logs on designated archive hosts.

The log archiving process is performed by hosts that are installed and configured with the server components. Those components mandatorily install the Privilege Management REST service which is essential in logfile movement and tracking.



**Note:** REST Services are not fully supported on macOS.

The hosts involved in log archiving are categorized as:

## Log Server

The host where the eventlog or I/O log is created either by **pblogd** or **pbmasterd**.

The **pblogarchive** program found on this host initiates the logfile movement. After a successful archive, the logfile will exist on the destination Log Archive Storage Server and removed from this host.

 For more information, please see "[pblogarchive](#)" on page 399.

The settings file on this machine requires **enablelogtrackingdb**, **logarchivehost**, **logarchivedbhost**.

 For more information, please see "[Settings](#)" on page 52.

## Log Archive Storage Server

The destination host of the archived logfiles.

The settings file on this machine requires **logarchivedir**, the main directory under which the archived logfiles are organized.

 For more information, please see "[Settings](#)" on page 52.

To support multi-tier archiving, this host can also function as a Log Server, transferring files to another archive server. In such case, the required settings mentioned above are needed as well.

## Log Archive Database Server

The host where the centralized log tracking database is created and maintained.

The settings file on this machine requires **logarchivedb** which is the path name of the SQLite database file.

 For more information, please see "[Settings](#)" on page 52.

It is recommended that you do not designate a primary Logserver/Policy Server as the database server to avoid degrading log host performance. Plan for growth of the database file, depending on the volume of logfiles that get created.

Regardless of function, all hosts involved in log archiving are required to have **pbestport** configured in the settings file. Optionally, **pbesturi** may also be used.

 For more information, please see "[Settings](#)" on page 52.

## Archive Encrypted Log Files

The log archiving feature supports encrypted logfiles.

**IMPORTANT!**

*The Log Server sending files to be archived and the Log Archive Storage Server receiving the archived logs must use the same encryption algorithm and key.*

For eventlogs, **eventlogencryption** setting must be the same on the source and the destination. For I/O logs, the **iologencryption** setting must be the same on the source and the destination. Otherwise, the logfile transfer could fail.

### Archive by Age

Archiving by age may be achieved by configuring **cron** to invoke the **pblogarchive** program.

## Other Logging Limitations

Privilege Management for Unix & Linux has a local mode that can be used when an administrator needs only to monitor who started tasks, and whether or not they were approved. This feature reduces resource usage by making Privilege Management for Unix & Linux programs leave the job stream as soon as a secured task is approved. When using local mode, only the start of the secured task is logged.



For more information about local mode, please see the following:

- ["Optimized Run Mode Processing" on page 22](#)
- ["Local Mode Processing" on page 23](#)
- ["allowlocalmode" on page 102](#)

## Message Router Troubleshooting

The Message Router provides a method of consuming and storing large amounts of different types of messages from various Privilege Management services. For example, **pbmasterd** and **pblogd** services employ it to write event data to the event log and to other integrated products such as BeyondInsight and Solr. This increases the performance when systems are loaded, while reducing load on the system. However, this also increases the complexity of the overall system. This means that while the service is running smoothly, no maintenance is required. However, if there is a problem with the service, vital other services may be affected.

The **pbadmin** command is used to monitor normal statistics for the Message Router:

```
pbadmin -P --info --msgs
{
  "pid": 8486,                /* Process ID of the Message Router */
  "num_svcs": 2,            /* The number of services it provides */
  "curr_clnts": 0,          /* The number of currently connected clients */
  "tot_clnts": 3487,        /* The total number of clients connected this session */
  "total_msgs": 10635,      /* The total number of messages routed */
  "svcs": [                 /* Per service statistics */
    {
      "name": "session authenticate", /* The name of the service */
      "last_active": "2018-10-25 10:13:14", /* Last event seen by that service */
      "restarts": 1,          /* The number of process restarts */
      "pid": 8487,            /* The process ID of the Service Router */
      "queue_len": 0,         /* The current number of messages in the queue */
      "maxq_len": 200,        /* The maximum number of entries in the queue */
      "replies": 0,          /* (not applicable for authentication service) */
      "maxq_sz": 0,           /* The maximum queue size in bytes */
      "requests": 3487        /* The number of messages routed by this service */
    },
    {
      "name": "event log",    /* The name of the service */
      "last_active": "2018-10-25 10:13:01", /* Last event seen by that service */
      "restarts": 1,          /* The number of process restarts */
      "pid": 8488,            /* The process ID of the Service Router */
      "queue_len": 0,         /* The current number of messages in the queue */
      "maxq_len": 200,        /* The maximum number of entries in the queue */
      "replies": 0,          /* The number of replies to services */
      "maxq_sz": 102408,      /* The maximum queue size in bytes */
      "requests": 0           /* The number of messages routed by this service */
    }
  ]
}
```

This example output is typical, and shows the Message Router is running and is receiving requests.

If the error:

```
6101.53 Error accessing Message Router statistics - No such file or directory
```

is displayed, the Message Router is not running, and should be restarted to continue normal operations.



**Note:** The setting **restservice <yes|no>** can be configured in **pb.settings** so that **pblighttpd-svc** does not start up the REST service. However, it allows the Message Router to run.



For more information on how to restart the **pblighttpd** service, please see "[pblighttpd Service](#)" on page 428.

If the Message Router is not running and messages need to be routed to the various services, the requests are queued in the Message Router directory (normally **/opt/pbul/msgrouter**) and will look similar to:

```
# ls -l /opt/pbul/msgrouter/
total 100
-rwx----- 1 root root  5482 Oct 25 10:26 wq_0004
-rwx----- 1 root root 10251 Oct 25 10:26 wq_0255
-rwx----- 1 root root 10251 Oct 25 10:26 wq_0501
-rwx----- 1 root root  5482 Oct 25 10:26 wq_0550
-rwx----- 1 root root 10251 Oct 25 10:26 wq_0684
-rwx----- 1 root root  5482 Oct 25 10:26 wq_0755
-rwx----- 1 root root 10251 Oct 25 10:26 wq_0785
-rwx----- 1 root root  5482 Oct 25 10:26 wq_0858
-rwx----- 1 root root  5482 Oct 25 10:26 wq_0869
-rwx----- 1 root root 10251 Oct 25 10:26 wq_0912
```

These Message Router Write Queue files are used for temporary storage when the Message Router is unavailable or under severe load. Once the Message Router is available again, it will consume these files and store the data in the appropriate databases.



**Note:** This presents a significant difference from previous Privilege Management for Unix & Linux functionality in that Event Logs and other Integrated Products will not be updated while the Message Router is unavailable. The data will be stored securely in the Message Router Write Queues until it can be processed in the normal manner when the Message Router is available again.

The Message Router will log all errors in the REST log, in the specified directory, and so it is recommended that this log is regularly monitored. One of the warnings that may be displayed is, **WARNING: Out of free slots for the Message Router. Consider increasing 'messengerouterqueuesize' to avoid slowdown.**

This warning is not critical and is simply stating that the Message Router is under an increased load and would run faster if the specific setting is increased. If your system is displaying this warning on a regular basis, and often experiences heavy load, it is recommended that you increase the **messengerouterqueuesize** setting, incrementing by roughly 25% each time. This will, however, use up more memory resources on the system as larger shared memory queues are used.



For more information, please see "[messengerouterqueuesize](#)" on page 119



**Note:** **pbconfig** has a **--call** option. This action requires a JSON string parameter to process and processes as if the call was made over REST. This allows specific calls that are required to action licensing and message router queuing calls to be made.

## Firewalls

This section discusses advanced configuration options for firewalls.

Privilege Management for Unix & Linux can communicate through firewalls. To configure a firewall, it is necessary to know the following:

- TCP/IP concepts and terms
- How Privilege Management for Unix & Linux establishes a connection
- Which directions the firewall is filtering

## TCP/IP Concepts and Terms

In a TCP/IP network, a connection or communications channel between two processes is made up of a path through the network with a socket at each end. Each socket has its own identifying address consisting of its host ID (IP address) and a port number. The combination of the two socket addresses uniquely defines the channel in that network.

Port numbers can be assigned by the user or selected by the operating system. In some cases, the port number is well known and established by tradition. For example, FTP has used port 21 for many years. To establish an FTP session, a process would open a socket (identified by the local host ID and a port number that is assigned by the operating system) and attempt to connect it to the socket that is identified by the combination of the remote host ID and port 21. Historically, port numbers below 1024 are usually reserved for programs that are run by root, while ports from 1024 through 65535 are open for use by any program.

By default, **pbmasterd** uses port **24345**, **pblocald** uses port **24346**, **pblogd** uses port **24347**, and **pbguid** uses ports **24348** and/or **24349**. The user can reassign these by changing the port number in their services and in the settings file. Aside from those ports, Privilege Management for Unix & Linux is content to let the operating systems assign ports for the rest of its connections, unless there is a firewall in the middle.

A firewall is a security mechanism that controls network traffic that tries to pass through it. Privilege Management for Unix & Linux can work with packet-filtering firewalls. A packet-filtering firewall can allow traffic on designated ports to pass through it with no filtering.

To work with a firewall, both Privilege Management for Unix & Linux and the firewall have to agree on which ports can pass through the firewall. As an extra measure of security, Privilege Management for Unix & Linux makes use of reserved ports (numbered less than 1024) to initiate connections across a firewall. Doing so helps assure the remote machine that it is being contacted by a **root**-enabled program on the other end. The remote end of the connection can use any non-reserved ports that the firewall permits.

Previously, connections could be originated using reserved ports only. Beginning with V3.2, connections can be originated using reserved and non-reserved ports. On the receiving side, connections from non-reserved ports can be enabled by setting **allownonreservedconnections** to **true**.

The range of reserved ports that can be used to initiate outbound connections is defined in the settings file in V3.2 and later using **minoutgoingport** and **maxoutgoingport**.

In V3.2 and later, the non-reserved ports that can be used on the receiving side are defined in the settings file using **minlisteningport** and **maxlisteningport**.



For more information, please see the following:

- "**allownonreservedconnections**" on page 107
- "**minoutgoingport** and **maxoutgoingport**" on page 108
- "**minlisteningport** and **maxlisteningport**" on page 107

## Privilege Management for Unix & Linux Connections

Before you learn how Privilege Management for Unix & Linux establishes connections across a firewall, it is important to understand how Privilege Management for Unix & Linux establishes connections in general. The following example shows a typical session without I/O logging.

A user starts **pbrun** to access a command.

**pbrun** opens a port in the range from the **minoutgoingport** to the **maxoutgoingport** and attempts to connect to the **pbmasterd** well-known port on the Policy Server host.

If the **pbmasterd** policies reject the request, then **pbmasterd** opens a port in the **minoutgoingport** to **maxoutgoingport** range, and attempt to connect it to **pblogd**'s well-known port on the log host to log the rejection, and the process ends here.

If the **pbmasterd** policies accept the request, then **pbmasterd** opens a port in the **minoutgoingport** to **maxoutgoingport** range, and attempts to connect it to the **pblocald** well-known port on the run host.

**pblocald** opens a port in the **minoutgoingport** to **maxoutgoingport** range, and attempts to connect it to **pblogd**'s well-known port on the log host. **pblocald** then sends the accept information to the log server. **pblocald** then closes the log server connection.

If the configuration permits, **pblocald** attempts to connect directly to **pbrun**, freeing **pbmasterd** to exit from the job stream. **pblocald** does this by obtaining a port in the **minoutgoingport** to **maxoutgoingport** range and attempting to connect to a port in the **minlisteningport** to **maxlisteningport** range, which **pbrun** is listening to (**pbrun**'s actual port number is passed to **pblocald** through **pbmasterd**). **pbmasterd** can then exit. If **pblocaldreconnection** is set to **true**, then **pbrun** will originate and **pblocald** will listen.

**pblocald** runs the requested job. When it finishes, it opens another connection to the log server to log the finish status of the job.

### Connections Across a Firewall

A full Privilege Management for Unix & Linux session requires two to six connections. Generally, there are two types of connections:

- Connection to a well-known port
- Connection to a dynamic connection

When connecting to a well-known port, the originator asks the operating system for a port in the range between **minoutgoingport** and **maxoutgoingport**. The port number is selected by the operating system and is called an ephemeral port. This port is opened on the originating side and connected to the well-known port on the target side. The firewall must be able to pass traffic on the well-known port. No configuration is needed for Privilege Management for Unix & Linux in this case. The following table summarizes the connection information for well-known ports.

Originator	Outbound Port Type	Target	Inbound Port Type	Default
pbrun	Ephemeral	pbmasterd	Well known	24345
pbmasterd	Ephemeral	pblocald	Well known	24346
pbmasterd	Ephemeral	pblogd	Well known	24347
pblocald	Ephemeral	pblogd	Well known	24347

The second type of connection is a dynamic connection. These connections originate on a port in the range from **minoutgoingport** and **maxoutgoingport** that is selected by the originating machine's operating system (ephemeral port) and connect to a listening port on the target end (also an ephemeral port).

For this configuration, the firewall must be configured to pass a range of ports and Privilege Management for Unix & Linux must be configured to use those ports. If the originating side is filtered, the firewall needs to allow a range of reserved ports to pass. Beginning with Privilege Management for Unix & Linux V3.2, the port range should be configured in the firewall and the same range of ports should be set in **pblocald**'s settings file with the settings **minlisteningport** and **maxlisteningport**.

If the target machine is filtering incoming traffic, then the firewall should be configured to pass the listening ports, and the settings file on the submit host and the log host should set the same port range in their respective settings files, using the **minlisteningport** and **maxlisteningport** settings (Privilege Management for Unix & Linux V3.2 and later).

The dynamic connections from **pblocald** are summarized in the following table:



**Note:** Setting **pbrunreconnection** and/or **pblogreconnection** to **true** reverses the direction of the connections that are listed in the following table.

Originator	Outbound Port Type	Settings File	Target	Inbound Port Type	Settings File
pblocald	Ephemeral	minoutgoingport	pbrun	Ephemeral	minlisteningport
	reserved	maxoutgoingport		non- reserved	maxlisteningport
pblocald (when logmktemp() is used in a policy)	Ephemeral	minoutgoingport	pblogd	Ephemeral	minlisteningport
	reserved	maxoutgoingport		non- reserved	maxlisteningport

# Privilege Management for Unix & Linux Shells

- **Version 3.5 and earlier:** Privilege Management for Unix & Linux: shells not available
- **Version 4.0 and later:** Privilege Management for Unix & Linux shells available

The Privilege Management for Unix & Linux shells provide transparent command line access to Privilege Management for Unix & Linux without the use of **pbrun**. These shells are based on the public-domain Korn shell and provide the following features:

- Bourne (**pbsh**) and Korn (**pbksh**) variants: The Korn shell variant offers a convenient user interface that includes command history, command editing, and so on. The Bourne shell variant is optimized for shell scripts, size, and performance by leaving out the extra user-interface layer.
- Transparent authorization for every command, redirection, and built-in command
- Control of shell scripts
- I/O logging for the entire shell session or for selective commands
- Event logging for every command, redirection, and built-in command
- No need for wrapped shells
- Native-**root** mode for maintenance
- Enabling debug trace logging

Beginning with Privilege Management for Unix & Linux 5.0, the shells **pbsh** and **pbksh** honor the **runuser**, **rungroup**, and **runumask** settings for built-ins and I/O redirection. This feature enables built-ins to run with elevated privileges without having to elevate the privileges of the entire shell. In addition, files that are created with I/O redirection will have their ownership and permissions set according to these variables.

## Processing

When a shell starts, it first contacts a Policy Server host to establish its initial environment. After the initial environment is established, the Policy Server host is contacted for every command, shell built-in, and shell redirection, depending on the user, the environment, and the shell settings that are described in this section.

## Shell Startup

At startup time, the shell contacts a Policy Server host to establish the initial environment. After the initial environment is set, it does not change for the life of that shell. Shell start is sent to the Policy Server host with the following characteristics:

- **localmode** is set to **true**; startup is internal to the shell, and must be run in local mode
- **pbclientmode** is set to **shell start**
- Command contains the name of the shell
- **argv** contains the arguments to the shell, including the shell name.

The policy configuration language can determine that this is a shell startup by testing the variable **pbclientmode** for the value **shell start**. The shell startup is always run in local mode. The policy can control the shell startup through several variables:

- **shellallowedcommands**: A list of commands that the shell can execute without consulting a Policy Server and without logging. Shell pattern-matching characters are allowed. Judicious use of this list can reduce processing and network overhead. The default is an empty list, which makes the shell consult a Policy Server host for every command.
- **shellforbiddencommands**: A list of commands that the shell should reject without consulting a Policy Server and without logging. Shell pattern-matching characters are allowed. Judicious use of this list can reduce processing and network overhead. The default is an empty list.

- **shellcheckbuiltins**: When set to **true**, the shell consults a Policy Server host for every shell built-in command as if it were a command. The default is **false**.
- **shellcheckredirections**: When set to **true**, the shell consults a Policy Server host for every redirection attempt as if it were a command. The default is **false**. The shell redirections that the shells can check include **<**, **>** and **>>**.
- **shelllogincludefiles**: When set to **true**, the shell will log I/O streams for included (sourced) shell scripts, such as **.profile**. The default is **false**.
- **shellreadonly**: A list of environment variables that are made read-only in the shell session. The default is an empty list.
- **shellrestricted**: When set to **true**, the shell is run as a restricted shell using the shell's native restrictions. The default is **false**. These native restrictions include:
  - The change directory built-in command, **cd**, is disabled
  - The environment variables **SHELL**, **ENV**, and **PATH** are set to read-only
  - Command names do not allow absolute or relative paths.
  - Redirections that create files are not allowed (**>**, **>>**, **<>** and **>|**).
  - The **iolog** setting contains the full path of an I/O log file that records the entire shell session.

## Shell Commands

Every command that the shell processes, except those that are in the **shellallowedcommands** or **shellforbiddencommands** lists, are authenticated by a Policy Server host. The commands are sent to the Policy Server host with the following characteristics:

- **localmode** is set to **true**: The policy can override this setting by setting **runlocalmode** to **false**.
- **pbclientmode** is set to **shell command**
- **command** contains the full path of the command
- **argv** contains the arguments to the command, including the program name.

If you want to log the I/O streams for a specific command, then you can set the **iolog** variable to an I/O log file name, and the set **runlocalmode** variable to **false**.



**Note:** If the **iolog** variable is set to an I/O log file name but a log server is not accessible or is not specified in the **logservers** setting, then the I/O log is stored locally on the machine where the shell is invoked.

If **shellallowedcommands** and **shellforbiddencommands** are set, then commands are examined with the following precedence:

1. Commands that exactly match (no shell pattern-matching characters) in the **shellallowedcommands** list are accepted.
2. Commands that exactly match (no shell pattern-matching characters) in the **shellforbiddencommands** list are rejected.
3. Commands that match templates (with shell pattern-matching characters) in the **shellallowedcommands** list are accepted.
4. Commands that match templates (with shell pattern-matching characters) in the **shellforbiddencommands** list are rejected.
5. All other commands are sent to a Policy Server host.

## Shell Built-in Commands

All shells contain built-in commands, that is, commands that are part of the shell rather than separate programs. The built-in commands include:

.	exit	pwd	true
:	export	read	typeset
bg	false	readonly	ulimit
bind	fc	return	umask
break	fg	set	unalias
builtin	getopts	shift	unset
cd	hash	test	wait
continue	jobs	[ and ]	whence
echo	kill	time	
eval	let	times	
exec	print	trap	

When **shellcheckbuiltins** is set to **true**, the built-in commands are sent to a Policy Server host with the following characteristics:

- **localmode** is set to **true**; built-in commands are internal to the shell, and must be run in local mode.
- **pbclientmode** is set to **shell builtin**
- Command contains the name of the built-in command
- **argv** contains the arguments to the built-in command, including the built-in command name.

## Shell Redirections

All shells enable I/O redirection. When **shellcheckredirections** is set to **true**, any redirection that reads or writes a file is sent to a Policy Server host with the following characteristics:

- **localmode** is set to **true**; redirections are internal to the shell, and must be run in local mode.
- **pbclientmode** is set to **shell redirect**
- **argv[0]** contains **shell redirect read**, **shell redirect write**, or ""
- **argv[1]** contains the name of the file

## Shell Script Processing

When a shell executes an authorized script file, it will try to execute it in the following sequence:

1. If the script starts with an interpreter line (**#!<program name>**), then the shell executes the script with the named program.
2. If there is no interpreter program, then the shell looks for the environment variable **EXECHELL** and executes the script with that value.
3. If there is no **EXECHELL**, then the shell looks for the environment variable **SHELL** and executes the script with that value.
4. If there is no **SHELL**, then the shell executes the program with **/bin/sh**.

If the script is executed by one of the Privilege Management for Unix & Linux shells, then all of the commands within the script are controlled by Privilege Management for Unix & Linux. If any other program executes the script, then the script is run in its entirety with no further control from Privilege Management for Unix & Linux.

## Native Root Mode

All machines experience failures from time to time. When a network fails or no local Policy Server host is available, root may need to do maintenance, reboot the machine, and so on. In this case, the Privilege Management for Unix & Linux shells, when started by someone logged in as **root**, allow that user to perform the needed maintenance with minimal interference.

In this mode, the shells allow the native **root** user to perform all commands. It will attempt to record events for all commands, built-in commands, and redirections, using a log server. Similarly, the shells will attempt to log the I/O streams for the native root session. If the shell cannot contact a log server, then it will log both the events and the keystrokes to the local file system.

## Enable Debug Trace Logging for pbsh and pbksh

You can enable debug trace logging for **pbsh** and **pbksh**, and the other Privilege Management for Unix & Linux components that participate in processing the shell commands.

To enable tracing for **pbksh**:

```
pbksh --debug=<level number>
```

The debug trace log can be found in same directory specified in the **kshlog** setting. To enable tracing for **pbsh**:

```
pbsh --debug=<level number>
```

The debug trace log can be found in same directory specified in the **shlog** setting.



For more information, please see "[Debug Trace Logging](#)" on page 293.

## System Upgrades

Operating system, hardware, and network upgrades can affect your installation. Before making any changes to your system, contact a BeyondTrust Technical Support representative to review any corresponding changes that might be needed for your installation. It is also strongly recommended that you run **pbbench** before and after making system changes. If you are making changes to a Policy Server host, then **pbcheck** is also recommended.

### Operating System and Hardware Upgrades

Privilege Management for Unix & Linux must be re-installed when making operating system or hardware upgrades. In the case of hardware upgrades, it may also be necessary to request a new license string from your BeyondTrust sales representative. If the unique machine ID generated by **pbadmin --info --uuid** for a Primary License Server host changes, then your current license string becomes invalid and Privilege Management for Unix & Linux will no longer work.

### Network Upgrades

Changes to the network environment may make it necessary to change the Privilege Management for Unix & Linux configuration. The specific actions required to configure Privilege Management for Unix & Linux during a network upgrade vary with the items that are installed or modified.

#### Add NIS, NIS+, and Netgroups

The NIS services maps need to be updated if NIS, NIS+ or netgroups is configured after Privilege Management for Unix & Linux installation. Any superdaemons (**inetd** or **xinetd**) must also be restarted so that the new or updated port information is read from NIS.

#### Add Kerberos

If Kerberos is configured after Privilege Management for Unix & Linux installation, the Kerberos settings in the settings file need to be updated:

- Change the existing **kerberos** setting from **no** to **yes**.
- Check the **keytab** setting to see if it is relevant



For more information, please see "[keytab](#)" on page 213.

- Ensure that all of the principals and other Kerberos artifacts are added as appropriate.

#### Add NFS

When mounting file systems across different platforms, ensure that the correct platform executable files are available for each platform and that the **PATH** environment variable points to the correct executable files for that platform.

Remember that Privilege Management for Unix & Linux daemon error logs, event logs, and I/O logs on remote mounted file systems are not supported.

#### Add DNS

When using DNS to resolve unqualified host names, run **nslookup** to verify the host name exists and resolves properly.

In all cases, remember to do the name and reverse lookup. Both must work correctly for Privilege Management for Unix & Linux to function.

### Add a Firewall

If your installation needs to be updated to work through a firewall, then specific entries need to be updated or added in the `/etc/pb.settings` file.

### Add SSL

Entries need to be updated or added in the `/etc/pb.settings` file if your Privilege Management for Unix & Linux installation needs to be updated to work with SSL.

## Administration Programs

This section describes the Privilege Management for Unix & Linux system administration programs and their options.

**i** For detailed information about installation-related programs, including package installation, please see the [Privilege Management for Unix & Linux Installation Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

### pbbench

The **pbbench** program tests installation and network configuration. If **pbbench** detects an error, an error message is printed to **stdout**. If no errors are detected, **pbbench** returns silently. **pbbench** generates a report that includes information about the tests that were performed, the results of the tests, and any errors that were encountered.

**pbbench** checks for very old versions of Privilege Management for Unix & Linux (before V2.0) by looking for **/etc/pb.ports** and **/etc/pb.masters** and reports a warning if these are found. The HTML GUI version of **pbbench** does not check for the Privilege Management for Unix & Linux pre-V2 files.

You can use the **--skip-\*** options (such as **--skip-inetd** and **--skip-logs**) to prevent **pbbench** from performing those tests. However, the **--skip-logs**, **--skip-gui**, and **--skip-sync** options do not prevent **pbbench** from testing the connections to those hosts. To suppress the connection tests to these hosts, you must specify the **--skip-connect** option as well. This option suppresses connection tests for all host types.

To conduct connection tests only, use the **-l** (for log host connection tests) or **-m** (for Policy Server host connection tests) options. These options can be specified individually or together, for a single specified host name or IP address, or for all configured log hosts or Policy Server hosts. For both of these options, current output messages are skipped, and a single message is issued to **stdout** containing the version of the connected Privilege Management for Unix & Linux daemon (or **connection failed**). The exit status will be zero if the specified host (or every configured Policy Server/log host) was successfully contacted. The exit status will be non-zero if any Policy Server/log host could not be contacted.

### Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pbbench [options]
  -e, --stderr
  -E, --errors
  -l, --logServerTest=[host_name|IP_address|SRV lookup|`external program`]
  -m, --masterServerTest=[host_name|IP_address|SRV lookup|`external program`]
  -V, --verbose
      --no-timeouts
      --skip-connect
      --skip-inetd
      --skip-old
      --skip-logs
      --skip-gui
      --skip-path
      --skip-shells
      --skip-sync
```

```
pbbench -v | --version
pbbench --help
```

## Arguments

<b>-e, --stderr</b>	Optional. Send all output to <b>stderr</b> .
<b>-E, --error</b>	Optional. Treat warnings as errors.
<b>-l,</b> <b>--logServerTest</b> =[ <b>host_name</b> <b>IP_address</b> <b> SRV lookup</b> <b> "`external program`"]</b>	<p>Optional. Bypasses all existing tests and performs only the log host connection test on the specified <b>host_name</b> or <b>IP_address</b>. If the <b>host_name</b> or <b>IP_address</b> is not specified, the connection test is performed for all configured log hosts.</p> <p>Successful connections reported when running <b>pbbench -l</b> from the Policy Server host will tell you that the log server is available, and Accept/Reject events can be logged when optimized run mode is used.</p> <p>Successful connections reported when running <b>pbbench -l</b> from the run host will tell you if Accepts/Finish events can be logged via <b>pblocald</b>, and <b>pblocald</b> can perform I/O logging.</p> <p>Successful connections reported when running <b>pbbench -l</b> from the submit host will tell you that Finish events can be logged while in optimized run mode and I/O logging is possible while in optimized run mode.</p> <p><b>Version 6.2 and earlier:</b> option not available</p> <p><b>Version 7.0 and later:</b> option available</p>
<b>-m,</b> <b>--masterServerTest</b> =[ <b>host_name</b> <b>IP_address</b> <b> SRV lookup</b> <b> "`external program`"]</b>	<p>Optional. Bypasses all existing tests and performs only the Policy Server host connection test on the specified <b>host_name</b> or <b>IP_address</b>. If the <b>host_name</b> or <b>IP_address</b> is not specified, the connection test is performed for all configured Policy Server hosts.</p> <p><b>Version 6.2 and earlier:</b> option not available</p> <p><b>Version 7.0 and later:</b> option available</p>
<b>-V, --verbose</b>	Optional. Verbose mode
<b>--no-timeouts</b>	Optional. Disable connection test timeouts
<b>--skip-connect</b>	Optional. Disable connection tests for all host types.
<b>--skip-inetd</b>	Optional. Disable superdaemon ( <b>inetd/xinetd</b> ) tests
<b>--skip-old</b>	Optional. Disable checking of old constructs
<b>--skip-logs</b>	Optional. Disable log file tests
<b>--skip-gui</b>	Optional. Disable <b>pbguid</b> -related tests
<b>--skip-path</b>	Disable path tests of executable files
<b>--skip-shells</b>	Disable tests of <b>/etc/shells</b> .

<code>--skip-sync</code>	Optional. Disable <b>pbsync</b> -related tests <b>Version 4.0 and earlier:</b> option not available <b>Version 5.0 and later:</b> option available
<code>-v, --version</code>	Optional. Display the <b>pbbench</b> version and exit.
<code>--help</code>	Optional. Display program help and usage information

## Files

- `/etc/inetd.conf`
- `/opt/pbul/policies/pb.conf`
- `/etc/pb.key`
- `/etc/pb.masters`
- `/etc/pb.ports`
- `/etc/pb.settings`
- `/etc/pbmasters`
- `/etc/resolv.conf`
- `/etc/services`
- `/etc/syslog.conf`
- `/etc/xinetd.conf` DNS
- `mc NIS NIS+`
- `PBexternal pbrun`
- `SMF`
  - **Version 3.5 and earlier:** Solaris SMF not supported
  - **Version 3.5.4 and later:** Solaris SMF supported

## Example

In the example, **pbbench** runs and the output is redirected to the file **pbbench.output** rather than standard error.

```
pbbench > pbbench.output
```

## See Also

```
pbcheck, pbguid, pbsync, pbsyncd
```

## pbcall

- **Version 4.0.0 and later:** **pbcall** setting available

The **pbcall** program is used for two purposes. To test, on the local machine, what a given function call would do, and to allow a Privilege Management for Unix & Linux policy language function to be executed from the command line.

## Syntax

```
pbcall -policy-function-name args ...
```

## Arguments

<b>-policy-function-name</b>	Required. The name of the policy function
<b>args</b>	Optional. The arguments to the function.

## Files

None

## Example

Using the Privilege Management for Unix & Linux **stat()** function as an example:

```
pbcall -stat /etc
```

This command returns, on the screen, the results of a call to the Privilege Management for Unix & Linux **stat** call. Using this program from a Privilege Management for Unix & Linux session, you can execute a command such as:

```
list = system("/usr/local/bin/pbrun -h "+submithost+  
" /usr/local/bin/pbcall -stat /etc");  
statresult = split(list,",");
```

This command gives the same results as:

```
statresult = stat("/etc")
```

except that it is executed on the local machine as opposed to the Policy Server host.

Multiple Privilege Management for Unix & Linux functions can be called at the one time:

```
pbcall -gethome user1 -getname user1
```

The output is put on different lines.

Lists need to be specified within quotation marks. For example:

```
pbcall -search "{a,b,c}" a
```

Strings can be quoted using single quotation marks or double quotation marks.

## pbcheck

The **pbcheck** program processes a policy file and produces a report of syntax or language problems, or an entitlement report. The Policy Server daemon (**pbmasterd**) reports any policy file errors to a log file; however, **pbcheck** should be used to detect errors

before you install a policy file on a live system.

With no options, **pbcheck** performs a run-check on the policy file that is specified in your settings file.



**Note:** The **-c** option to check licenses has been retired. Use **pbadmin --lic -l** for this purpose.

With the **-e** option, **pbcheck** produces an entitlement report in CSV format. The output data contains the columns **submithost**, **user**, **command**, **argv**, **runhost**, **runuser**, **runcommand**, and **runargv**. When a field has no value, the entitlement report displays an empty string for that field.

The policy file must first be syntactically correct, so you should run **pbcheck** to check the policy syntax before running **pbcheck -e**. Because **pbcheck -e** processes the policy without arguments, you should ensure that the logic of the policy works even if no argument is passed to it.

With the **-U**, **-C**, or **-H** options, **pbcheck** produces a formatted text entitlement report that is sorted by **user**, **command**, or **host**, respectively. If more than one of these options is specified, then each of the reports will be produced, one after the other. Using the **-x** or **--csv2** option, you can export the entitlement data to Microsoft® Excel CSV format.

In CSV format, the resulting data is presented as comma-separated values and contains ASCII-formatted information for the following (in this order):

- Submit host
- User
- Command
- Argv
- Accept/reject/error text
- Run host
- Run user
- Run command
- Run argv
- **lolog (yes/no)**: Not displayed when detail level is low
- **Policy file name**: Not displayed when detail level is low
- **Policy line number**: Not displayed when detail level is low
- **Policy Server host**: Displayed only when detail level is high
- **Dependencies**: Displayed only when detail level is high
- **Constraints**: Semi-colon separated. Displayed only when detail level is high

The fields displayed in this format are displayed as empty quotation marks ("" ) if they were not specified in the policy; this means they could be any value.

If a field contains *Can not evaluate soft ... expression* in the output, it means the policy was setting the corresponding variable to a value that can be evaluated only at runtime (when running **pbrun**), such as **argv**, **date**, **time**, and so on.

With the option **-H**, each submit host is displayed on the top, followed by as many lines as necessary containing the other fields in the same order as above (except the submit host field). For example:

```
Host: <submithost>
<submitUser> <command> <argv> <Accept/Reject/Error Text> <runHost> <runUser>
  <runCommand> <runArgv> <iolog> <policyName> <policyLineNumber> <masterHost>
  <dependency> <constraints>
```

With the option **-U**, each user is displayed on the top, followed by as many lines as necessary containing the other fields in the same order as above (except the user field). For example:

```
User: <user>
<submitHost> <command> <argv> <Accept/Reject/Error Text> <runHost> <runUser>
  <runCommand> <runArgv> <iolog> <policyName> <policyLineNumber> <masterHost>
  <dependency> <constraints>
```

With the option **-C**, each command is displayed on the top, followed by as many lines as necessary containing the other fields in the same order as above (except the command field). For example:

```
Command: <command>
<submitHost> <submitUser> <argv> <Accept/Reject/Error Text> <runHost>
  <runUser> <runCommand> <runArgv> <iolog> <policyName> <policyLineNumber>
  <masterHost> <dependency> <constraints>
```

The fields displayed in **-H**, **-U**, and **-C** are displayed as **<UNSPECIFIED>** if they were not specified in the policy, and means they could have any value.

The fields **iolog**, **polycname**, and **policyLineNumber** are not displayed if detail level is low, and the fields **masterhost**, **dependency**, and **constraints** are displayed only when detail level is high.

The entitlement report mechanism uses a temporary work file before creating the final report. This temporary file is created in the **\$TMPDIR** directory. If the **TMPDIR** environment variable is not set (or is set to **/tmp/**), the workfile will be written in the **/tmp** directory.



**Note:** Temporary files that are owned by **root** in **/tmp** are a potential vulnerability. We recommend you set **TMPDIR=/var** or some other appropriate directory where normal users do not have write access.

Policies that use looping constructs which modify the iterating variable within the loop will not work correctly. Policies that test the contents of **argv** or **runargv** may produce incomplete results.

Policies that use data that is known only at an actual run-time (such as the **date** and **argv** variables) will produce incomplete results. In these cases, warnings and errors use the term "soft" when referring to variables that cannot be fully evaluated.

If a policy contains conditions that are based on external **data** sources or on external files that are generated at run time, the entitlements are evaluated as if the conditions are true. The last column (displayed when the **--detail** option is set to **High**), **Constraint**, will then show that each row is displayed when a condition is accepted. For example, if the policy checks whether a user belongs to a certain **netgroup** before accepting the command, the report will show the command for this user as accepted; the **Constraint** field will show the condition that the user belongs to the **netgroup**. At runtime, a particular user listed in the report might actually not be part of that **netgroup**, and therefore will be rejected.

The **constraint** option enables you to limit the report by using any valid Privilege Management for Unix & Linux policy language expression. For example:

```
-c "user=='dba'" -c "host in {'A', 'B'}"
```

limits the report to **dba** privileges on hosts **A** and **B**.

Most user defined functions will not be properly processed for entitlement reporting.

**pbcheck** evaluates a limited set of functions in a constraint when those functions are used against the output variables **submitHost**, **user**, **command**, **runhost**, **runuser**, and **runcommand**. The supported functions are **basename()**, **tolower()**, and **toupper()**.

Examples of constraints whose function calls will be evaluated are:

- `basename(command)` in `Allowed_Cmds`
- `tolower(user)` in `Allowed_Users`
- `toupper(submithost)` in `Allowed_Hosts`

All other functions are not evaluated, and will not show actual values for the affected output field. For example, the following policy will not produce specific values in the command field:

```
gsub("^.*/", "", command) in Allowed_Cmds
```

It will, however, insert that whole constraint in the command field for informational purposes.



**Note:** The `-b (--nobasename)` option for `pbcheck` has been deprecated because `pbcheck` now evaluates the `basename()` function.

## Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pbcheck [options] [command [arguments]]
  -f, --file=file_name
  -h, --host=host_name
  -r, --run
  -s, --syntax
  -t, --type
  -x, --csv2
  -p, --policydir=directory
  -L, --showlists[=listname [,listname]...]
  -S, --showduplicates
pbcheck [options] [-c constraint [-c constraint]...] [command [arguments]]
  -f, --file=file_name
  -p, --policydir=directory
  -e, --entitlement [=abridged|standard|extended| exhaustive]
  -b, --nobasename
  -l, --uselistnames [=columnname [,columnname]...]
  --maxchildren <number>
  --maxloopchildren <number>
  -U, --user_report
  -H, --host_report
  -C, --command_report
  -D, --detail [=low|medium|high]
  -d, --display_headers
  -A, --accepted
  -R, --rejected
  -I, --rejected_implicit
  -c, --constraint=expression
  -x, --csv2
pbcheck -v | --version
pbcheck --help
```

## Arguments

<b>-A, --accepted</b>	<p>Optional. For entitlement reporting only. Report accepted commands (default).</p> <p>May be combined with <b>-I</b> and <b>-R</b>.</p> <p><b>Version 4.0 and earlier:</b> option not available</p> <p><b>Version 5.0 and later:</b> option available</p>
<b>-b, --nobasename</b>	<p>Obsolete. Optional. For entitlement reporting only. Remove basename function calls from the entitlement report, leaving only the command or runcommand.</p> <p><b>Version 6.0 and earlier:</b> option not available</p> <p><b>Version 6.1 through 6.2.2:</b> option available</p> <p><b>Version 6.2.3 and later:</b> option deprecated.</p> <p>This is the built-in default behavior of <b>pbcheck</b>.</p>
<b>-c, --constraint =expression</b>	<p>Optional. Restrict the entitlement report to items that match the expression (for example, <b>-c "user=='root'"</b>).</p> <p><b>Version 4.0 and earlier:</b> option not available</p> <p><b>Version 5.0 and later:</b> option available</p>
<b>-C, --command_report</b>	<p>Optional. Produce a formatted entitlement report in command sequence.</p> <p><b>Version 4.0 and earlier:</b> option not available</p> <p><b>Version 5.0 and later:</b> option available</p>
<b>-d, --display_headers</b>	<p>Optional. Display the field headers as the top of an entitlement report.</p> <p><b>Version 6.0.0 and earlier:</b> option not available</p> <p><b>Version 6.0.1 and later:</b> option available</p>
<b>-D, --detail [=low medium high]</b>	<p>Optional. Produce the specified level of detail.</p> <p><b>Version 4.0 and earlier:</b> option not available</p> <p><b>Version 5.0 and later:</b> option available</p>
<b>-e, --entitlement [=abridged standard  extended exhaustive]</b>	<p>Optional. Produce entitlement data in CSV format. The optional arguments are:</p> <p><b>abridged:</b> Simplest and fastest method. It ignores the interactions between different if statements and groups similar data (for example, users or hosts) during evaluation.</p> <p><b>standard</b> (default): Slower and more detailed method. It tracks the interactions between different conditionals.</p> <p><b>extended:</b> Method providing more detail. It tracks interactions between different conditionals and evaluates the policy for each member of a list, rather than treating the list as a group.</p> <p><b>exhaustive:</b> Method providing more detail. The output is currently the same as extended, but may be changed in the future.</p> <p><b>Version 4.0 and earlier:</b> option not available</p>

	<p><b>Version 5.0 and later:</b> option available</p>
<b>-f, --file=file_name</b>	Optional. The file name to check. Defaults to the normal policy file.
<b>-h, --host=host_name</b>	Optional. Simulate a check with a remote host name.
<b>-H, --host_report</b>	<p>Optional. Produce a formatted entitlement report in host sequence.</p> <p><b>Version 4.0 and earlier:</b> option not available</p> <p><b>Version 5.0 and later:</b> option available</p>
<b>-I, --rejected_implicit</b>	<p>Optional. For entitlement reporting only. Report commands that are implicitly rejected at the end of the policy. May be combined with <b>-A</b> and <b>-R</b>.</p> <p><b>Version 4.0 and earlier:</b> option not available</p> <p><b>Version 5.0 and later:</b> option available</p>
<b>-I, --uselistnames [=column_name [column_name]...]</b>	<p>Optional. For entitlement reporting only. Replace the list values with the name of the list variable for all fields or for specific fields. Valid field names are <b>submitHost</b>, <b>submitUser</b>, <b>command</b>, <b>runHost</b>, <b>runUser</b>, and <b>runCommand</b>. When specifying multiple field names, enter them as comma-separated values (no spaces). Omit the field name to replace all applicable fields with the list variable name.</p> <p>Statements that act on individual items (for example, <b>switch</b> and <b>case</b>) cause the list to be expanded in the report, regardless of the <b>-I</b> option.</p> <div style="border: 1px solid orange; padding: 10px; margin: 10px 0;"> <p><b>i</b> If the run variables <b>runuser</b> and <b>runcommand</b> are not explicitly set in the policy, their values will depend on the variables <b>user</b> and <b>command</b>. For more information, please see the <a href="https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm">Privilege Management for Unix &amp; Linux Policy Language Guide</a> at <a href="https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm">https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm</a>.</p> </div> <p>In such a case, the <b>--uselistnames</b> option applied to <b>user</b> and <b>command</b> fields (<b>submitUser</b>, <b>command</b>) will automatically affect the output of their corresponding run variables (fields <b>runUser</b> and <b>runCommand</b>). Similarly, if a policy has an explicit dependency for <b>runhost</b> on <b>submithost</b>, then the <b>--uselistnames</b> option applied to the <b>submitHost</b> field will also be reflected in the <b>runHost</b> field.</p> <p><b>Version 6.0 and earlier:</b> option not available</p> <p><b>Version 6.1 and later:</b> option available</p>
<b>-L, --showlists [listname [listname]...]</b>	<p>Optional. Show members of all lists or of specific lists. Omit the list name to display members of all lists.</p> <p><b>Version 6.2.2 and earlier:</b> option not available</p> <p><b>Version 6.2.3 and later:</b> option available</p>
<b>--maxchildren &lt;number&gt;</b>	<p>Limit the total number of live <b>pbcheck</b> descendant processes. After this limit is reached, the entire <b>pbcheck</b> process tree is terminated. This is a safety mechanism to prevent crippling a system with too many processes. The default value is <b>200</b>. Increasing the value should only be necessary for policies with a large number of "if", "case", or looping statements that do not result in an accept or a reject.</p> <p><b>Version 6.1 and earlier:</b> option not available</p> <p><b>Version 6.2 and later:</b> option available</p>
<b>--maxloopchildren</b>	Limit the number of child processes that evaluate the same policy line (for example, an endless loop).

<b>&lt;number&gt;</b>	<p>After this limit is reached, the process that encounters the same line for the specified number of iterations issues a diagnostic message indicating the policy line and statement. Then the process exits. That child's parent and all ancestors are free to continue processing, resulting in a possibly incomplete entitlement report. This is a safety mechanism to prevent crippling a system with too many processes. The default value is <b>25</b>.</p> <p><b>Version 6.1 and earlier:</b> option not available</p> <p><b>Version 6.2 and later:</b> option available</p>
<b>-p, --policydir =directory</b>	<p>Optional. Provide a policy directory to control <b>include</b> files in the configuration policy. If a file name in an <b>include</b> statement starts with a / (slash), then that file is used. Otherwise, the directory that is specified using the <b>-p</b> option is used to search for the file in the <b>include</b> statement.</p>
<b>-r, --run</b>	<p>Optional. Perform run-time checking (forces syntax and type checking).</p>
<b>-R, --rejected</b>	<p>Optional. For entitlement reporting only. Report commands that are rejected by an explicit reject statement. May be combined with <b>-A</b> and <b>-I</b>.</p> <p><b>Version 4.0 and earlier:</b> option not available</p> <p><b>Version 5.0 and later:</b> option available</p>
<b>-s, --syntax</b>	<p>Optional. Perform syntax checking.</p>
<b>-S, --showduplicates</b>	<p>Optional. Show information on lists with duplicate members.</p> <p><b>Version 6.2.2 and earlier:</b> option not available</p> <p><b>Version 6.2.3 and later:</b> option available</p>
<b>-t, --type</b>	<p>Optional. Perform type checking (forces syntax checking).</p>
<b>-U, --user_report</b>	<p>Optional. Produce a formatted entitlement report in user sequence.</p> <p><b>Version 4.0 and earlier:</b> option not available</p> <p><b>Version 5.0 and later:</b> option available</p>
<b>[command [arguments]]</b>	<p>Optional. Search through the policy for the specified command and arguments to display whether it is accepted or rejected. The command and its arguments must be specified last in the <b>pbcheck</b> argument list. If the <b>pbcheck</b> argument list includes options that accept arguments, they must be specified before command.</p>
<b>-v, --version</b>	<p>Optional. Display the version information on <b>stderr</b> and exits.</p>
<b>-x, --csv2</b>	<p>Optional. Export entitlement data in Microsoft Excel CSV format.</p> <p><b>Version 6.2 and earlier:</b> option not available</p> <p><b>Version 6.2.1 and later:</b> option available</p>
<b>--help</b>	<p>Optional. Display the program's help message and exits.</p>

## Files

Privilege Management for Unix & Linux policy file

## Example

In the example, **pbcheck** performs a syntax check of the user-specified configuration file **pb.mainconfig** located in **/etc**:

```
pbcheck -f /etc/pb.mainconfig
```

## See Also

`pbkey`, `pblocald`, `pbmasterd`, `pbpasswd`, `pbprint`, `pbreplay`, `pbrun`, `pbsum`

## pbdbutil

- **Version 8.5.0 and earlier:** **pbdbutil** setting not available
- **Version 9.0.0 and later:** **pbdbutil** setting available

Starting with version 9, Privilege Management for Unix & Linux uses database files for the storage of all the normal configuration files and scripts, plus data storage for a range of new facilities. The utility **pbdbutil** provides a command line tool to maintain all of these databases.



**Note:** Due to the evolving nature of the **pbdbutil** command, its name will be changing to **pbadmin** in the future. To assist in this future transition a symbolic link called **pbadmin** is now automatically created for your convenience.

The command has "global" options that are used to carry out maintenance tasks on all databases, and more specific options that allow maintenance of specified databases. Each group of database options have their own usage/help:

## Usage

```
pbdbutil [<options>] [ <file> <file> ...]
```

## Global Options

<b>-y</b>	Use cached credentials for remote functionality
<b>-c &lt;files(s)&gt;</b>	Perform database integrity check
<b>-K &lt;newkeypath&gt; &lt;file(s)&gt;</b>	(Re)encrypt the database
<b>-O &lt;oldkeypath&gt;</b>	Specify the old database key file
<b>-C</b>	Output in CSV format instead of JSON
<b>-P</b>	Pretty print JSON output

## Authentication Options

<b>--auth &lt;options...&gt;</b>	Various authentication options
<b>-h</b>	Help on authentication options

### Info Options

<code>--info &lt;options...&gt;</code>	Various information options
<code>-h</code>	Help on info options

### License Maintenance and Statistics Options

<code>--lic &lt;options...&gt;</code>	License Maintenance and Statistics options
<code>-h</code>	Help on License Maintenance and Statistics options

### Setting/Configuration/Key Options

<code>--cfg &lt;options...&gt;</code>	Specify setting/config options
<code>-h</code>	Help on Setting/Configuration options

### Role Based Policy Options)

<code>--rbp &lt;options...&gt;</code>	Role Based Policy options
<code>-h</code>	Help on Role Based Policy options

### Client Registration Profile Options

<code>--reg &lt;options...&gt;</code>	Client Registration options
<code>-h</code>	Help on Client Registration options

### Management Event Options

<code>--evt &lt;options...&gt;</code>	Event options
<code>-h</code>	Help on Management Event options

### REST Keystore Options

<code>--rest &lt;options...&gt;</code>	REST keystore options
<code>-h</code>	Help on Management REST keystore options

### Sudo Policy Database Options

<code>--sudo &lt;options...&gt;</code>	Sudo database options
<code>-h</code>	Help on Management sudo database options

### Registry Name Service Database Options

<code>--svc &lt;options...&gt;</code>	Registry Name Service database options
---------------------------------------	--

### Database Synchronization Options

<code>--dbsync &lt;options...&gt;</code>	Database Synchronization options
--	----------------------------------

### Registry Name Service Cache Options

<code>--scache &lt;options...&gt;</code>	Registry Name Service cache options
--	-------------------------------------

### File integrity Monitor Options

<code>--fim &lt;options...&gt;</code>	File integrity monitor options
---------------------------------------	--------------------------------

### Event Log Cache Options

<code>--evtcache &lt;options...&gt;</code>	Event Log Cache options
<code>-h</code>	Help on Event Log Cache options

### IO Log Cache Options

<code>--iocache &lt;options...&gt;</code>	IO Log Cache options
<code>-h</code>	Help on IO Log Cache options

### IO Log Queue Options

<code>--iologidx &lt;options...&gt;</code>	IO Log Queue options
<code>-h</code>	Help on IO Log Queue options

### Integrated Product Options

<code>--intprod &lt;options...&gt;</code>	Integrated Product options
<code>-h</code>	Help on Integrated Product options

### Global Options

<code>--check &lt;file(s)...&gt;</code>	Do an integrity check on the specified files. If the database(s) are encrypted it will attempt to read the file using the database key specified in the <b>pb.settings</b> file.
<code>&lt;-c --csv&gt;</code>	By default all output messages and data is output in JSON format. This option will specify output in

	Comma Separated Values.
<code>&lt;-p --pretty&gt;</code>	When outputting data in JSON "pretty" print the data in a more human readable form.
<code>&lt;-K --newkeypath&gt;</code> <code>&lt;-O --oldkeypath&gt;</code> <code>&lt;file(s)...&gt;</code>	Re-encrypt database file(s) using the specified new key. If the old key path is not supplied it will attempt to open the database file with the key specified in <b>pb.settings</b> file.

## Setting/Configuration Options

These options provide methods to import, maintain and export the settings, configuration and key files that were traditionally kept in files in Privilege Management for Unix & Linux. These files can now be imported into a database which will provide versioning and change management, methods to retrieve, update, and save settings and configuration across the enterprise in a secure manner using the Privilege Management for Unix & Linux REST services.

These options need to be specified after the **--cfg** option.

## Usage

```
pbdbutil --cfg [<options>] [ <file> <file> ...]
```

<code>-i [&lt;file(s)&gt;]</code>	Import/update all or specified cfg file(s) in the database
<code>-m &lt;msg&gt;</code>	Specify message. Required when change management enabled
<code>-N</code>	Do no rename file on import
<code>-e [&lt;files(s)&gt;]</code>	Export all or specified cfg file(s) in the database
<code>-e -o &lt;outfile&gt;</code> <code>&lt;file&gt;</code>	Export cfg file from database and output to new file name
<code>--force</code>	Force the overwrite of the output file when exporting
<code>-V &lt;ver tag&gt;</code>	Used with export cfg file, but export given version or tag
<code>-D [&lt;file(s)&gt;]</code>	Diff all/specified file(s) with current exported file(s)
<code>-V &lt;from:to&gt;</code>	Used to specify from/to versions to diff
<code>-V &lt;ver tag&gt;</code>	Used to specify version or tag to diff
<code>-r &lt;files(s)&gt;</code>	Mark specified cfg file(s) deleted in the database
<code>-l</code>	List all cfg files in the database
<code>-s &lt;[- +]</code> <code>attribute&gt;</code>	Sort the list of records by attribute (asc/desc)
<code>-I &lt;file(s)&gt;</code>	List version information of cfg file(s) in the database
<code>-t &lt;tag&gt;</code> [ <code>&lt;file(s)&gt;</code> ]	Tag cfg file(s) in the database at current version

<b>-x &lt;tag&gt; [&lt;file (s)&gt;]</b>	Delete tag from cfg file(s) in the database
<b>-k &lt;encryption&gt; &lt;file(s)&gt;</b>	Encrypt cfg file(s) in the database
<b>n [--force] &lt;file (s)&gt;</b>	Create new key file(s) in the database
<b>-U</b>	Force unlock of locked cfg files in the database
<b>-A &lt;file&gt; &lt;svcname&gt; &lt;...&gt;</b>	Set file as being automatically synchronized within Service Group
<b>-X &lt;file&gt; &lt;svcname&gt; &lt;...&gt;</b>	Unset file as being automatically synchronized within Service Group
<b>-L</b>	List synchronization configuration for cfg files in the database
<b>-u &lt;setting&gt; &lt;arg&gt;[ &lt;argN&gt;]</b>	Set the setting in the current settings file.
<b>-o &lt;file&gt;</b>	Set the setting in the specified settings file. Need to use <b>-o</b> with <b>-u</b> .
<b>-u ' {"&lt;setting&gt;": "&lt;val&gt;" ,...}'</b>	Set the setting using JSON format.
<b>-g &lt;setting&gt; -- value</b>	Displays the value of the variable <setting> as set in /etc/pb.settings in a simple string format. Wildcards are allowed. If used, the output will be in "variable=value" format.
<b>-g &lt;setting&gt;</b>	Get the setting from the current settings file in JSON format.
<b>-o &lt;file&gt;</b>	Get the setting from the specified settings file. <b>-o</b> need to be used with <b>-g</b> .
<b>-g --default &lt;setting&gt;</b>	Gets the default value of the variable <setting>. This is not the value in pb.settings, but the default value when the variable is not defined (or commented out) in pb.settings. The output is displayed in JSON format with all metadata.  For example, the following command will display the values in JSON format of the variable <b>pbresttimeskew</b> :  <pre># pbadm --cfg --default -g pbresttimeskew {"disabled":true,"description":"Max time skew between hosts (sec)", "default":60, "type":"number", "gtype":4, "deprecated":false, "name":"pbresttimeskew"}</pre>
<b>-g --default -- value &lt;setting&gt;</b>	Displays the value of the variable in a simple string format.  For example, the following command gets default variable value in simple string form:  <pre>pbadmin --cfg --default --value -g &lt;var&gt;</pre>

	<p>Wildcards are allowed. If used the output will be in "variable=value" format.</p> <p>Examples with wildcard:</p> <pre>pbadmin --cfg --default -g \*</pre> <pre>pbadmin --cfg --default -g pb\*</pre>
<b>-g ["&lt;setting1&gt;" [, "&lt;settingN&gt;"]</b>	Get the settings using JSON format.
<b>-d &lt;setting&gt;</b>	Delete the setting in the current settings file.
<b>-o &lt;file&gt;</b>	Delete the setting in the specified settings file. <b>-o</b> needs to be used with <b>-d</b> .
<b>-d ["&lt;setting1&gt;" [, "&lt;settingN&gt;"]</b>	Delete the settings using JSON format.

## Descriptions

<b>"&lt;-i --import&gt;" "&lt;-m --msg&gt;"</b> <b>"&lt;message&gt;"</b> <b>"[&lt;file(s)...&gt;]"</b>	Import specified settings, configuration or key files into the <b>/etc/pb.db</b> database. If Change Management is enabled, a message must be supplied to log in the audit event database. If no files are specified on the command line, all files that already exist in the database will be checked and imported if required.
<b>&lt;-e --export&gt; [-f] [&lt;file (s)...&gt;]</b> <b>&lt;-e --export&gt; [-f] &lt;-V --version&gt; &lt;num tag&gt; [&lt;file (s)...&gt;]</b> <b>&lt;-e --export&gt; [-f] &lt;-o --output&gt; &lt;outfile&gt; &lt;file&gt;</b> <b>&lt;-e --export&gt; [-f] &lt;-V --version&gt; &lt;num tag&gt; &lt;-o --output&gt; &lt;outfile&gt;</b> <b>&lt;file&gt;</b>	Export specified settings, configuration or key file(s) from the <b>/etc/pb.db</b> database. If no files are specified on the command line, all files that exist in the database will be exported. Specific versions or tagged groups of files can be exported. If the output file(s) already exist the <b>-f</b> parameter must be applied to force the overwrite of the existing file.
<b>&lt;-l --list&gt;</b>	List all the current files held in the <b>/etc/pb.db</b> database.
<b>&lt;-l --list&gt; [-j] [&lt;file (s)...&gt;]</b>	List all the versions of specified files held in the <b>/etc/pb.db</b> database. By default this is displayed in csv, but can be displayed in JSON using the <b>-j</b> option. Specify a tag for current versions of files that exist in the <b>/etc/pb.db</b> database. These files can then be exported as a tagged group to facilitate change sets of files.
<b>&lt;-t --tag&gt; &lt;tag text&gt; [&lt;file (s)...&gt;]</b>	Specify a tag for current versions of files that exist in the <b>/etc/pb.db</b> database. These files can then be exported as a tagged group to facilitate change sets of files.  If file names are not specified, all current versions are added to the tagged group.
<b>&lt;-d --deltag&gt; &lt;tag text&gt; [&lt;file(s)...&gt;]</b>	Remove the tag from files specified. If file names are not specified, the tag is removed from all files that exist in the

	<code>/etc/pb.db</code> database.
<code>&lt;-k --encrypt&gt; &lt;algorithm&gt; [&lt;file(s)...&gt;]</code>	Encrypt existing setting/configuration files in the <code>/etc/pb.db</code> database.
<code>&lt;-n --newkey&gt; [&lt;file(s)...&gt;]</code>	Create a new key file in the <code>/etc/pb.db</code> database.

## License Management Options

From version 10.0, License Management is now centralized and can be carried out on the Primary License Server using the command `pbadmin`.

### Usage

```
pbadmin --lic [<options>] ...
```

<code>-u '{ param }'</code>	Update Primary License Server License where the <code>{ param }</code> argument is the supplied JSON formatted license
<code>-u &lt;path&gt;</code>	Update Primary License Server License where <code>&lt;path&gt;</code> is the path to a file that contains the supplied JSON formatted license
<code>-G</code>	Retrieve the License String and attributes
<code>-l [&lt;wildcard&gt;] [-l]</code>	List client License usage summary. Supply an extra <code>-l</code> to detail service information.
<code>-l '{ ... ["fqdn" : "&lt;wildcard&gt;"], ["retired" : &lt;true false&gt;], ["updated_older" : &lt;epoch&gt;], ["updated_newer" : &lt;epoch&gt;], ["updated_older" : { "years" : n, "months" : n, "days" : n, "hours" : n } ["updated_newer" : { "years" : n, "months" : n, "days" : n, "hours" : n } }</code>	Alternatively specify a filter expression to list only those clients that match the filter.
<code>-s &lt;[- +]attribute&gt;</code>	Use <code>-s</code> to sort the list of records by attribute name (asc/desc)
<code>-L [&lt;service&gt;] [-L]</code>	List client Service License Usage summary. Specify an extra <code>-L</code> to detail client information.
<code>-r {"uuid" : "&lt;uuid wildcard&gt;" -r {"uuid" : ["&lt;uuid wildcard&gt;", "uuid", ...]} -r {"fqdn" : "&lt;fqdn wildcard&gt;" -r {"fqdn" : ["&lt;fqdn wildcard&gt;", "fqdn", ...]} --force</code>	Retire client(s) by uuid or fqdn. Use <code>--force</code> to over-ride warning message.

<b>-R</b>	Immediately refresh the License Statistics from the Primary License Server
-----------	--

## Authentication Credential Cache Options

These options allow users of **pdbutil** to cache credentials to facilitate working with remote services.

### Usage

```
pdbutil --auth [<options>] [ <file> <file> ...]
```

### Auth Options

<b>--login { "appid":"&lt;appid&gt;","appkey":"&lt;appkey&gt;[,"svc":"&lt;svc&gt;"] }</b>	Cache specified appid/appkey credential for authentication
<b>--logout [{"key":"&lt;key&gt;[,"svc":"&lt;svc&gt;"]}]</b>	Remove default or specified credential key from cache
<b>-l</b>	List cached credentials
<b>-h</b>	Help on auth options

### Information Options

These options provide various information about the current system configuration or status.

### Usage

```
pdbutil --info [<options>]
```

### Info Options

<b>--fqdn [&lt;hostname&gt;]</b>	Get fully qualified name for this host or hostname
<b>--sched</b>	List Scheduler tasks
<b>--uuid</b>	Get the local hosts UUID
<b>--msgs</b>	Retrieve the Message Router statistics
<b>--restsvr</b>	Retrieve the REST Service statistics
<b>-h</b>	Help on info options

## Role Based Policy Options

The Role Based Policy is held in multiple tables. Each table refers to an individual entity with attributes, and is referenced by unique entity id's. Each entity is then linked together into a Role. When retrieving, updating or deleting entities, either the **name** or **id** can be used. The command line utility **pdbutil** with the option **--rbp** can be used to retrieve (**-g**), update (**-u**) or delete (**-d**) entities. When updating complete entities, including all its attributes, need to be defined. The REST API uses the same JSON format and

parameters, and use **GET**, **PUT** and **DELETE** respectively. There are also a number pseudo-attributes that allow the retrieval of lists based upon the parent grouping, these are:

- **usergrpname**: list User Lists which correspond to the specified User Group
- **hostgrpname**: list Host Lists which correspond to the specified Host Group
- **cmdgrpname**: list Command Lists which correspond to the specified Command Group
- **tmdategrpname**: list Time/Date Lists which correspond to the specified Time/Date Group
- **rolename**: list all lists which correspond to the specified Role Group

For example:

List all of the User Groups whose name matches **ug\***

```
pbdbutil --rbp -g '{ "usergrp" : { "name" : "ug*" } }'
[{"id":1,"ug1":"name","description":"desc","disabled":0,"single":0,"type":"I","ext info":null}]
```

List the User Group whose **id=1**

```
pbdbutil -g '{ "usergrp" : { "id" : "1" } }'
[{"id":1,"ug1":"name","description":"desc","disabled":0,"single":0,"type":"I","ext info":null}]
```

## Usage

```
pbdbutil --rbp [<options>] [ <file> <file> ...]
```

<b>-b</b>	Begin Role Based Policy change transaction
<b>-m &lt;msg&gt;</b>	Specify change management message. Required when change management is enabled.
<b>-c</b>	Commit Role Based Policy change transaction
<b>-r</b>	Rollback Role Based Policy change transaction
<b>--force -m &lt;msg&gt;</b>	Force Rollback of other users change transaction
<b>-i &lt;file&gt;</b>	Import Role Based Policy file in the database
<b>-e -o &lt;outfile&gt;</b>	Export Role Based Policy from database and output to file
<b>-V &lt;ver&gt;</b>	Used with export, but export specified version
<b>-g { json param }</b>	Get Role Based Policy database records
<b>-u { json param }</b>	Update Role Based Policy database records
<b>-d { json param }</b>	Delete Role Based Policy database records
<b>-n</b>	Create new Role Based Policy database
<b>-R { json param }</b>	Report user entitlements from the database
<b>-R</b>	Add option to display commands

<b>-R</b>	Add option to display time/date restrictions
<b>-R</b>	Add option to display additional role options
<b>-E { json param }</b>	List user entitlements data from the database
<b>-L</b>	List all Role Based Policy policies in the database
<b>-I</b>	List all Role Based Policy versions in the database

## Record Entities

- **usergrp**
- **userlist**
- **hostgrp**
- **hostlist**
- **cmdgrp**
- **cmdlist**
- **tmdategrp**
- **tmdatelist**
- **role**
- **roleusers**
- **roleghost**
- **rolecmds**
- **roletmdates**

Entities can be listed by attributes **name** and **id**, and entity specific attribute names **rolename**, **usergrpname**, **hostgrpname**, **cmdgrpname**, **tmdategrpname**.

For example:

```
-g '{ "role" : { "name" : "*" } } ' Display all Roles
-g '{ "usergrp" : { "name" : "n*" } }' Display all User Groups which match "n*"
-g '{ "userlist" : { "name" : "usergrp1" } } ' Display group membership for usergrp by name
-g '{ "roleusers" : { "rolename" : "role1" } }' Display list of usergrps assigned to role
-g '{ "rolehosts" : { "id" : 1 } } ' Display list of hostgrps assigned to role id 1
```

## Descriptions

**-b [-m <msg> ]**

This option is mandatory if the Role Based Policy transactions are enabled.



For more information on this setting in the Privilege Management/**etc/pb.settings** configuration file, please see "[Role Based Policy](#)" on page 57.

Before any changes can be made the administrator must begin the

	<p>transaction with a suitable Change Management message. This transaction is then kept open until the same user Commits or Rolls back the transaction. The transaction will not be visible by the live authorization process until it has been Committed.</p> <p>Available if the Role Based Policy Transactions are enabled.</p>
<b>-c</b>	Commit the current open transaction making it "live".
<b>-r [ --force -m &lt;msg&gt; ]</b>	<p>Rollback the current open transaction, discarding any changes that have been made.</p> <p>Available if the Role Based Policy Transactions are enabled.</p>
<b>-i &lt;file&gt;</b>	Import Role Based Policy file in the database
<b>-e -o &lt;outfile&gt; [-V &lt;ver&gt;]</b>	Export Role Based Policy from database and output to file
<b>-g { json param }</b>	Retrieve and display attributes of the entities within the Role Based Policy database.
<b>-u { json param }</b>	Update entities and attributes within the Role Based Policy database.
<b>-d { json param }</b>	Delete entities within the Role Based Policy database.
<b>-n</b>	Create a new Role Based Policy database, as specified by the <b>policydb</b> keyword in the Privilege Management/etc/pb.settings configuration file.
<b>-R { json param }</b>	Report user entitlements from the database
<b>-R</b>	Add option to display commands
<b>-R</b>	Add option to display time/date restrictions
<b>-R</b>	Add option to display additional role options
<b>-E { json param }</b>	<p>List user entitlements data from the database where { json param } is one or more of:</p> <p>"submituser" : "user1" Specify submit user or wildcard</p> <p>"submithost" : "host1" Specify submit host or wildcard</p> <p>"runuser" : "user1" Specify run user or wildcard</p> <p>"runhost" : "host1" Specify run host or wildcard</p> <p>"command" : "command" Specify command or wildcard</p>
<b>-L</b>	List all Role Based Policy policies in the database
<b>-I</b>	List all Role Based Policy versions in the database

## User Group Examples

Retrieve list of User Groups that match **ug\***:

```
-g '{ "usergrp" : { "name" : "ug*" }}'  
[{"id":1,"ug1":"name","description":"desc","disabled":0,"single":0,"type":"I","extinfo":null}]
```

Retrieve list of Users in the User Group **ug1**:

```
-g '{ "userlist" : { "usergrpname" : "ug1" }}' [{"id":1,"user":"root"}, {"id":1,"user":"adm*"}]
```

Update User Group **ug1** with new attributes:

```
-u '{ "usergrp" : { "id":1,"name":"ug1","description":"new  
description","disabled":0,"single":0,"type":"I","extinfo":null}}'
```

Add new user to User Group **ug1**:

```
-u '{ "userlist" : { "usergrpname":"ug1","user":"wheel"} }'
```

To delete all users from User Group **ug1**:

```
-d '{ "userlist" : { "usergrpname":"ug1"} }'
```

To delete specified user from User Group **ug1**:

```
-d '{ "userlist" : { "usergrpname":"ug1", "user" : "user1"} }'
```

## Host Group Examples

Retrieve list of Host Groups that match **hg\***:

```
-g '{ "hostgrp" : { "name" : "hg*" }}'  
[{"id":1,"hg1":"name","description":"desc","disabled":0,"type":"I","extinfo":null}]
```

Retrieve list of Hosts in the Host Group **hg1**:

```
-g '{ "hostlist" : { "hostgrpname" : "hg1" }}' [{"id":1,"host":"host2"}, {"id":1,"host":"*.dev.com"}]
```

Update Host Group **hg1** with new attributes:

```
-u '{ "hostgrp" : { "id":1,"name":"hg1","description":"new  
description","disabled":0,"type":"I","extinfo":null}}'
```

Add new host to Host Group **hg1**:

```
-u '{ "hostlist" : { "hostgrpname":"hg1","host":"host5"} }'
```

To delete all hosts from Host Group **hg1**:

```
-d '{ "hostlist" : { "hostgrpname":"hg1"} }'
```

To delete specified host from Host Group **hg1**:

```
-d '{ "hostlist" : { "hostgrpname":"hg1", "host" : "host1"} }'
```

## Command Examples

Retrieve list of Command Groups that match **cg\***:

```
-g '{ "cmdgrp" : { "name" : "cg*" } }'  
[{"id":1,"cgl":"name","description":"desc","disabled":0}  
]
```

Retrieve list of Commands in the Command Group **cg1**:

```
-g '{ "cmdlist" : { "cmdgrpname" : "cg1" } }'  
[{"id":1,"cmd":"rm *","rewrite":"echo $*"}, {"id":1,"cmd":"/usr/bin/rm  
*","rewrite":"echo $*"}]
```

Update Command Group **cg1** with new attributes:

```
-u '{ "cmdgrp" : { "id":1,"name":"cg1","description":"new description","disabled":0} }'
```

Add new command to Command Group **cg1**:

```
-u '{ "cmdlist" : { "cmdgrpname":"cg1","cmd":"/bin/rm *","rewrite":"echo  
$*"} }'
```

To delete all commands from Command Group **cg1**:

```
-d '{ "cmdlist" : { "cmdgrpname":"cg1"} }'
```

To delete specified cmd from Command Group **cg1**:

```
-d '{ "cmdlist" : { "cmdgrpname":"cg1", "cmd" : "rm *"} }'
```

## Time/Date Examples

Retrieve list of Time/Date Groups that match **td\***:

```
-g '{ "tmdategrp" : { "name" : "td*" } }'  
[{"id":1,"td1":"name","description":"desc","disabled":0}  
]
```

Retrieve list of Time/Dates in the Time/Date Group **td1**:

```
-g '{ "tmdatelist" : { "tmdategrpname" : "td1" } }'  
[{"id":1,"tmdate" : "{  
  \"mon\" : [0,0,0,0,0,0,0,15,15,15,15,15,15,15,15,15,15,3,0,0,0,0,0],  
  \"tue\" : [0,0,0,0,0,0,0,15,15,15,15,15,15,15,15,15,15,3,0,0,0,0,0],
```

```

\"wed\" : [0,0,0,0,0,0,0,15,15,15,15,15,15,15,15,15,15,15,15,3,0,0,0,0,0,0],
\"thu\" : [0,0,0,0,0,0,0,15,15,15,15,15,15,15,15,15,15,15,15,3,0,0,0,0,0,0],
\"fri\" : [0,0,0,0,0,0,0,15,15,15,15,15,15,15,15,15,15,15,15,3,0,0,0,0,0,0],
\"sat\" : [0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0],
\"sun\" : [0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0] ]}]
    
```

Update Time/Date Group **td1** with new attributes:

```
-u '{ "tmdategrp" : {
      "id":1,"name":"td1","description":"new description","disabled":0}}'
```

Add new time/date to Time/Date Group **td1**:

```
-u '{ "tmdate" : { "tmdategrpname":"td1","tmdate":{" \"range\" : {
      \"from\" : 1415851283, \"to\" : 1415887283 }}}}'
```

To delete all times/dates from Time/Date Group **td1**:

```
-d '{ "tmdate" : { "tmdategrpname":"td1"}}'
```

To delete specified cmd from Time/Date Group **td1**:

```
-d '{ "tmdate" : { "tmdategrpname":"td1", "tmdate" : "{ \"range\" : {
      \"from\" : 1415851283, \"to\" : 1415887283 }}}}'
```

## Role Examples

Retrieve list of Roles that match **Role\***:

```
-g '{ "role" : { "name" : "Role*" }}'
[{"id" : 0, "name" : "Role5", "rorder" : 3, "description" : "Desc3",
 "disabled" : 0, "risk" : 1, "action" : "A", "iolog" : "/tmp/iolog_XXXXXX",
 "script" : "accept;"}, {"id" : 1, "name" : "Role6", "rorder" : 2,
 "description" : "Desc3", "disabled" : 0, "risk" : 1, "action" : "A",
 "iolog" : "/tmp/iolog_XXXXXX", "script" : null}, {"id" : 2, "name" :
 "Role7", "rorder" : 1, "description" : "Desc3", "disabled" : 0, "risk" : 1,
 "action" : "A", "iolog" : "/tmp/iolog_XXXXXX", "script" : null}]
```

Retrieve list of User Groups listed in the Role **Role6**:

```
-g '{ "roleusers" : { "name" : "Role6" }}'
[{"id":1,"users":1,"type":"R"}, {"id":1,"users":1,"type":"S"}]
```

Update Role **Role5** with new attributes:

```
-u '{ "role" :
{"id":0,"name":"Role5","rorder":3,"description":"Description
4","disabled":0,"risk":1,"action":"A","iolog":"/tmp
/iolog_XXXXXX","script":"accept;"},
```

```
{ "id":1, "name": "Role6", "rorder":2, "description": "Desc3", "disabled":0, "risk":1, "action": "A", "iolog": "/tm
/tm

p/iolog_XXXXXX", "script":null},

{ "id":2, "name": "Role7", "rorder":1, "description": "Desc3", "disabled":0, "risk":1, "action": "A", "iolog": "/tmp/io
/tmp/io

log_XXXXXX", "script":null}'
```

Add new Submit Host, **hostgrp2**, to Role **Role5**:

```
-u { "rolehosts" : { "name" : "Role5", "hostgrpname" : "hostgrp2" , "type"
: "S"}}
```

To delete all User Groups from Role **Role5**:

```
-d '{ "roleusers" : { "name": "Role5"}}
```

To delete specified User Group from Role **Role5**:

```
-d '{ "roleusers" : { "name" : "Role5", "usergrpname": "ug1"}}
```

To delete all User Groups from Role **Role5**:

```
-d '{ "roleusers" : { "name": "Role5"}}
```

To delete specified User Group from Role **Role5**:

```
-d '{ "roleusers" : { "name" : "Role5", "usergrpname": "ug1"}}
```

## Client Registration Options

These options provide methods to create, maintain, export, and import role based policies into Privilege Management for Unix & Linux, used with the **--rbp** option.

### Usage

```
pbdbutil --reg [<options>] [ <file> <file> ...]
```

<b>-g { json param }</b>	Get Client Registration profile records
<b>-u { json param }</b>	Update Client Registration profile records
<b>-d { json param }</b>	Delete Client Registration profile records
<b>-n</b>	Create new Client Registration profile database

```
-l
```

List all Client Registration profiles in the database

### Client Registration Database Options

These options provide methods to define and maintain Client Registration profiles, used to simplify the registration of hosts within the Privilege Management enterprise.

```
"<-g|--get>" "{ param }"
```

#### Example:

Retrieve Client Registration profile using the specified name:

```
-g '{ "name" : "default" }

{"type":"settings","fname":"/etc/pb.settings"}
{"type":"certificate","to":"/etc/${prefix}pbrest.pem${suffix}" }
{"type":"save","sname":"networkencryption"}
{"type":"save","sname":"restkeyencryption"}
{"type":"save","sname":"sslservercertfile"}
{"type":"save","sname":"sslserverkeyfile" }
```

```
"<-u|--update>" "{ param }"
```

#### Example:

Update the specified Client Registration profile:

```
-u '{ "name" : "prof1", [{"type":"settings",
    "fname":"/etc/pb.mysettings"},
    {"type":"save","sname":"networkencryption"} ]' }
```

```
"<-d|--delete>" "{ param }"
```

#### Example:

Delete the specified Client Registration profile:

```
-d '{ "name" : "prof1" }'
```

```
<-l|--list>
```

List all the Client Registration profiles.

```
<-n|--new>
```

Create and initialize the Client Registration database.

## Management Event Options

These options provide methods to create, maintain, export, and import Role Based Policies into Privilege Management for Unix & Linux.

### Usage

- `pbdbutil --evt [<options>] [ <file> <file> ...]`
- **-s { json param }**: Search Management event records
- **Record entities:**
  - **hostname**
  - **evtname**
  - **service**
  - **by**
  - **severity**
  - **before/after/then progame**
  - **version**
  - **arch**
  - **taxonomy**

Records can be searched using the above entities and are matched as wildcards. For example:

```
-s '{ "taxonomy" : "chgmt" } 'Display all Change Management Events
```

```
-s '{ "taxonomy" : "chgmt", "hostname" : "host1" } ' Display all Change Management Events for host1
```

### Description

```
<-S|--searchevt> { json parameters }
```

This option provides a method of retrieving change management events from the change management database.

### Examples

Retrieve all change management events:

```
-S '{ "taxonomy" : "chgmt" }'  
{ "hostname" : "pbuild", "evtname" : "file_import", "service" : "pbdbutil9.0.0-01_debug", "who" :
```

```
"ctaylor", "severity" : 16, "progname" : "pbdbutil9.0.0-01_debug", "version" : "9.0.0-01_debug",
"arch" : "x86_64_linuxA", "data" : {"msg" : "foo, bar", "fname" : "/opt/pbul/policies/pb.conf,
conf","version" : 4, "sid" : 4995, "pid" : 31976, "uid" : 0}, "utc" : "2014-11-1109 : 19 : 28"}
{"hostname" : "pbuild", "evtname" : "tag_file", "service" : "pbdbutil9.0.0- 01_debug", "who" :
"ctaylor", "severity" : 16, "progname" : "pbdbutil9.0.0- 01_debug", "version" : "9.0.0-01_debug",
"arch" : "x86_64_linuxA", "data" :{"fname" : "/opt/pbul/policies/pb.conf", "tag" : "foo", "version"
: -1, "sid" : 4995,"pid" : 31979, "uid" : 0}, "utc" : "2014-11-11 09 : 19 : 30"}
```

Retrieve change management events for **host1** only:

```
-S '{ "taxonomy" : "chgmt" , "hostname" : "host1" }'
```

## REST Keystore Options

### Usage

```
pbdbutil --rest [<options>] [ <file> <file> ...]
```

<b>-l</b>	List all Application IDs in the database
<b>-d &lt;appid&gt;</b>	Delete Application key
<b>-g &lt;appid&gt; [--svcgname &lt;name&gt;] [&lt;acl&gt; ...]</b>	<p>Create new Application key with ACLs Specify <b>svcgname</b> to sync key across Service Group where <b>acl</b> is up to 8 regular expression strings in the form <b>METHOD:/PATH/ATTRIBUTE</b> where <b>METHOD</b> is <b>GET</b>, <b>PUT</b>, <b>POST</b> or <b>DELETE</b>.</p> <p>For example:</p> <p><b>GET:/events</b></p> <p><b>PUT:/setting/</b></p> <p><b>POST:/key</b></p> <p><b>\(GET PUT\):/setting/(submitmaster acceptmasters)</b></p> <p><b>-x &lt;yyyy-mm-dd&gt;</b> Specify Application ID expiry</p>

## Sudo Database Options

These options provide methods to create, maintain, export, and import sudoers policy files into Privilege Management for Unix & Linux, used with **--sudo** option.

### Usage

```
pbdbutil --sudo [<options>] [ <file> <file> ...]
```

### Options for the Sudo Client Host Only

<b>-R</b>	Force refresh of the sudo client cache file(s)
<b>-E</b>	Extract sudo policy to local file system.

### Options for Client Remote Management

<b>--client='{ params }'</b>	<p>Specify client REST parameters (NB use of "=" for optional parameter) where the { param } argument is formatted JSON with parameters:</p> <ul style="list-style-type: none"> <li>• <b>["hostname" : "host1"]</b>: hostname of the sudoer database REST service (optional)</li> <li>• <b>["port" : "24351"]</b>: port of the sudoer database REST service (optional)</li> <li>• <b>"appid" : "appid"</b>: appid of the sudoer database REST service</li> <li>• <b>"appkey" : "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx"</b>: appkey of the sudoer database REST service</li> </ul>
------------------------------	--



### IMPORTANT!

*Uploading a sudoers policy from the client side will override the sudoers policy stored in the Privilege Management for Unix & Linux Basic database on the policy server. If you have made changes on the Policy Server, it is recommended to continue managing your sudoers files centrally on the Policy Server.*

### Options for the Sudo Server Host Only

<b>-n</b>	Create new sudoer policy database
-----------	-----------------------------------

### Options for Policy Management

<b>-i [&lt;file(s)&gt;]</b>	Import/update specified sudoer policy file(s) in the database
<b>-m &lt;msg&gt;</b>	Specify message. Required when change management enabled
<b>-N</b>	Do not rename file on import
<b>-e</b>	Export all sudoer policy files in the database
<b>-e [&lt;files(s)&gt;]</b>	Export all or specified sudoer policy file(s) in the database
<b>-e -o &lt;outfile&gt; &lt;file&gt;</b>	Export sudoer file from database and output to new file name
<b>--force</b>	Force the overwrite of the output file when exporting
<b>-V &lt;ver tag&gt;</b>	Used with export sudoer policy file, but export given version or tag
<b>-D [&lt;file(s)&gt;]</b>	Diff specified file(s) with current exported file(s)
<b>-V &lt;from:to&gt;</b>	Used to specify from/to versions to diff

<b>-V &lt;ver tag&gt;</b>	Used to specify version or tag to diff
<b>-r &lt;files(s)&gt;</b>	Mark specified sudoer policy file(s) deleted in the database
<b>-t &lt;tag&gt; [&lt;file(s)&gt;]</b>	Tag sudoer policy file(s) in the database at current version
<b>-x &lt;tag&gt; [&lt;file(s)&gt;]</b>	Delete tag from sudoer policy file(s) in the database
<b>-A &lt;alias&gt; &lt;hosts(s)&gt;</b>	Assign host to alias for sudoer policy lookup
<b>-X &lt;alias&gt; &lt;hosts(s)&gt;</b>	Unassign host from alias for sudoer policy lookup
<b>-G [&lt;wildcard(s)&gt;]</b>	List aliases for sudoer policy lookup
<b>-G</b>	For client add an extra <b>-G</b> to list all aliases
<b>-s &lt;[- +]attribute&gt;</b>	Sort the list of records by attribute name (asc/desc)
<b>-l</b>	List all sudoer policy files in the database
<b>-l</b>	Add an extra <b>-l</b> to list hosts/aliases using the policy file
<b>-l &lt;file(s)&gt;</b>	List all sudoer policy files with change management summary
<b>-l</b>	Add an extra <b>-l</b> to list file versions
<b>-s &lt;[- +]attribute&gt;</b>	Sort the list of records by attribute name (asc/desc)
<b>-a &lt;hostname alias&gt;</b>	Override the hostname/alias for sudo commands

## Examples

Assumptions for examples:

- Sudoers file on **pbsudo** client: **/etc/sudoers**
- Name of **pbsudo** client: **sudohost.bt.com**
- Name of policy server: **PShost.bt.com**
- App id: **PBSUDO**
- Appkey: **"479aba39-7820-47f8-a954-3a877393c7b7"**

### Example Import Command (-i):

The client import command loads the current sudoers file on sudo client into the remote sudo database.

```
/usr/sbin/pbdbutil --sudo --client='{ "hostname" : " PShost.bt.com ", "port" : 64667, "appid" :
"PBSUDO", "appkey" : "479aba39-7820-47f8-a954-3a877393c7b7" }' -i /etc/sudoers
```

### List All Sudoer Policy Files in the Database (-l):

```
pbdbutil --sudo -l /etc/sudoers
{"pathname":"/etc/pbsudoers/sudohost.bt.com/etc/sudoers","version":1,"tag":nu
ll,"deleted":0,"created":"2015-07-07 12:15:47"}
```

## Export Specified Sudoer Policy File from Database (-e):



**Note:** For export, if you use the **-force** option, target directory structure will get created. If you do not want to use force, you can manually create the directories before export.

```
pbdbutil --sudo -e /etc/pbsudoers/sudohost.bt.com/etc/sudoers -force
```

If there are multiple versions of a file in the database, an export with **-V** option will check out the file with specified version

```
pbdbutil --sudo -l /etc/sudoers
  {"pathname":"/etc/pbsudoers/sudohost.bt.com/etc/sudoers", "version":1, "tag":null, "deleted":0, "created":"2015-07-07 12:15:47"}
  {"pathname":"/etc/pbsudoers/sudohost.bt.com/etc/sudoers", "version":2, "tag":null, "deleted":0, "created":"2015-07-07 12:26:59"}

pbdbutil --sudo -e -V "2" /etc/pbsudoers/sudohost.bt.com/etc/sudoers -force
```

## Export Sudoer File from Database and Output to New File Name

```
pbdbutil --sudo -e -o /tmp/sudoers.new /etc/pbsudoers/sudohost.bt.com/etc/sudoers
```

## Export All the Sudoers Policy Files from Database



**Note:** If you do not specify the file path/name, it will export all the files that are in the database.

```
pbdbutil --sudo -e -force
```

## Examples of Import(-i)

```
pbdbutil --sudo -I "":"/etc/pbsudoers/sudohost.bt.com/etc/sudoers
```

## Example of Import with changemanagementevents Set

```
pbdbutil --sudo -i -m "testing changemanagement"
```

## Example of Import All the Files Back to Database

```
pbdbutil --sudo -i
```

### Example of Creating/Deleting Tags

```
pbdbutil --sudo -t "my tag" /etc/pbsudoers/sudohost.bt.com/etc/sudoers pbdbutil --sudo -x "my tag" /etc/pbsudoers/sudohost.bt.com/etc/sudoers
```

### Example to Create Alias, List It, and Delete It

```
pbdbutil --sudo -A "solaris_hosts" host1 host2 host3

pbdbutil --sudo -G "*"
{"hostname":"host1","alias":"solaris_hosts"}
{"hostname":"host2","alias":"solaris_hosts"}
{"hostname":"host3","alias":"solaris_hosts"}

pbdbutil --sudo -G sol*
{"hostname":"host1","alias":"solaris_hosts"}
{"hostname":"host2","alias":"solaris_hosts"}
{"hostname":"host3","alias":"solaris_hosts"}

pbdbutil --sudo -G *3
{"hostname":"host3","alias":"solaris_hosts"}
```

### Example of Deassigning an Alias:

```
pbdbutil --sudo -X "solaris_hosts" host3 pbdbutil --sudo -G "*"
{"hostname":"host1","alias":"solaris_hosts"}
{"hostname":"host2","alias":"solaris_hosts"}
{"count":2} - if you have two sudo clients connected to policy server
```

### Example of Overriding the Sudo Policy Using Hostname/Alias (-a):

This will add a local sudoers into the database for the given host. Run this on policy server:

```
pbdbutil --sudo -a <sudo client name or alias name> -i /etc/sudoers
```

### Example of Diff with -V

This will show the difference between current exported file and specified version of file in database.

```
pbdbutil --sudo -D /etc/pbsudoers/sudohost.bt.com/etc/sudoers -V "1" 2> /tmp/diff_version.dat
```

This will show the difference between current exported file and the file with specified tag.

```
pbdbutil --sudo -D /etc/pbsudoers/sudohost.bt.com/etc/sudoers -V "My tag"
```

Difference between two versions:

```
pbdbutil --sudo -D /etc/pbsudoers/sudohost.bt.com/etc/sudoers -V "1:2"
```

## Registry Name Service Options

These options allow the maintenance and interrogation of the Registry Name Services.

### Usage

```
pbdbutil --svc [<options>] [ <file> <file> ...]
```

<b>-u '{ "svcname" : "name", params... }'</b>	Create/Update Registry Name Service Group
<b>-u '{ "cn" : "hname", params... }'</b>	Create/Update Registry Name Service Host
<b>-u '{ "cn" : "hname", "uuid" : "", params... }'</b>	Create/Update external Host in Registry Name Service
<b>-u '{ "svcname" : "name", "cn" : "hname", params... }'</b>	Add/Update Registry Name Service Host to Service Group
<b>-g '{ "svcname" : "name" }'</b>	Retrieve Registry Name Service Group information
<b>-g '{ "primary" : "name" }'</b>	Lookup the Primary Server within the Registry Name Service Group
<b>-g '{ "cn" : "name" }'</b>	Retrieve Registry Name Service Host information by host common name
<b>-g '{ "uuid" : "name" }'</b>	Retrieve Registry Name Service Host information by uuid
<b>-d '{ "svcname" : "name" }'</b>	Delete Registry Name Service Group
<b>-d '{ "svcname" : "name", "cn" : "name" }'</b>	Remove a host from Registry Name Service Group
<b>-d '{ "cn" : "name" }'</b>	Delete Registry Name Service Host by host common name
<b>-z &lt;oldgrp&gt; &lt;newgrp&gt;</b>	Rename Registry Name Service Group
<b>-l [&lt;wildcard(s)&gt;]</b>	List all the Registry Name Service Groups that match wildcard(s)
<b>-l</b>	Add an extra <b>-l</b> to list Servers in the Registry Name Service Group(s)
<b>-L [&lt;wildcard(s)&gt;]</b>	List all the Hosts that match wildcard(s)
<b>-L</b>	Add an extra <b>-L</b> to list Service Group membership and Role
<b>-p &lt;svcgrp&gt; &lt;host&gt;</b>	Promote host to Primary Service within the specified Registry Name Service Group
<b>-N [[&lt;cn&gt; [&lt;port&gt;]]</b>	Create and initialize Primary Registry Name Service database
<b>-n</b>	Create new Registry Name Service database

## Recreate the Registry Name Service Database

```
# pbdbutil --svc -N --force
```

## List Service Groups from Registry Name Service Database

```
# pbdbutil -P --svc -l
```

Example result:

```
{
  "svcgid": 1,
  "svcgname": "registry_name_svc",
  "svc": "registry",
  "updated": "2016-06-09 15:42:33",
  "deleted": 0
}
{
  "svcgid": 2,
  "svcgname": "df1_pb_policy_svc",
  "svc": "pbpolicy",
  "updated": "2016-06-09 15:42:33",
  "deleted": 0
}
{
  "svcgid": 3,
  "svcgname": "df1_log_svc",
  "svc": "logsvr",
  "updated": "2016-06-09 15:42:33",
  "deleted": 0
}
{
  "svcgid": 4,
  "svcgname": "df1_sudo_policy_svc",
  "svc": "sudopolicy",
  "updated": "2016-06-09 15:42:33",
  "deleted": 0
}
```

## List Primary and Secondary Servers Within the Service Groups

```
# pbdbutil -P --svc -l -l
```

Example result:

```
{
  "svcgid": 1,
  "svcgname": "registry_name_svc",
  "svc": "registry",
```

```
"updated": "2016-06-14 10:43:14",
"deleted": 0,
"svcs": [
{
  "svcgid": 1,
  "hostid": 1,
  "role": "primary",
  "created": "2016-06-14 10:43:14",
  "updated": "2016-06-14 09:43:14",
  "deleted": 0,
  "cn": "pbuild",
  "uuid": "969ecab2-93d8-4322-a8cf-6314457053bb",
  "fqdn": "pbuild",
  "addrs": [
    {
      "family": 4,
      "port": 24351,
      "addr": "192.168.16.138"
    }
  ]
  "tnlzone": 0
}
]
}
{
  "svcgid": 2,
  "svcgname": "dfl_pb_policy_svc",
  "svc": "pbpolicy",
  "updated": "2016-06-14 10:43:14",
  "deleted": 0
}
{
  "svcgid": 3,
  "svcgname": "dfl_log_svc",
  "svc": "logsvr",
  "updated": "2016-06-14 10:43:14",
  "deleted": 0
}
{
  "svcgid": 4,
  "svcgname": "dfl_sudo_policy_svc",
  "svc": "sudopolicy",
  "updated": "2016-06-14 10:43:14",
  "deleted": 0
}
}
```

## Retrieve specified Service Group

```
pbdbutil --svc -g '{ "svcgname" : "registry_name_svc" }'
```

### Example result:

```
{"svcgid":1,"svcgname":"registry_name_svc","svc":"registry","updated":"2016-06-06
16:56:53","deleted":0}
```

### Retrieve Specified Host by "cn"

```
pbdbutil --svc -g '{ "cn" : "pbuild" }'
```

#### Example result:

```
{"attrs": [{"family": 4, "addr": "192.168.16.138", "port": 24351}], "cn": "pbuild", "uuid": "969ecab2-93d8-4322-a8cf-6314457053bb", "$
```

#### Or by uuid:

```
pbdbutil --svc -g '{ "uuid" : "969ecab2-93d8-4322-a8cf-6314457053bb" }'
```

#### Example result:

```
{"attrs": [{"family": 4, "addr": "192.168.16.138", "port": 24351}], "cn": "pbuild", "uuid": "969ecab2-93d8-4322-a8cf-6314457053bb", "$
```

### Retrieve Host Entry for the Primary of the Specified Service Group

```
pbdbutil --svc -g '{ "primary" : "registry_name_svc" }'
```

#### Example result:

```
{"svcgid": 1, "svcgname": "registry_name_svc", "svc": "registry", "updated": 1465228621, "deleted": 0, "hostid": 1, "role": "primary", "$
```

### Retrieve Host Information for Specified Host

```
pbdbutil --svc -L pbuild
```

#### Example result:

```
{"fqdn": "pbuild", "cn": "pbuild", "uuid": "969ecab2-93d8-4322-a8cf-6314457053bb", "attrs": [{"addr": "192.168.16.138", "family": 4, $
```

### List All Hosts

```
# pbdbutil -P --svc -L
{
  "hostid": 1,
  "cn": "pbuild",
```

```
"uuid": "969ecab2-93d8-4322-a8cf-6314457053bb",
"fqdn": "pbuild",
"attrs": [
  {
    "family": 4,
    "port": 24351,
    "addr": "192.168.16.138"
  }
],
"ttlzone": 0,
"updated": 1465897394,
"deleted": 0
}
{
  "hostid": 4,
  "cn": "pbtest",
  "uuid": "969ecab2-93d8-4322-a8cf-6314457053bf",
  "fqdn": "pbtest",
  "attrs": [
    {
      "family": 4,
      "port": 24351,
      "addr": "192.168.16.184"
    }
  ],
  "ttlzone": 0,
  "updated": 1465898703,
  "deleted": 0
}
```

### Add a Specified Host ("cn" Common Name and "uuid" Are Required)

```
# pbdbutil --svc -u '{ "cn" : "pbtest" , "uuid" : "969ecab2-93d8-4322-a8cf-6314457053bf" }'
```

### Add New Service Group

```
# pbdbutil --svc -u '{ "svcname" : "foobar", "svc" : "logsvr" }'
```

### Add Host to Service Group

```
# pbdbutil --svc -u '{ "svcname" : "foobar", "cn" : "pbtest" }'
```

### Delete Host

```
# pbdbutil --svc -d '{ "cn" : "pbtest" }'
```

### Add Host to Service Group as Primary Server

```
# pbdbutil --svc -u '{ "svcname" : "foobar", "cn" : "pbtest", "role" : "primary" }'
```

### Delete Host When It Is a Primary

```
# pbdbutil --svc -d '{ "cn" : "pbtest" }'
```

**4011.01 Host** is a primary server. Please reassign primary before deleting host from service group, or use **force** on the \$.

### Delete the Service Group

```
# pbdbutil --svc -d '{ "svcname" : "foobar" }' --force
```

### Promote a Host That Is Currently a Secondary Server to a Primary Server

```
# pbdbutil --svc -p foobar pbtest
```

## Database Synchronization Options

These options allow the interrogation of Database Synchronization status on primary servers.

### Usage

```
pbdbutil --dbsync [<options>] [ <file> <file> ...]
```

<b>-l</b>	List Database Synchronization history
<b>-l [&lt;dbfile(s)&gt;]</b>	List outstanding Database Synchronization entries
<b>-c [&lt;dbfile(s)&gt;]</b>	Clear the outstanding synchronization entries from database
<b>-R &lt;svc&gt; [&lt;cn&gt;]</b>	Initiates a synchronize on database immediately even if there is no change, for specified service
<b>-A &lt;svcname&gt; &lt;...&gt;</b>	Set databases in Service Group(s) as being automatically synchronized
<b>-X &lt;svcname&gt; &lt;...&gt;</b>	Unset databases in Service Group(s) as being automatically synchronized

## Registry Name Service Cache Options

Each host has a Registry Name Service Cache that holds the Service Group information that is applicable to them.

These options allow the retrieval of information and options to re-initialize the Registry Name Service Cache database.

### Usage

```
pbdbutil --scache [<options>] [ <file> <file> ...]
```

<b>--cn</b>	Retrieve Common Name from the Registry Name Service
<b>-w</b>	Retrieve my Registry Name Service information

<b>-l</b>	List all the locally cached Registry Name Service entries
<b>-s &lt;[- +]attribute&gt;</b>	Sort the list of records by attribute name (asc/desc)
<b>-R</b>	Refresh the local Registry Name Service cache
<b>-N { param }</b>	Create and initialize the Primary Registry Name cache database where the { param } argument is formatted JSON with parameters: <ul style="list-style-type: none"> <li>• <b>"hostname" : "host1"</b>: hostname of the Registry Manager REST service</li> <li>• <b>"port" : 24351</b>: port of the Registry Manager REST service</li> <li>• <b>"appid" : "appid"</b>: appid of the Registry Manager REST service</li> <li>• <b>"appkey" : "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx"</b>: appkey of the Registry Manager REST service</li> </ul>
<b>-m &lt;msg&gt;</b>	Specify message. Required when change management enabled

## File Integrity Monitor Options

These options provide maintenance for the File Integrity Monitor database, and options for the client to run an Integrity Check.

### Usage

```
pbdbutil --fim [<options>] [ <file> <file> ...]
```

### Options for FIM Client

<b>-r</b>	Run FIM check
<b>-U</b>	Run FIM check and update database

### Options for FIM Server Database Management

<b>-n</b>	Create new FIM database
<b>-l</b>	List all FIM configurations in database
<b>-l</b>	Add an extra -l to list host assignments
<b>-s &lt;[- +]attribute&gt;</b>	Sort the list of records by attribute name (asc/desc)
<b>-i &lt;file&gt;</b>	Import FIM configuration file
<b>-e &lt;name&gt; &lt;file&gt;</b>	Export specified FIM configuration
<b>-g &lt;name&gt;</b>	Get FIM configuration by name
<b>-d &lt;name&gt;</b>	Delete FIM configuration
<b>-d { "cfg" : { "name" : "&lt;wildcard&gt;" } }</b>	Delete FIM configuration matching wildcard

<code>-u { "name" : "&lt;name&gt;", "cfg": { json param... } }</code>	Update FIM configuration
<code>-A &lt;name&gt; &lt;host(s)&gt;</code>	Assign host to configuration
<code>-X &lt;host(s)&gt;</code>	Unassign host from configuration
<code>-g { "rpt" : { "uuid" : "&lt;uuid&gt;" } }</code>	Get specified FIM report
<code>-g { "rpt" : { params ... } }</code>	Retrieve report summarized from multiple reports. See below for attributes.
<code>--format '[ "header", "header2", ... ]'</code>	Define retrieved fields when using CSV report
<code>-d { "rpt" : { "uuid" : "&lt;uuid&gt;" } }</code>	Delete FIM report
<code>-d { "rpt" : { params ... } }</code>	Delete FIM report(s) - see below for attributes
<b>-L</b> <b>[ Retrieve, List or Delete FIM reports, with attributes:</b> [ "name" : "<wildcard>", ] [ "uuid" : "<uuid>", ] [ "host" : "<wildcard>", ] [ "older" : <epoch>, ] [ "newer" : <epoch>, ] [ "older" : { "years" : n, "months" : n, "days" : n, "hours" : n } ] [ "newer" : { "years" : n, "months" : n, "days" : n, "hours" : n } ] [ "updates" : <bool>, ] [ "risk" : <lvl>, ] [ "risk_higher" : <lvl>, ] [ "risk_lower" : <lvl>, ] [ "regex" : true ] <b>-s &lt;[-+]attribute&gt;</b>	
<code>-s &lt;[-+]attribute&gt;</code>	Sort the list of records by attribute name (asc/desc)

## Event Logfile Cache Options

These options allow users to query and maintain the database that caches the event logfile names for use with BeyondInsight for Unix & Linux.

### Usage

```
pdbutil --evtcache [<options>]
```

Display cached list of eventlog files:

<code>--lstcache='{param...}'</code>	Use equals sign (=) for optional parameter
<code>  -S'{param...}'</code>	No space between switch name and optional parameter
<code>-s &lt;[-+]attribute&gt;</code>	Sort the list of records by attribute name (asc/desc)

Where the **{ param }** argument is formatted JSON parameters:

- {"path":"<pattern>"}: glob wildcard for logfile path
- {"runhost":"<host1>"}: Filter by runhost name
- {"loghost":"<host2>"}: Filter by loghost name
- {"from":"<yyyy-mm-dd HH:MM>"}: Filter by eventlogs active on or after this date/time
- {"to":"<yyyy-mm-dd HH:MM>"}: Filter eventlogs active on or before this date/time
- {"start":"<offset>"}: Specify record offset (number) when limiting output
- {"len":"<limit>"}: Specify number of rows when limiting output

Remove eventlog file entries from the logfile cache database:

```
-d '{param...}'
```

Where the **{ param... }** argument is formatted JSON parameters:

- {"path":"pattern"}: glob wildcard for logfile path
- {"loghost":"host2"}: Filter by loghost name
- {"from":"<yyyy-mm-dd HH:MM>"}: Filter eventlogs active on or after this date/time
- {"to":"<yyyy-mm-dd HH:MM>"}: Filter eventlogs active on or before this date/time

## I/O Logfile Cache Options

These options allow users to maintain the database that caches the I/O logfile names for use with BeyondInsight for Unix & Linux.

### Usage

```
pdbbutil --iocache [<options>]
```

Display cached list of IOlog files:

<b>--lstcache=[{ param... }]</b>	Use "=" for optional parameter
<b>  -S[{ param... }]</b>	No space between switch name and optional parameter
<b>-s &lt;[-+]attribute&gt;</b>	Sort the list of records by attribute name (asc/desc)

Remove IOlog file entries from the logfile cache database:

```
-d '{param...}'
```

Where the **{ param... }** argument is formatted JSON parameters:

- {"path":"pattern"}: glob wildcard for logfile path
- {"loghost":"host1"}: Filter by loghost name
- {"submithost":"host2"}: Filter by submithost name
- {"runhost":"host3"}: Filter by runhost name
- {"submituser":"user1"}: Filter by submituser name

- {"runuser":"user2"}: Filter by runuser name
- {"runcmd":"command"}: Filter by run command
- {"from":"<yyyy-mm-dd HH:MM>"}: Filter IO logs created on or after this date/time
- {"to":"<yyyy-mm-dd HH:MM>"}: Filter IO logs created on or before this date/time
- {"start":"<offset>"}: Specify record offset (number) when limiting output
- {"len":"<len>"}: Specify number of rows when limiting output

Migrate IOlog location cache database (Upgrades only):

```
-n [--force]
```

Migrates pre-v10.3.1 IOlog location cache database to the new database configuration.

Migration is automatically done during an upgrade via **pbinstall**. Running this manually is typically not necessary unless circumstances had prevented the automatic migration during the upgrade. The optional **--force** skips backup of the original/obsolete IOlog cache database if it already has been backed up by other methods.

Where the { **param** } argument is formatted JSON with parameters:

- "path":"pattern": glob wildcard for logfile path.
- "loghost":"host2": loghost name.
- "submithost":"host1": Filter by submithost name.
- "runhost":"host1": Filter by runhost name.
- "submituser":"user1": Filter by submituser name.
- "runuser":"user1": Filter by submituser name.
- "runcmd":"cmd": Filter by runcmd name.
- "from":"<yyyy-mm-dd HH:MM>": Filter by logfiles opened on or after this date/time.
- "to":"<yyyy-mm-dd> HH:MM": Filter by logfiles opened on or before this date/time.
- "start":"<offset>": Specify record offset (number) when limiting output.
- "len":"<limit>": Specify number of rows when limiting output.

## I/O Logfile Queue Options

These options allow users to maintain the database that queues the I/O logfile names for indexing to Solr.

### Usage

```
pbdbutil --iologidx[<options>]
```

<b>-l</b>	List queued iolog files
<b>-d &lt;wildcard spec&gt;</b>	Delete queued iolog files

When an iolog is started, **pblogd** (or **pbmasterd**) adds that iolog to the logfile queue with a **pblogd\_status** of **started** and **retry** set to **never**. When the iolog file is closed in a normal fashion, the **pblogd\_status** is set to **finished**. During the time that **pblogd** is active, it periodically sends a heartbeat. When an iolog is not properly closed (for example, **pbrun** killed or network issues), the heartbeat is used in conjunction with the **iologactionqueuetimelimit** keyword to artificially set the **pblogd\_status** to **finished**, so that iolog can be

processed for Solr or **iologcloseaction**. When an iolog is being processed for Solr or **iologcloseaction**, the **proc\_status** is set to **processing**. When solr or **iologcloseaction** has successfully completed, the **proc\_status** is set to **finished**. When solr reports a recoverable error, or **iologcloseaction** returns **-1**, the iolog is re-queued by setting **lastupdated** to **now**, setting **retry** (**now** + **iologactionretry** minutes), and incrementing the **retries**.

### Example

```
pbdbutil --iologidx -d \*
```

Delete all queued Iolog file names

## Integrated Product Options

These options provide options to configure the Integrated Products Queue database.

### Usage

```
pbdbutil --intprod [<options>] [ <file> <file> ...]
```

<b>-l</b>	List all entries in Integrated Product database queue
<b>-d &lt;wildcard&gt;</b>	Delete entries from Integrated Product database queue

## poldbg

### Description

Policy language debugging can be enabled, disabled, and reviewed using the **poldbg** option. With this command, you can list policy debugging entries in an attempt to identify and resolve issues that may have occurred within a policy. In addition, you can specify users whose policy will be debugged, and can even specify the amount of time that debugging will be enabled for that user and policy. The user executes the **pbrun** command, and the administrator can then review the debugging information.



**Note:** Policy debugging is only available for if statements and switch case statements.

### Syntax

Run to list debugging policy entries.

```
--poldbg -l
```

Run to identify users who can debug entries. You can also designate how long the user has access.

```
--poldbg -u
```

Run to view and print a clean output of events for policy debugging in JSON-equivalent format.

```
pbadmin -P --evt -s '{taxonomy" : policydbg }'
```

Run to view and print events for policy debugging in a CSV-type format.

```
pbadmin -C --evt -s '{taxonomy" : policydbg" }'
```

### Example

```
pbadmin --poldbg -u rjones 2h
```

In this example, the user **rjones** is specifically allowed to debugging access for two hours.

```
pbadmin -C --evt -s '{taxonomy" : policydbg", "rowid" : 3 }'
```

In this example, the events are going to be provided in a CSV--type format in which the information specifically in row three is expanded.

## pbencode

**pbencode** reads a file and encrypts it using the encryption key that is specified on the command line or in the settings file. The encrypted result is displayed on the standard output.



***pbencode** should be used only on files that are backed up. There is no way to decrypt a file after it has been encrypted.*

### Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pbencode [options]
  -f, --file=file_name
  -E, --encryptiontype=policy|report|settings
pbencode -v | --version
pbencode -h | --help
```

### Arguments

<b>-f, --file=file_name</b>	The input file to encode. The default is the policy configuration file.
<b>-E, --encryptiontype =policy  report settings</b>	The encryption type to use, based on the definition set in the settings file.
<b>-v, --version</b>	Optional. Print the <b>pbencode</b> version and exit.
<b>-h, --help</b>	Optional. Display the <b>pbencode</b> help message and exit.

## Files

The files used may appear on the command line.

## Example

```
pbencode -f /opt/pbul/policies/pb.conf -E policy > /etc/pb.conf.enc
```

Encodes the policy file with the encryption type and key that is specified in the settings file and places the result in **/etc/pb.conf.enc**.

## See Also

pbkey

## pbguid

The **pbguid** command runs the server for the browser-based Privilege Management for Unix & Linux GUI. This program enables you to change settings files, view event and I/O logs (including archived I/O logs), edit policy configuration files, run the event log report writer, and update the GUI configuration. A socket-listener process (typically **inetd**, **xinetd**, or **pbguid -d -p**) starts **pbguid**.

Changes that are made to the **pb.settings** file after the daemon is started will not affect the operation of the daemon. If you change the **pb.settings** file, then you must restart the daemon for the changes to take effect. If you do not restart the daemon, then the daemon continues to operate using a snapshot of the **pb.settings** file that was cached at the time the daemon was started.

Start the GUI by pointing a browser at a machine with the GUI installed and using the appropriate protocol. For example, on a machine called **pbguidhost** with the GUI running on port 24348 using HTTP, a user would type <http://pbguidhost:24348> in the browser.

The GUI user is authenticated by checking the entered user name and password against the Unix/Linux passwords on the host that is running **pbguid**.

The user is authorized by a request that is sent from **pbguid** to the Policy Server **pbmasterd** with the **pbclientname** of **pbguid** and the variables **browserip** and **browserhostname** set. The browser variables might reflect the proxy name if the browser uses a proxy to get to the **pbguid** machine.

The type of requested activity is indicated by arguments that are sent to **pbmasterd**. These arguments are checked against the policy file to determine if the user is allowed to conduct the activity.

For all activities:

- The value of the **pbclientname** variable is set to **pbguid**
- The value of the command variable is set to **pbguid**
- The value of **argv[0]** is set to **pbguid** (or the prefix/suffix version of the **pbguid** command name). Each activity is identified by the values of **argv[1]**, **argv[2]**, and **argv[3]**, as shown in the following table.

Activity	argv[1]	argv[2]	argv[3]
Selecting a file with File Browser	browse		
Viewing an I/O log	iolog	file name of I/O log	
Viewing an event log	log		
Updating the settings file	settings		
Updating the GUI Configuration options	defaults		

Activity	argv[1]	argv[2]	argv[3]
Accessing the Policy Editor	policy		
Saving a policy file	save	policy file name	
Saving a policy file to a different file name	report	new policy file name	original policy file name
Accessing the event log reporting pages	report		
Creating a new event log report set	report	edit	
Selecting event log fields for a report set	report	select	
Editing an existing event log report set	report	edit	report set file name
Executing an event log report set	report	exec	report set file name
Retrieving information about an event log report set	report	info	report set file name
Saving an event log report set	report	save	report set file name
Accessing the entitlement reporting pages	entitlement		
Creating a new entitlement report set	entitlement	edit	
Editing an existing entitlement report set	entitlement	edit	report set file name
Executing an entitlement report set	entitlement	exec	report set file name
Retrieving information about an entitlement report set	entitlement	info	report set file name
Saving an entitlement report set	entitlement	save	report set file name
Access the Task Manager	console		

You can distinguish the *accessing the event log reporting pages* activity from the other event log reporting activities by checking the value of **argc**, which will be **2** for the accessing activity and **3** or **4** for the other activities. Use a similar technique to distinguish the *accessing the entitlement reporting pages* activity from the other entitlement reporting activities.



For more information about the **pbclientname**, **command**, **argv**, and **argc** variables, please see the [Privilege Management for Unix & Linux Policy Language Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

## Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pbguid [options]
  -d, --daemon
  -e, --error_log=log_file
  -f, --foreground
  -p, --port=port_number
  -S, --secure
pbguid -v | --version
pbguid -help
```

## Arguments

<b>-e, --error_log=log_file</b>	Optional. Specifies a diagnostic log.
<b>-S, --secure</b>	Optional. Uses <b>HTTPS</b> rather than <b>HTTP</b> as the protocol. This option provides a more secure mode of operation.   <b>Note:</b> In version 6.0 and later, the <b>--https</b> long command option is no longer valid. Use <b>--secure</b> instead.
<b>-d, --daemon</b>	Optional. Run as a stand-alone daemon instead of from <b>inetd</b> or <b>xinetd</b> . This option can be specified only with the port number. For example:  <pre>pbguid -d -p</pre>
<b>-f, --foreground</b>	Run as a foreground job instead of forking and dissociating from the current job. This is the most useful for running <b>pbguid</b> from <b>inittab</b> .
<b>-p, --port=port_number</b>	Optional. Listens to the specified port, instead of the default, when running as a stand-alone daemon. This option requires <b>-d</b> .
<b>-v, --version</b>	Optional. Displays the <b>pbguid</b> version and exits.
<b>--help</b>	Displays the <b>pbguid</b> help message and exits.

## Files

- Privilege Management for Unix & Linux settings file
- Privilege Management for Unix & Linux configuration file

## See Also

pbbench, pbcheck, pbkey, pbmasterd, pbreplay

## pbhostid



**Note:** *pbhostid* has been deprecated in version 10.0. Use **pbddadmin --info --uid**.

## pbkey

The **pbkey** program generates an encryption key that is suitable for any of the Privilege Management encryption algorithms and stores it in a file that is specified on the command line or in the settings file. If **pbrun**, **pbmasterd**, or **pblocald** find the file **/etc/pb.key**, then they use it to encrypt data that is sent to the other programs.

If encryption is used, then the Privilege Management for Unix & Linux programs use the key that is specified in the settings file to encrypt local data and network traffic.

For network traffic, the contents of this file must be the same on all machines that are running Privilege Management for Unix & Linux for requests to execute. The file should be owned by root and have permissions set so that only root can read or write the file.

### Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported
- **Version 8.5 and later:** **-F** option added

```
pbkey [options]
    -f, --keyfile=key_file_name
    -F, --seckeyfile=key_file_name
pbkey -v | --version
pbkey -h | --help
```

### Arguments

<b>f, --keyfile=key_file_name</b>	Optional. The name of the key file to create. The default is the value that is specified in the settings file or <b>/etc/pb.key</b> .
<b>-F --seckeyfile=key_file_name</b>	Optional. The name of the new high security key file to create. This <b>-F --seckeyfile=key_file_name</b> key file format must be used when enhanced security is required. Available in v8.5 or later.
<b>-v, --version</b>	Optional. Displays the <b>pbkey</b> version and exits.
<b>-h, --help</b>	Optional. Displays the program's help message and exits.

### Files

<b>key_file_name</b>	The resulting key file.
----------------------	-------------------------

### Example

Executing the command generates a new key and puts it into the file **/etc/pb.key**:

```
pbkey /etc/pb.key
```

## See Also

```
pbcheck, pbhostid, pblocald, pbmasterd, pbpasswd, pbreplay, pbrun, pbsum
```

## pbless

- **Version 4.0.0 and later:** **pbless** setting available

The **pbless** pager is similar to the **less** pager. It has been modified so that it can be used securely with the Privilege Management for Unix & Linux programs. Security is enhanced by the following features:

- **pbless** must be started with a full path name specified for the file to be read.
- The user will not be able to access any files other than the one that is specified at startup time.
- The user will not be allowed to spawn any processes.

This program, when used in conjunction with Privilege Management for Unix & Linux, allows users to access a specific file as root but not to access other **root** functions.

## Syntax

```
pbless fullpathname
```

## Arguments

```
fullpathname
```

File to display

## Files

None

## Example

In the example the contents of the file called **filename** are displayed.

```
pbless filename
```

## See Also

```
pbrun
```

## pblicense



**Note:** *pblicense* has been deprecated in version 10.0 of Privilege Management for Unix & Linux. Please use *pbadmin* with the *--lic* option to maintain licenses.

## pblocald

**pblocald** is the local daemon that runs programs, when instructed, by the appropriate Policy Server daemon. A socket-listener process (typically **inetd**, **xinetd**, Solaris SMF, or **pblocald -d**) starts **pblocald**. **pblocald** checks the command line arguments (**-m** or **--accept\_masters**), the **acceptmasters** setting in the settings file, or the netgroup **pbacceptmasters** to determine the Policy Server hosts from which it accepts requests.

Requests from Policy Server daemons that are not in this list are refused. **pblocald** logs all diagnostic messages in the log file that is specified by the **-e** command line argument or by the **pblocaldlog** setting.

Changes that are made to the **pb.settings** file after the **pblocald** daemon is started will not affect the operation of the daemon. If you change the **pb.settings** file, then you must restart the daemon for the changes to take effect. If you do not restart the daemon, then the daemon continues to operate using a snapshot of the **pb.settings** file that was cached at the time the daemon was started.

### Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pblocald [options]
-a, --syslog_accepts
-m, --accept_masters=host_list
-d, --daemon
-D, --debug=<level>
-e, --error_log=log_file_name
-f, --foreground
-i, --info <argument placeholder characters>
-p, --port=port_number
-s, --syslog
-V, --check_version
pblocald -v | --version
pblocald --help
```

### Arguments

<b>-a, --syslog_accepts</b>	Optional. Records accepted tasks in the syslog. <b>Version 6.2 and earlier:</b> option not available <b>Version 7.0 and later:</b> option available
<b>-m, --accept_masters=host_list</b>	Optional. A list of Policy Server hosts from which <b>pblocald</b> accepts secured task requests. The list can include hostnames, IP addresses, DNS SRV lookups, and external program specifications
<b>-d, --daemon</b>	Optional. Runs as a standalone daemon instead of from <b>inetd</b> or <b>xinetd</b> .

	<p>This mode listens to the port that is defined by the <b>-p</b> command line argument or in the localport setting.</p>
<b>-D, --debug=&lt;level&gt;</b>	<p>Generate debug trace logs in the same directory pointed to by <b>pblocaldlog</b>.</p> <p><b>Version 7.5 and earlier:</b> option not available</p> <p><b>Version 8.0 and later:</b> option available</p>
<b>-e, --error_log=log_file_name</b>	<p>Optional. Records diagnostic messages in the file <b>logfile</b> instead of using the settings file entry <b>pblocald-log</b>.</p>
<b>-f, --foreground</b>	<p><b>pblocald</b> normally spawns a child process and dissociates from the job that it starts. Although this method is beneficial when running from <b>inetd</b>, <b>xinetd</b>, or the command line, it stops <b>pblocald</b> from running under the init daemon (from <b>/etc/inittab</b>). This option prevents <b>pblocald</b> from dissociating and allows it to run from the <b>inittab</b>.</p>
<b>-i -info &lt;argument placeholder characters&gt;</b>	<p>On Linux, Mac OS X, and AIX, the <b>pblocald</b> process will replace the argument placeholder characters with the following information about the submitting request:</p> <ul style="list-style-type: none"> <li>• submitting user</li> <li>• submit host</li> <li>• pbrun's pid</li> <li>• runuser</li> <li>• runargv</li> </ul> <p>The format is:</p> <pre>submituser@submithost pid runuser: runargv</pre> <p>This allows an administrator to use the <b>ps</b> command to view more information about the running <b>pblocald</b> processes.</p> <div style="border: 1px solid black; padding: 5px; background-color: #e0f0ff;"> <p> <b>Note:</b> This feature is not available on HP-UX and Solaris.</p> </div>
<b>-p, --port=port_number</b>	<p>Optional. When running as a standalone daemon, listens to the provided port instead of the default.</p>
<b>-s, --syslog</b>	<p>Optional. Sends error messages to syslog in addition to the diagnostic message file.</p> <p><b>-s</b> works only if <b>/etc/syslog.conf</b> is configured to have syslog process <b>auth.err</b> (or less severe) messages.</p>
<b>-V, --check_version</b>	<p>Optional. Records diagnostic messages if a connecting client version does not match the <b>pbmasterd</b> version</p>
<b>-v, --version</b>	<p>Optional. Displays the program version and exit.</p>
<b>--help</b>	<p>Optional. Displays the program's help message and exit.</p>

## Files

The `/etc/pb.settings` file that contains a list of valid **acceptmasters** hosts

## See Also

`pbcheck`, `pbhostid`, `pbkey`, `pbmasterd`, `pbpasswd`, `pbreplay`, `pbrun`, `pbsum`

## pblog

The **pblog** program selectively displays entries from an event log. Each time a job is accepted, rejected, or completed, or a keystroke action event occurs, an entry is appended to the **eventlog** file. The **eventlog** file is specified by the **eventlog** setting in the settings file or by the **eventlog** variable in the Privilege Management for Unix & Linux policy file. By default, the **eventlog** variable is set to `/var/log/pb.eventlog`, `/usr/log/pb.eventlog`, `/var/adm/pb.eventlog`, or `/usr/adm/pb.eventlog`, depending on the operating system.

With no command line arguments, **pblog** reads and displays all entries in the default **eventlog** file. You can specify a different event log with the `-f` or `--eventlog` argument. You can specify a decryption key file with the `-k` or `--keyfile` argument.

## Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pblog [options]
  -a, --accept_format=expression
  -c, --constraint=expression
  -d, --dump
  -e, --finish_format=expression
  -f, --eventlog=file_name
  --db
  --ff
  --odbc
  -i, --keystroke_format=expression
  -k, --keyfilefile_name
  -l, --verbose
-o, --dbout=file_name>
  -O, --odbcout=<dsn>
  -D, --diff
  -p, --all_formats=expression
  -q, --quiet
  -r, --reject_format=expression
  -t, --tail
pblog -X|--xml [options]
  -c, --constraint=<expression>
  -F, --field_list=field_names
  -f, --eventlog=file_name
  -k, --keyfile=file_name
pblog -C|--csv [options]
  -c, --constraint=expression
  -F, --field_list=field_names
  -f, --eventlog=file_name
  -H, --csv_header
```

```

        -k, --keyfile=file_name
        -S, --csv_separator
pblog  -J, --json
        -P, --pretty
pblog  -v|--version
pblog  --help
    
```

## Arguments

<b>-a, --accept_format=expression</b>	Optional. Format expression for accept events.
<b>-c, --constraint=expression</b>	Optional if the expression is the last argument on the command line. Constrains entries according to the expression.
<b>-C, --CSV</b>	Optional. Produces comma-separated value (CSV) output.
<b>-d, --dump</b>	Optional. Dumps entries as they are read.
<b>-e, --finish_format=expression</b>	Optional. Format expression for finish events.
<b>-f, --eventlog=file_name</b>	Optional. Alternate event log to report.
<b>--db</b>	Optional. Alternate event log is a database.
<b>--ff</b>	Optional. Alternate event log is a flat file.
<b>--odbc</b>	Optional. Alternate event log is a ODBC DSN.
<b>-F, --field_list=field_names</b>	Optional field list to be displayed for CSV and XML output. When specifying multiple field names, enter them as comma-separated values (no spaces).
<b>-H, --csv_header</b>	Optional. Produces a field-name header in CSV mode.
<b>-i, --keystroke_format =expression</b>	Optional. Format expression for keystroke action events.
<b>-k, --keyfile=file_name</b>	Optional. Name of the encryption key file. The <b>file_name</b> specified needs to be listed as one of the <b>keyfile</b> in <b>eventlogencryption</b> keyword.
<b>-l, --verbose</b>	Optional. Turns on verbose mode. Prints all variables, one per line.
<b>-o, --dbout=file name&gt;</b>	Optional. Copy missing records to database.
<b>-O, --odbcout=&lt;dsn&gt;</b>	Optional. Copy missing records to ODBC.



**Note:** This attribute does not apply to Privilege Management for Unix & Linux Basic.



For more information about syntax to specify multiple encryption algorithms and files, please see "[eventlogencryption](#)" on page 178.

<b>-D, --diff</b>	Optional. Report differences instead of copying.
<b>-p, --all_formats=expression</b>	Optional. Print format expression for all events.
<b>-q, --quiet</b>	Optional. Turns on quiet mode. Do not report expression errors (for example, undefined variables).
<b>-r, --reject_format=expression</b>	Optional. Format expression for reject events.
<b>-S, --csv_separator</b>	Optional. Field separator for CSV mode (default is comma).
<b>-t, --tail</b>	Optional. Tail mode. Loop and report new entries as they occur (forces dump mode).
<b>-J --json</b>	Optional. Produces output in JSON format.
<b>-P --pretty</b>	Optional. Pretty print.
<b>-v, --version</b>	Optional. Displays the <b>pblog</b> version and exits.
<b>-X, --xml</b>	Optional. Produces XML-formatted output.
<b>--help</b>	Optional. Displays the program help message and exit.

### Default Output Expressions

<b>Accept Dump</b>	<pre>printf('%s %s %s %s %s@%s -&gt; %s@%s\n\t%s', uniqueid, event, date, time, user, submithost, runuser, runhost, join(runargv))</pre>
<b>Reject Dump</b>	<pre>printf('%s %s %s %s %s@%s\n\t%s', uniqueid, event, date, time, user, submithost, join(argv))</pre>
<b>End/Finish Dump</b>	<pre>printf('%s %s %s', uniqueid, event, exitstatus) printf('%s %s %s %s@%s -&gt; %s@%s\n\t%s\n\t%s', event, date,</pre>
<b>Accept</b>	<pre>time, user, submithost, runuser, runhost, join(runargv), exitstatus)</pre>
<b>Reject</b>	<pre>printf('%s %s %s %s@%s\n\t%s', event, date, time, user, submithost, join(argv))</pre>
<b>End/Finish</b>	<pre>printf('%s %s %s', uniqueid, event, exitstatus)</pre>
<b>Keystroke</b>	<pre>printf('%s %s %s %s %s', event, keystrokestatus, keystrokedate, keystroketime, keystroke)</pre>

## Read an Event Log

If `pblog` is run without the `-f <file_name>` option, it tries to read the file defined by `eventlog` in `pb.settings` if available, or it uses a default pathname.



For more information, please see the default values listed in "eventlog" on page 113.

Starting in v10.3.0, `pblog` assumes by default that the event log is a SQLite database. If the file you want `pblog` to read is not a SQLite database, or if the file is different from the one specified by the `eventlog` setting, the option `-f`, along with `--db`, `--ff` or `--odbc` should be used.



**Note:** If `eventdestinations` setting is commented out in the configuration file or is set to `authevt=db` and the option `-f <file_name>` was not provided, `pblog` will use the filename specified in the `eventlog` settings but will implicitly append `.db` to the name when processing it.

Example of reading a SQLite DB event log whose path is specified in the `eventlog` setting:

```
# pblog
```

Example of reading a specific SQLite DB event log:

```
# pblog -f /path/to/mypb.eventlog.db --db
```

Example of reading a specific flat file event log:

```
# pblog -f /path/to/mypb.eventlog.flat --ff
```

Example of reading an ODBC type event log:

```
# pblog -f MyDSN --odbc
```

In the case above, `odbc.ini` and `odbcinidir` files located in the directory specified in `odbcinidir` setting (default `/etc/pbul/etc`) will be read to get the connection information to the MySQL or Oracle database.

## Copy Event Log Records

If multiple targets for authorized events were defined in `eventdestinations`, or if you want to copy eventlog records from one eventlog file to another, the options `-o` (output to SQLite database) or `-O` (output to ODBC database) can be used. This will only copy the eventlog records with a uniqueid that does not exist in the destination.

Example of copying from a flat file to a SQLite database:

```
# pblog --ff -f /var/log/pb.eventlog.flat -o /var/log/pb.eventlog.db
```

### Example of copying records from a flat file to the ODBC database:

```
# pblog --ff -f /var/log/pb.eventlog.flat -O MyDSN
```

Where **MyDSN** is the ODBC Data Source Name whose connection information to the MySQL or Oracle database is configured in the **odbc.ini/odbcinst.ini** files (see **odbcinidir** setting).

### Example of copying records from a SQLite database to the ODBC database:

```
# pblog --db -f /var/log/pb.eventlog.db -O MyDSN
```

Where **MyDSN** is the ODBC Data Source Name whose connection information to the MySQL or Oracle database is configured in the **odbc.ini/odbcinst.ini** files.



For more information, please see "**odbcinidir**" on page 116.

### Report Difference Between Event Log Destinations:

If multiple event destinations were used, and you want to report on records that might be in one destination but not another, you can use **-o**, **-O** with **-D** option:

### Example of reporting differences between event log records in a flat file versus a SQLite database:

```
# pblog --ff -f /var/log/pb.eventlog.flat -o /var/log/pb.eventlog.db -D
uniqueid,etype,epoch
ac1420215df2ac3604C5,Reject,2020/02/20 13:08:06
ac1420215df2ac3604C7,Accept,2020/02/20 13:08:06
ac1420215df2ac3604C7,Finish,2020/02/20 13:08:54
ac1420215df2ac3704C9,Accept,2020/02/20 13:08:07
ac1420215df2ac3704C9,Finish,2020/02/20 13:08:55
```

### Example of reporting differences between event log records in a flat file versus a MySQL database:

```
# pblog --ff -f /var/log/pb.eventlog.flat -O MyDSN -D
uniqueid,etype,epoch
ac1420215df2ac3604C5,Reject,2020/02/20 13:08:06
ac1420215df2ac3604C7,Accept,2020/02/20 13:08:06
ac1420215df2ac3604C7,Finish,2020/02/20 13:08:54
ac1420215df2ac3704C9,Accept,2020/02/20 13:08:07
ac1420215df2ac3704C9,Finish,2020/02/20 13:08:55
```

### Example of reporting differences between event log records in a SQLite database versus an Oracle database:

```
# pblog --db -f /var/log/pb.eventlog.db -O oracle -D
uniqueid,etype,epoch
ac1420215df2ac6d04EC,Reject,2020/02/20 13:09:01
ac1420215df2ac6d04EE,Accept,2020/02/20 13:09:01
```

```
ac1420215df2ac6d04EE,Finish,2020/02/20 13:09:49
ac1420215df2ac6d04F1,Accept,2020/02/20 13:09:01
ac1420215df2ac6d04F1,Finish,2020/02/20 13:09:49
```

## Dumping Records in JSON Format

Starting with v10.3.0, the option **-J** has been added to display the eventlog records in JSON format. Combine with **-P** to enhance readability.

### Example:

```
# pblog --db -f /var/log/pb.eventlog.db -J -P
```

### See Also

pbmasterd

## pblogd

**pblogd** is the log server daemon that records event and I/O logs as directed by other Privilege Management for Unix & Linux programs. A socket-listener process (typically **inetd**, **xinetd**, or **pblogd -d**) starts **pblogd**.

Changes that are made to the **pb.settings** file after the daemon is started will not affect the operation of the daemon. If you change the **pb.settings** file, then you must restart the daemon for the changes to take effect. If you do not restart the daemon, then the daemon continues to operate using a snapshot of the **pb.settings** file that was cached at the time the daemon was started.

### Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pblogd [options]
-a, --syslog_accepts
-d, --daemon
-D, --debug=<level>
-e, --error_log=log_file_name
-f, --foreground
-i, --info <argument placeholder characters>
-p, --port=port_number
-r, --syslog_rejects
-s, --syslog
pblogd -v | --version
pblogd --help
```

### Arguments

<b>-a, --syslog_accepts</b>	Optional. Records accepted task requests in the syslog.
<b>-d, --daemon</b>	Optional. Runs as stand-alone daemon instead of from <b>inetd</b> or <b>xinetd</b> . This

	mode listens to the port that is defined in the <b>logdport</b> setting or the <b>-p</b> command line argument.
<b>-D,</b> <b>--debug=&lt;level&gt;</b>	Optional. Generate debug trace logs in the same directory pointed to by <b>pblogdlog</b> . <b>Version 7.5 and earlier:</b> option not available <b>Version 8.0 and later:</b> option available
<b>-e, --error_log=log_file_name</b>	Optional. Records diagnostic messages in the file <b>logfile</b> .
<b>-f, --foreground</b>	Optional. Run in the foreground when using daemon mode.
<b>-i, -info &lt;argument placeholder characters&gt;</b>	On Linux, macOS, and AIX, the <b>pblogd</b> process will replace the argument placeholder characters with the following information about the submitting request: <ul style="list-style-type: none"> <li>• submitting user</li> <li>• submit host</li> <li>• pbrun's pid</li> <li>• runuser</li> <li>• runargv</li> </ul> The format is: <pre>submituser@submithost pid runuser: runargv</pre> This allows an administrator to use the <b>ps</b> command to view more information about the running <b>pblogd</b> processes. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  <b>Note:</b> This feature is not available on HP-UX and Solaris.                 </div>
<b>-p, --port=port</b>	Optional. When running as a stand-alone daemon, listens to the provided port instead of the default.
<b>-r, --syslog_rejects</b>	Optional. Records rejected task requests in the syslog (unless Privilege Management for Unix & Linux is configured with a log server).
<b>-s, --syslog</b>	Optional. Records diagnostic messages in the syslog. <b>-s</b> works only if <b>/etc/syslog.conf</b> is configured to have syslog process <b>auth.err</b> (or less severe) messages.
<b>-v, --version</b>	Optional. Displays the program version and exits.
<b>--help</b>	Optional. Displays the program help message and exits.

## Files

<b>/etc/pb.settings</b>	Privilege Management for Unix & Linux settings file
-------------------------	---

## See Also

`pbcheck`, `pbhostid`, `pbkey`, `pbmasterd`, `pblocald`, `pbpasswd`, `pbreplay`, `pbrun`, `pbsum`

## pbmasterd

The Policy Server daemon, **pbmasterd**, is the Privilege Management for Unix & Linux decision-maker. **pbmasterd** receives secured task requests from **pbrun**, **pbguid**, **pbksh**, and **pbsh** and evaluates them according to the policy that is written in the configuration file that is specified in the settings file or `/opt/pbul/policies/pb.conf`. If the request is accepted, then **pbmasterd** directs either the client or **pblocald** to run the request in a controlled account such as root.

Policy Server daemons should reside on a secure machine and are started from a socket-listener process (typically **inetd**, **xinetd**, or **pbmasterd**).

**pbmasterd** expects to find the configuration file in the **policyfile** setting in the settings file (default `/opt/pbul/policies/pb.conf`) on the host where **pbmasterd** resides. There may be more than one Policy Server daemon on different hosts for redundancy or to serve multiple networks.

**pbmasterd** logs all diagnostic messages in a log file that is specified by the **pbmasterdlog** setting or the **-e** command line argument.

Changes that are made to the **pb.settings** file after the daemon is started will not affect the operation of the daemon. If you change the **pb.settings** file, then you must restart the daemon for the changes to take effect. If you do not restart the daemon, then the daemon continues to operate using a snapshot of the **pb.settings** file that was cached at the time the daemon was started.

## Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pbmasterd [options]
-a, --syslog_accepts
-d, --daemon
--disable_optimized_runmode
-D, --debug=<level>
-e, --error_log=log_file_name
-f, --foreground
-i, --info <argument_placeholder_characters>
-p, --port=port
-r, --syslog_rejects
-s, --syslog
-V, --check_version
pbmasterd -v | --version
pbmasterd --help
```

## Arguments

**-a, --syslog\_accepts**

Optional. Sends job accept messages to syslog (unless Privilege Management for Unix & Linux is configured with a log server).

**-d, --daemon**

Optional. Runs as a stand-alone daemon instead of from **inetd** or **xinetd**. This mode listens to the port that is defined in the **masterport** setting or by the **-p** command line argument.

<code>--disable_optimized_runmode</code>	<p>Optional. Disable <b>pbrun</b> optimization and use <b>pblockd</b> even when submit host and run host are the same.</p> <p><b>Version 4.0 and earlier:</b> option not available</p> <p><b>Version 5.0 and later:</b> option available</p>
<code>-D, --debug=&lt;level&gt;</code>	<p>Generate debug trace logs in the same directory pointed to by <b>pbmasterrlog</b>.</p> <p><b>Version 7.5 and earlier:</b> option not available</p> <p><b>Version 8.0 and later:</b> option available</p>
<code>-e, --error_log=log_file_name</code>	Optional. Records diagnostic messages in the file logfile.
<code>-f, --foreground</code>	<p><b>pbmasterrd</b> normally spawns a child process and dissociates from the job that starts it. Although this method is beneficial when running from <b>inetd</b>, <b>xinetd</b>, or the command line, it stops <b>pbmasterrd</b> from running under the init daemon (from <b>/etc/inittab</b>). This switch prevents <b>pbmasterrd</b> from dissociating and allows it to run from the <b>inittab</b>.</p>
<code>-i -info &lt;argument placeholder characters&gt;</code>	<p>On Linux, macOS, and AIX, the <b>pbmasterrd</b> process will replace the argument placeholder characters with information about the submitting request. Prior to evaluating the policy, this includes the submitting user, submit host, pbrun's pid, the word "EVALUATING", requestuser, requested argv. After evaluating the policy, this is changed to include submitting user, submit host, pbrun's pid, runuser, runargv.</p> <p>This allows an administrator to use the <b>ps</b> command to view more information about the running <b>pbmasterrd</b> processes.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  <b>Note:</b> This feature is not available on HP-UX and Solaris.                 </div>
<code>-p, --port=port</code>	Optional. When running as a standalone daemon, listen to the provided port instead of the default.
<code>-r, --syslog_rejects</code>	Optional. Sends job reject messages to syslog (unless Privilege Management for Unix & Linux is configured with a log server).
<code>-s, --syslog</code>	Optional. Sends diagnostic messages to syslog.
<code>-V, --check_version</code>	Optional. Records diagnostic messages if the connecting client's version does not match the <b>pbmasterrd</b> version.
<code>-v, --version</code>	Optional. Displays the program's version and exits.
<code>--help</code>	Optional. Displays the program's help message and exits.

## Files

<code>/opt/pbul/policies/pb.conf</code>	Privilege Management for Unix & Linux configuration file
---	--

## See Also

pbcheck, pbguid, pbhostid, pbkey, pbksh, pblockd, pbpasswd, pbprint, pbreplay, pbrun, pbsh, pbsum

## pbmg

- **Version 4.0.0 and later:** **pbmg** setting available

The **pbmg** editor is similar to the **mg** editor. **mg** is a small version of GNU **emacs** with GNU-style **emacs** key bindings. The **pbmg** version has been modified so that it can be used securely with the Privilege Management for Unix & Linux programs. Security is enhanced by the following features:

- **pbmg** must be started with a full path name specified for the file to be opened.
- The user cannot access any files other than the one that is specified at startup time.
- The user is not allowed to spawn any processes.

This program, when used with Privilege Management for Unix & Linux, allows users to access a specific file as **root**, but not other **root** functions or files.

### Syntax

```
pbmg fullpathname
```

### Arguments

<b>fullpathname</b>	File to edit
---------------------	--------------

### Files

None

### Example

Executing the following displays the contents of the **fullpathname** file for editing:

```
pbmg fullpathname
```

### See Also

```
pbrun
```

## pbnvi

- **Version 4.0.0 and later:** **pbnvi** setting available

The **pbnvi** editor is similar to the standard vi editor. It has been modified so that it can be used securely with the Privilege Management for Unix & Linux programs. The user cannot access any files other than the ones that are specified at startup time. The user also is not allowed to spawn any processes.

This program, when used in conjunction with Privilege Management for Unix & Linux, can allow users to access a specific file as **root**, but not access other **root** functions or files.

The edited file is written back to the same path. If this path has been changed by an external process, then the file is written to the new location to which the path now refers. Whenever **pbnvi** is run from Privilege Management for Unix & Linux, the arguments should be checked to ensure that the user could not change the path and introduce a security hole.

## Syntax

```
pbnvi fullpathname
```

## Arguments

<b>fullpathname</b>	File to edit
---------------------	--------------

## Files

None

## Example

Entering the following displays the contents of the **fullpathname** file for editing:

```
pbnvi fullpathname
```

## See Also

```
pbrun
```

## pbpasswd

**Version 10.3.0:** **pbpasswd** deprecated. **pbpasswd** functionality is supported through the **pbadmin** program.

**pbpasswd** generates an encrypted password that can be used by the **getstringpasswd()** function in the configuration file. When you run **pbpasswd**, you can specify a password with the **-i** option or provide it on standard input. If standard input is a **tty**, then the program asks you to type the password twice; otherwise, it reads the raw password from standard input.

The program then writes the encrypted version of the password to the file that is specified by the **-o** option, or prints it on standard output.

## Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pbpasswd [options]
-i, --password=password
-o, --output=filename
pbpasswd -v | --versions
pbpasswd --help
```

## Arguments

<b>-i, --password=password</b>	Optional. The password to encrypt.
<b>-o, --output=filename</b>	Optional. Writes the encrypted version of the password to the specified output file.
<b>-v</b>	Optional. Display the <b>pbpasswd</b> version and exit.
<b>--help</b>	Displays the program help message and exits.

## Files

None

## Examples

In the following example, encrypts the string **FELIX** and places the encrypted result in the file **/tmp/pbpasswd.out**.

```
pbpasswd -i FELIX -o /tmp/pbpasswd.out
```

In the following example, the string **FELIX** is hashed and displayed. The first line shows the command that was entered and the second line shows the hashed string.

```
pbpasswd -i FELIX
0123m68dg5.87
```

The following example prompts for a new password, encrypts it, and displays the result in the standard output. The first line shows the command **tat** was entered, and the next two lines prompt for the password and prompt for the password to be retyped. The final two lines display the result of the hashed string.

```
pbpasswd
Enter Password:
Retype Password:
The encrypted password is:
4567j68gf5.88
```

## See Also

```
pbcheck, pbmasterd, pbrun
```

## pbping

- **Version 6.2 and earlier:** **pbping** not available
- **Version 7.0 and later:** **pbping** available

The **pbping** program is BeyondTrust Privilege Management's client connectivity health check utility. **pbping**, run from a Policy Server daemon, checks connectivity to licensed clients' **pblocald** daemon. When run without options, **pbping** checks connectivity to all licensed clients.

## Syntax

```
pbping [options]
  -h, --host host_name|IP_address
  --csv
pbping -v, --version
pbping --help
```

## Arguments

<b>-h, --host host_name IP_address</b>	Checks a single host by host name or IP address.
<b>--csv</b>	Produces output in comma-separated values.
<b>-v, --version</b>	Displays the program information and exit.
<b>--help</b>	Displays the program help message and exit.

## Files

None

## Example

The following example checks the status of all client hosts and returns the results in comma-separated values format:

```
pbping --csv
```

The following example checks the status of **host1**:

```
pbping -h host1
```

## See Also

```
pbcheck, pblocald, pbmasterd
```

## pbprint

The **pbprint** program is used to format a configuration file. It reads the specified file and sends the formatted information to standard output. **pbprint** ignores incoming white space and places white space, indentation, and line breaks in the appropriate places. Except for line breaks that are added at the ends of statements, the program attempts to preserve line breaks from the original file as much as possible.

## Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pbprint [options]
  -f, --input=file_name
pbprint -v | --version
pbprint --help
```

## Arguments

<b>-f, --input=&lt;filename&gt;</b>	Specifies the policy configuration file to use.
<b>-v, --version</b>	Displays the program information and exit.
<b>--help</b>	Displays the program help message and exit.

## Files

None

## Example

The following example prints the policy file:

```
pbprint
```



**Note:** If the installation is prefixed and/or suffixed, then the prefixed and/or suffixed configuration file is printed.

The following example prints the policy file at the specified path:

```
pbprint -f <pathtofilename>
```

The following example prints the policy file at the specified path:

```
pbprint --input=<pathtofilename>
```

## See Also

```
pbcheck
```

## pbregister

Registers a Privilege Management for Unix & Linux client or secondary server to the Primary License Server.

The command line utility provides a method of retrieving default configuration and required data files from the Primary License Server to aid the initial install of the service.



**Note:** **Pbregister** is primarily used by Privilege Management for Unix & Linux installer. It is highly recommended that its direct use should be made under the guidance of BeyondTrust Technical Support.

## Syntax

- **Version 9.0 and earlier:** **pbregister** options not supported
- **Version 10.0.1 and later:** **pbregister** options supported

## Usage

```
pbregister <options...>
```

## Arguments

<b>-a &lt;application id&gt;</b>	The REST Application ID generated on the Primary License Server. Required to authenticate against the remote REST service.
<b>-k &lt;application key&gt;</b>	The REST Application Key generated on the Primary License Server. Required to authenticate against the remote REST service.
<b>-n &lt;hostname/address&gt;</b>	The TCP/IP address/domain name to contact the Primary License Server REST service. This is required.
<b>-p &lt;port&gt;</b>	The TCP/IP port to contact the Primary License Server REST service. If not specified, default is 24351.
<b>-c &lt;path&gt;</b>	Path to the libcurl shared libraries supplied by Privilege Management for Unix & Linux. Multiple libraries can be specified separated by a colon.
<b>-s &lt;path&gt;</b>	Path to the <b>libcom_err</b> and <b>libssl</b> shared libraries supplied by Privilege Management for Unix & Linux. Multiple libraries can be specified separated by a colon.
<b>-N &lt;profile&gt;</b>	The Registration Client Profile name, as defined in the Primary License Server database. If none is supplied the default profile is used.
<b>-P &lt;prefix&gt;</b>	The Privilege Management for Unix & Linux prefix.
<b>-S &lt;suffix&gt;</b>	The Privilege Management for Unix & Linux suffix.
<b>-z</b>	Set this hosts name when registering with Registry Name Service
<b>-g '{"svcname" : "&lt;name&gt;", "role" : "&lt;primary secondary client&gt;"}, {...}'</b>	Register this host as given roles within specified Service Groups.
<b>-R</b>	Register with the Primary Registry Name Service.
<b>-C</b>	Create simple x509 certificate.
<b>-q</b>	Run the command in "quiet" mode. Displays minimal feedback, and will not interact.
<b>-v</b>	--version

## pbreplay

**pbreplay** replays the contents of an I/O log file for an active or completed session.

If you set the **iolog** variable to a unique path name in a policy file, then Privilege Management for Unix & Linux logs all of the input and output from the secured task to an I/O log file.

The input and output for the secured task can be logged to a file in **/usr/adm** with a file name, such as **pb.jqpublic.ksh.a05998**, that can be examined later using **pbreplay**. The name of the I/O log is a unique temporary file name that is generated by the **logmktemp()** function in the configuration file. The following is an example of such a filename:

```
iolog=mktemp("/usr/adm/pb." + user + "." + basename(command) + ".XXXXXX");
```



**Note:** Privilege Management for Unix & Linux sets the permissions on the I/O log file so that only **root** can read the file. No other user can examine the contents of the I/O log files. You must be logged in as **root** to use **pbreplay** on these files. You can also use Privilege Management for Unix & Linux to delegate this privilege to the appropriate people.

Starting in version 9.4.0, when user requests to replay an archived IO log, **pbreplay** will make a REST GET request for a copy of the archived logfile from the Log Archive Storage Server. The copy of the file will be saved to a temporary file for use by **pbreplay**. When **pbreplay** exits, this temporary file is removed.

**pbreplay** has four main ways of replaying an iolog:

- **Interactively:** The viewer interactively controls the speed of viewing the iolog.
- **Raw:** The entire iolog is replayed at "computer speed". The raw terminal control codes are interpreted by the terminal (resulting in visually correct output that is not easily searched via **grep**).
- **Processed:** The entire iolog is replayed at "computer speed". The terminal control codes are interpreted by **pbreplay** (resulting in output that is searchable).
- **Policy variables:** The values of Privilege Management for Unix & Linux Policy variables are printed.

### Interactive Syntax

```
pbreplay [ -ao | -ax ] [ -h ] [ -t <date format> ] <iolog filename>
```

### Raw Syntax

```
pbreplay <[ -I | -i | -o | -e ]> [ [-ao | -ax | -am ] ] [ -h ] [ -m ] [ -t <date format> ]
```

### Processed Syntax

```
pbreplay -O [--regex <regex expression> [--ignore-case ] [ -c <constraint expression> ] [ -p <format expression> ] ] <iolog filename>
```

```
pbreplay -O [--regex <regex expression> [--ignore-case ] [ -c <constraint expression> ] [ -p <format expression> ] --files <glob pattern>
```

## Solr Indexing Syntax

```
pbreplay -X [-T]
pbreplay -Z [-T]
```

## Policy Variable Only Syntax

```
pbreplay -av <iolog filename>
```

The **-O** option by itself produces searchable output by processing the terminal control codes in a virtual screen, then producing output based on that virtual screen. This feature is intended to search shell sessions delegated by **pbrun**, for shell command entries. Searching for data within a CURSES application is not supported. The goal of being able to search for shell commands that the user entered is problematic. **Stdin** is not used, since it can contain shell history recall and editing commands that the shell can process, but for which Privilege Management has no context. This mechanism works on the **stdout** data stream which should normally contain the resulting command with editing completed. This is easily defeated, however by turning echo off.

This has several limitations:

- This means that the output will have newline characters when the screen width is reached, which does not accurately represent a shell command entry that wraps across the screen from one line to the next.
- Typeahead is another problem. If the user begins typing the command before the shell prompt is output, the first few characters of the command entry will not be contiguous with the rest of the command.
- Termcap data for a given terminal is actually different across different platforms. For example, the vt100 left arrow is very different between Solaris and HP-UX. It may be necessary to replay iologs on the same operating system as they were generated from.
- Large window sizes require more memory and processing time.
- For iologs that have no TERM environment variable (for example, cron jobs), the xterm TERM is used.
- Terminal commands that do not directly affect the screen data or the cursor position are ignored (for example: reverse video, dim, bright, blinking, underlined).

Given the limitations, this output is suitable for processing via **grep**, **awk**, **perl**, etc. If initial searches fail to find the offending pattern, try searches allowing for typeahead, and try searching for commands that turn echo off.

The **--regex** option enables built-in searching via the standard regcomp mechanism.



For more information, please see **man regcomp**.

This uses POSIX Extended Regular Expression syntax. Substring addressing of matches is not supported. The Match-any-character operators don't match a newline. The Match-beginning-of-line operator (^) matches the empty string immediately after a newline, and the Match-end-of-line operator (\$) matches the empty string immediately before a newline.



**Note:** Since this feature works on output (not **stdin**), the beginning of line for command entry will typically be a shell prompt.

The following options require both **-O** and **--regex**:

- **--ignore-case**: Ignores case during the regex comparison
- **-c <constraint expression>**: Allows the search to be limited to iologs who's policy variables meet the criteria specified in the constraint expression (for example, the search can be limited to iologs for a specific runhost, or specific submituser).
- **-p <format expression>**: Allows the output to be customized
- **--files <glob pattern>**: Allows multiple files to be searched. The glob mechanism supports the '?' matching any single character, the '\*' matching any string, and character classes, ranges, and complementation within '[' and ']'.
 

 For more information, please see **man glob(7)**.

- The **-X** option processes the terminal control codes in the same way as **-O**, then sends the data to Solr for indexing.
- The **-Z** option processes the terminal control codes in the same way as **-O** and **-X**, and creates XML data, without sending that data to Solr.

## Syntax

- **Version 3.5 and earlier**: long command options not supported
- **Version 4.0 and later**: long command options supported

```

pbreplay [options] I/O_log_name
  --history
  --history2
  --history3
  --hidshellstartup
  --nolinenumbers--markshellstartup
  --showall
  -am, --map_printable
  -ao, --map_octal
  -av, --variables
  -ax, --map_hex
  -aX
  -e, --show_stderr
  -h, --header
  -i, --show_raw_stdin
  -I, --show_translated_stdin
  -k, --keyfile=key_file
  -m, --more
  -o, --show_stdout
  -A --audit
  -t, --timestamp[=format]
pbreplay -O [options] [I/O_log_name]
  -R, --regex <regular expression>
  --files <file glob pattern>
  -c <constraint expression>
  -p <format expression>
pbreplay <--sendindex | -X> [options] [I/O_log_name]
pbreplay <--index | -Z> [options] [I/O_log_name]
pbreplay --forward
pbreplay -v | --version
pbreplay --help
    
```

## Arguments

<b>--history</b>	Derives shell history from an ACA I/O log where session history was enabled via <b>enable-session-history(true)</b> ;
<b>--history2</b>	Create more detailed ACA Session History Report.
<b>--history3</b>	Create ACA Session History Report of all execs.
<b>--hideshellstartup</b>	<p><b>Version 10.2.0 and earlier:</b> <b>--hideshellstartup</b> not available.</p> <p><b>Version 10.3.0 and later:</b> <b>--hideshellstartup</b> available.</p> <p>Use alone, or in combination with the <b>--history</b>, <b>--history2</b>, and <b>--history3</b> options.</p> <p>Commands executed as part of the shell startup scripts (identified as processes with the same process group as the main shell) are omitted from the history report.</p>
<b>--markshellstartup</b>	<p><b>Version 10.2.0 and earlier:</b> <b>--markshellstartup</b> not available.</p> <p><b>Version 10.3.0 and later:</b> <b>--markshellstartup</b> available.</p> <p>Use alone, or in combination with the <b>--history</b>, <b>--history2</b>, and <b>--history3</b> options.</p> <p>Commands executed as part of the shell startup scripts (identified as processes with the same process group as the main shell) are included in the history report with the text <b>shellstartup</b> preceding the command and arguments. For example:</p> <pre>[root@dev-01 tmp]# /tmp/pbreplay --history --markshellstartup iolog.CbCezgQDCBwV7F18tdVPAdi1 1 Info      working directory set to: /tmp 2 Allowed  shellstartup id -gn 3 Allowed  shellstartup id -un 4 Allowed  shellstartup uname -s 5 Allowed  shellstartup ls /etc/bash_completion.d 6 Allowed  shellstartup   /bin/grep -q /home/bginn/.cabal/bin 7 Allowed  shellstartup /usr/bin/tty -s 8 Allowed  shellstartup /usr/bin/tput colors 2&gt; /dev/null 9 Allowed  shellstartup /usr/bin/dircolors --sh /etc/DIR_COLORS 2&gt; /dev/null 10 Allowed shellstartup /bin/grep -qi ^COLOR.*none /etc/DIR_COLORS &gt; /dev/null 2&gt; /dev/null 10 Allowed shellstartup /usr/bin/id -u 11 Allowed shellstartup /bin/hostname 12 Allowed shellstartup   sed -e s#\..*\$\$\$ 12 Allowed shellstartup /bin/hostname 13 Allowed shellstartup   head -1 13 Allowed shellstartup   tail -1 13 Allowed shellstartup   sed -e s#\..*\$\$\$ 13 Allowed shellstartup   head -1 13 Allowed shellstartup   tail -1 14 Allowed shellstartup /usr/bin/tty 14 Allowed shellstartup   sed -e s#/#\$# 15 Allowed id 17 Allowed date [root@dev-01 tmp]#</pre>
<b>--nolinelnumbers</b>	Do not display line numbers on the ACA history report.

<b>--showall</b>	Do not remove duplicate output from the ACA Audit report.
<b>-am, --map_printable</b>	Optional. Maps unprintable characters in the selected streams ( <b>-e</b> , <b>-i</b> , <b>-l</b> , <b>-o</b> ) to printable sequences.
<b>-ao, --map_octal</b>	Optional. Maps unprintable characters in the selected streams to octal format. ( <b>\xxx</b> ).
<b>-av, --variables</b>	Optional. Displays the variables for the secured task.
<b>-ax, --map_hex</b>	Optional. Maps unprintable characters in the selected streams to hexadecimal format.
<b>-aX [mV], --map_xwindows</b>	Optional. Dump relevant X11 captured events from the iolog. Major events such as creating and destroying windows, textual window updates, text input and mouse clicks will be displayed as a summary alongside any output from the parent process. <b>m</b> will add selected streams, <b>V</b> will log all X events.
<b>-e, --show_stderr</b>	Optional. Non-interactive. Dumps the contents of the standard error stream. This option is useful for redirecting the data to a file or another program. For example, the output can be piped to <b>grep</b> to search for specific words or sequences.
<b>-h, --header</b>	Optional. Non-interactive. Prints a header that contains the secured task information. This option is useful only with dump options. The header is always printed in interactive mode.
<b>-i, --show_raw_stdin</b>	Optional. Non-interactive. Dumps the contents of the standard input stream. This option is useful for redirecting the data to a file or another program. For example, the output can be piped to <b>grep</b> to search for specific words or sequences.  <div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;">  <b>Note:</b> If the user typed carriage returns during the session, the input stream might contain carriage returns without linefeeds. On replay these cause the cursor to return to the left margin of the display and overwrite the previous line with the next line. If you are examining the data, lines may appear to be lost. To add line feeds to the display, use the option: <b>-l (--show_translated_stdin)</b>.                 </div>
<b>-l, --show_translated_stdin</b>	Optional. Non-interactive. Dumps the contents of the standard input stream, adding linefeeds to carriage returns to improve readability. This option is useful for redirecting the data to a file or another program. For example, the output can be piped to <b>grep</b> to search for specific words or sequences.
<b>-k, --keyfile=&lt;name&gt;</b>	Optional. Uses the named key file to decrypt an encrypted I/O log file.
<b>-m, --more</b>	Optional. Interactively display the I/O log file using a pager-styles display (for example, <b>less</b> , <b>more</b> , <b>pg</b> ) instead of using the native display.
<b>-o, --show_stdout</b>	Optional. Non-interactive. Dumps the raw contents of the standard output stream. The terminal will interpret the raw terminal commands such as <b>&lt;beginning of line&gt;</b> , <b>&lt;delete char&gt;</b> , and <b>&lt;delete word&gt;</b> . This option is useful for viewing the logged output.
<b>-A, --audit</b>	Display ACA audit stream.
<b>-t, --timestamp [=format]</b>	Displays timestamps on each line of output. The optional format argument can be any format string that is suitable for the date command. If the optional format string is omitted, then the system <b>-t, --timestamp[=format]</b> default time format is used.  <b>[ver 4.0 and earlier]:</b> option not available

	<b>[ver 5.0 and later]:</b> option available
<b>-v, --version</b>	Required. Displays the program's version and exits.
<b>--help</b>	Optional. Displays the program's help message and exits.

The ACA Audit report lists file related libc/system calls and whether those calls were allowed or blocked via ACA.

Prior to Privilege Management for Unix & Linux 9.4, the output was similar to:

```
Fri Nov 11 12:02:41 2016:      7115      1      owner      9      execve      /usr/bin/id
Fri Nov 11 12:02:41 2016:      7115      1      read       9      fopen       /etc/passwd
Fri Nov 11 12:02:41 2016:      7115      1      read       9      fopen       /etc/group
```

Starting with PBUL 9.4, the output is changed to:

```
Fri Nov 11 2016 12:02:41 PM [ 7115] Allowed exec /usr/bin/id
Fri Nov 11 2016 12:02:41 PM [ 7115] Allowed read /etc/passwd
Fri Nov 11 2016 12:02:41 PM [ 7115] Allowed read /etc/group
```

And with additional loglevels:

```
Fri Nov 11 2016 12:08:36 PM [ 7359] Allowed read /etc/group TAG:DEFAULT dev:64768 ino:2107740
mode:100644 uid:0 gid:0
Fri Nov 11 2016 12:08:37 PM [ 7368] Allowed exec /usr/bin/head ARGV:[head /etc/passwd] TAG:DEFAULT
ENV: LOGNAME=jsmith
ENV: PWD=/home/jsmith
ENV: HISTSIZE=1000
```

The ACA history report derives shell history from the ACA I/O log, and produces a report similar to a shell's history command:

```
# pbreplay --history aca.iolog.log.aZTkfJ
1 Info      working directory set to: /home/jsmith
2 Allowed   date
3 Allowed   id
4 Allowed   head /etc/passwd
```

**-O** Optional. Non-interactive. Produces searchable output by interpreting tty commands such as **<beginning of line>**, **<insert char>**, and **<delete word>**. This option is useful for redirecting the data to a file or piping to another program. For example, the output can be piped to `grep` to search for specific words or sequences. This option also allows direct searching via the **--regex** option.

## -O Arguments

<b>--R, --regex &lt;regular expression&gt;</b>	Optional regular expression to search for using built-in search mechanism. The default output will include runhost, user, date/time, and matching line of text.
<b>--ignore-case</b>	Optional flag to ignore case during regex search.
<b>-c &lt;constraint expression&gt;</b>	Optional constraint expression using the policy language. Similar to constraints used by <code>pblog</code> . Requires the <b>-O</b> and <b>--regex</b> options.
<b>-p &lt;format expression&gt;</b>	Optional output format expression using the policy language. Similar to format expressions

	used by <b>pblog</b> . Requires the <b>-O</b> and <b>--regex</b> options.
<b>--files "&lt;file glob pattern&gt;"</b>	<p>Optional file glob pattern used to search more than one file at a time.</p> <div style="border: 1px solid black; padding: 5px; background-color: #e6f2ff;">  <b>Note:</b> Quotes are required, so that the shell does not interpret the glob pattern prior to passing it to <b>pbreplay</b>.                 </div> <p>Requires the <b>-O</b> and <b>--regex</b> options. The default output will include filename, runhost, user, date/time, and matching line of text.</p>

### -X Arguments

<b>-T, --indextime</b>	Include newline timestamp in indexed data.
<b>-Q</b>	Retrieve filenames from indexing queue.

### -Z Arguments

<b>-T, --indextime</b>	Include newline timestamp in indexed data.
<b>--forward</b>	Index IOLogs identified in the IOLog index store and forward file.

The following table shows the keyboard keys that can be used with **pbreplay** in interactive mode to emulate the Unix/Linux pager:

### Keyboard Keys Used with **pbreplay** in Interactive Mode

Key	Description
<b>g</b>	Go to the beginning of the I/O log.
<b>G</b>	Go to end
<b>Space</b>	Display the next screen of the I/O log.
<b>&lt;CR&gt; or &lt;NL&gt;</b>	Advance the display one line.
<b>s</b>	Skip to the next time marker
<b>u</b>	Undo
<b>t</b>	Display the time stamp from the current line in the I/O log file.
<b>r</b>	Redraw from the start
<b>q or Q</b>	Quit
<b>v</b>	Display the variables for the I/O log file.
<b>Backspace or Delete</b>	Back up to the last position
<b>c</b>	Continuous slow speed replay
<b>+ or -</b>	Use <b>+</b> to increase the replay speed. Use <b>-</b> to decrease the replay speed.

Key	Description
	<b>Version 5.1.1 and earlier:</b> option not available <b>Version 5.1.2 and later:</b> option available
<b>f</b>	Find
<b>k</b>	Find time stamp. The format is <b>[MM/DD/[CC]YY HH:M [:SS]</b> .
<b>.h or ?</b>	Display a navigation help message

## Files

I/O log file

### Example

Entering the command,

```
pbreplay /usr/adm/pb.jqpublic.ksh.a05998
```

produces output similar to the following:

```
Start of log =====
2005/09/08 15:16:07 jqpublic@athena.unix.company.com -> root@athena.company.com ksh
Commands:
g - go to start,
G - go to end,
Space - go to next input
<CR> or <NL> - go to next newline,
s - skip to next time marker
u - undo,
t - display time, r - redraw from start, q/Q - quit
v - dump variables, <BS> or <DEL> - backup to last position
c - continuous slow speed replay, f - find, k - find time stamp
h or ? - display this help message
```

You can navigate the I/O log file by pressing the space key (next input character), the carriage return or newline key (newline), or the s character that shows you what happened each second. Alternatively, you can back up through the log file by pressing the **Backspace** or **Delete** key. You can quickly go to the start or end of the log file using **g** or **G**, respectively. Display the time of an action at any point in the log file using **t**, redraw the log file using **r**, and undo your last action using **u**. You can also display all of the environment variables that were in use at the time the log file was created using **v**. Use **q** or **Q** to quit **pbreplay**.

### Example

```
pbreplay -O /var/log/pbul/iolog.aaaaaa
pbreplay -O --regex 'passwd' /var/log/pbul/iolog.aaaaaa
pbreplay -O --regex 'passwd' --files '/var/log/PBLOGS*/iolog.*'
pbreplay -O --regex "passwd" --files "/var/log/pbul.iolog.*" \
-c "runhost=='hostabc.beyondtrust.com'" -c "date=='2012/04/10'"
pbreplay -O --regex 'passwd' --files '/var/log/PBLOGS*/iolog.*' \
-p "sprintf('%s %s %s %s\n', basename(iolog), user, runhost, regexmatch)"
```

## See Also

pbcheck, pbguid, pbhostid, pbkey, pblocald, pbmasterd, pbpasswd, pbrun, pbsum

## pbreport

- **Version 3.5 and earlier:** **pbreport** not available
- **Version 4.0 and later:** **pbreport** available

**pbreport** extracts data from the Privilege Management for Unix & Linux event logs and optionally generates one or more reports based on the extracted data as specified in the named report file. The report file is an XML file that contains the extraction and reporting specifications, and is typically configured using the event log reporting feature of **pbguid**, the Privilege Management for Unix & Linux web GUI.

## Syntax

```
pbreport [options] report-file
  -i, --info
  -k, --keyfile=file_name
  -s, --suppress
  -t, --temp
  -V, --verbos
pbreport -v | --version
pbreport -h | --help
```

## Arguments

<b>-i, --info</b>	Optional. Displays detailed information about the named report-file.
<b>-k, --keyfile=<i>file_name</i></b>	Optional. Name of the encryption key file.
<b>-s, --suppress</b>	Optional. Suppress report output to the screen and user-defined commands, if any, that are specified in the named report-file. Useful for testing report runs by overriding any user-defined commands that are specified in the report specifications.
<b>-t, --temp</b>	Optional. Does not remove the temporary files that are created during the reporting process. If reporting problems occur, then you can send these files to BeyondTrust Technical Support for analysis.
<b>-V, --verbose</b>	Optional. Displays more verbose output.
<b>-v, --version</b>	Optional. Displays the program version and exit.
<b>-h, --help</b>	Optional. Displays the program help and usage information.

## Files

Report set file

## Example

```
pbreport /temp/report.set
```

## See Also

```
pbguid, pblog
```

## pbrun

**pbrun** requests that a secure task be run in a controlled environment. The user prefixes the command line with **pbrun**.

For example:

```
pbrun backup /usr/dev/dat
```

**pbrun** checks the settings file for a **submitmasters** entry or the netgroup **@pbsubmitmasters** to determine the Policy Server daemon to which it should send the request. If the Policy Server daemon accepts the request, then it directs a local daemon to start the task request on the run host.

## Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pbrun [options] command [command_arguments]
-b, --background
-d, --debug=connect
-d, --debug=log=<level>
-d, --debug=mlog=<level>
-d, --debug=glog=<level>
-d, --debug=llog=<level>
-d, --debug=time
-d, --debug=ttime
--disable_optimized_mode
-h, --host=run_host
-l, --local_mode
-n, --null_input
-p, --pipe_mode
--solarisproject projectname
-u, --user=request_user
--testmaster=master_host
-X
pbrun -v | --version
pbrun --help
```

## Arguments

**-b, --background**

Optional. The target job is directed to ignore hang up signals. This option is particularly useful for running the target program in the background.

<b>-d connect, --debug=connect</b>	Optional. Displays Policy Server connection information for debugging.
<b>-d log=level, --debug=log=level</b>	<p>Optional. Generate debug trace logs for <b>pbrun</b> and all active Privilege Management for Unix &amp; Linux components that will process the command. Specify a level number from <b>1</b> (least detail) to <b>9</b> (most detail). The resulting logs will reside in the same location as the corresponding diagnostics log.</p> <div data-bbox="662 493 1511 577" style="border: 1px solid orange; padding: 5px;"> <p> For more information, please see the <b>pb.settings</b> file.</p> </div> <div data-bbox="662 598 1511 720" style="border: 1px solid orange; padding: 5px;"> <p> For more information, please see "<a href="#">Debug Trace Logging</a>" on page 293.</p> </div> <p><b>Version 7.5 and earlier:</b> setting not available  <b>Version 8.0 and later:</b> setting available</p>
<b>-d glog=level, --debug=glog=level</b>	<p>Optional and only available when running as <b>root</b>. Generate debug trace log for <b>pblogd</b> that will process the command. This setting will be made permanent for that log host. Specify a level number from <b>1</b> (least detail) to <b>9</b> (most detail). The resulting logs will reside in the same location as the <b>pblogd</b> diagnostic log file.</p> <div data-bbox="662 1012 1511 1096" style="border: 1px solid orange; padding: 5px;"> <p> For more information, please see the <b>pb.settings</b> file.</p> </div> <div data-bbox="662 1117 1511 1239" style="border: 1px solid orange; padding: 5px;"> <p> For more information, please see "<a href="#">Debug Trace Logging</a>" on page 293.</p> </div> <p><b>Version 7.5 and earlier:</b> setting not available  <b>Version 8.0 and later:</b> setting available</p>
<b>-d mlog=level, --debug=mlog=level</b>	<p>Optional and only available when running as <b>root</b>. Generate debug trace log for <b>pbmastard</b> that will process the command. This setting will be made permanent for that Policy Server host. Specify a level number from <b>1</b> (least detail) to <b>9</b> (most detail). The resulting logs will reside in the same location as the <b>pbmastard</b> diagnostic log file.</p> <div data-bbox="662 1528 1511 1612" style="border: 1px solid orange; padding: 5px;"> <p> For more information, please see the <b>pb.settings</b> file.</p> </div> <div data-bbox="662 1633 1511 1755" style="border: 1px solid orange; padding: 5px;"> <p> For more information, please see "<a href="#">Debug Trace Logging</a>" on page 293.</p> </div> <p><b>Version 7.5 and earlier:</b> setting not available  <b>Version 8.0 and later:</b> setting available</p>

<b>-d time, --debug=time</b>	Optional. Displays <b>pbrun</b> timing information for debugging. This option is intended primarily for BeyondTrust Technical Support.
<b>-d ttime, --debug=tttime</b>	Optional. Display <b>pbrun</b> total run time for debugging.
<b>--disable_optimized_runmode</b>	<p>Disable <b>pbrun</b> optimization and use <b>pblocald</b> even when submit host and run host are the same. This affects only the local submit host.</p> <p><b>Version 4.0 and earlier:</b> option not available</p> <p><b>Version 5.0 and later:</b> option available</p>
<b>-h, --host=run_host</b>	Optional. Requests <b>run_host</b> as the run host for the secured task. Ignored if <b>-l</b> is also specified, or if the <b>runlocalmode</b> policy variable is set to true.
<b>-l, --local_mode</b>	Optional. Requests that the secured task run locally. Once the Policy Server host's policy accepts the request and logs its start, the target program replaces the <b>pbrun</b> on the local machine. This option provides increased efficiency and reduced network traffic, but job termination status and timeout processing. This mode can be disabled in the configuration file by setting <b>allowlocalmode</b> to false. This mode can also be overridden in the policy by setting <b>runlocalmode</b> to <b>0</b> .
<b>-n, --null_input</b>	Optional. Redirects the standard input of <b>pbrun</b> to <b>/dev/null</b> . You sometimes need this option to avoid interactions between <b>pbrun</b> and the shell that invokes it. For example, if you are running <b>pbrun</b> and start <b>pbrun</b> in the background without redirecting its input away from the terminal, it blocks even if no reads are posted by the remote command. These options prevent this situation.
<b>-p, --pipe_mode</b>	Optional. Puts <b>pbrun</b> into pipe mode. Forces the secured task to behave as if it is run in a pipeline rather than a terminal session.
<b>--solarisproject projectname</b>	<p>Optional. Associates the Solaris Project projectname with the secured task. Requires Solaris version 9 or later on the runhost.</p> <p><b>Version 6.0 and earlier:</b> option not available</p> <p><b>Version 6.1 and later:</b> option available</p>
<b>--testmaster=master_host</b>	<p>Optional and only available when running as root. Requests <b>master_host</b> as the Policy Server host to test if a command will be accepted or rejected. The command itself is not executed. Specify either the hostname or the IP address for the <b>master_host</b>.</p> <p><b>Version 7.5 and earlier:</b> option not available</p> <p><b>Version 8.0 and later:</b> option available</p>
<b>-u, --user=request_user</b>	Optional. Sets the variable <b>requestuser</b> to <b>request_user</b> . The policy can then decide to honor the request and set <b>runuser</b> and/or <b>runeffectiveuser</b> equal to <b>request_user</b> .
<b>.-v, --version</b>	Optional. Displays the program version and exits.
<b>--help</b>	Optional. Displays the program help message and exits.
<b>-X</b>	Optional. Activates X11 forwarding.

When running **pbrun** with the **-X** option, the **DISPLAY** environment variable needs to be set, and a valid XAuthority token needs to exist in the users **.Xauthority** file. This can be checked using:

```
xauth list $DISPLAY
```



For more information, please see the **xwinforward** and **xwinreconnect** policy variables in the [Privilege Management for Unix & Linux Policy Language Guide](https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm) at <https://www.beyondtrust.com/docs/privilege-management/unix-linux/index.htm>.

## Files

**/etc/pb.settings**

Local Privilege Management for Unix & Linux **submithost** settings.

## Example

```
pbrun -h runhost uname -a
```

## See Also

pbcheck, pbhostid, pblocald, pblog, pbmasterd, pbpasswd, pbreplay, pbsum

## pbssh

- **Version 6.0.1 and earlier:** **pbssh** program not available
- **Version 6.1 and later:** **pbssh** program available

Using Privilege Management for Unix & Linux policy and the **pbssh** program, you can control access to, and activities on, SSH-managed devices. The **pbssh** program is similar to the **pbrun** program, except that it uses the SSH protocol (or, optionally, the telnet protocol) to connect to devices that do not have Privilege Management for Unix & Linux installed on them; such devices can include Windows computers and certain network devices.

You must specify the **-h** option (to indicate the host name of the target device), and the **-u** option (to indicate the user name with which to log in to the device). To execute a command on the target device, use the **-C** option. You may also optionally use the **-P (--port)** option to specify a particular port for the SSH connection.

If you have a Password Safe appliance, the Privilege Management for Unix & Linux can be configured to automatically obtain the device password from Password Safe. To do so, the following Privilege Management for Unix & Linux settings must be specified on the submit host:

- **pkrunfile**
- **pk\_cert** (or the **--pk\_cert** option)
- **pk\_servers** (or the **--pk\_servers** option)
- **pbsshshell** (optional)



For more information about these settings, please see ["Connections to SSH-Managed Devices"](#) on page 93.

If you do not have a Password Safe appliance, then **pbssh** prompts the user for the password. The user is also prompted under these circumstances:

- The Password Safe appliance is not available
- The Privilege Management for Unix & Linux settings are not specified or not correctly specified
- The **--skip\_pkrun** option is specified on the **pbrun** command line
- The **--telnet** option is specified on the **pbrun** command line

The **--domain** option has two purposes, both of which are related to Password Safe:

- If you need to log into a host using a domain account, then you use the **--domain** option defines the domain from which Password Safe should obtain the domain account password.
- If the **--user** option defines a user account, and you want to use a Password Safe managed account alias in place of the actual managed system name, then you use the **--domain** option to specify the managed system alias.



**Note:** Unlike **pbrun**, **pbssh** does not require a command to be specified. Consequently, the Privilege Management for Unix & Linux policy function **basename()** always returns **pbssh**. In the Privilege Management for Unix & Linux policy, to determine the command that was specified, parse the **argv** list.

## Syntax

```
pbssh [options] command [command_arguments]
-c, --pk_cert
-C, --command
-d, --debug=connect
-d, --debug=time
-d, --debug=tttime
-D, --domain
-h, --host=run_host
-k, --skip_pk
-K, --pk_servers
-P, --port=ssh_port
-r, --pk_reset_password
-T, --telnet
-u, --user=request_user
pbssh -v | --version
pbssh --help
```

## Arguments

**-c, --pk\_cert**

Optional. Absolute path to the Password Safe certificate on the submit host. Overrides the **pk\_cert** Privilege Management for Unix & Linux setting.

**-C, --command='ssh\_command'**

Optional. Command and arguments to be executed on the target SSH-managed device. If arguments are specified, the command and its arguments must be enclosed together in single quotation marks.

<b>-d connect, --debug=connect</b>	Optional. Displays Policy Server connection information for debugging.
<b>-d time, --debug=time</b>	Optional. Displays <b>pbssh</b> timing information for debugging. This option is intended primarily for BeyondTrust Technical Support.
<b>-d ttime, --debug=tttime</b>	Optional. Displays <b>pbssh</b> total run time for debugging.
<b>-D, --domain</b>	Optional. Specifies a domain for Password Safe to use when obtaining a domain account password, or defines a Password Safe managed system alias to use instead of the actual host name.  <b>Version 6.1 and earlier:</b> option not available <b>Version 6.2 and later:</b> option available
<b>-h, --host=run_host</b>	Requests <b>run_host</b> as the run host for the secured task.
<b>-k, --skip_pkrun</b>	Optional. Specifies that the SSH-managed device password not be obtained from Password Safe.
<b>-K, --pk_servers</b>	Optional. Specifies the host name or IP address of one or more PowerBroker Safe appliances. Overrides the <b>pk_servers</b> Privilege Management for Unix & Linux setting. To specify more than one PowerBroker Safe appliance, separate each name by a space and enclose the list in quotation marks.
<b>-P, --port=ssh_port</b>	Specifies a TCP port to use for the SSH session. If not specified, then a default port number is used.
<b>-r, --pk_reset_password</b>	Optional. Specifies that PowerBroker Safe check in a new password for the user after the PowerBroker Safe command is complete.
<b>-T, --telnet</b>	Optional. Specifies that a connection to an SSH-managed device be made using the telnet protocol, not the SSH protocol.
<b>-u, --user=request_user</b>	Sets the variable <b>requestuser</b> to <b>request_user</b> . The policy can then decide to honor the request and set <b>runuser</b> and/or <b>runeffectiveuser</b> equal to <b>request_user</b> .
<b>-v, --version</b>	Optional. Displays the program version and exits.
<b>--help</b>	Optional. Displays the program help message and exits.

## Files

**/etc/pb.settings** Local Privilege Management for Unix & Linux **submitthost** settings

## Example

```
pbssh -h runhost -u jjones -C "dir /w"
```

## pbsum

**pbsum** prints the checksum of one or more files. The checksum can be used in a policy configuration file to check the requested program's integrity. If anyone has modified the program and thereby changes the checksum, the secured task is refused. The string

that is produced by **pbsum** can be used to set the value of the **runmd5sum** variable in the Privilege Management for Unix & Linux policy configuration file.

### Syntax

- **Version 3.5 and earlier:** long command options not supported
- **Version 4.0 and later:** long command options supported

```
pbsum file_names
pbsum -m | --md5 file_names
pbsum -v | --version
pbsum --help
```

### Arguments

<b>-m, --md5 file_names</b>	Optional. Use the MD5 algorithm to generate a checksum.
<b>-v, --version</b>	Optional. Displays the <b>pbsum</b> version and exits.
<b>--help</b>	Optional. Displays the program help message and exits.

### Files

None

### Example

```
pbsum /etc/pb.settings file
>pbsum -m /etc/pb.settings /bin/ls
```

### See Also

`pbcheck`, `pbhostid`, `pbkey`, `pblocald`, `pbmasterd`, `pbpassword`, `pbreplay`, `pbrun`

## pbsync

- **Version 4.0 and earlier:** **pbsync** not available
- **Version 5.0 and later:** **pbsync** available

The **pbsync** command starts the log synchronization process. The command takes as an input one or more log servers, port numbers, and log file names, and uses that information to synchronize the network logs. This component is referred to as the client.

On the first execution of this feature, the complete event logs are transferred from the failover log servers to the primary log server; event log files are merged there into one log file to make auditing easier.

**pbsync** can request the following:

- Event logs from different log servers be merged
- Partial I/O logs from different log servers be merged into one I/O log

- Merged logs be sent to the client

## ! IMPORTANT!

For encrypted I/O logs to be successfully merged, all log servers must use the same encryption algorithm and key. For more information, please see "[iologencryption](#)" on page 179.

In Privilege Management for Unix & Linux Version 6.0 and later, the log synchronization server (**pbsyncd**) uses the **eventlog** setting in its own **pb.settings** file to determine the location of the event log file when it receives a **pbsync -l** request. This change can cause errors when merging pre-version 6.0 event logs if the **eventlog** setting on the log synchronization server does not match the **eventlog** setting on the requesting client host. To ensure that pre-version 6.0 event logs are found by the log synchronization server, use **pbsync** with the **-L** option.

## Syntax

```
pbsync [options]
pbsync -v|--version
pbsync --help
```

## Arguments

<b>-l, --event</b>	Uses the log synchronization server's <b>pb.settings</b> file to automatically obtain the event log server, port, and event log file to use. Specify the event log file name in the <b>eventlog</b> keyword, specify the event log server in the <b>logservers</b> keyword, and use the <b>syncport</b> keyword to specify the port.
<b>-L, --eventlog server_info[:path/file_name[:port]]</b>	Manually adds a server to gather the event logs from. <b>path</b> and <b>file_name</b> are optional the path and file name of the event log file to retrieve. The <b>server_info</b> may be a hostname or an IP address. When specifying an IPv6 address, it must be enclosed in square brackets. If <b>port</b> is not specified, then the default port from the settings file ( <b>syncport</b> setting) is used.  You must repeat the <b>-L</b> switch for each server from which you want to retrieve event log files.
<b>-i, --iosearch basepath</b>	Queries the I/O log servers that are listed in the <b>logservers</b> setting in the server's <b>pb.settings</b> file to obtain any partial I/O log files that have <b>basepath</b> in their file names. <b>basepath</b> is the path and file name of the original I/O log file. All matching partial I/O log files are merged to create a single output I/O log file.  <b>Version 5.2 and earlier:</b> option not available <b>Version 6.0 and later:</b> option available
<b>-l, --iolog server_info:path/file_name[:port]</b>	Manually adds a server to gather an I/O log file from. <b>path</b> and <b>file_name</b> are the required path and file name of the I/O log file to retrieve. The <b>server_info</b> may be a hostname or an IP address. When specifying an IPv6 address, it must be enclosed in square brackets. If port is not specified, then the default port from the

	<p>settings file (<b>syncport</b> setting) is used.</p> <p>If this option is used to merge the I/O logs (without <b>-r</b>), only the I/O Logs of the same session (partial I/O logs) will be merged together in the generated output file. Any I/O log that does not belong to the same session as the first I/O log gathered will be ignored. You must repeat the <b>-I</b> switch for each server from which you want to retrieve I/O log files.</p> <p><b>Version 5.2 and earlier:</b> option not available</p> <p><b>Version 6.0 and later:</b> option available</p>
<b>-o, --outputfile <i>file_name</i></b>	User-defined path for the local output file. Cannot be used with <b>-O</b> or <b>-P</b> . Path must be to a secure directory (that is, readable and writable by <b>root</b> only).
<b>-O, --outputdir <i>directory_name</i></b>	Uses alternate path to write the collected files. Cannot be used with <b>-o</b> or <b>-P</b> . Path must be to a secure directory (that is, readable and write able by <b>root</b> only).
<b>-d, --daemon</b>	Starts the synchronization process in daemon mode. In daemon mode, <b>pbsync</b> attempts to resynchronize the specified logs at a frequency that is specified by the <b>logresynctimermin</b> setting in the client's <b>pb.settings</b> file.
<b>-r, --retrieve</b>	Only retrieves log files; does not merge them. Cannot be used with <b>-P</b> .
<b>-v, --version</b>	Displays the version.
<b>--help</b>	Displays the help message and exits.

## Command Line Responses

Command Line Response	Description
Synchronization daemon unable to start	The synchronization daemon was unable to start
Synchronization daemon: Unknown request (0xcode)	The request from <b>pbsync</b> was unknown or not supported
Unable to connect to log server <name>	The system is unable to establish communications with the server, and is therefore unable to retrieve the log records
Unable to retrieve file <path> on server <name>	The remote server reports that it is unable to read or transmit the file; check the file permissions or path
Unique ID mismatch on <server name>:<path>: <uniqueID> (local ID: <uniqueID>)	The unique ID in the remote log files mismatch with the local server
Timed out while retrieving <server>	The operation timed out while retrieving a remote log file, causing the merge to fail

Command Line Response	Description
name>:<path>:<port>	
Insufficient storage space to complete synchronization	There is insufficient storage to either retrieve or merge the file; User must free up some space
Success	The synchronization operation was successful

## Files

None

## Example

Executing the following causes **pbsync** to look for the file pattern **/var/adm/pb.user1**, collect the logs, and synchronize them:

```
pbsync -i /var/adm/pb.user1
```

Executing the following synchronizes the log files on machines **dart** and **aji**:

```
pbsync -L dart:/var/log/pb.eventlog:6298 -L aji:/var/adm/pb.eventlog:6298
```

## See Also

```
pbsyncd
```

## pbsyncd

- **Version 4.0 and earlier:** **pbsyncd** not available
- **Version 5.0 and later:** **pbsyncd** available

The **pbsyncd** server listens for log synchronization requests from one or multiple **pbsync** clients.

**pbsyncd** is started as a stand-alone service or daemon from the command line or startup scripts, preferably running on each system that is also running **pblogd** (for log synchronization) or **pbmastord** (for policy updates). A new TCP port is required to accept requests. The default port is **24350**. This component is referred to as the server.

**Log synchronization:** When the server receives a synchronization request, it checks its own **pb.settings** file to determine the event log file name (as specified in the **eventlog** keyword) to retrieve. If the **eventlog** keyword is not specified, then the server uses the event log file name that is specified in the request.

Changes that are made to the **pb.settings** file after the daemon is started will not affect the operation of the daemon. If you change the **pb.settings** file, then you must restart the daemon for the changes to take effect. If you do not restart the daemon, then the daemon continues to operate using a snapshot of the **pb.settings** file that was cached at the time the daemon was started.

If **pbsyncd** detects an error, then an error message is logged to the server's diagnostic log file. For log synchronization, the client can request the following:

- Event logs from different log servers be merged
- Partial I/O logs from different log servers be merged into one I/O log

- Merged logs be sent to the client



For more information, please see ["pbsync" on page 390](#).

## Syntax

```
pbsyncd [options]
pbsyncd -v|--version
pbsyncd --help
```

## Arguments

<b>-d, --daemon</b>	Runs <b>pbsyncd</b> in daemon mode
<b>-f, --foreground</b>	Runs the server in the foreground when using daemon mode
<b>-p, --port <i>port_number</i></b>	Instructs the server to listen to the defined port number (use a TCP port other than the default)
<b>-e, --errorlog <i>errorfile</i></b>	Uses the named file as the error log
<b>-s, --syslog <i>&lt;facility&gt;</i></b>	Uses the syslog facilities
<b>-v, --version</b>	Displays the version
<b>--help</b>	Displays the help message and exits



**Note:** To use the **-d** option, you must also use the **-p** option.

## Command Line Responses

Synchronization daemon unable to start	The synchronization daemon was unable to start
Synchronization daemon: Unknown request (0xcode)	The request from <b>pbsync</b> was unknown or not supported
Unable to connect to log server <i>&lt;name&gt;</i>	The system is unable to establish communications with the server, and is therefore unable to retrieve the log file
Unable to retrieve file <i>&lt;path&gt;</i> on server <i>&lt;name&gt;</i>	The remote server reports that it is unable to read or transmit the file; check file permissions or path
Unique ID mismatch on <i>&lt;server name&gt;</i> : <i>&lt;path&gt;</i> : <i>&lt;uniqueID&gt;</i> (local ID: <i>&lt;uniqueID&gt;</i> )	The unique ID in the remote log files mismatch with the local server
Timed out while retrieving <i>&lt;server name&gt;</i> : <i>&lt;path&gt;</i> : <i>&lt;port&gt;</i>	The operation timed out while retrieving a remote log file, causing the merge to fail
Insufficient storage space to complete synchronization	There is insufficient storage to either retrieve or merge the file; user must free up some space

Success

The synchronization operation was successful.

## Files

None

## Example

Entering the following starts the daemon and specifies `/var/log/syncserver.log` as the output error file:

```
pbsyncd -d -p 24345 -e /var/log/syncserver.log
```

## See Also

`pblog`, `pbsync`

## pbumacs

**pbumacs** is an editor similar to **umacs**. **umacs** is a small version of **emacs** with gosling-style **emacs** key bindings.

**pbumacs** has been modified so that it can be used securely with the Privilege Management for Unix & Linux programs.

Security has been enhanced with the following features:

- **pbumacs** must be started with a full path name specified
- The user will not be able to access any files other than the one that is specified at startup time
- The user will also not be allowed to spawn any processes.

This program, when used with Privilege Management for Unix & Linux, can allow users to access a specific file as root, but not other **root** functions or files.

## Syntax

```
pbumacs fullpathname
```

## Arguments

**fullpathname**

File to edit

## Files

None

## Example

Executing this command displays the contents of the file called **fullpathname** for editing:

```
pbumacs fullpathname
```

## See Also

`pbrun`

## **pbufvqrpq**

- **Version 3.5 and earlier:** **pbufvqrpq** not available
- **Version 4.0 and later:** **pbufvqrpq** available

**pbufvqrpq** is a licensed utility from UV Software's Vancouver Utilities set. It is used internally to generate textbased reports from a description file that is created by the Privilege Management for Unix & Linux **pbreport** program.

## Syntax

`pbufvqrpq`

## Arguments

Not published

## Example

None

## See Also

`pblog`, `pbreport`

## pbversion

- **Version 5.1.2 and earlier:** **pbversion** not available
- **Version 5.2 and later:** **pbversion** available

**pbversion** reports the binary file version numbers and optionally reports installed components of Privilege Management for Unix & Linux. This non-interactive utility can be run on any machine and provides a list of the version numbers for all known Privilege Management for Unix & Linux binary files. Installations are identified using the prefix and suffix arguments or the default installation if a prefix and/or suffix is not specified.

Only **root** can run **pbversion**. Prior to v8.0 **pbversion** can only be run from the installation directory and it should not be moved from the installation directory because it is dependent on Privilege Management for Unix & Linux installer scripts.

With v8.0 and later, **pbversion** is available as part of the installed binaries after the install (located in the admin directory which is **/usr/sbin** by default).

**pbversion** does not report on Privilege Management for Unix & Linux versions prior to V4.0 because the binary version arguments were not available previously. Also, it does not report on binary version for executable files **pbnvi** or **pbuvqprpg** because the version argument does not display the binary version.

### Syntax

```
pbversion [options]
  -p prefix
  -s suffix
  -c
pbversion -v
pbversion -h
```

### Arguments

<b>-c</b>	Displays the installed components.
<b>-h</b>	Prints usage message and exits.
<b>-p prefix</b>	Sets the installation prefix.
<b>-s suffix</b>	Sets the installation suffix.
<b>-v</b>	Prints the version of <b>pbversion</b> and exits.

### Example

Executing the following:

```
./pbversion -p my -c
```

This displays the binary versions for the installation using the prefix **my** along with the Privilege Management for Unix & Linux installation components.

## See Also

```
pbinstall(8), pbuninstall(8)
```

## pbvi

- **Version 4.0.0 and later:** **pbvi** setting available

## Description

The **pbvi** editor is similar to the standard **vi** editor. It has been modified so that it can be used securely with the Privilege Management for Unix & Linux programs. Security is enhanced with the following features:

- **pbvi** must be started with a full path name specified
- The user will not be able to access any files other than the one that is specified at startup time
- The user will also not be allowed to spawn any processes

This program, when used with Privilege Management for Unix & Linux, allows users to access a specific file as **root**, but not access other **root** functions or files.

The edited file is written back to the same path. If this path changed by an external process, then the file is written to the new location to which the path refers. Whenever **pbvi** is run from Privilege Management for Unix & Linux, the arguments should be checked to ensure that the user cannot change the path and no security hole is introduced.

## Syntax

```
pbvi fullpathname
```

## Arguments

<b>fullpathname</b>	File to edit
---------------------	--------------

## Files

None

## Example

Entering the following:

```
pbvi fullpathname
```

displays the contents of the file called **fullpathname** for editing.

## See Also

```
pbrun
```

## pblogarchive

- **Version 8.5 and earlier:** **pblogarchive** not available
- **Version 9.0 and later:** **pblogarchive** available

**pblogarchive** is the log archiving utility that can archive I/O logs and Event logs off the original logserver and onto an archive host.

It will be installed on hosts configured as Log Servers and Policy Servers. It must be called from a host containing the event logs or I/O logs to be archived.

You must be logged in as root to use **pblogarchive**.

### Syntax

```
pblogarchive [options]
  -e, --eventlog [filepathname]
  -E, --eventlogbase "<shell pattern>"
  -i, --iolog <filepathname>
  -I, --iologbase "<shell pattern>"
  -s, --serverinfo <archivehost>
  -l, --list[e|i]
pblogarchive -v | --version
pblogarchive -h | --help
```

### Arguments

<b>-e</b>	Archive the eventlog specified in the settings file. Cannot be combined with the I/O log options ( <b>-i</b> , <b>-I</b> ).
<b>--eventlog</b> <b>[=filepathname]</b>	Archive an eventlog. Provide the absolute file path name of the eventlog to archive. If file path name is omitted, <b>pblogarchive</b> will determine the eventlog from the settings file. Cannot be combined with the I/O log options ( <b>-i</b> , <b>-I</b> ).
<b>-E, --eventlogbase</b> <b>"shell_pattern"</b>	Archive eventlog(s) matching the shell pattern. Shell pattern must be enclosed in quotes. Cannot be combined with the I/O log options ( <b>-i</b> , <b>-I</b> ).
<b>-i, --iolog</b> <b>&lt;filepathname&gt;</b>	Archive the specified I/O log. Cannot be combined with the Eventlog options ( <b>-e</b> , <b>-E</b> ).
<b>-I, --iologbase</b> <b>"shell_pattern"</b>	Archive I/O log(s) matching the shell pattern. Shell pattern must be enclosed in quotes. Cannot be combined with the Eventlog options ( <b>-e</b> , <b>-E</b> ).
<b>-s, --serverinfo</b> <b>&lt;archivehost&gt;</b>	Specify the name or IP address of the destination archive host. This overrides <b>logarchivehost</b> in <b>pb.settings</b> .
<b>-l, --list[e i]</b>	List logfile locations in the log tracking DB. <b>-le</b> : Lists only eventlog information. <b>-li</b> : Lists only I/O log information.

For eventlogs, displays the name of the original logserver, eventlog creation datetime in UTC, eventlog archive datetime in UTC(when the eventlog was first rotated), original eventlog path, current host where logfile is located/archived, and the current path name of the logfile.

For I/O logs, displays the name of the original logserver, I/O log creation datetime in UTC, uniqueid associated with the I/O log, I/O logfile sequence number if partitioned, original I/O log path, current host where logfile is located/archived, and the current path name of the logfile.

## Examples

Example of archiving the eventlog named by the **eventlog** setting in **pb.settings**:

```
pblogarchive -e
```

Example of archiving a specific eventlog:

```
pblogarchive --eventlog=/var/log/my90pb.eventlog_20150512_161106
```

Example of archiving multiple eventlogs using a filename shell pattern:

```
pblogarchive -E "/var/log/my90pb.eventlog_2015*"
```

Example of archiving a specific I/O log

```
pblogarchive -i /var/log/iolog/my90iolog.7ZSa1y
```

Example of archiving multiple I/O logs using a filename shell pattern:

```
pblogarchive -I "/var/log/iolog/my90iolog.7*"
```

Example of archiving an eventlog to a specific archive host (override settings file):

```
pblogarchive -s archost21 --eventlog=/var/log/my90pb.eventlog_20150512_161106
```

Example of listing eventlog location as recorded by the log tracking database:

```
#pblogarchive -le
List of Event Logs:
Orig_Logserver,Date_Created_UTC,Date_Archived_UTC,Orig_Path,Current_Host,Current_Path
dev-erolnd-01.unix.ca.com,2015-05-2802:49:21,-,/var/log/ABCac90pb.eventlog,dev-erolnd-
```

```
01.unix.ca.com,/var/log/ABCac90pb.eventlog

dev-erolnd-01.unix.ca.com,2015-05-28 02:48:00,2015-05-28
02:48:00,/var/log/ABCac90pb.eventlog,dev-erolnd-01.unix.ca.com,/var/log/ABCac90pb.eventlog_20150527_
194800

dev-erolnd-01.unix.ca.com,2015-05-28 02:43:01,2015-05-28
02:44:34,/var/log/ABCac90pb.eventlog,dev-erolnd-01.unix.ca.com,/opt/ARCHIVELOGS3/eventlog/dev-
erolnd-01.unix.ca.com/ABCac90pb.eventlog_20150527_194433
```

Example of listing I/O log location as recorded by the log tracking database:

```
# pblogarchive -li

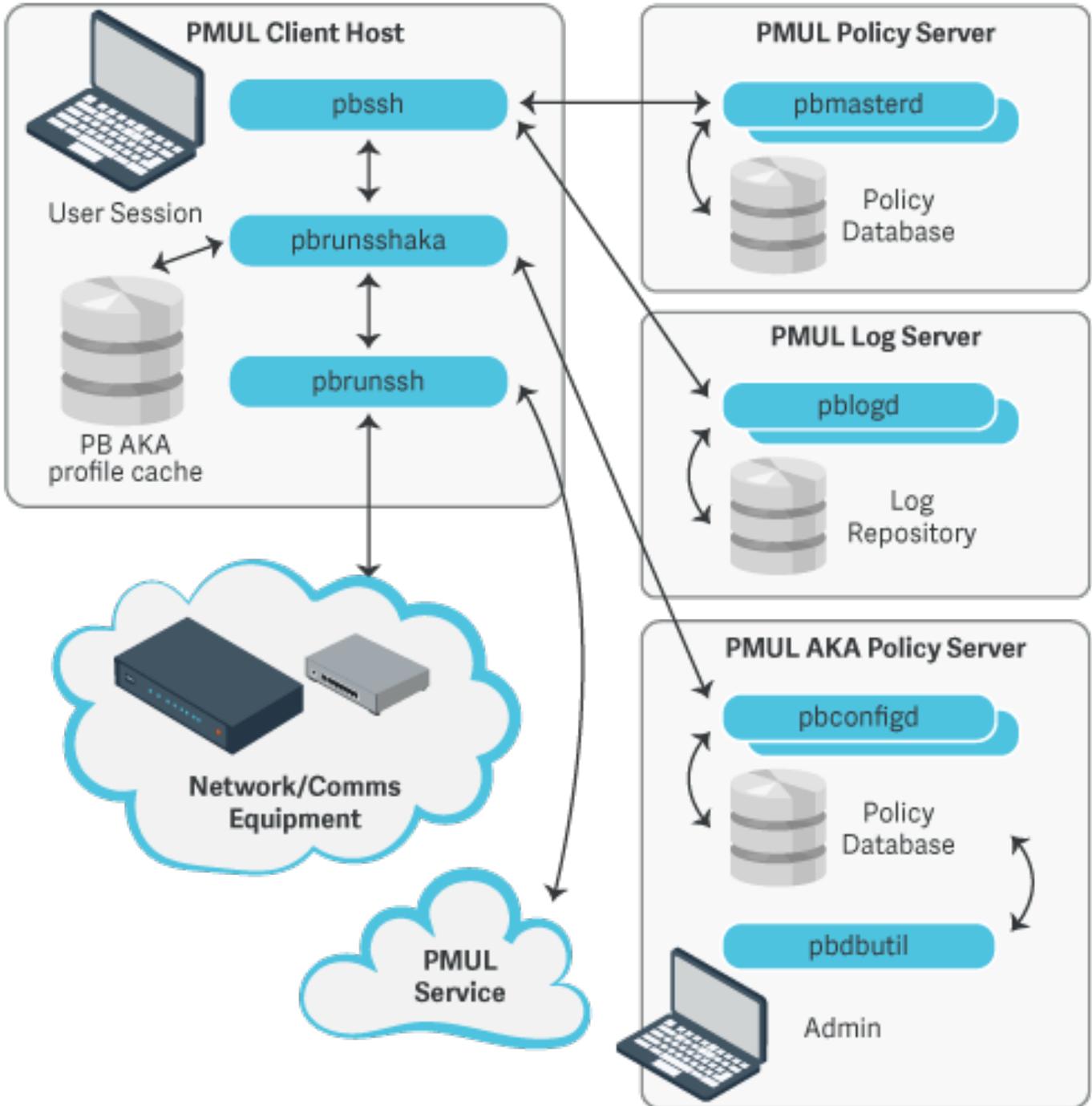
List of IO Logs:

Orig_Logserver,Date_Created_UTC,Unique_Id,Partial_Id,Orig_Path,Current_Host,Current_Path
dev-erolnd-01.unix.ca.com,2018-09-18 18:25:53,ac1420205ba1435717DE,1,/var/log/pbsudo/dev-eolog-
08.unix.ca.com/pbsudo.iolog.kAWJLT,dev-erolnd-02.unix.ca.com,/opt/iolog/dev-eolog-
08.unix.ca.com/testuser/20180918/pbsudo.iolog.kAWJLT.ac1420205ba1435717DE
```

## Advanced Keystroke Action

A new feature called Advanced Keystroke Action has been introduced to allow control and audit of command line based network appliances. The new technology has been implemented as an enhancement to the **pbssh** feature. Full session logging provides a complete command audit trail through the existing session logging technology.

Advanced Keystroke Action differs from previous features in that instead of trying to apply command control as the user types, it emulates an interactive command line, and only then authorizes the command once the user has pressed enter to execute the command. This means the policy can try to match the command it has received in context to the task the user is performing, and it can choose to re-write the command, accept it, or reject it. It also allows the policy to change the user environment as they carry out their tasks. For example, changing prompts or tab completion.



## Get Started with Advanced Keystroke Action

### Configure Privilege Management for Unix & Linux Policy

Advanced Keystroke Action is implemented on top of existing **pbssh** technology and appropriate configuration is required in the policy script file. For example:

```

if(pbclientname=="pbssh") {
myadmins={"admin1"};
myswitches={"ciscos1"};
if(pbclientmode=="pbssh") {
if(search(myadmins,user) >= 0 && search(myswitches,host) >= 0) {
accept;
} else {
reject;
}
} else if(pbclientmode=="run") {
args=split(argv[argc-1]," ");
argslen = length(args);
if(argslen > 0 && search(myswitches,args[argslen-1]) >= 0) {
keystrokeactionprofile="cisco profile1";
accept;
} else {
reject;
}
}
}
    
```

### Configure Password Safe

Configure Password Safe on the Advanced Keystroke Action primary server or Policy Servers.



To provide automatic authentication, Password Safe can be configured to retrieve logon credentials. For information on this configuration, including the specification of **pkrunfile**, **pk\_cert**, and **pk\_servers** in the **pb.settings** configuration file, please see "**pbssh**" on page 387

### Configure the Advanced Keystroke Action Primary Server or Policy Servers

If the Advanced Keystroke Action is being configured for the first time, the policy database will need to be created on the primary AKA server or primary Policy Server.

1. Specify the Advanced Keystroke Action Policy Database by adding the keyword **advkeystrokeactionpolicydb** to the **pb.settings** on all server hosts.
2. If you are using Registry Name Service you will need to define your Primary Server in the RNS using:

```
pbadmin --svc -u '{ "svcgname":"dflt_aka_service", "cn" : "host", "role", "primary"}
```

3. Create the policy database (which includes a demo policy that can be used as a basis for further configuration and learning)

```
pbadmin -aka -n
```

The **pbadmin** command can then be used to export and re-import Advanced Keystroke Action policies. The Privilege Management for Unix & Linux script policy keyword must match a valid Advanced Keystroke Action policy name for the session to run.

## Maintenance and Configuration of Advanced Keystroke Action Policy

**pbadmin** has been enhanced to provide methods to maintain the Advanced Keystroke Action Policy on the Primary Policy server. This includes a new section (**--aka**) with new options.

### Usage

```
pbdbutil --aka [<options>] [ <file> <file> ...]
```

Options for AKA client:

<b>-R</b>	Force refresh of the client aka profile cache file(s)
<b>args</b>	Optional. The arguments to the function.

Options for Advanced Keystroke Action profile server database management:

<b>-n</b>	Create new AKA database
<b>-l</b>	List all AKA configurations in database
<b>-s &lt;[- +]attribute&gt;</b>	Sort the list of records by attribute name (asc/desc)
<b>-i &lt;file&gt;</b>	Import AKA configuration file
<b>-e &lt;name&gt; &lt;file&gt;</b>	Export specified AKA configuration
<b>-g &lt;name&gt;</b>	Get AKA configuration by name
<b>-d &lt;name&gt;</b>	Delete AKA configuration
<b>-u { "name" : "&lt;name&gt;", "cfg": { json param... } }</b>	Update AKA configuration

## Advanced Keystroke Action Policy

Policies for Advanced Keystroke Action are different from normal Privilege Management for Unix & Linux policies because they have a different function to fulfill. The policy is defined as a JSON object split into a number of separate sections including variables, prerun, complete actions, macros, readonly, and policy. The primary section of the policy is an ordered list of **match** and **action** nodes. These will match the command line, or other variable, and perform specified actions if the match is successful.

### Preamble

The preamble defines the name of the configuration and whether debug can be enabled. For example, through the command line:

```
set akadebug 10
```

```
{
  "name": "demo",
  "cfg": {
    "debug_enabled": true,
    ...
  }
}
```

## Variables

The variables section allows the configuration of variables that can be used within the policy. These variables, by default are read/write within the policy but may be defined as **readonly** in the readonly section. All JSON data types are supported, including Booleans (**true/false**), strings, integers, floating point numbers (reals), and arrays of datatypes using the JSON format. These can then be referred to by name using a notation similar to bash. For example, **`\${varname}`** or **`\${arrayelement[2]}`**. Some of the variables are special in that they can only hold specific values. For example, **editor** can only be **emacs** or **vi**, and **keymap** can only hold specific definitions of keys (similar to the NetBSD libedit or GNU readline names).



For more information, please see the NetBSD **editline(7)** man page.

The variable **input** is the current command line, and if it is rewritten it will change the command line. If it is set to **null**, it will remove the current input and return the user to the command line.

```
"variables": {
  "editor": "emacs", "prompt": "$ ", "ro_var": "this variable is readonly", "remote_prompt":
    "##prompt##:",
  "keymap": [{ "key": "^I", "value": "ed-complete" } ]
},
```

Key definitions by default are listed below.

In **vi** input mode, input characters are bound to the following editor commands by default:

Ctrl-D, EOF	vi-list-or-eof
Ctrl-H, BS	vi-delete-prev-char
Ctrl-J, LF	ed-newline
Ctrl-M, CR	ed-newline
Ctrl-Q	ed-tty-start-output
Ctrl-S	ed-tty-stop-output
Ctrl-U	vi-kill-line-prev
Ctrl-V	ed-quoted-insert
Ctrl-W	ed-delete-prev-word

Ctrl-[, ESC	vi-command-mode
Ctrl-\, QUIT	ed-ty-sigquit
Ctrl-?, DEL	vi-delete-prev-char

All other input characters except the NUL character (**Ctrl-@**) are bound to **ed-insert**.

In **vi** command mode, input characters are bound to the following editor commands by default:

Ctrl-A	ed-move-to-beg
Ctrl-C, INT	ed-ty-sigint
Ctrl-E	ed-move-to-end
Ctrl-H, BS	ed-delete-prev-char
Ctrl-J, LF	ed-newline
Ctrl-K	ed-kill-line
Ctrl-L, FF	ed-clear-screen
Ctrl-M, CR	ed-newline
Ctrl-N	ed-next-history
Ctrl-O	ed-ty-flush-output
Ctrl-P	ed-prev-history
Ctrl-Q	ed-ty-start-output
Ctrl-R	ed-redisplay
Ctrl-S	ed-ty-stop-output
Ctrl-U	vi-kill-line-prev
Ctrl-W	ed-delete-prev-word
Ctrl-[, ESC	em-meta-next
Ctrl-\, QUIT	ed-ty-sigquit
Space	ed-next-char
#	vi-comment-out
\$	ed-move-to-end
%	vi-match
+	ed-next-history
,	vi-repeat-prev-char

-	ed-prev-history
.	vi-redo
/	vi-search-prev
0	vi-zero
1 to 9	ed-argument-digit
:	ed-command
;	vi-repeat-next-char
?	vi-search-next
@	vi-alias
A	vi-add-at-eol
B	vi-prev-big-word
C	vi-change-to-eol
D	ed-kill-line
E	vi-end-big-word
F	vi-prev-char
G	vi-to-history-line
I	vi-insert-at-bol
J	ed-search-next-history
K	ed-search-prev-history
N	vi-repeat-search-prev
O	ed-sequence-lead-in
P	vi-paste-prev
R	vi-replace-mode
S	vi-substitute-line
T	vi-to-prev-char
U	vi-undo-line
W	vi-next-big-word
X	ed-delete-prev-char
Y	vi-yank-end

[	ed-sequence-lead-in
^	ed-move-to-beg
_	vi-history-word
a	vi-add
b	vi-prev-word
c	vi-change-meta
d	vi-delete-meta
e	vi-end-word
f	vi-next-char
h	ed-prev-char
i	vi-insert
j	ed-next-history
k	ed-prev-history
l	ed-next-char
n	vi-repeat-search-next
p	vi-paste-next
r	vi-replace-char
s	vi-substitute-char
t	vi-to-next-char
u	vi-undo
v	vi-histedit
w	vi-next-word
x	ed-delete-next-char
y	vi-yank
	vi-to-column
~	vi-change-case
Ctrl-?, DEL	ed-delete-prev-char
Meta-O	ed-sequence-lead-in
Meta-[	ed-sequence-lead-in

In **emacs** mode, input characters are bound to the following editor commands by default:

0 to 9	ed-digit
Ctrl-@, NUL	em-set-mark
Ctrl-A	ed-move-to-beg
Ctrl-B	ed-prev-char
Ctrl-C, INT	ed-tty-sigint
Ctrl-D, EOF	em-delete-or-list
Ctrl-E	ed-move-to-end
Ctrl-F	ed-next-char
Ctrl-H, BS	em-delete-prev-char
Ctrl-J, LF	ed-newline
Ctrl-K	ed-kill-line
Ctrl-L, FF	ed-clear-screen
Ctrl-M, CR	ed-newline
Ctrl-N	ed-next-history
Ctrl-O	ed-tty-flush-output
Ctrl-P	ed-prev-history
Ctrl-Q	ed-tty-start-output
Ctrl-R	ed-redisplay
Ctrl-S	ed-tty-stop-output
Ctrl-T	ed-transpose-chars
Ctrl-U	ed-kill-line
Ctrl-V	ed-quoted-insert
Ctrl-W	em-kill-region
Ctrl-X	ed-sequence-lead-in
Ctrl-Y	em-yank
Ctrl-Z, TSTP	ed-tty-sigtstp
Ctrl-[, ESC	em-meta-next
Ctrl-\\, QUIT	ed-tty-sigquit
Ctrl-]	ed-tty-dsusp

Ctrl-?, DEL	em-delete-prev-char
Ctrl-Meta-H	ed-delete-prev-word
Ctrl-Meta-L	ed-clear-screen
Ctrl-Meta-_	em-copy-prev-word
Meta-0 to 9	ed-argument-digit
Meta-B	ed-prev-word
Meta-C	em-capitol-case
Meta-D	em-delete-next-word
Meta-F	em-next-word
Meta-L	em-lower-case
Meta-N	ed-search-next-history
Meta-O	ed-sequence-lead-in
Meta-P	ed-search-prev-history
Meta-U	em-upper-case
Meta-W	em-copy-region
Meta-X	ed-command
Meta-[	ed-sequence-lead-in
Meta-b	ed-prev-word
Meta-c	em-capitol-case
Meta-d	em-delete-next-word
Meta-f	em-next-word
Meta-l	em-lower-case
Meta-n	ed-search-next-history
Meta-p	ed-search-prev-history
Meta-u	em-upper-case
Meta-w	em-copy-region
Meta-x	ed-command
Ctrl-Meta-?	ed-delete-prev-word

The **prompt** variable is the prompt that the user will see to type at. The **remote\_prompt** is important in that AKA will attempt to wait for the remote prompt before letting the user type at the command line. This should make interaction clearer and more intuitive without mixing input and output characters in the input/output terminal data stream.

Other special variables are:

- **runuser**: The remote run user
- **runhost**: The fully qualified domain name of the the remote run host
- **runhostname**: The simple hostname of the remote run host
- **runcmd**: The command line passed to **pbssh**
- **argv**: The command line array passwd to **pbssh**
- **prompt\_wait**: The maximum time to wait for remote command to run (in milliseconds)
- **history**: The number of command line history entries to save for the next session
- **input**: The submitted command line
- **prerun\_prompt\_wait**: The maximum time to wait for remote command to run when executing the pre-run as the user session starts (in milliseconds)
- **prerun\_slowdown**: The delay time added to each prerun command to slow down the prerun (in milliseconds)
- **remote\_prompt**: The remote prompt, used by Advanced Keystroke Action profiles to synchronize the terminal session input and output sequences.
- **akadebug**: Built-in debugging to allow the policy writer to diagnose issues in policy
- **pkcert**: The value of the **pk\_cert** passed into the Advanced Keystroke Action service
- **pkserver**: The value of the **pk\_server** passed into the Advanced Keystroke Action service
- **pkdomain**: The value of the **pk\_domanit** passed into the Advanced Keystroke Action service

## Prerun

The pre-run section is an array of string commands that are submitted to the remote system before any user commands can be submitted. It is recommended, if possible, to define prompts, etc, so they can be waited for using **remote\_prompt** variable. The strings are submitted one after another with a short delay, but with not intelligent processing. If processing is required is recommended that normal policy is used.

```
"prerun": [ "PS1=##prompt##:", "unset PROMPT_COMMAND" ],
```

## Filter

The filter section is an array of strings that are filtered from the session output and are therefore not displayed on the client terminal session.

```
"filter": [ "Filtered string one", "Filtered string two" ],
```

## Login\_sequence

The login sequence object details what happens with a successful or unsuccessful login. It details whether the user is allowed any input during the login phase, the successful/unsuccessful messages and strings that are matched to determine whether it was successful:

```
"login_sequence" : {
  "input_allowed" : true,
  "successful" : "*** Login sequence successful ***",
  "denied" : "*** Failed login sequence - access denied ***",
  "prematch" : [
    {"Last login: " : true },
    {"Access denied" : false }
  ]
},
```

## Completion

Completion is a list of strings that can be used to complete command lines (usually when the **ed-complete** key is submitted). If more than one string can complete the command, the list will be provided. If only one matches, the current command line is rewritten to the completion string. There are two types of completion value. A line completion, where the whole line will be compared up to the cursor, and word completion that simply checks the previous word.

```
"complete": [ {"value": "compabcd", "type": "line"}, {"value": "compadef", "type": "line"}, {"value": "compxyz", "type": "word" } ],
```

## Macros

Macros are an ordered list of regular expression patterns and re-write strings. It is used to simply re-write the current command line if patterns match when return is pressed. This should simplify the majority of policy that are simple re-writes.

For example:

```
"macros": [
  { "pattern": "macroa(b)(c)d", "value": "echo macro rewrites to ${1} ${2}" }
],
```

When the user types **macroabcd**, it will rewrite the command line to **echo macro rewrites to b c**, and it will execute the command on the remote system.

## Readonly

The readonly section is a simple list of variables that are readonly and cannot be re-written. This is useful for constant strings or messages.

```
"readonly": {
  "ro_var": true
},
```

## Policy

The policy section is an ordered list of matching conditions and actions that are taken if the match is positive. Matching is processed against variables or user input, and can be any normal operation, including regular expressions. Actions can be:

- **Accept:** Immediately accept the current command line and submit the command line to the remote host to execute.
- **Reject:** Immediately reject the current command line, optionally displaying a message.
- **Restart:** Restart processing the policy list from the beginning

- **ReadOnly:** Mark the specified variable readonly for the rest of the session
- **Disable:** Execute the current command line, but disable command line processing until either the specified string is matched in the output, or the remote prompt is once again displayed. This allows interactive sessions to be authorized.
- **Unset:** Unset the specified variable
- **Printf:** Display the specified message to the users terminal session, processing specified arguments to make up the message
- **Sendf:** Send the specified message to the remote application as if typed, processing specified arguments to make up the input
- **Set:** Set the specified variable to a constant or calculated value. Constant values can include any data type, or can reference another variable. Calculated values can be integer or floating point math, shift or logic values, substrings, substituted strings, upper/lower case strings, split or sprintf strings. Arguments can be constants or specified variable values, or the arguments matched from the regular expression match.
  - Operators on integers include add(+), subtract (-), divide (/), multiply (\*), logical AND (&&), bitwise AND (&), logical OR (||), bitwise OR (|), NOT (!), shift left (<<), shift right (>>), modulo divide (%)
  - Operators on floating point include add(+), subtract (-), divide (/), multiply (\*)
  - Operators on strings include concatenation (+), substitute (**sub**), substring (**substr**), uppercase (**upper**), lowercase (**lower**), split/tokensize string (**split**) and sprintf to format a string with arguments.
  - Operators on arrays include append/extend (+), remove (-) and index set (=)

The match node consists of a singular expression match, or an array of called **and** or **or** which are evaluated to a logical AND or OR of the constituent singular expression matches. For example:

- Simple match

```
"match": { "op": "=", "var": "var1", "value": 123 }
```

- Logical AND of simple matches

```
"match": { "and" = [
  { "op": "=", "var": "var1", "value": 123 },
  { "op": "=", "var": "var2", "value": 678 }
]}
```

- Logical OR of simple matches

```
"match": { "or" = [
  { "op": "=", "var": "var1", "value": 123 },
  { "op": "=", "var": "var2", "value": 678 }
]}
```

## A Simple Example of Policy

```
"policy": [
{
  "match": {
    "op": "=~",
    "var": "${input}",
    "value": "PS1=.*"
  },
},
```

```

"actions": [
  {
    "action": "reject",
    "value": "sorry, you cannot reset the prompt"
  }
]
}, ...
    
```

The above example shows a simple policy where the command line is matched against the user typing **PS1=....** If it matches, the command is rejected with a suitable message to the user.



For more examples, please see the demo policy in the default Advanced Keystroke Action database.

## Advanced Keystroke Action Logging / Events

Similarly to Privilege Management for Unix & Linux session logging, Advanced Keystroke Action sessions can be logged and events collated. The keyword **advkeystrokeactionevents yes** should be added to **pb.settings**. By default, the events will be collated in the event database or they can be logged in CSV or JSON to syslog, a normal text file, or sent to a program using the keyword **eventdestinations**.



For more information, please see ["Auditing and Logging" on page 109](#).

An example Advanced Keystroke Action log:

```

{"hostname":"pbuild","evtname":"aka_start_session","service":"pbrunsshaka9.4.4-03_
debug","who":"root","severity":16,"utc":"2017-06-23 11:19:00","progname":"pbrunsshaka9.4.4-03_
debug","version":"9.4.4-03_debug","arch":"linux.x86-64","data":
{"runhost":"cisco1","hostname":"pbuild","pid":23319,"runuser":"admin","sid":23319,"uid":0}}

{"hostname":"pbuild","evtname":"aka_accept_cmd","service":"pbrunsshaka9.4.4-03_
debug","who":"root","severity":16,"utc":"2017-06-23 11:19:09","progname":"pbrunsshaka9.4.4-03_
debug","version":"9.4.4-03_debug","arch":"linux.x86-64","data":
{"hostname":"pbuild","pid":23319,"cmd":"show ip interface brief","sid":23319,"uid":0}}

{"hostname":"pbuild","evtname":"aka_reject_cmd","service":"pbrunsshaka9.4.4-03_
debug","who":"root","severity":16,"utc":"2017-06-23 11:19:11","progname":"pbrunsshaka9.4.4-03_
debug","version":"9.4.4-03_debug","arch":"linux.x86-64","data":
{"hostname":"pbuild","pid":23319,"cmd":"wexit","policy":{"action":"reject"},"sid":23319,"uid":0}}

{"hostname":"pbuild","evtname":"aka_terminate","service":"pbrunsshaka9.4.4-03_
debug","who":"root","severity":16,"utc":"2017-06-23 11:19:11","progname":"pbrunsshaka9.4.4-03_
debug","version":"9.4.4-03_debug","arch":"linux.x86-64","data":
{"hostname":"pbuild","pid":23319,"cmd":"exit","policy":{"action":"terminate"},"sid":23319,"uid":0}}

{"hostname":"pbuild","evtname":"aka_end_session","service":"pbrunsshaka9.4.4-03_
debug","who":"root","severity":16,"utc":"2017-06-23 11:19:11","progname":"pbrunsshaka9.4.4-03_
debug","version":"9.4.4-03_debug","arch":"linux.x86-64","data":{"status":
{"status":0},"hostname":"pbuild","pid":23319,"sid":23319,"uid":0}}
    
```

# File Integrity Monitoring

The new version of Privilege Management for Unix & Linux introduces File Integrity Monitoring (FIM) to compliment the Privilege Management for Unix & Linux suite, to enhance system security, and audit. FIM policies can be configured to schedule regular checks of the integrity of operating systems, software applications, and customer data. This verifies file permissions, ownership, and even cryptographic checksums and produce details reports for security alerts, vulnerability assessments, and audit.

## Overview

FIM policies are configured and maintained in a centralized repository. FIM clients will be assigned to specific policy, and will automatically retrieve and use these policies to compare the local file system against a system baseline. Any policy violations or inappropriate changes to the file system will be detailed in a report which is compiled and sent back to the central repository for future reference. Events are also generated to alert administrators of the security transgression.

## Policy Configuration

FIM Policy configuration is stored as a JSON script. Each policy is named and details which file systems and files to verify, what aspects of each file to check, and assigns a perceived risk level to any violation. Each individual client host will be assigned to a single named policy (or will use the default policy if unassigned). Each policy is named and is subject to change control if it is enabled.

Each policy is split into sections dealing with predefinitions of what aspects of individual files and file types to check, a list of included paths and files and what predefinitions to use for them, and a list of paths or files to exclude from the file integrity check.

## Predefinitions Section

This section of the policy defines what checks need to be made on specific file types. For example:

```
"sysconf": {
  "exec": { "ino": true, "mode": true, "uid": true, "gid": true, "pmask": "022", "size": true,
  "mtime": true, "ctime": true, "hash": true, "risk": 10 },
  "script": { "ino": true, "mode": true, "uid": true, "gid": true, "pmask": "022", "size": true,
  "mtime": true, "ctime": true, "hash": true, "risk": 10 },
  "dev": { "uid": true, "gid": true, "mode": true, "risk": 10 },
  "other": { "ino": true, "mode": true, "uid": true, "gid": true, "pmask": "002", "size": true,
  "mtime": true, "ctime": true, "risk": 6 }
}
```

The above predefinition details file system attributes to check for executable files, scripts, devices, and then all other files.

File types are defined as:

- **dir**: Directory
- **dev**: Character or block device
- **link**: Symbolic link
- **sock**: File socket
- **script**: Script (#! interpreter)
- **exec**: Executable file
- **file**: Any other file type

A file type of **all** will override all other entries within that predef.

A file type of **other** will match anything that isn't matched by more specific types.

The complete list of file system attribute checks are:

<b>dev</b>	Boolean	Check the file device
<b>ino</b>	Boolean	Check the file inode
<b>pdev</b>	Boolean	Check the parent device
<b>pino</b>	Boolean	Check the parent inode
<b>mode</b>	Boolean	Check the file mode (07777, includes owner/group/other and setuid/setgid)
<b>uid</b>	Boolean	Check the uid
<b>gid</b>	Boolean	Check the gid
<b>size</b>	Boolean	Check the file size
<b>hash</b>	Boolean	Check the SHA256 hash of the file
<b>hash_smaller</b>	Integer	Check the SHA256 hash if the file is smaller than <num> kilobytes
<b>size_min</b>	Boolean	Check the file is the same or larger (for log files)
<b>mtime</b>	Boolean	Check the modification time
<b>mtime_later</b>	Boolean	Check the modification is equal or later (for log files)
<b>ctime</b>	Boolean	Check the change time
<b>ctime_later</b>	Boolean	Check the change time is equal or later (for log files)
<b>perm</b>	07777	Check specified permissions are set.  For more information, please see <b>man umask</b> .
<b>pmask</b>	07777	Check specified permissions are NOT set.  For more information, please see <b>man umask</b> .
<b>risk</b>	Integer	Arbitrary number, Magnitude denotes risk
<b>own</b>	Integer/String	UID or Username of ownership of the file
<b>gown</b>	Integer/String	GID or Group ownership of the file
<b>file</b>	Boolean	Check the file's file name
<b>ftype</b>	Boolean	Check the file's type



**Note:** When symbolic links are scanned and checked, and the link is not broken, the link target's canonicalized name is reported and the link target's device and inode. These are reported as fields **linktarget**, **linkdev**, and **linkino**. This data is stored and checked within the hash field.

## Include Section

The include section lists all those files to include in the file system scan. Each entry defines a file specification which may be wildcarded, the name of the predef check that is performed, whether to recurse down the folder (if one is specified), whether to follow links into different directories, and whether to cross devices.

When wildcards are used on directory names, any dot files in that directory are not matched. To match files whose name begins with a dot, the path and directory name must not include wildcards.

Files are scanned in order of entries in the include section, according to the first pattern that matches the file. Any subsequent file matching patterns will be ignored. For example, if we generally want **/etc/\*** scanned with the **sysconf** predef, yet we specifically want **/etc/passwd** scanned with the **log** predef, the rule for **/etc/passwd** must appear before the entry for **/etc**.

### Example

```
"include": [
  { "path": "/etc/mtab", "chk": "log", "recurse": false },
  { "path": "/etc/motd", "chk": "log", "recurse": false },
  { "path": "/etc/passwd", "chk": "log", "recurse": false },
  { "path": "/etc/shadow", "chk": "log", "recurse": false },
  { "path": "/etc/*", "chk": "sysconf", "recurse": true, "follow": false, "xdev": true },
  { "path": "/proc", "chk": "log", "recurse": false },
  { "path": "/mnt", "chk": "log", "recurse": false },
  { "path": "/boot/*", "chk": "sysconf", "recurse": true, "follow": false, "xdev": true },
  { "path": "/bin/*", "chk": "bin", "recurse": true, "follow": false, "xdev": true },
  { "path": "/var/log/*", "chk": "log", "recurse": true, "follow": false, "xdev": true },
  { "path": "/var/adm/*", "chk": "log", "recurse": true, "follow": false, "xdev": true }
]
```

## Exclude Section

The exclude section defines a list of wildcard strings that will exclude files that have previously been specifically included in the previous section.

```
'exclude': [
  '\root/.sh_history',
  '\home/*',
  '\etc/pb.db'
]
```

## Policy Configuration and Maintenance

All configuration and maintenance of FIM policy is carried out using the **pbdbutil** utility. The utility has been enhanced to provide methods to retrieve, store, and list policies, as well as retrieving and summarizing the reports generated from client hosts. The utility is also used on client hosts to initiate the file system checks, either from the command line, or scheduled using **cron**.

## Syntax

### Usage

```
pbdbutil --fim [<options>] [ <file> <file> ...]
```

Options for FIM client:

<b>-r</b>	Run FIM check
<b>-U</b>	Run FIM check and update database

Options for client remote management:

<b>--client='{ params }'</b>	Specify client REST parameters (NB use of = for optional parameter)
------------------------------	---

Options for FIM server database management:

<b>-n</b>	Create new FIM database
<b>-l</b>	List all FIM configurations in database
<b>-l</b>	Add an extra '-l' to list host assignments
<b>-s &lt;[-+]attribute&gt;</b>	Sort the list of records by attribute name (asc/desc)
<b>-i &lt;file&gt;</b>	Import FIM configuration file
<b>-e &lt;name&gt; &lt;file&gt;</b>	Export specified FIM configuration
<b>-g &lt;name&gt;</b>	Get FIM configuration by name
<b>-d &lt;name&gt;</b>	Delete FIM configuration
<b>-d { "cfg" : { "name" : "&lt;wildcard&gt;" } }</b>	Delete FIM configuration matching wildcard
<b>-u { "name" : "&lt;name&gt;", "cfg" : { json param... } }</b>	Update FIM configuration
<b>-A &lt;name&gt; &lt;host(s)&gt;</b>	Assign host to configuration
<b>-X &lt;host(s)&gt;</b>	Assign host to configuration
<b>-g { "rpt" : { "uuid" : "&lt;uuid&gt;" } }</b>	Get FIM report
<b>-g { "rpt" : { params ... } }</b>	Retrieve report summarized from multiple reports
<b>--format '[ "header", "header2", ... ]'</b>	Define retrieved fields when using CSV report
<b>-d { "rpt" : { "uuid" : "&lt;uuid&gt;" } }</b>	Delete FIM report
<b>-d { "rpt" : { params ... } }</b>	Delete FIM report(s)



For more information, please see below for attributes.

	 For more information, please see below for attributes.
-L {	Retrieve, List or Delete FIM reports, with the attributes: <ul style="list-style-type: none"> <li>• ["name" : "&lt;wildcard&gt;"],</li> <li>• ["uuid" : "&lt;uuid&gt;"],</li> <li>• ["host" : "&lt;wildcard&gt;"],</li> <li>• ["older" : &lt;epoch&gt;, ["newer" : &lt;epoch&gt;],</li> <li>• ["older" : { "years" : "months" : n, "days" : "hours" : n }</li> <li>• ["newer" : { "years" : n, "months" : n, "days" : n, "hours" : n }</li> <li>• ["updates" : &lt;bool&gt;],</li> <li>• ["risk" : &lt;lvl&gt;],</li> <li>• ["risk_higher" : &lt;lvl&gt;],</li> <li>• ["risk_lower" : &lt;lvl&gt;],</li> <li>• ["regexp" : true]}</li> </ul>
-s <[-+]attribute>	Sort the list of records by attribute name (asc/desc)

## Initial Setup and Configuration of the Service

1. Specify the FIM database by adding the keyword **fileintegritydb** to the **pb.settings** on all hosts.
2. If you are using Registry Name Service you will need to define your Primary Server in the RNS db using:

```
pbdbutil --svc -u '{ "svcgname":"dflt_fim_service", "cn" : "host", "role", "primary"}'
```

If you are not using Registry Name Service the **submitmasters** keyword is used to specify the FIM Server.

3. Initially , on the centralized server, the FIM database will need to be created using:

```
pbdbutil --fim -n
```

4. A configuration will need to be defined and stored using:

```
pbdbutil --fim -u '{ "cfg": { ... } }'
```

5. Once this has been performed each client will be assigned a configuration using:

```
pbdbutil --fim -A <cfgname> <hostname>
```

- On the client, run the following command to setup the initial baseline database and check the results are expected.

```
pbdbutil --fim -U
```

- Once this has been completed, add a **cron** job to run the check on a regular basis:

```
0 0 * * * /usr/sbin/pbdbutil --fim -r > /dev/null 2>&1
```

Each run will upload the results to the centralized report repository. If configured by adding the setting **fileintegrityevents** on the primary service, each run will also send an event to the **eventdb** database.

### File Integrity Monitor Reports

Reports consist of a JSON array of results, containing **before** (for example, existing entries in the baseline database) and **after** or new items which represent the current file system file status. Depending upon the checks run, various attributes will be reported in each **before** or **after** item.

All character data (for example, file names) must consist of valid UTF-8 characters. Character bytes that are not valid UTF-8 characters are reported as **[\<hex value of the byte>]**, and further, the slash is escaped and appears as two slashes.

For example, **\\[98]** represents the byte value **98** hex, or **10011000** binary.

```
# pbdbutil -P --fim -r
{
  "rpt": [
    {
      "path": "/etc",
      "risk": 6,
      "change": "updated",
      "before": {"size": 249, "mtime": "2016-09-23 09:13:19", "ctime": "2016-09-23
09:13:19", "name": "resolv.conf",
      "dev": 2051, "ino": 3415679},
      "after": {"size": 0, "mtime": "2016-09-26 08:20:09", "ctime": "2016-09-26 08:20:09", "name":
"foo",
      "dev": 2051, "ino": 3415679 }
    },
    {
      "path": "/var/log",
      "risk": 4,
      "change": "new",
      "after": {"pdev": 2051, "pino": 3933733, "mode": "600", "uid": 0, "gid": 0, "size": 1493,
      "mtime": "2016-09-26 08:20:01",
      "ctime": "2016-09-26 08:20:01", "ftype": "file", "name": "cron", "hash": null, "dev":
2051, "ino": 3933604 }
    }
  ],
  "new": 1,
  "deleted": 0,
  "updated": 1,
  "policy": 0,
  "total": 2,
}
```

```

    "max_risk": 6,
    "name": "default",
    "hostname": "pbuild",
    "uuid": "e62df7ea-980c-4252-a924-79a71a6ccc0f",
    "whoami": "ctaylor"
}

```

Details at the end of the report include the number of new files, deleted files, updated files and those reported because they do not meet policy. Also detailed at the end of the report is the maximum risk (for example, the highest risk item that was tagged as updated), the name of the configuration, the hostname, a unique uuid of the report, who ran it, and the number of updates that were logged. The attributes name, inode, device, and path are always logged for every item so offending files can be uniquely identified on the file system.

As well as the standard report, the customer can choose to report in CSV using the **-C** option on the command line. For example:

```

rpt{*}.path,max_risk,name,host,uuid,rundate,total,new,updated,policy,deleted,rpt{*}.risk,rpt
{*}.change,rpt{*}.before.name,rpt{*}.before.ftype,rpt{*}.before.dev,rpt{*}.before.ino,rpt
{*}.before.pdev,rpt{*}.before.pino,rpt{*}.before.size,rpt{*}.before.ctime,rpt{*}.before.mtime,rpt
{*}.before.mode,rpt{*}.before.gid,rpt{*}.before.uid,rpt{*}.before.hash,rpt{*}.after.name,rpt
{*}.after.ftype,rpt{*}.after.dev,rpt{*}.after.ino,rpt{*}.after.pdev,rpt{*}.after.pino,rpt
{*}.after.size,rpt{*}.after.ctime,rpt{*}.after.mtime,rpt{*}.after.mode,rpt{*}.after.gid,rpt
{*}.after.uid,rpt{*}.after.hash

/etc/pki,6,default,-,eff6b3c4-5a2e-4d10-8352-
3c7e1a1d4523,-,10,7,3,0,0,6,updated,nssdb,-,2051,3408221,-,-,-,2016-09-22 15:02:45,2016-09-22
15:02:45,-,-,-,-,nssdb,-,2051,3408221,-,-,-,2016-09-26 08:09:35,2016-09-26 08:09:35,-,-,-,-

/etc,6,default,-,eff6b3c4-5a2e-4d10-8352-
3c7e1a1d4523,-,10,7,3,0,0,6,new,-,-,-,-,-,-,-,-,-,resolv.conf,file,2051,3428436,2051,3407873
,249,2016-09-26 08:19:15,2016-09-26 08:19:15,644,0,0,-

```

The summary information is added to every row, thereby "flattening" the CSV report. Additionally, a list of headers can be provided using the **--format** option. For example:

```

pbdbutil -C -fim -r --format='["rpt{*}.path","max_risk","name","host","uuid","rpt{*}.change"]'

```

# REST API

## Introduction

A REST API is available to allow Privilege Management data to be configured, customized, and retrieved by other software. The API is web based and uses industry standard modern components, connectors, and data elements within a distributed and secure enterprise environment.

The REST API is bundled with the main installation and configured in **pbinstall**:

```
15  Install REST Services?           [yes]
72  REST Service installation directory?  [/usr/lib/beyondtrust/pb/rest]
```

The menu response shown above will install the REST API web server components. When installing any server components, REST API installation becomes mandatory.

```
73  Install REST API sample code?  [yes]
74  REST API sample code directory?  [/usr/local/lib/pbrest]
```

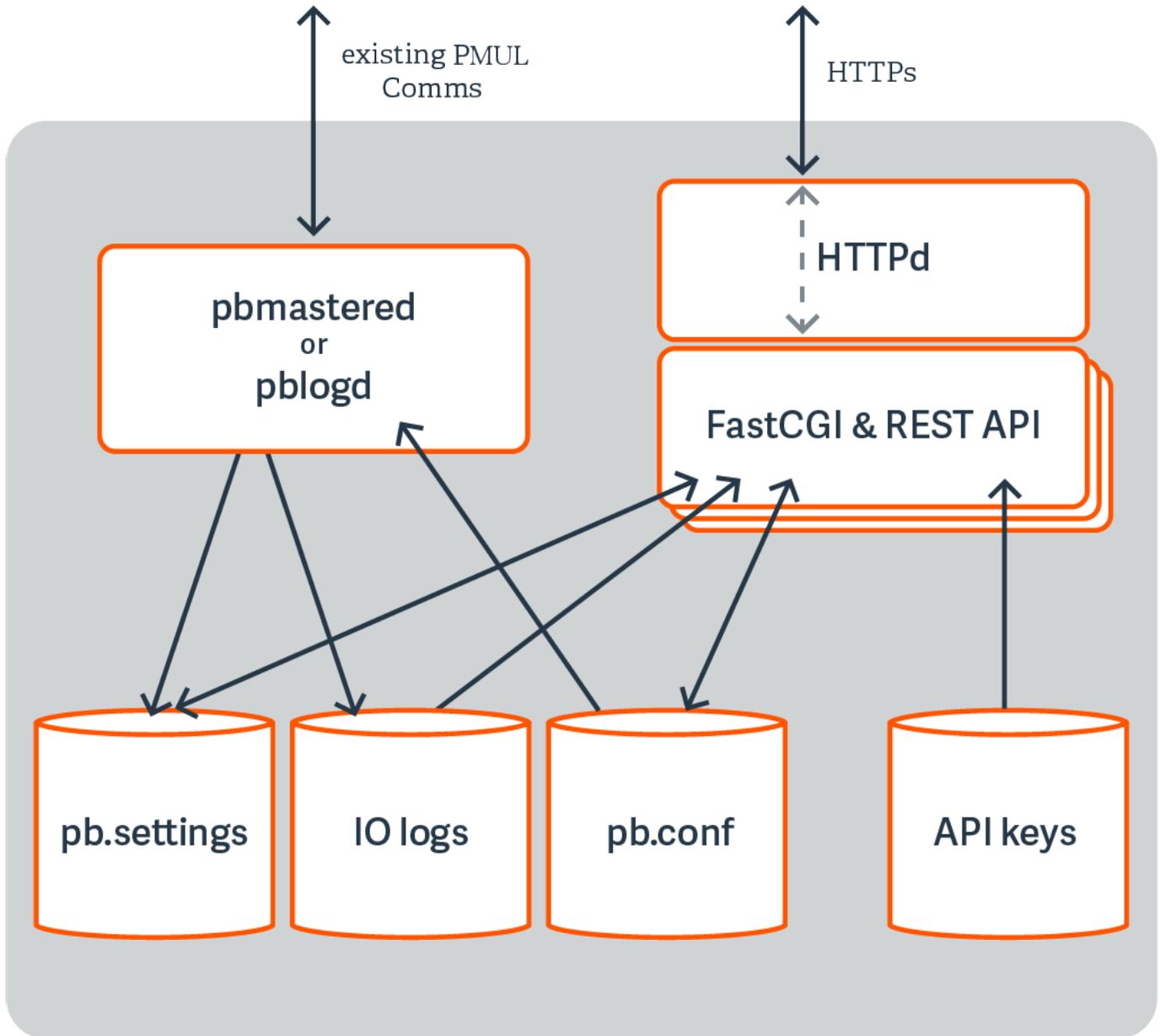
The menu response shown above will install the Java and scripting example code.

The API can be used with Privilege Management for Unix & Linux v7.1.0 and later.



**Note:** REST Services are not fully supported on macOS.

## Architecture Overview



## Functionality

### Settings

- **Get All Settings:** Get all of the settings from **pb.settings** (or equivalent). Each setting has one of 4 distinct types:
  - String
  - Boolean
  - List of Strings
  - **altsubmitmasters:** Has a special list of Privilege Management for Unix & Linux objects
- **Get Individual Settings:** Gets an individual setting as specified on the URL
- **Put Setting:** Put (modify) a setting into the **pb.settings** file. The type must correspond to the original setting type.
- **Get Settings file as attachment:** Retrieves the whole **pb.settings** file as a binary attachment

### License

- **License Get:** Retrieves the text value of the license

### Policy

- **Policy List Dir:** List all of the files in a given directory (without checking if they are iologs). This would be limited to **policydir** if defined. Some system directories cannot be listed for security.
- **Policy (Script) Get Lines:** Get a script based policy file as an ordered array of lines, making line based modifications to the policy file easier.
- **Policy (Script) Get Full File:** Get the full script based policy file as a long string
- **Policies (CSV) Get All:** Retrieves an array of CSV policies. Elements are generally strings or arrays of strings.
- **Policy (CSV) Get (by name):** Retrieve a given named CSV policy.
- **Policy (CSV) Put (by name):** Put a given CSV policy, named on the URL.
- **Policy (Script) Set New Policy File:** Create a new (optionally empty) policy script file. Directory is limited by **policydir** if it is set. Parent directories are not created.
- **Policy check:** Checks policy in a similar manner to **pbcheck**.
- **Get Policy file as attachment:** Retrieves a full policy file as a binary attachment.

### IO Logs

- **IO Log Get:** Retrieves an IO log file. Output can be limited by **len** and **start** parameters so that individual parts of the log can be retrieved in "chunked" form.
- **IO Log List Dir:** List all of the files in a given directory (without checking if they are iologs). **Filter** can be specified as a regular expression to filter output. Some system directories cannot be listed for security.
- **IO Log Get Variables:** Retrieves the log variables from the specified IO log.
- **Get IO Log file as attachment:** Retrieves an iolog file as a binary attachment.
- **IO Log search:** Search a list of iologs, specified with a glob style wildcard parameter **file**, for the query string **<query>**. This is a similar format to the SOLR search string where you have a regular expression query, with **keyword:value** values. For example, **stdout:\*inittab** would search for any iologs that incorporate the word **inittab** in the output. All of the standard

keyword values that can be extracted from iologs can be used in the search criteria. Regular expression matches are not made across newlines.

- **IO Log Replay:** Retrieves and interprets an IO log file ready to be output by a GUI. Override terminal emulation using the parameter **term**, and the output can be limited by **len** and **start** parameters so that individual parts of the log can be retrieved in "chunked" form.
- **IO Log Get:** Retrieves an IO log file. Output can be limited by **len** and **start** parameters so that individual parts of the log can be retrieved in "chunked" form.
- **IO Log List Dir:** List all of the files in a given directory (without checking if they are iologs). **Filter** can be specified as a regular expression to filter output. Some system directories cannot be listed for security.
- **IO Log Get Variables:** Retrieves the log variables from the specified IO log.
- **Get IO Log file as attachment:** Retrieves an iolog file as a binary attachment.
- **IO Log search:** Search a list of iologs, specified with a glob style wildcard parameter **file**, for the query string **<query>**. This is a similar format to the SOLR search string where you have a regular expression query, with **keyword:value** values. For example, **stdout:\*inittab** would search for any iologs that incorporate the word **inittab** in the output. All of the standard keyword values that can be extracted from iologs can be used in the search criteria. Regular expression matches are not made across newlines.
- **IO Log Replay:** Retrieves and interprets an IO log file ready to be output by a GUI. Override terminal emulation using the parameter **term**, and the output can be limited by **len** and **start** parameters so that individual parts of the log can be retrieved in "chunked" form.

## Event Logs

- **Event Log Get:** Retrieves the specified event log.
- **Get Event Log file as attachment:** Retrieves the specified event log as a binary attachment.

## Key File

- **Key Get:** Gets the specified **pb.key** file as a base64 encoded string
- **Key Set:** Sets the specified **pb.key** to the base64 encoded string
- **Create a new key:** Creates a new specified **pb.key** file and generates random contents
- **Get Key file as attachment:** Retrieves the specified **pb.key** file as a binary attachment

## SOLR

- **Solr Get:** Retrieves SOLR search results based upon the supplied criteria

## Authentication

REST is a stateless protocol, which is strongly stressed and adhered to, and so each and every call must authenticate itself to the REST service. Privilege Management for Unix & Linux REST API will use an authentication method developed by Amazon Web Services that uses a pre-shared key and HMAC signature.

An Application ID, devised by the administrator, is inputted into a key store maintenance program that stores the ID alongside a randomly generated Application Key, and specified ACL's that specify what access the Application ID has. The Application Key is outputted, and these two together form the authentication mechanism.

The Application ID and a timestamp (epoch seconds) of information are hashed together using the Application Key to make an MD5 HMAC signature that is appended onto the URL of each call. It checks the timestamp to make sure it is relatively recent, retrieves the Application ID and produces the HMAC using the same parameters to check the authentication is valid. The key store is encrypted by default, and can be relocated using configuration in **pb.settings**.

## Installation and Configuration

The REST API is bundled in tar files and package installers.



**Note:** REST API is not fully supported on macOS.

### Prerequisites

- A suitable web server that supports Fast CGI protocol, configured to support Fast CGI modules and HTTPS/SSL (with a suitable certificate). This includes the enabling of any firewalls to allow HTTPS access.
- Privilege Management for Unix & Linux v7.1.0 or above preinstalled and configured.
- Root access on the host that will provide REST API to enable the installation of the module.
- For development with the Java example sources, a Java 7 JDK is required, and the Eclipse IDE project files are provided for convenience.

The REST API must be installed on different Privilege Management for Unix & Linux hosts, based on the functionality required:

REST API Call	Privilege Management Component Requiring REST API Installation
Get License	Policy Servers
Get/Put Policy	Policy Servers
Get/Put Settings	The local host where the settings need to be read/written to
Get/Search/List iologs	Log Servers
Get Eventlogs	Log Servers
Get/Create keyfile	Policy Servers
Solr search	Any host

### REST API Installed Files



**Note:** *tempfilepath* defines a temporary path to be used as the temporary filesystem for PMUL binaries. The default is set as */tmp*. At install time, if *pbinstall* is invoked, using "*-t <tempdir>*" option, *tempfilepath* will be set to *<tempdir>*. *lockfilepath* defines a lock file path for PMUL binaries as needed. The default is */opt/pbul/locks*.

When REST API is installed, the following files will be copied to the host:

- The binary **pbrestcall** will be copied to the Administration Program Location (*/usr/sbin*, by default).
- The binary **pbconfigd** will be copied to WWW server CGI directory specified during the installation.



For more information on **pbrestcall** and **pbconfigd**, please see "**pbrestcall**" on page 430 and "**pbconfigd**" on page 429.

- The sample code files will be copied to the REST API sample code directory specified during the installation:
  - **examples/lighttpd/**: Example configuration files for **lighttpd**. The contents of these are referenced below in the example configuration of web server
  - **examples/java/**: Java sources and Eclipse project for Java API examples
  - **examples/java/PBULAPI/build.xml**: Ant build script to build the Java **.jar**
  - **examples/java/PBULAPI/doc**: Javadoc documentation
  - **examples/jsoncalls.html**: Example of static HTML file, containing JavaScript implementation of JSON API. The file contains JavaScript sections that implement the MD5 HMAC required to make the REST call.
  - **examples/java/PBULAPI/test**: JUnit test suite to test all areas of the JSON REST API using Java
  - **examples/java/PBULAPI/src/\***: The Java example source to call the REST API
  - **examples/scripts/**: Example bash scripts that implement JSON API calls

## pblighttpd Service

**pblighttpd** is the HTTP server daemon which launches the REST service. It is configured to run as a service in the background on hosts where a Privilege Management for Unix & Linux server component is installed. After a successful installation, the **pblighttpd** service is configured to startup and shutdown via **init** on Linux/HP-UX, **initab** for AIX, and **SMF** for Solaris 10+.

### Stop pblighttpd

Platform	Command
Linux	<code>service pblighttpd stop</code>
HP-UX	<code>/sbin/init.d/pblighttpd stop</code>
AIX	<code>stopsrc -s pblighttpd</code>
Solaris	<code>svcadm disable pblighttpd</code>

### Start pblighttpd

Platform	Command
Linux	<code>service pblighttpd start</code>
HP-UX	<code>/sbin/init.d/pblighttpd start</code>
AIX	<code>startsrc -s pblighttpd</code>
Solaris	<code>svcadm enable pblighttpd</code>

You can also restart **pblighttpd** using the **pblighttpd\_svc.sh** script. The script simply restarts **pblighttpd** without having to remember how to start the service on different platforms.

```
<prefix>pblighttpd_svc.sh<suffix> <action>
```



**Note:** When required, **<action>** is one of the following: *start, stop, or restart.*

This script uses **pbdbutil/pbadmin** option to check to see if **pblighttpd/pbconfigd** processes are accepting requests before attempting to stop or restart.

```
<prefix>pbdbutil<suffix> --info --restsvr
```

If not accepting requests, the script displays **The process does not seem to accept requests, attempting to <stop/restart> anyway** to inform user of current status but proceeds with stopping or restarting the service anyway.

To avoid running out of resources during heavy load while support authentication events to a program (**eventdestinations authedt=|program**), **pblighttpd-svc** must be started with unlimited **NOFILES** and **NPROC**, at least. For example, on Linux with **systemd**:

```
# cat /etc/systemd/system/pblighttpd.service
[Unit]
Description=BeyondTrust Privilege Management - REST Server
After=network.target
[Service]
Type=forking
Environment=LD_LIBRARY_PATH=/opt/pbul/rest/lib:/opt/pbul/lib:/usr/lib/oracle/19.5/client64/lib
ExecStart=@/opt/pbul/rest/sbin/pblighttpd-svc pblighttpd-svc -d -i xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
ExecReload=/bin/kill -HUP $MAINPID
TasksAccounting=false
LimitNPROC=infinity
LimitNOFILE=infinity
LimitCORE=infinity
[Install]
WantedBy=multi-user.target
```

For legacy sysV, simply add **ulimit -u unlimited** and **ulimit -n unlimited** to the start routine of **/etc/rc.d/init.d/pblighttpd**.

### Restart pblighttpd when pb.settings is changed

The **pblighttpd** service must be restarted when the following keywords are changed in **pb.settings**:

- **svccacherefresh**
- **dbsyncrefresh**
- **pblicenserefresh**
- **autofwdtime**
- **iologactioninterval**
- **sharedlibssldependencies**
- **sharedlibcurldependencies**
- **schedulingservice**
- **restservice**
- **pbrestlog**
- **messengeroutersocketpath**
- **messengerrouterqueuesize**

## Privilege Management for Unix & Linux REST API Programs

### pbconfigd

- **Version 8.5.0 and earlier:** **pbconfigd** setting not available
- **Version 9.0.0 and later:** **pbconfigd** setting available

The **pbconfigd** binary is utilized by the **pblighttpd** process to provide REST services. Much of the functionality that is provided by newer versions of Privilege Management for Unix & Linux uses facilities that the REST services provide. These include secure communication between services across the enterprise, a reliable replicated database layer, scheduled tasks that provide automated maintenance and housekeeping for background processes, the REST API layer used by the BeyondInsight for Unix & Linux GUI management tool, and can be used by customers to integrate Privilege Management for Unix & Linux with their own in-house processes and systems.

**pbconfigd** is launched by the **pblighttpd** server and communicates in JSON over the FastCGI protocol. The service is started automatically by the operating system and services requests when various other facilities of Privilege Management for Unix & Linux require it. Primary Servers will tend to instantiate more **pbconfigd** processes so that they can more readily serve Secondary Servers and Clients with services such as Registration Name Service, Role Based Policy configuration, File Integrity Monitoring, and Licensing framework. Client hosts do not generally run **pbconfigd** processes, but can momentarily launch the service to allow client configuration or to retrieve valuable data for the BeyondInsight for Unix & Linux management GUI.

As more Privilege Management for Unix & Linux facilities become more reliant upon the REST service for reliable and successful functioning, it is vital to make sure that the service is working correctly. We recommend the REST log file is closely monitored and the troubleshooting guide is used whenever issues are noted.

Generally **pbconfigd** is launched automatically by the **pblighttpd** service and should not be launched manually.



**Note:** **pbconfigd** has a **--call** option. This action requires a JSON string parameter to process and processes as if the call was made over REST. This allows specific calls that are required to action licensing and message router queuing calls to be made.



For more information, please see "[pblighttpd Service](#)" on page 428.

## Usage

```
pbconfigd [options]
  -v, --version
  --help
```

## Arguments

<b>-v, --version</b>	Optional. Display version and exit.
<b>--help</b>	Optional. Display this help message and exit.

## pbrestcall

- **Version 8.0 and earlier:** **pbrestcall** setting not available
- **Version 8.1.0 and later:** **pbrestcall** setting available

The **pbrestcall** utility provides a method of making REST API calls from the command line. It will calculate the MD5 HMAC of the header to provide authentication, and will encode command line parameters on the URL.

## Example

```
pbrestcall -l -a appid -k f339c33b-64d7-44f4-b113-34e344cff670 https://myhost:24351/REST/settings
```

This would retrieve and display all of the `/etc/pb.settings` from the Policy Server host using the REST API, and the `-l` parameter would list them in a formatted JSON format.

## Usage

```
pbrestcall [options] [param=value param=value...]
  -a <appId> [<acl> ...]
  -k <appKey>
  -d
  -X
  -l
  -v
  -t
  -p
```

## Arguments

<code>-a &lt;appId&gt;</code>	Mandatory. Specify Application ID to use.
<code>-k &lt;appKey&gt;</code>	Mandatory. Specify Application Key to use.
<code>-d</code>	http body data as a string, or - to use <b>stdin</b>
<code>-X</code>	http request method. <b>GET, PUT, POST, DELETE.</b>
<code>-l</code>	Long (pretty print) JSON
<code>-v</code>	Verbose
<code>-t</code>	Debug
<code>-p</code>	Print the URL and exit

## Configuration of pbconfigd FastCGI Module

The `pbconfigd` specific parameters below may need to be added to `/etc/pb.settings` manually.

### restkeyencryption

- **Version 8.0 and earlier:** `restkeyencryption` setting not available
- **Version 8.1.0 and later:** `restkeyencryption` setting available

This is similar to other encryption keywords but only takes one value at a time.



For more information, please see "[networkencryption](#)" on page 176.

```
restkeyencryption <algorithm-1>:<keyfile=/fullpath/data-file-1>
[:<startdate=yyyy/mm/dd>:<enddate=yyyy/mm/dd>]
```

### Example

```
restkeyencryption aes-256:keyfile=/etc/pb.key
```

### Default

```
restkeyencryption aes-256
```

### Used on

- All hosts where **pbconfigd** is installed.
- Privilege Management for Unix & Linux Basic client hosts

### pbrestlog

- **Version 8.0 and earlier:** **pbrestlog** setting not available
- **Version 8.1.0 and later:** **pbrestlog** setting available

This option configures where the **pbconfigd** binary should log debug and error messages.

### Example

```
pbrestlog /var/log/pbrest.log
```

### Default

Depending on the operating system standards, this can be any of the following:

- **/var/log/pbrest.log**
- **/var/adm/pbrest.log**
- **/usr/adm/pbrest.log**

### Used on

All hosts where **pbconfigd** is installed

### pbrestkeyfile

- **Version 8.0 and earlier:** **pbrestkeyfile** setting not available
- **Version 8.1.0 and later:** **pbrestkeyfile** setting available

This option allows the specification of where the **pbconfigd** keys are kept. This keystore is encrypted using the **restkeyencryption** option above. It may be written as an absolute path, or a path relative to the **basedir** setting.

### Example

```
pbrestkeyfile /mypath/pbrstkeys.db
```

## Default

```
pbrestkeyfile /opt/pbul/dbs/pbrstkeys.db
```

## Used on

All hosts where **pbconfigd** is installed

## REST ACL's

To allow different applications to have different access over the REST API ACL's have been implemented and can be created against given application ID's. These take the form of regular expressions that match specific REST API URL's. Each application ID can have up to 8 regular expressions assigned to them.

## Examples

<b>GET:/settings</b>	Allow retrieval of any settings
<b>PUT:/settings</b>	Allow the change of any settings
<b>(GET PUT):/setting^(submitmaster acceptmasters\)</b>	Allow the modification of <b>submitmaster</b> and <b>acceptmasters</b>
<b>GET:/iolog.*file=%2Ftmp%2F.*</b>	Allow the retrieval of any iolog in <b>/tmp</b>

## Configuration of pbconfigd Keystore

To enable the authentication of REST API sessions pre-shared keys are created with application identifiers. These are used to identify the application and to create a MD5 HMAC (along with a timestamp) to authenticate the session.

For example, the most basic configuration would be to run:

```
pbdbutil --rest -g appid
```

This would create an application id of **appid** and display the application key, which needs to be noted down as it cannot be retrieved and added to the web application.

## Specify a REST URL Path and Parameters

RESTful interfaces use the URL path to specify data and attributes, not actions. Actions are specified using the HTTP request methods **GET**, **PUT**, **POST**, and **DELETE**. Data is grouped together in the URL path, so for example all Privilege Management for Unix & Linux settings are specified in the path **/REST/settings** (or **/REST/setting** when accessing a single setting). HTTP **GET** requests always pass parameters (URL encoded) as URL parameters on the URI. **PUT**, **POST**, and **DELETE** can use either the URI or the HTTP body to pass more complicated data.

## Examples

To retrieve the iolog **/tmp/iolog+root.log**:

```
GET https://<host>:<port>/REST/iolog?file=%2f/tmp%2fiolog%2broot%2elog
```

To overwrite the **pb.settings** parameter **submitmaster**:

```
PUT https://<host>:<port>/REST/setting/submitmaster
{ "setting": { "values": ["pbuild", "pbuild2", "pbuild3"] }}
```

## Privilege Management for Unix & Linux REST Calls and Parameters

### Authentication

#### Authentication (unsuccessful)

Invalid authentications can be because of incorrect **appid**, **appkey**, invalid HMAC calculation or invalid **pbrest** keystore.

```
GET https://pbuild:24351/REST/setting/policydir?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE {"error":"8119 Invalid Authentication for appId 'myappid' from
192.168.16.128","status":8119}
```

### Settings

#### Get Settings

Get all of the settings from **pb.settings** (or equivalent). Each setting has one of 4 distinct types:

- String
- Boolean
- List of Strings
- **altsubmitmasters**: Has a special list of Privilege Management for Unix & Linux objects.

```
GET https://pbuild:24351/REST/settings?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE {"status":0,"settings":[{"values":["8da3e912","83099374","52adfcae","27825f05"],
"description":"Validation","name":"validation","type":3},
{"description":"Licensing Data to Save","name":"licensedata","value":"datenodename","type":2}, ...
```

#### Get Setting

Gets an individual setting as specified on the URL.

```
GET https://pbuild:24351/REST/setting/submitmasters?appid=<appid>&timestamp=
<timestamp>&hmac=<hmac>
```

```
RESPONSE {"setting":[{"values":["pbuild","pbuild2","pbuild3"],"description":"Submit
Masters","name":"submitmasters","type":3}], "status":0}
```

## Put Setting

Put (modify) a setting into the **pb.settings** file. The type needs to correspond to the original setting type.

```
PUT https://pbuild:24351/REST/setting/warnuseronerror?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST {"setting":{"name":"warnuseronerror","value":"no","type":1}}
```

```
RESPONSE {"status":0}
```

## Get Settings file as attachment

Retrieves the whole **pb.settings** file as a binary attachment.

```
GET https://pbuild:24351/REST/settingsfile?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&file=%2Fetc%2Fpb.settings <binary attachment>
```

## License

### List Client License Information

#### List Client Host Details

Optional argument: verbose=0|1

```
GET https://pbuild:24351/pbrest/REST/v2.0/license/clients?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

Without verbose:

```
RESPONSE { "clients" : [ {"lid":123, "uuid":"66fd4906-81c9-4739-8a27-308546af90ae", "fqdn":"myhost1.com", "addr" : "[ {\\"family\\": 4, \\"port\\": 5678, \\"addr\\": \"192.168.1.1\" } ]", "lastupdated" : "2017-08-01", "retired" : "2017-08-01", "recycle" : "2017-09-01" } ] }
```

With verbose:

```
RESPONSE { "clients" : [ {"lid":123, "uuid":"66fd4906-81c9-4739-8a27-308546af90ae", "fqdn":"myhost1.com", "addr" : "[ {\\"family\\": 4, \\"port\\": 5678, \\"addr\\": \"192.168.1.1\" } ]", "lastupdated" : "2017-08-01", "retired" : "2017-08-01", "recycle" : "2017-09-01", "stats" : [ { "lid" : 123, "svc" : "pbpolicy", "firstupdated" : "2017-01-01", "lastupdated" : "2017-10-01"}, { "lid" : 123, "svc" : "sudopolicy", "firstupdated" : "2017-01-01", "lastupdated" : "2017-11-01"}, { "lid" : 123, "svc" : "fim", "firstupdated" : "2017-01-01", "lastupdated" : "2017-11-21" } ] } ] }
```

#### List Client Host Details

Optional argument: verbose=0|1

```
GET https://pbuild:24351/pbrest/REST/v2.0/license/clients/<host>?appid=<appid>
&timestamp=<timestamp>&hmac=<hmac>
```

## RESPONSE

As above, but only for one specified host

### List Client Host (wildcard) Details

**Optional argument:** verbose=0|1

```
GET https://pbuild:24351/pbrest/REST/v2.0/license/clients?appid=<appid>&timestamp=
<timestamp>&hmac=<hmac>&hostname=<wildcard>
```

## RESPONSE

As above, but only for wildcarded hosts

### List Service License Information

#### List All Service Records

**Optional argument:** verbose=0|1

```
GET https://pbuild:24351/pbrest/REST/v2.0/license/svc?appid=<appid>&timestamp=
<timestamp>&hmac=<hmac>
```

Without verbose:

```
RESPONSE {"stats" : [ {"attr" : "PBULPolClnts", "cnt" : 800}, {"attr" : "SudoPolClnts", "cnt" : 800},
{"attr" : "ACAClnts", "cnt" : 800}]}
```

With verbose:

```
RESPONSE {"stats" : [ { "lid" : 123, "attr" : "PBULPolClnts", "firstupdated" : "2017-01-01",
"lastupdated" : "2017-10-01"}, { "lid" : 123, "attr" : "SudoPolClnts", "firstupdated" : "2017-01-01",
"lastupdated" : "2017-11-01"}, { "lid" : 123, "attr" : "ACAClnts", "firstupdated" : "2017-01-01",
"lastupdated" : "2017-11-21"} ]}}
```

#### List Specified Service Records

**Optional argument:** verbose=0|1

```
GET https://pbuild:24351/pbrest/REST/v2.0/license/svc/<svctype>?appid=<appid>&timestamp=
<timestamp>&hmac=<hmac>
```

Without verbose:

```
RESPONSE {"stats" : [ {"attr" : "PBULPolClnts", "cnt" : 800}]}
```

With verbose:

```
RESPONSE {"stats" : [ { "lid" : 123, "attr" : "PBULPolClnts", "firstupdated" : "2017-01-01",  
"lastupdated" : "2017-10-01" } ] }
```

## Get License Record

**Optional argument:** verbose=0|1

```
GET https://pbuild:443/pbrest/REST/v2.0/license?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE { "license" : { "PBULPolClnts":100, "SudoPolClnts":0, "RBPClnts":100, "ACAClnts":100,  
"AKAClnts":0, "FIMClnts":10, "SOLRClnts":2, "Expires":"2018/12/25 23:59:00",  
"Terminates":"2019/03/25 23:59:00", "HostId":"6fce4d59-7359-4c7e-a793-90f3989214a0", "Owner":"My  
Company PLC", "Comment":"This is the PBUL license for My Company",  
"AutoExpiry": 90, "Recycle": 30, "HMAC":"skSUGmkZ491x6Bzul2g5wgl/WsY6WbFUwMB8kT3zmro=" } }
```

## Put License Record

```
PUT https://pbuild:443/pbrest/REST/v2.0/license?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

### Args

```
{ "whoami" : "root", "license" : { "PBULPolClnts":100, "SudoPolClnts":0, "RBPClnts":100,  
"ACAClnts":100, "AKAClnts":0, "FIMClnts":10, "SOLRClnts":2, "Expires":"2018/12/25 23:59:00",  
"Terminates":"2019/03/25 23:59:00", "HostId":"6fce4d59-7359-4c7e-a793-90f3989214a0", "Owner":"My  
Company PLC", "Comment":"This is the PBUL license for My Company",  
"AutoExpiry": 90, "Recycle": 30, "HMAC":"skSUGmkZ491x6Bzul2g5wgl/WsY6WbFUwMB8kT3zmro=" } }
```

### Failure

```
RESPONSE {"status": 3828,"error": "3828.41 Failed to update License - Invalid argument"}
```

## Retire Client Record

```
PUT https://pbuild:443/pbrest/REST/v2.0/license/retire?appid=<appid>&timestamp=  
<timestamp>&hmac=<hmac>
```

### By UUID:

```
{ "whoami" : "root", "retire" : { "uuid" : "..." } }
```

### By FQDN:

```
{ "whoami" : "root", "retire" : { "fqdn" : "..." } }
```

### By List:

```
{ "whoami" : "root", "retire" : [ { "uuid" : "..." }, { "uuid" : "..." } ] }
```

```
RESPONSE {"status" : 0}
```

### Process licensing write queues and send them to the primary license server

```
PUT put_sync cd /usr/lib/beyondtrust/pb/rest/sbin  
./pbconfigd --call '{ "appid" : "appid", "appkey" : "866bfc75-72d2-4dcf-9b08-4dbd9474a493",  
"request" : {"content_type" : "application/json", "method" : "GET", "uri" : "/v2/license/put_sync"  
}}'
```

```
RESPONSE Status: 200  
Content-type: application/json  
{"status":0}
```

### Retrieve licensing statistics from the primary license server and write them to the local pbulicense.db

```
GET get_sync cd /usr/lib/beyondtrust/pb/rest/sbin  
./pbconfigd --call '{ "appid" : "appid", "appkey" : "866bfc75-72d2-4dcf-9b08-4dbd9474a493",  
"request" : {"content_type" : "application/json", "method" : "GET", "uri" : "/v2/license/get_sync"  
}}'
```

```
RESPONSE Status: 200  
Content-type: application/json  
{"status":0}
```

## Policy

### Policy List Dir

List all of the files in a given directory (without checking they are policy files). Some system directories cannot be listed for security.

```
GET https://pbuild:24351/REST/policies?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>  
&path=%2Fopt%2Fpbul%2Fpolicies
```

```
RESPONSE {  
  "dir": [  
    {  
      "path": "/opt/pbul/policies/pbul_policy.conf",  
      "type": "file",  
      "name": "pbul_policy.conf",  
      "size": 5345,  
      "mtime": "2018-11-02 16:36:23",  
      "where": "fs"  
    },  
    {  
      "path": "/opt/pbul/policies/pb.conf",  
      "type": "file",  
      "name": "pb.conf",  
    }  
  ]  
}
```

```
"size": 228,
"mtime": "2018-11-17 16:20:55",
"where": "fs"
},
{
  "path": "/opt/pbul/policies/pbul_functions.conf",
  "type": "file",
  "name": "pbul_functions.conf",
  "size": 11747,
  "mtime": "2018-11-02 16:36:23",
  "where": "fs"
}
]
}
```

### Policy (Script) Get Lines

Get a script based policy file as ordered an array of lines, making line based modifications to the policy file easier.

```
GET https://pbuild:24351/REST/policies?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&format=script&file=%2Fopt%2Fpbul%2Fpolicies%2Fpb.conf
```

```
RESPONSE {
  "file": "/opt/pbul/policies/pb.conf",
  "format": "script",
  "lines": [
    "result=getuserpasswd(user, \"Passwd for \"+user+\": \", 1, \"/opt/pbul/gp001\", 20);",
    "printf(\"result=%d\\n\", result);",
    "if (result == 0) ",
    "reject;",
    "else",
    "accept;"
  ]
}
```

### Policy (Script) Get Full File

Get the full script based policy file as a long string.

```
GET https://pbuild:24351/REST/policy?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&format=script&file=%2Fopt%2Fpbul%2Fpolicies%2Fpb.conf
```

```
RESPONSE {
  "file": "/opt/pbul/policies/pb.conf",
  "format": "script",
  "policy": "result=getuserpasswd(user, \"Passwd for \"+user+\": \", 1, \"/opt/pbul/gp001\",
20);\nprintf(\"result=%d\\n\", result);\nif (result == 0) \n reject;\nelse\n accept;\n"
}
```

### Policies (CSV) Get All

Retrieves an array of CSV policies. Elements are generally strings or arrays of strings.

```
GET https://pbuild:24351/REST/policies?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&format=csv&file=%2Fetc%2Fpb%2Fpb.csv
```

```
RESPONSE {"status":0,"file":"/etc/pb/pb.csv","format":"csv","policies":
[{"dateend":"none","enabled":"Active","verifyuser":0,"adgrps":
["PBSE\\pbqa","PBSE\\pbdev"],"datestart":"none","timeoutstop":"","hostsmatch":"1","args":
["0","0","0","0","0","0"],"lclgrps":["root","pbdev"],"subhosts":["ANY"],"adusers":
[""],"type":"Accept","runcmds":
["","","","","",""],"hostlistsmatch":"1","runhosts":[""],"subcmds":

["bash","csh","ksh","ksh93","tcsh","sh"],"defineenv":0,"name":"Shell","timestart":"none","timeend":"
none","keylog
":0,"preserveenv":0,"runas":["root","qareveal","PBSE\\qareveal","qareveal@pbse.lab"],"lcllusers":
["ctaylor"]},
{"dateend":"none","enabled":"Active","verifyuser":0,"adgrps":
["PBSE\\pbqa","PBSE\\pbdev"],"datestart":"none","timeoutstop":"","hostsmatch":"1","args":
["0","0","0","0","0","0"],"lclgrps":["root","pbdev"],"subhosts":["ANY"],"adusers":
[""],"type":"Accept","runcmds":
["","","","","",""],"hostlistsmatch":"1","runhosts":[""],"subcmds":

["bash","csh","ksh","ksh93","tcsh","sh"],"defineenv":0,"name":"FOO","timestart":"none","timeend":"no
ne","keylog
":0,"preserveenv":0,"runas":["root","qareveal","PBSE\\qareveal","qareveal@pbse.lab"],"lcllusers":
["ctaylor"]}, ...
```

## Policy (CSV) Get (by name)

Retrieve a given named CSV policy.

```
GET https://pbuild:24351/REST/policy/BOO?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&format=csv&file=%2Fetc%2Fpb%2Fpb.csv
```

```
RESPONSE {"status":0,"file":"/etc/pb/pb.csv","policy":
{"dateend":"none","enabled":"Active","verifyuser":0,"adgrps":
["PBSE\\pbqa","PBSE\\pbdev"],"datestart":"none","timeoutstop":"","hostsmatch":"1","args":
["0","0","0","0","0","0"],"lclgrps":["root","pbdev"],"subhosts":["ANY"],"adusers":
[""],"type":"Accept","runcmds":
["","","","","",""],"hostlistsmatch":"1","runhosts":[""],"subcmds":

["bash","csh","ksh","ksh93","tcsh","sh"],"defineenv":0,"name":"BOO","timestart":"none","timeend":"no
ne","keylog
":0,"preserveenv":0,"runas":["root","qareveal","PBSE\\qareveal","qareveal@pbse.lab"],"lcllusers":
["ctaylor"]},"format":"csv"}
```

## Policy (CSV) Put (by name)

Put a given CSV policy, named on the URL.

```
PUT https://pbuild:24351/REST/policy/BOO?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&format=csv&file=%2Fetc%2Fpb%2Fpb-tmp.csv
```

```
REQUEST {"policy":{"dateend":"none","enabled":"disabled","verifyuser":0,"adgrps":
["PBSE\\pbqa","PBSE\\pbdev"],"datestart":"none","timeoutstop":"","hostsmatch":"1","args":
["0","0","0","0","0","0"],"lclgrps":["root","pbdev"],"subhosts":["ANY"],"adusers":
[""],"type":"Accept","runcmds":
["","","","","",""],"hostlistsmatch":"1","subcmds":
["bash","csh","ksh","ksh93","tcsh","sh"],"runhosts":

[""],"defineenv":0,"name":"BOO","keylog":0,"timeend":"none","timestart":"none","preserveenv":0,"runa
s":
["root","qareveal","PBSE\\qareveal","qareveal@pbse.lab"],"lclusers":["ctaylor"]}}
```

```
RESPONSE {"status":0}
```

### Policy (Script) Set New Policy File

Create a new (optionally empty) policy script file. Directory is limited by **policydir** if it is set.

```
POST https://pbuild:24351/REST/policy?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&format=script&file=%2Fetc%2Fpb%2Ffoobar
```

```
REQUEST {"script":"accept;\n"}
```

```
RESPONSE {"status":0,"file":"/etc/pb/foobar"}
```

### Policy check (unsuccessful)

Checks policy in a similar manner to **pbcheck**.

```
GET https://pbuild:24351/REST/policies/check?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2Fopt%2Fbul%2Fpolicies%2FpbOLD.conf
```

```
RESPONSE {
  "status": 8103,
  "error": "8103.1 Error parsing policy file /opt/pbul/policies/pbOLD.conf, 3964 file
/opt/pbul/policies/pbOLD.conf does not exist"
}
```

### Policy check (successful)

Checks policy in a similar manner to **pbcheck**.

```
GET https://pbuild:24351/REST/policies/check?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2Fetc%2Fpb%2Ftry
```

```
RESPONSE {"message":"Syntax check completed with no problems detected","status":0}
```

### Policy check inline script (unsuccessful)

Checks inline script policy in a similar manner to **pbcheck**.

```
PUT https://localhost:24351/REST/policy/check?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST { "script" : "foobar\nbarfoo\n" }
```

```
RESPONSE {"errors":[{"line":1,"file":"inline","msg":"syntax error, unexpected $end"}, {"line":1,"file":"inline","msg":"1167.2 Expected a statement"}],"status":8103,"error":"8103.1 Error parsing policy script"}
```

### Policy check inline script (successful)

Checks inline script policy in a similar manner to **pbcheck**.

```
PUT https://localhost:24351/REST/policy/check?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST { "script" : "accept;" }
```

```
RESPONSE{"message":"Syntax check completed with no problems detected"}
```

### Get Policy file as attachment

Retrieves a full policy file as a binary attachment.

```
GET https://pbuild:24351/REST/policyfile?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&file=%2Fetc%2Fpb%2Fpb.conf <binary attachment>
```

### Role Based Policy Authentication

Test Role Based Policy authentication.

```
PUT https://localhost:24351/REST/policy/rbp/checkauth?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

#### Parameters

```
{ "rbp" : { "user" : "root", "submithost" : "pbuild", "command" : "/usr/bin/id", "runhost": "pbuild1", "pbclientmode": "pbrun" } }
```

The parameter node must contain at least **user**, **submithost** and **command**, but may also contain any other Privilege Management for Unix & Linux Policy variable, used when matching Roles. On a positive response the **info** part of the JSON response is the Role **row** that matched.

#### Positive Response

```
{
  "result": {
    "access": "allowed",
    "iolog": "/tmp/admin_iolog_root_XXXXXX",
    "userMessage": "hello root - risk 9\n",
    "info": {
      "name": "Admin",
      "runuser": "root",
      "runhost": "pbuild1",
      "risk": 9,
      "action": "A",
      "iolog": "/tmp/admin_iolog_%user%_XXXXXX",
      "message": "hello %user% - risk %pbrisklevel%",
      "variables": null,
      "auth": null,
      "script": null,
      "runcommand": ""
    }
  }
}
```

### Negative Response

```
{
  "result": {
    "access": "denied"
  }
}
```

## IO Logs

### IO Log Get

Retrieves an IO log file. Output can be limited by **len** and **start** parameters so that individual parts of the log can be retrieved in "chunked" form.

```
GET https://pbuild:24351/REST/iolog?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2Ftmp%2Fiolog.root.ckYxun
```

```
RESPONSE {"bytes":5832,"start":-1,"status":0,"file":"/tmp/iolog.root.ckYxun","len":0,"log":
[{"time":1386255179},
{"cols":80,"cmd":"CMD_WINCH","rows":24}, {"time":1386255179},
{"blob":"G10wO2N0YXlsb3JAcGJlaWxkOi9ob211L2N0YXlsb3IHG1s/MTAzNGhbcm9vdEBwYnVpbGQgY3RheWxvcl0jIA==", "cmd":"stdout", "blen":64}, {"time":1386255180}, {"blob":"bA==", "cmd":"stdin", "blen":1}, {"time":1386255180}, {"blob":"bA==", "cmd":"stdout", "blen":1}, {"time":1386255180}, {"blob":"cw==", "cmd":"stdin", "blen":1}, {"time":1386255180}, {"blob":"cw==", "cmd":"stdout", "blen":1}, {"time":1386255181}, {"blob":"DQ==", "cmd":"stdin", "blen":1}, {"time":1386255181}, {"blob":"DQo=", "cmd":"stdout", "blen":2}, {"time":1386255181}, ...
```

## IO Log List Dir

List all the files in a given directory (without checking if they are iologs). **Filter** can be specified as a regular expression to filter output. Some system directories cannot be listed for security.

```
GET https://pbuild:24351/REST/iolog?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&path=%2Ftmp
```

```
RESPONSE {"dir":
[{"name":"iolog.root.XXXXXX","mtime":1386252738,"path":"/tmp/iolog.root.XXXXXX","size":4928},
{"name":".8.0.0-
04.debug.60505","mtime":1386332287,"path":"/tmp/.8.0.0-04.debug.60505","size":850},
{"name":"pbcheck.log","mtime":1386076851,"path":"/tmp/pbcheck.log","size":94},
{"name":"iolog.root.jVruz1","mtime":1386255133,"path":"/tmp/iolog.root.jVruz1","size":5032},
{"name":".8.0.0-
04.debug.42263","mtime":1386335007,"path":"/tmp/.8.0.0-04.debug.42263","size":46}, {"name":".8.0.0-
04.debug.42219","mtime":1386334929,"path":"/tmp/.8.0.0-04.debug.42219","size":835},
{"name":"iolog.root.0HEKM5","mtime":1386256245,"path":"/tmp/iolog.root.0HEKM5","size":4979}, ...
```

## IO Log Get Variables

Retrieves the log variables from the specified IO log.

```
GET https://pbuild:24351/REST/iolog/variables?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2Ftmp%2Fiolog.root.ckYxun
```

```
RESPONSE {"status":0,"log":{"umask":18,"masterlocale":"en_
US","nice":0,"rungroup":"root","eventlog":"/var/log/800pb.eventlog","loghostip":"192.168.16.138","ma
sterhostip":"192.168.16.138","rlimit_fsize":-
1,"pbmasterdsysname":"Linux","optopt":"","time":"14:52:58","submithost":"pbuild","event":"Accept","p
blogdversion":"#1 SMP Wed Oct 16 18:37:12 UTC 2013","false":0,"runlimit_
core":0,"year":2013,"groups":
[[],"pbversion":"8.0.0-06","pbmasterdversion":"#1 SMP Wed Oct 16 18:37:12 UTC
2013","host":"pbuild","optind":1,"pbmasterdnodename":"pbuild","rlimit_cpu":-1,"logservers":
[],"runlimit_
memlock":65536,"runbkgd":0,"rcsworkgroup":"tramboyPBULMasterBeyondTrustWorkgroup","rungroups":
[[],"logserverlocale":"en_US","runeffectiveuser":"root","pbrunmachine":"x86_
64","runtimeout":0,"month":12,"dayname":"Thu","pbrunnodename":"pbuild","runoptimizedrunmode":1,"iolo
g":"/tmp/iolog.root.XXXXXX","submitlocale":"en_GB.UTF-8","runlimit_
nofile":1024,"optarg":"","cwd":"/home/ctaylor","runlimit_cpu":-1,"date":"2013/12/05", ...
```

## Get IO Log file as attachment

```
GET https://pbuild:24351/REST/iologfile?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2Ftmp%2Fiolog.root <binary attachment>
```

## IO Log search

Search a list of logs, specified with a glob style wildcard parameter **file**, for the query string **<query>**. This is a similar format to the SOLR search string where you have a regular expression query, with **keyword:value** values. For example **stdout:\*inittab** would

search for any iologs that incorporate the word **inittab** in the output. All of the standard keyword values that can be extracted from iologs can be used in the search criteria. Regular expression matches are not made across newlines.

```
GET https://pbuild/REST/iolog/search?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2ftmp%2fiolog%2a&query=stdout%3a%2e%2apbrest%2e
```

```
RESPONSE {"iologs":["/tmp/iolog.root.LNRRnt","/tmp/iolog.root.XXXXXX"],"status":0}
```

## IO Log Get Replay

Retrieves and interprets an IO log file ready to be output by a GUI. Terminal emulation can be overridden using the parameter **term**, and the output can be limited by **len** and **start** parameters so that individual parts of the log can be retrieved in "chunked" form.

```
GEThttps://pbuild:24351/REST/iolog/replay?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2ftmp%2fiolog.root.ckYxun
```

```
RESPONSE {"status":0,"file":"/tmp/iolog-root.HxV7YJ","term":"xterm","start":-
1,"len":0,"bytes":10676,"log":
[{"type":"token","name":"sz","values":[44,125]},{type:"text","time":1398357936,"value":"
[root@pbuild tmp]# "},
{"type":"text","time":1398357937,"value":"l"},{"type":"text","time":1398357937,"value":"s"},
{"type":"token","name":"absx","values":[0]},{type:"token","name":"nel"},
{"type":"text","time":1398357937,"value":"beyondtrust_pbinstall"},
{"type":"token","name":"htab","values":[1]},
{"type":"token","name":"htab","values":[1]},{type:"token","name":"htab","values":[1]},
{"type":"token","name":"htab","values":[1]},{type:"text","time":1398357937,"value":" img2c.8.5.0-
01.debug.31350 img2c.8.5.0-01.debug.31548"},{"type":"token","name":"absx","values":[0]},
{"type":"token","name":"nel"},{"type":"text","time":1398357937,"value":"beyondtrust_
solrinstall.prompt_log"},
{"type":"token","name":"htab","values":[1]},{type:"token","name":"htab","values":[1]},
{"type":"text","time":1398357937,"value":" img2c.8.5.0-01.debug.31359 img2c.8.5.0-01.debug.31557"},
{"type":"token","name":"absx","values":[0]},{type:"token","name":"nel"},
{"type":"text","time":1398357937,"value":"beyondtrust_solrinstall.prompt_log.ctime.Dec_5_14:15
img2c.8.5.0-01.debug.31368 iolog-root.HxV7YJ"},{"type":"token","name":"absx","values":[0]},
{"type":"token","name":"nel"},
{"type":"text","time":1398357937,"value":"beyondtrust_solrinstall.prompt_log.ctime.Dec_5_14:16
img2c.8.5.0-01.debug.31377 keyring-4E6Ccd"},{"type":"token","name":"absx","values":[0]},
{"type":"token","name":"nel"},
{"type":"text","time":1398357937,"value":"beyondtrust_solrinstall.prompt_log.ctime.Dec_5_14:18
img2c.8.5.0-01.debug.31386 keyring-IAzgb5"},{"type":"token","name":"absx","values":[0]},
{"type":"token","name":"nel"},
{"type":"text","time":1398357937,"value":"beyondtrust_solrinstall.prompt_log.ctime.Dec_5_14:21
img2c.8.5.0-01.debug.31395 keyring-qafDnO"},{"type":"token","name":"absx","values":[0]},
{"type":"token","name":"nel"},
{"type":"text","time":1398357937,"value":"gedit.ctaylor.233387052"},
{"type":"token","name":"htab","values":[1]},
{"type":"token","name":"htab","values":[1]},{type:"token","name":"htab","values":[1]},
{"type":"token","name":"htab","values":[1]},{type:"text","time":1398357937,"value":" img2c.8.5.0-
01.debug.31404 keyring-sQMK20"},{"type":"token","name":"absx","values":[0]},
{"type":"token","name":"nel"},
{"type":"text","time":1398357937,"value":"gedit.root.2441861592"},
```

```
{"type":"token","name":"htab","values":[1]},  
{"type":"token","name":"htab","values":[1]},{ "type":"token","name":"htab","values":[1]}, ...
```

## IO Log Cached List

If you chose to install the Log Cache database for use with PowerBroker Server Management Console, the Log Host creates and maintains a database to cache the names, locations, and other pertinent information about IO logs. You can retrieve the list of cached IO log information using the following calls. Options are provided to filter and sort the output based on certain criteria. Output can also be limited by "len" and "start" parameters so that individual parts of the log can be retrieved in "chunked" form.

```
GET https://pbuild/REST/iolog/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE {"result":  
 [{"uniqueid":"ac14202058221f4b116C","partnum":1,"createtime":1478631243787,"loghost":"uni.symark.com",  
  "logpath":"/var/log/pbiolog_SEPI7FJ5b","submithost":"uni.symark.com","submituser":"root","runhost":"uni.symark.com","runuser":"root",  
  "runcmd":"rm"},  
 {"uniqueid":"ac14202058221fb9118E","partnum":1,"createtime":1478631354266,"loghost":"uni.symark.com",  
  "logpath":"/var/log/pbiolog_SEPWd7Drt","submithost":"uni.symark.com","submituser":"root","runhost":"uni.symark.com","runuser":"root",  
  "runcmd":"passwd"}]}
```

## Filters

To retrieve the cached IO Log list filtered by the log path name, use the REST GET HTTP method with a URL similar to **https://.../list?path**, specifying a glob wildcard.

### Example

```
https://pbuild/REST/iolog/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&path=%2fvar%2flog%2f%2apb%5fiolog%2a
```

To retrieve the cached list of IO Log containing events on or after the given date/time, use the REST GET HTTP method with a URL similar to **https://.../list?from**, specifying date/time in the **yyyy-mm-dd HH:MM** format.

### Example

```
https://pbuild/REST/iolog/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&from=2016%2d11%2d02+18%3a00
```

To retrieve the cached list of IO Log containing events on or before the given date/time, use the REST GET HTTP method with a URL similar to **https://.../list?to**, specifying date/time in the **yyyy-mm-dd HH:MM** format.

### Example

```
https://pbuild/REST/iolog/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&to=2016%2d11%2d02+18%3a00
```

To retrieve the cached IO Log list filtered by **runhost**, use the REST GET HTTP method with a URL similar to **https://.../list?runhost**, specifying a **runhost**.

#### Example

```
https://pbuild/REST/iolog/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&runhost=uni%2esymark%2ecom
```

To retrieve the cached IO Log list filtered by **submithost**, use the REST GET HTTP method with a URL similar to **https://.../list?submithost**, specifying a **submithost**.

#### Example

```
https://pbuild/REST/iolog/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&submithost=uni%2esymark%2ecom
```

To retrieve the cached IO Log list filtered by **submituser**, use the REST GET HTTP method with a URL similar to **https://.../list?submituser**, specifying a **submituser**.

#### Example

```
https://pbuild/REST/iolog/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&submituser=root
```

To retrieve the cached IO Log list filtered by **runuser**, use the REST GET HTTP method with a URL similar to **https://.../list?runuser**, specifying a **runuser**.

#### Example

```
https://pbuild/REST/iolog/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&runuser=root
```

To retrieve the cached IO Log list filtered by **runcommand**, use the REST GET HTTP method with a URL similar to **https://.../list?runcmd**, specifying a **runcommand**.

#### Example

```
https://pbuild/REST/iolog/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&runcmd=rm
```

To retrieve the cached IO Log list limited by an offset and number of records, use the REST GET HTTP method with a URL similar to **https://.../list?path**, specifying **start** and/or **len** parameters.

#### Example

```
https://pbuild/REST/iolog/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&start=10&len=5
```

## Event Logs

### Event Log Get

Retrieves the specified event log

```
GET https://pbuild:24351/REST/events?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE {"time":0,"status":0,"events":
```

```
[{"runuser":"root","id":"c0a8108a52775f9781521","time":"08:49:27","masterhost":"pbuild","submithost":"pbuild",
,"event":"Accept","argv":["typeset","-x","SHELL","PATH","HOME"],"runhost":"pbuild","date":"2013/11/04","user":"root","exitstatus":"local shell builtin",
"runargv":["typeset","-x","SHELL","PATH","HOME"]},

{"runuser":"root","id":"c0a8108a528ce1a0462F","time":"16:21:52","masterhost":"pbuild","submithost":"pbuild",
"event":"Reject","argv":["bash"],"runhost":"pbuild","date":"2013/11/20","user":"root","exitstatus":"","runargv":["bash"]},

{"runuser":"root","id":"c0a8108a5285f5d350FE","time":"10:22:11","masterhost":"pbuild","submithost":"pbuild",
"event":"Accept","argv":

["pbguid","policy"],"runhost":"pbuild","date":"2013/11/15","user":"root","exitstatus":"Authorized",
"runargv":
["pbguid","policy"]},

{"runuser":"ctaylor","id":"c0a8108a528ce3414793","time":"16:28:49","masterhost":"pbuild","submithost":"pbuild",
,"event":"Accept","argv":

["CSV","ctaylor","udev","bash#csh"],"runhost":"192.168.16.138","date":"2013/11/20","user":"ctaylor",
"exitstatus":
"Command finished with exit status 0","runargv":["echo",""]}, ...
```

### Filters

To enable the filtering of events, parameters can be passed to this REST endpoint.

<b>accept=0 1</b>	(default=1)	Return Accept events
<b>reject=0 1</b>	(default=1)	Return Reject events
<b>keystroke=0 1</b>	(default=1)	Return events that resulted in an IO Log

These 3 filters are logically "OR"ed together, and should all be specified to limit the return of events.

Alternatively, the attribute **constraint** can be specified with a URL encoded string, using a format similar to the **-c** option of the **pblog** command, to filter events in a more advanced way. The **start** and **end** parameters can be specified as UNIX epoch seconds to limit the time/date range of searched events. Adding the parameter **verbose=1** will retrieve all of the data from the filtered events.

### Get Event Destinations

Retrieve a list of the current Event Log destinations. This will detail only the current settings, and will include all of the current options. A "null" or "false" attribute is taken as disabled.

```
GET https://<host>:24351/REST/v2.0/events/destinations
```

```
Response {
  "destinations": {
    "db": "/var/log/pb.eventlog.db",
    "ff": "/tmp/pb.eventlog",
    "prog": null,
    "odbc": "MySQL",
    "syslog": false
  }
}
```

### Filtered/Paged Events

Retrieve events from the data source, providing paging and filter attributes. This will work slowly on flat-file event files as each event is searched from the first to the limit (or end) sequentially. However, it should be instantaneous on database and ODBC sources.

**glob** wildcard matched attributes include: uniqueid, "etype" (event type 'A'ccept, 'R'eject, 'F'inish and 'K'eystroke), submituser, submithost, runuser, runhost, runcommand and exitstatus.

<b>from</b>	Match events after/from <date> (in time_t epoch or YYYY/MM/DD or full "YYYY/MM/DD HH:MM:SS" format)
<b>to</b>	Match events before/to <date> (in time_t epoch or YYYY/MM/DD or full "YYYY/MM/DD HH:MM:SS" format)
<b>start</b>	The start <b>recnum</b> record. The <b>recnum</b> is returned by previous calls or can be any known value.
<b>offset</b>	The start offset of the <b>recnum</b> required. This is returned by a previous call to this endpoint. It is optional, but greatly speeds up retrieval, if provided.
<b>verbose</b>	By default, only the common attributes are returned. However, if verbose is set the complete event is returned.
<b>limit</b>	Limit on records returned. The default is set to 32768, or 512 if verbose is set, to stop massive data results being returned by default.
<b>order</b>	Attribute to retrieve the data in. For example, <b>epoch</b> to get records in date order, or <b>recnum</b> to retrieve in logged order.
<b>orderdirection</b>	Attribute specifying "asc" or "desc" ordering.

**recnum** is returned for every retrieved record, and can be used as the next **start**.

Flat-file searching also returns **offset** which should also be supplied.

```
GET https://<host>:24351/REST/v2.0/events
```

```
Response {
  "events": [
    {
      "recnum": 2,
      "uniqueid": "c0a8108a5d0cce5b7239",
      "etype": "A",
      "epoch": "2019-06-21 18:03:52",
      "submituser": "root",
      "submithost": "pbuild",
      "runuser": "root",
      "runhost": "pbuild",
      "runcommand": "id",
      "exitstatus": null
    }
  ]
}
```

### Get Event Log File as Attachment

Retrieves the specified event log as a binary attachment.

```
GET https://pbuild:24351/REST/eventfile?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2Fvar%2Flog%2Fpb.eventlog <binary attachment>
```

### Event Log Cached List

If you chose to install the Log Cache database for use with BeyondInsight for Unix & Linux, the Log Host creates and maintains a database to cache the names, locations, and other pertinent information about event logs. You can retrieve the list of cached event log information using the following calls. Options are provided to filter and sort the output based on certain criteria. Output can also be limited by **len** and **start** parameters so that individual parts of the log can be retrieved in "chunked" form.

```
GET https://pbuild/REST/events/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE {"result":
[{"loghost": "tramboyo", "logpath": "/var/log/pb.eventlog", "startaccess": 1478628082763, "lastaccess": 1478630805131}, {"loghost": "dragonet.unix.symark.com", "logpath": "/var/log/pb.eventlog_20161108_110359", "startaccess": 1478631353890, "lastaccess": 1478631834290}, {"loghost": "dragonet.unix.symark.com", "logpath": "/var/log/pb.eventlog_20161108_110606", "startaccess": 1478631903222, "lastaccess": 1478631960983}]}
```

### Filters

To retrieve the cached Event Log list filtered by the log path name, use the REST GET HTTP method with a URL similar to **https://.../list?path**, specifying a glob wildcard.

### Example

```
GET https://pbuild/REST/events/list?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&path=%2fvar%2flog%2f%2a
```

To retrieve the cached Event Log list filtered by **runhost**, use the REST GET HTTP method with a URL similar to **https://.../list?runhost**, specifying a **runhost**.

#### Example

```
GET https://pbuild/REST/events/list?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&runhost=uni%2esymark%2ecom
```

To retrieve the cached list of Event Logs containing events on or after the given date/time, use the REST GET HTTP method with a URL similar to **https://.../list?from**, specifying date/time in the **yyyy-mm-dd HH:MM** format.

#### Example

```
GET https://pbuild/REST/events/list?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&from=2016%2d11%2d02+18%3a00
```

To retrieve the cached list of Event Logs containing events on or before the given date/time, use the REST GET HTTP method with a URL similar to **https://.../list?to**, specifying date/time in the **yyyy-mm-dd HH:MM** format.

#### Example

```
GET https://pbuild/REST/events/list?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&to=2016%2d11%2d02+18%3a00
```

To retrieve the cached Event Log list limited by an offset and number of records, use the REST GET HTTP method with a URL similar to **https://.../list?path**, specifying **start** and/or **len** parameters.

#### Example

```
GET https://pbuild/REST/events/list?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&start=10&len=5
```

## List Events by Eventdestination

### For SQLite DB

```
pbrestcall -a appid -k d0822498-b9aa-4eb0-8cd3-b95873a6dc4a -l -X GET
https://localhost:24351/REST/v2/events format=db
```

or nothing, since that's the default.

### For Flat File

You must set the file name. Example below **/var/log/pb.eventlog**:

```
pbrestcall -a appid -k d0822498-b9aa-4eb0-8cd3-b95873a6dc4a -l -X GET
https://localhost:24351/REST/v2/events format=ff file=/var/log/pb.eventlog
```

## For ODBC

You must set the DSN. Example below **oracle**:

```
pbrestcall -a appid -k d0822498-b9aa-4eb0-8cd3-b95873a6dc4a -l -X GET
https://localhost:24351/REST/v2/events format=odbc dsn=oracle
```

## Filters for Events

```
pbrestcall -a appid -k d0822498-b9aa-4eb0-8cd3-b95873a6dc4a -l -X GET
https://localhost:24351/REST/v2/events
[etype|runhost|submithost|runuser|submituser|runcommand|exitstatus]=<value>
```

## Order and Limit Number of Rows

```
pbrestcall -a appid -k d0822498-b9aa-4eb0-8cd3-b95873a6dc4a -l -X GET
https://localhost:24351/REST/v2/events order=<field> orderdirection=[asc|desc] limit=<number_of_
rows> start=<start_recnum> offset=<offset> from=<from_date> to=<to_date>
```

## File Integrity Monitoring (FIM)

### FIM - Get Config

Retrieve the specified FIM configuration policy

```
GET https://server1:24351/REST/fim/configs?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE {"name":"default","cfg":{"predefs":{"bin":{"all":
{"ino":true,"mode":true,"uid":true,"gid":true,"own":"root","pmask":"022","size":true,"mtime":true,"c
time":true,"hash":true,"risk":10},"sysconf":{"exec":
{"ino":true,"mode":true,"uid":true,"gid":true,"pmask":"022","size":true,"mtime":true,"ctime":true,"h
ash":true,"risk":10},"script":
{"ino":true,"mode":true,"uid":true,"gid":true,"pmask":"022","size":true,"mtime":true,"ctime":true,"h
ash":true,"risk":10},"dev":{"uid":true,"gid":true,"mode":true,"risk":10},"other":
{"ino":true,"mode":true,"uid":true,"gid":true,"pmask":"002","size":true,"mtime":true,"ctime":true,"r
isk":6},"log":{"all":{"uid":true,"gid":true,"mode":true,"pmask":"002","mtime_later":true,"ctime_
later":true,"risk":4}},"include":
[{"path":"/etc/*","chk":"sysconf","recurse":true,"xdev":true,"follow":false},
{"path":"/proc","chk":"log","recurse":false},{"path":"/mnt","chk":"log","recurse":false},
{"path":"/etc/mstab","chk":"log","recurse":false},{"path":"/etc/motd","chk":"log","recurse":false},
{"path":"/etc/passwd","chk":"log","recurse":false},
{"path":"/etc/shadow","chk":"log","recurse":false},
{"path":"/boot/*","chk":"sysconf","recurse":true,"xdev":true,"follow":false},
{"path":"/bin/*","chk":"bin","recurse":true,"xdev":true,"follow":false},
{"path":"/var/log/*","chk":"log","recurse":true,"xdev":true,"follow":false},
```

```
{ "path": "/var/adm/*", "chk": "log", "recurse": true, "xdev": true, "follow": false }, "exclude": [ "/root/.sh_history", "/home/*", "/etc/pb.db" ] }
```

## FIM - List configuration assignments

List all of the FIM configuration policies

```
GET https://server1:24351/REST/fim/assign?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE { "name": "default", "hostname": "pbuild", "lastupdated": "2016-11-14 16:17:08" }
```

## FIM - Get configuration assignment for Host

Get the name of the currently assigned configuration policy

```
GET https://server1:24351/REST/fim/config/host?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&hostname=<hostname>
```

```
GET https://server1:24351/REST/fim/config/host?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&name=<name>
```

```
RESPONSE { "name": "default", "hostname": "pbuild", "lastupdated": "2016-11-14 16:17:08" }
```

## FIM - List Reports

List the FIM reports

```
GET https://server1:24351/REST/fim/reports?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE [ { "uuid": "d897e8d5-d854-450a-be83-faeef2d52dae", "rundate": "2016-11-14 19:43:41", "updated": 0, "deleted": false, "new": 3332, "total": 3332, "policy": 0, "max_risk": 10, "name": "default", "host": "pbtest" } ]
```

## FIM - Get Report

Retrieve the specified report

```
GET https://server1:24351/REST/fim/report?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&uuid=<uuid>
```

```
RESPONSE { "uuid": "8511cd6f-f21e-4832-ba2a-33b2c483012f", "rundate": 26860624, "updated": 1, "deleted": 0, "new": 0, "total": 1, "policy": 0, "max_risk": 6, "name": "default", "host": "pbuild", "rpt": [ { "after": { "mtime": "2016-11-15 13:20:16", "ctime": "2016-11-15 13:20:16", "ino": 544386, "dev": 2051, "file": "foo" }, "path": "/etc", "before": { "mtime": "2016-11-04" } } ] }
```

```
16:14:03", "ctime": "2016-11-04  
16:14:03", "ino": 544386, "dev": 2051, "file": "foo"}, "risk": 6, "change": "updated"]}]}
```

### FIM - Put Configuration

Put the specified configuration policy

```
PUT https://server1:24351/REST/fim/config?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST { JSON config }
```

```
RESPONSE { "status" : 0 }
```

### FIM - Assign Configuration

Assign the specified host to the named configuration policy

```
PUT https://server1:24351/REST/fim/assign?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST { "name" : "<configname>", "hostname" : "<hostname>" }
```

```
RESPONSE { "status" : 0 }
```

### FIM - Delete Config

Delete the specified policy configuration

```
DELETE https://server1:24351/REST/fim/config?appid=<appid>&timestamp=<timestamp>  
&hmac=<hmac>&name=<name>
```

### FIM - Delete Report

Delete the specified FIM report

```
DELETE https://server1:24351/REST/fim/report?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

## Key File

### Key Get

Gets the specified **pb.key** file as a base64 encoded string.

```
GET https://pbuild:24351/REST/key?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE {"keyfile":
{"blob": "A8EumiklyZHh2yhJ/VeUXI1117r7WlXKuOkr/MtHY2fjqTB8q0/h0/rpsoJZrRJGmwvYiODH/uLIpfh2srZ01meA
p1tIypUCWzLop4Wmnfu4MWI7GtLYQnQbFjhm0jI3mrY8IDo0IusULmXTh7GCjYtS78Ypj3S2RZYQ2WNWZtoKtC2/Psv
+svTU9/Sj7K+Wna6zFvTnwqVTkdy8rOQ+kGDoBrZV0QbVowD2jWnGQjNjdne/w4mSdnX5BMATCe931aKbr4c+6MV
97S/HW9HUu/bxG7pf+Xcovax6d7WPRJYGVQP/GLJ6LER34MRpsuGJf3dMA4jvRGTPKue685pi41FyvIhacPKWBHBcD
e3mmIDlfoU7zzJy3k5hG1OEYARoAC/IBSjLQqIv4pTJr1FG95ko8T/DsVigg1VuFiB1VZg45FODzQy2sm5FHU47828kthvO
n30HXZBFFug2z7qcmohRGnKHHh9QSRzzy0GoaDs/+DTK1jOatwHXkzKBGLdyKRO068kk6xN9EafHWxq69zJ8v5nBZRL
8aOKn/4341U1LGsmPEtf+bNxJ7Wtlfw3pt3FSidC3ikButt3giM1dD42qYp2YYa19U7kNxC1+UiYK7EUJD7JI26MM/WiA3
uWCtkrz6iSnMxIZhhpYxV40jPFBNJg3entziObCw8DVzktPmYA+biXh05gnpUV7pSvq0XrefJ6/dXWLNosQD/znsFab
GzX/trWu1CNVqt1CW8nPzJD6gNFieWMavniipolDza+9Gdo9Sw1tFZyRip/ZZ56jvhnCKmOS8xOhfXx2c05kXwpBoBto8
FCrkiwjCi3f3YDz/RrNCspvWSgJN8MnNCXJRWy+cyQu7c/MQcwu+ySK1g0tqUhtLgKcJ7RwnGXrsUBu0F4WI9q6VCp
vfXDvnGCwsEwoyEnKMsMKGR30q6fM0tN+npq0zFLvnaAjtIgg0AxP4aHe6b6PLR/efTbt92EoyY6TbN+FsthUyjRTSbwh
lVnGs/291WemUJ4Pjss5FVBKoX5dKptivUDyvjChG7RQl/UuUzPtVvDr1c/oGPOf8VBT1jlg19s9w6GioofgoxW+/tGISwC
zQYgKkvNrAOLTTIGS2x/1WAxZCFZ74bffp/bsopnDxD+QzMrIBRQf0x9HdXC6vZPJvOdYIBCACp2fcwFE5aZ8y9o+gH3
cia2L0G5r07xEvIFp64xLKpBwCROyJXg0uwjIr1aWHk7BVUKUDeISH1KSyuZQwMskgaGtIZcPyyTmSnxYKIGHQnP854F4
4/4FLeDwnfiMGABN3WjOFvg9PvKcTJsa/0OUF4yw/oW7vGKaiJqG7bz0dsS0FRW/nQ3XsvUQ5p7oFX7", "blen":1026}
, "status":0}
```

## Key Set

Sets the specified **pb.key** to the base64 encoded string.

```
PUT https://pbuild:24351/REST/key?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2Fetc%2Fpb%2Ftmp.key
```

```
REQUEST {"blob": "WFP8yHAhy2KSublI34/azYmZeDHi3V1C+9H1nlmCthxqFD3B7ByQV8V3dCYP5N6S2nbIIHOWQ+emfzi5BS
YUxwRUqkS7dy5FnaquMVyIVFl1ehyqDufH38n33XOyN6dJjptcQS9bmlYoGT3IUrkyGLU6sHAN2k3HIDK4xDwu+wpgn
I8lLQOni6A2n4Hg7FHUcuvhtQG1D0XThe7qs1bEx4gb3o8ONR+dUMvvDpe40Sr6LCV8Lj3C8ixN1c8eqlMyxnUZr266J
5otWz+XCj44BhDndikJqwIucNADo50jnZL6leUmfds+5xoFiplUmrBzsdhpYf9H/Uo5zmICMjko+4VdaYTBhCmbEH63
MaQ6kXef3Nstyua4js7Xw6nzbJ2n2aXkQd0HFccSalpMMpFdB8v9VBgdKpAATq51bAwqREfo+LbEfnLtwvtKs9X/F36
```

```
3rI8dYCIyHqfz62sSFEqDcFuXKkp1HTagZL9tYk55Lts+mbFiDq7VvnpTBGaIL29Y+G3sSt/Stz2sUh7Fpjy3D30IgmynJhNj
ehmULOrjm6Rv1aFvN1LzBLKv63HhgMzYJ+FzcV9X9HEHWXAdfwrYNx+KGPqmyD8Prd6RSIX9gJUBks0VPfdmoEshS
W5iCXoStyPPGNQ1fFEcXQK69Pdrqr3Ltm3L2Lu0uQnNTBTfvdull+goGkiAFfJAY6kLOH5UTyC1cWzZkLI5Xb8EJ8nPT1
Ru5VBXI3f0Xhf97UfiKeCLzC2ewW1sV09NFqrtQG0Ie6uEsXJoSul2/196bB5A50zd8DVgnt57P08g09Y7hYkItYFFPNk5
UtAL+86BxlZFTbyiooCwHwrZbp9hBjAYhz84U7eKuPxVFKzL/Z9A3lWFMvdibPFwL+I2KWOED9b90wmQsC+RJZ7rm2x
JVF501D0ETm20t7vXIy5Kka2UAkLJPUptLPAVANbwBRHZ71j+D9UAczWth1YUmRPcKNNvRfj+grtvBb63oOouCUG
ZxPXSJfJ+b7Hwghi84ZTbxrSAzt2VRgUx0luSP0aogT9f11H7fuMjCtGPMsvBFgg/QvEwz10PEeY1DY8W5zVa11QMxf1lbBQ
JQQ+7iZLwG/pWnxo04tBYE5mxbt3AL9KHK9AIMx8e/vqSeu7cxJo2PAjnkEp+R1Q6gJprRCD19f0zQNV4IhRFFJ3eItF7
p003WS1iCPNATmpu+ZpYYeChCJlTL3+W8Tk8AsLCMTweZoJugFBKZ8fQR6W1PG6mzD98jgbet8czjpGpzA41", "blen":1
026}
```

```
RESPONSE {"status":0}
```

## Key New

Creates a new specified **pb.key** file and generates random contents.

```
POST https://pbuild:24351/REST/key?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2Fetc%2Fpb%2Ftmp.key
```

```
REQUEST {}
```

```
RESPONSE {"status":0}
```

## Get Key file as attachment

Retrieves the specified **pb.key** file as a binary attachment

```
GET https://pbuild:24351/REST/keyfile?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&file=%2Fetc%2Fpb.key
```

## Registry Name Calls

### Registry Name Service

### Registry Name Service Cache Update

Retrieves all the Registry Name Service Database updates for this host since **lastupdated**

```
GET https://server1:24351/REST/service/svccache?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&uuid=<uuid>&lastupdated=<num>
```

```
RESPONSE {"services":[{"svcgname":"registry_name_service","svc":1,"cn":"pbuild","uuid":"7d4504dd-
b64f-453c-9a12-53a079a8d4ff","fqdn":"pbuild","addrs":
[{"family":4,"addr":"192.168.16.138","port":24351}],{"role":4,"sorder":1,"lastupdated_
usec":1479140226550825},{"svcgname":"dflt_pbpolicy_service","svc":2,"cn":"pbuild","uuid":"7d4504dd-
b64f-453c-9a12-53a079a8d4ff","fqdn":"pbuild","addrs":
[{"family":4,"addr":"192.168.16.138","port":24351}],{"role":4,"sorder":1,"lastupdated_
usec":1479140226572396},{"svcgname":"dflt_log_service","svc":4,"cn":"pbuild","uuid":"7d4504dd-b64f-
453c-9a12-53a079a8d4ff","fqdn":"pbuild","addrs":
[{"family":4,"addr":"192.168.16.138","port":24351}],{"role":4,"sorder":1,"lastupdated_
usec":1479140226597899},{"svcgname":"dflt_sudopolicy_
service","svc":8,"cn":"pbuild","uuid":"7d4504dd-b64f-453c-9a12-
53a079a8d4ff","fqdn":"pbuild","addrs":
[{"family":4,"addr":"192.168.16.138","port":24351}],{"role":4,"sorder":1,"lastupdated_
usec":1479140226674180},{"svcgname":"dflt_fim_service","svc":128,"cn":"pbuild","uuid":"7d4504dd-
b64f-453c-9a12-53a079a8d4ff","fqdn":"pbuild","addrs":
[{"family":4,"addr":"192.168.16.138","port":24351}],{"role":4,"sorder":1,"lastupdated_
usec":1479140226701934},{"svcgname":"dflt_pbpolicy_service","svc":2,"cn":"pbtest","uuid":"024352a4-
d4d0-48d2-bdcc-76ec429632f7","fqdn":"pbtest","addrs":
[{"family":4,"port":24351,"addr":"192.168.16.184"}],{"role":1,"sorder":0,"lastupdated_
usec":1479152447772617},{"svcgname":"dflt_log_service","svc":4,"cn":"pbtest","uuid":"024352a4-d4d0-
48d2-bdcc-76ec429632f7","fqdn":"pbtest","addrs":
[{"family":4,"port":24351,"addr":"192.168.16.184"}],{"role":1,"sorder":0,"lastupdated_
usec":1479152447774991},{"svcgname":"dflt_fim_service","svc":128,"cn":"pbtest","uuid":"024352a4-
d4d0-48d2-bdcc-76ec429632f7","fqdn":"pbtest","addrs":
```

```
[{"family":4,"port":24351,"addr":"192.168.16.184"}],"role":2,"sorder":2,"lastupdated_
usec":1479152505459492}}]
```

## Registry Name Service - Get Service Group Info

Retrieves Service Group information from the Registry Name Service Database

```
GET https://server1:24351/REST/service/svcgrp?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE [{"svcgid":1,"svcgname":"registry_name_service","svc":"registry","updated_usec":"2016-11-14
16:17:06","deleted":false},
{"svcgid":2,"svcgname":"dflt_pbpolicy_service","svc":"pbpolicy","updated_usec":"2016-11-14
16:17:06","deleted":false},
{"svcgid":3,"svcgname":"dflt_log_service","svc":"logsvr","updated_usec":"2016-11-14
16:17:06","deleted":false},
{"svcgid":4,"svcgname":"dflt_sudopolicy_service","svc":"sudopolicy","updated_usec":"2016-11-14
16:17:06","deleted":false},
{"svcgid":5,"svcgname":"dflt_solr_service","svc":"solr","updated_usec":"2016-11-14
16:17:06","deleted":false},
{"svcgid":6,"svcgname":"dflt_logarch_service","svc":"logarchive","updated_usec":"2016-11-14
16:17:06","deleted":false},
{"svcgid":7,"svcgname":"dflt_beyondinsight_service","svc":"beyondinsight","updated_usec":"2016-11-14
16:17:06","deleted":false},
{"svcgid":8,"svcgname":"dflt_fim_service","svc":"fim","updated_usec":"2016-11-14
16:17:06","deleted":false}]
```

## Registry Name Service - Get Registry Name Service Host and Service Group Info

Retrieves Registry Name Service Host and Services information

```
GET https://server1:24351/REST/service/svchost/name?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&cn=<cn>&svcgname=<svcgname>
```

```
RESPONSE [{"svcgid":1,"svcgname":"registry_name_service","svc":"registry","updated_usec":"2016-11-14
16:17:06","deleted":false,"svcs":[{"svcgid":1,"hostid":1,"role":"primary","sorder":1,"created_
usec":"2016-11-14 16:17:06","updated_usec":"2016-11-14 16:17:06","cn":"pbuild","uuid":"7d4504dd-
b64f-453c-9a12-53a079a8d4ff","fqdn":"pbuild","addrs":
[{"family":4,"addr":"192.168.16.138","port":24351}],{"tnlzone":0,"deleted":0}}],
{"svcgid":2,"svcgname":"dflt_pbpolicy_service","svc":"pbpolicy","updated_usec":"2016-11-14
16:17:06","deleted":false,"svcs":[{"svcgid":2,"hostid":1,"role":"primary","sorder":1,"created_
usec":"2016-11-14 16:17:06","updated_usec":"2016-11-14 16:17:06","cn":"pbuild","uuid":"7d4504dd-
b64f-453c-9a12-53a079a8d4ff","fqdn":"pbuild","addrs":
[{"family":4,"addr":"192.168.16.138","port":24351}],{"tnlzone":0,"deleted":0}}],
{"svcgid":3,"svcgname":"dflt_log_service","svc":"logsvr","updated_usec":"2016-11-14
16:17:06","deleted":false,"svcs":[{"svcgid":3,"hostid":1,"role":"primary","sorder":1,"created_
usec":"2016-11-14 16:17:06","updated_usec":"2016-11-14 16:17:06","cn":"pbuild","uuid":"7d4504dd-
b64f-453c-9a12-53a079a8d4ff","fqdn":"pbuild","addrs":
[{"family":4,"addr":"192.168.16.138","port":24351}],{"tnlzone":0,"deleted":0}}],
{"svcgid":4,"svcgname":"dflt_sudopolicy_service","svc":"sudopolicy","updated_usec":"2016-11-14
16:17:06","deleted":false,"svcs":[{"svcgid":4,"hostid":1,"role":"primary","sorder":1,"created_
usec":"2016-11-14 16:17:06","updated_usec":"2016-11-14 16:17:06","cn":"pbuild","uuid":"7d4504dd-
```

```
b64f-453c-9a12-53a079a8d4ff", "fqdn": "pbuild", "addrs":
[{"family": 4, "addr": "192.168.16.138", "port": 24351}], "tnlzone": 0, "deleted": 0}},
{"svcgid": 5, "svcgname": "dflt_solr_service", "svc": "solr", "updated_usec": "2016-11-14
16:17:06", "deleted": false},
{"svcgid": 6, "svcgname": "dflt_logarch_service", "svc": "logarchive", "updated_usec": "2016-11-14
16:17:06", "deleted": false, "svcs": [{"svcgid": 6, "hostid": 1, "role": "primary", "sorder": 1, "created_
usec": "2016-11-14 16:17:06", "updated_usec": "2016-11-14 16:17:06", "cn": "pbuild", "uuid": "7d4504dd-
b64f-453c-9a12-53a079a8d4ff", "fqdn": "pbuild", "addrs":
[{"family": 4, "addr": "192.168.16.138", "port": 24351}], "tnlzone": 0, "deleted": 0}},
{"svcgid": 7, "svcgname": "dflt_beyondinsight_service", "svc": "beyondinsight", "updated_usec": "2016-11-14
16:17:06", "deleted": false},
{"svcgid": 8, "svcgname": "dflt_fim_service", "svc": "fim", "updated_usec": "2016-11-14
16:17:06", "deleted": false, "svcs": [{"svcgid": 8, "hostid": 1, "role": "primary", "sorder": 1, "created_
usec": "2016-11-14 16:17:06", "updated_usec": "2016-11-14 16:17:06", "cn": "pbuild", "uuid": "7d4504dd-
b64f-453c-9a12-53a079a8d4ff", "fqdn": "pbuild", "addrs":
[{"family": 4, "addr": "192.168.16.138", "port": 24351}], "tnlzone": 0, "deleted": 0},
{"svcgid": 8, "hostid": 2, "role": "secondary", "sorder": 2, "created_usec": "2016-11-14 19:41:45", "updated_
usec": "2016-11-14 19:40:47", "cn": "pbtest", "uuid": "024352a4-d4d0-48d2-bdcc-
76ec429632f7", "fqdn": "pbtest", "addrs":
[{"family": 4, "port": 24351, "addr": "192.168.16.184"}], "tnlzone": -1, "deleted": 0}}}]}
```

## Registry Name Service - Get Registry Name Service Group and Role Information

Retrieves Registry Name Service Group and Role information

**GET** <https://server1:24351/REST/service/svchost/role?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&role=<role>&svcgname=<svcgname>>

**RESPONSE** {"svcgid":1,"svcgname":"registry\_name\_service","svc":"registry","updated\_usec":"2016-11-14 16:17:06","deleted":false,"svcs":[{"svcgid":1,"hostid":1,"role":"primary","sorder":1,"created\_usec":"2016-11-14 16:17:06","updated\_usec":"2016-11-14 16:17:06","cn":"pbuild","uuid":"7d4504dd-b64f-453c-9a12-53a079a8d4ff","fqdn":"pbuild","addrs":[{"family":4,"addr":"192.168.16.138","port":24351}], "tnlzone":0,"deleted":0}]}

## Registry Name Service - Get Registry Name Service Host information

Retrieves Registry Name Service Group and Role information

**GET** <https://server1:24351/REST/service/host/name?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&cn=<cn>>

**GET** <https://server1:24351/REST/service/host/uuid?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&uuid=<uuid>>

**GET** <https://server1:24351/REST/service/host/fqdn?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&fqdn=<fqdn>>

**RESPONSE** {"hostid":1,"cn":"pbuild","uuid":"7d4504dd-b64f-453c-9a12-53a079a8d4ff","fqdn":"pbuild","addrs":

```
[{"family":4,"addr":"192.168.16.138","port":24351}],{"tnlzone":0,"updated_usec":"2016-11-14 16:17:06","deleted":false}
```

### Registry Name Service - Delete Service Group

Delete the specified Service Group

```
DELETE https://server1:24351/REST/service/svcgrp?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&svcgname=<svcgname>
```

### Registry Name Service - Delete Service Host

Delete the specified host from the specified Service Group

```
DELETEhttps://server1:24351/REST/service/svchost?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&svcgname=<svcgname>&cn=<cn>
```

### Registry Name Service - Delete Host

Delete the specified host from the Registry Name Service

```
DELETE
https://server1:24351/REST/service/host?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&cn=<cn>
```

### Registry Name Service - Put Service Group

Add/Update the specified Service Group

```
PUT https://server1:24351/REST/service/svcgrp?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST { "svc" : { "svcgname" : "<svcgname>", "svc" : "<svc>" } }
```

```
RESPONSE { "status" : 0 }
```

### Registry Name Service - Put Service Group Host

Assign the specified host as a given role within the specified Service Group

```
PUT https://server1:24351/REST/service/svchost?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST { "svc" : { "svcgname" : "<svcgname>", "cn" : "<cn>", "role" : "<role>" } }
```

```
RESPONSE { "status" : 0 }
```

## Registry Name Service - Put Host

Add/Update the named host in Registry Name Service

```
PUT https://server1:24351/REST/service/host?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST { "svc" : { "cn" : "<cn>", "fqdn" : "<fqdn>", "uuid", "<uuid>" } }
```

```
RESPONSE { "status" : 0 }
```

## Registry Name Service - Promote

Promote the specified server to Primary with its service group

```
PUT https://server1:24351/REST/service/promote?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST {"svcname" : "<svcname>", "cn" : "<cn>" }
```

```
RESPONSE { "status" : 0 }
```

## Sync

REST call to set a file to be synchronized within a service group. This is the same as `pbadmin -cfg -A <file> <svgroup>`.

### Set to sync

```
pbrestcall -a <appid> -k <appkey> -l -X PUT https://<host>:<restport>/REST/v1/cfg/sync -d '{ "file": "<file>", "svcs": ["<servicegroup>"] }'
```

### Example

```
pbrestcall -a admin -k d39cf6ea-e292-4c59-b60a-2d9650eb9cad -l -X PUT  
https://localhost:29106/REST/v1/cfg/sync -d '{"file": "/opt/pbul/policies/myfile", "svcs": ["dfilt_  
pbpolicy_service"]}'
```

## Import

```
pbrestcall -a <appid> -k <appkey> -l -X PUT https://<host>:<restport>/REST/v1/cfg/import -d '{ "file": "<filename>" }'
```

### Example

```
pbrestcall -a admin -k d39cf6ea-e292-4c59-b60a-2d9650eb9cad -l -X PUT  
https://localhost:29106/REST/v1/cfg/import -d '{"file": "/opt/rnsbul/policies/myfile"}'
```

If file already exist, you need to use “force”:

```
pbrestcall -a <appid> -k <appkey> -l -X PUT https://<host>:<restport>/REST/v1/cfg/import -d '{  
  "force":1, "file":"<filename>"}'
```

## Role Based Policy Database Manipulation

The functionality developed to manipulate the Role Based Policy Database was written with both the Command Line utility (**pbdbutil**), the Policy Server (**pbmasterd**) and the REST interface in mind. Functions use JSON objects to specify records to retrieve, update and delete.

To retrieve the whole Role Based Policy database, use the REST GET HTTP method, and specify a URL similar to **https:// ... /policies/rbp**.

To retrieve individual Role Based Policy entities, use the REST GET HTTP method with a URL similar to **https:// ... /policy/rbp/<entity>** and specify a parameter of either **name=<name>** or **id=<id>**.

### Example

```
https:// ... /policy/rbp/usergrp?.....name=ugrp1
```

To import a new Role Based Policy database, use the REST PUT HTTP method with a URL similar to **https:// ... /policies/rbp** and specify the complete database, in the appropriate format, in the BODY data.

To update specific Role Based Policy entities, use the REST PUT HTTP method with a URL similar to **https:// ... /policy/rbp/<entity>** and specify the entity, in the appropriate format, in the BODY data.

To delete specific Role Based Policy entities, the developer needs to use the REST DELETE HTTP method with a URL similar to **https:// ... /policy/rbp/<entity>** and specify a parameter of either **name=<name>** or **id=<id>**.

To begin a Role Based Policy Change Transaction, use the REST PUT HTTP method with a URL similar to **https:// ... /policy/rbp/begin**.

To commit a Role Based Policy Change Transaction, use the REST PUT HTTP method with a URL similar to **https:// ... /policy/rbp/commit**.

To rollback a Role Based Policy Change Transaction, use the REST PUT HTTP method with a URL similar to **https:// ... /policy/rbp/rollback**.

To retrieve a Role Based Policy Change Transaction details, use the REST GET HTTP method with a URL similar to **https:// ... /policy/rbp/transaction**.

## Role Based Policy - Miscellaneous Calls

### Retrieve RBP Version List

```
GET https://pbuild:24351/pbrest/REST/v2.0/policy/rbp/list?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE { "rbp": [{ "version": 1, "who": "ctaylor", "why": "New data",  
"created": 1529322345} ] }
```

### Retrieve Entitlement "Raw" Data

```
GET https://pbuild:24351/pbrest/REST/v2.0/policy/rbp/entitlement?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

### Optional Arguments

- **submituser=<wildcard>**
- **runuser=<wildcard>**
- **submithost=<wildcard>**
- **runhost=<wildcard>**
- **command=<wildcard>**

```
RESPONSE {  
  "results": [  
    {  
      "id": 1,  
      "name": "Admin",  
      "tag": null,  
      "description": "Super users and admins",  
      "rorder": 1,  
      "action": "allowed",  
      "iolog": true,  
      "auth": false,  
      "script": false,  
      "message": false,  
      "submitusers": {  
        "Admins": {  
          "description": "Admin users",  
          "list": [  
            "root",  
            "admin"  
          ]  
        }  
      },  
      "submithosts": {  
        "All Hosts": {  
          "description": "All Hosts",  
          "list": [  

```

```
""
]
},
"runusers": {
  "Admins": {
    "description": "Admin users",
    "list": [
      "root",
      "admin"
    ]
  },
  "Users": {
    "description": "Normal Users",
    "list": [
      "user*"
    ]
  }
},
"runhosts": {
  "All Hosts": {
    "description": "All Hosts",
    "list": [
      "*"
    ]
  }
},
"commands": {
  "User Commands": {
    "description": "Common UNIX Commands",
    "list": [
      { "cmd": "/bin/ls", "runcommand": "" },
      { "cmd": "/bin/ls *", "runcommand": "" },
      { "cmd": "/usr/bin/ls", "runcommand": "" },
      { "cmd": "/usr/bin/ls *", "runcommand": "" },
      { "cmd": "/bin/cat *", "runcommand": "" },
      { "cmd": "/usr/bin/cat *", "runcommand": "" }
    ]
  }
},
"time/dates": {
  "Any Time": {
    "description": "Any Time",
    "list": [
      {
        "dotw": {
          "mon": [
            15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15,
            15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15 ]
          },
          "tue": [
            15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15,
            15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15 ]
          },
          "wed": [
```



```

user at run time.\neg: pbrun -u runuser command [arguments]\n\nUser may request the following
commands using pbrun:\n/bin/find *,/usr/bin/ls,/bin/ls,/bin/cat *,/bin/ls *,/usr/bin/ls
*,/usr/bin/rm *,\n/usr/bin/cat *,/usr/bin/find *,/sbin/shutdown *,/bin/more *,/bin/id,/usr/bin/more
*,\n/usr/bin/mount *,/bin/lm *,/bin/mount *,/bin/rm *,/usr/sbin/shutdown *,\n/usr/bin/lm
*,/usr/bin/id,/sbin/ifconfig *,/usr/sbin/ifconfig
*\n\n\n=====
4\nName:          users\nDescription:      Normal users\nAction:           allowed\nTag:
\nMembership:     Users\n\nSubmit Host(s):
build.company.com,staging.company.com,nfs.company.com\nRun Host(s):
build.company.com,staging.company.com,nfs.company.com\n\nCommands will execute as user:
user*\n\nUser may request the following commands using pbrun:\n/usr/bin/ls,/bin/find
*,/bin/ls,/bin/cat *,/bin/ls *,/usr/bin/rm *,/usr/bin/ls *,\n/usr/bin/cat *,/usr/bin/find
*,/bin/id,/bin/more *,/usr/bin/more *,/bin/lm *,\n/bin/rm *,/usr/bin/lm *,/usr/bin/id\n\n\n"
}

```

## Client Registration

### Create Client Registration Profile

Create or update a Client profile. The format of these profiles are detailed below.

```
PUT https://pbuild:24351/REST/register?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
RESPONSE { "status" : 0 }
```

### Retrieve Client Registration Profile

Retrieve a client profile so that the client install can action the profile

```
GET
https://pbuild:24351/REST/register?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&profile=profile1
```

```
RESPONSE {"status": 0, "profile": [{"type": "settings", "fname": "/etc/pb.settings"}, {"sname":
"networkencryption", "type": "save"}, {"sname": "restkeyencryption", "type": "save"}, {"sname":
"sslservercertfile", "type": "save"}]}
```

### Retrieve Client Registration Profile File Attachment

Retrieve a client profile so that the client install can action the profile

```
GET https://pbuild:24351/REST/register/file?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&fname=%2fetc%2fpb%2esettings&index=0
```

### RESPONSE

File attachment or {"status": 8110}

### Retrieve List of Client Registration Profiles

Retrieve a list of client profiles that match the given profile wildcard

```
GET https://pbuild:24351/REST/register/profiles?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&profile=prof%2A
```

```
RESPONSE {"status": 0, "profiles": [{"type": "settings", "fname": "/etc/pb.settings"}, {"sname":
"networkencryption", "type": "save"}, {"sname": "restkeyencryption", "type": "save"}, {"sname":
"sslservercertfile", "type": "save"}]}
```

## Delete Client Registration Profile

Retrieve a client profile so that the client install can action the profile

```
DELETE
https://pbuild:24351/REST/register?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&profile=profile1
```

```
RESPONSE { "status" : 0 }
```

## Sudo

### Sudo - Retrieve Alias Information

```
GET https://server1:24351/REST/sudo/alias?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&hostname=<hostname>
```

```
RESPONSE {"alias":"foo","hostname":"pbuild"}
```

### Sudo - Retrieve List of Aliases

Retrieve a list of all the available alias/hostnames

```
GET https://server1:24351/REST/sudo/alias?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&hostname=<wildcard>
```

```
RESPONSE [{"alias":"foo","hostname":"pbuild"}]}
```

### Sudo - Get policy file

Retrieve the named policy file

```
GET https://server1:24351/REST/sudo/policyfile?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&fname=<path>
```

```
RESPONSE <file attachment>
```

## Sudo - List Policies

List all of the sudoers policy files

```
GET https://server1:24351/REST/sudo/policies?appid=<appid>&timestamp=<timestamp>
&hmac=<hmac>&fnames=<wildcard>
```

```
RESPONSE [{"version":1,"deleted":false,"pathname":"foo@/etc/sudoers","created":"2016-11-15
13:24:05"}, {"version":1,"deleted":false,"pathname":"pbuild@/etc/sudoers","created":"2016-11-15
10:07:03"}]
```

## Sudo - Get JSON Policy

Retrieve the sudoers policy as an encoded JSON string

```
GET
https://server1:24351/REST/sudo/policy?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&fname=<path>
```

```
RESPONSE { JSON encoded policy file }
```

## Sudo - Put Alias

Set a host alias for the specified host

```
PUT https://server1:24351/REST/sudo/alias?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST { "alias" : "<alias>", "hostname" : "<hostname>" }
```

```
RESPONSE { "status" : 0 }
```

## Sudo - Put Tag

Set a file tag for the specified sudoers policy files

```
PUT https://server1:24351/REST/sudo/tag?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST { "tag" : "<tag>", "fnames" : [ "<fname>", ... ] }
```

```
RESPONSE { "status" : 0 }
```

## Sudo - Put Policy

Put a new sudoers policy

```
PUT https://server1:24351/REST/sudo/policy?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST File attachment
```

```
RESPONSE { "status" : 0}
```

### Sudo - Check Policy

Check specified SUDO script policy

```
PUT https://server1:24351/REST/sudo/policy/check?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>
```

```
REQUEST { "script" : "<sudo script policy snippet>" }
```

Successful:

```
RESPONSE { "status" : 0}
```

Example invalid script:

```
RESPONSE {"status":8123,"error":"8123.89 unknown defaults entry 'set_loname'"}
```

### Sudo - Delete Tag

Delete the specified file tag

```
DELETE https://server1:24351/REST/sudo/tag?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&tag=<tag>
```

### Sudo - Delete Alias

Delete the specified Sudoers alias for the specified host

```
DELETE https://server1:24351/REST/sudo/alias?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&alias=<alias>&hostname=<hostname>
```

### Sudo - Delete Policy

Delete the specified Sudoers policy file

```
DELETE https://server1:24351/REST/sudo?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&fname=<path>
```

## SOLR

### Solr Get

Retrieves SOLR search results based on the supplied criteria.

```
GET https://pbuild:24351/REST/solr?appid=<appid>&timestamp=<timestamp>&hmac=<hmac>&query=%3A*
```

```
RESPONSE {"status":0,"iologs":[{"runuser":"root","endtime":"2013-12-05T15:20:18Z","id":"c0a8108a52a099b0586F","_version_":1453595633085579264,"starttime":"2013-12-05T15:20:16Z","replay_link":"http://pbuild:25348/iolog?file=/tmp/iolog.root.NMNzvX&foreground=White&background=Black&pause=1000&inputhistory=5&fontsize=10&submitButton=View+I/O+Log","runcommand":"bash","name":"/tmp/iolog.root.NMNzvX","runhost":"pbuild","user":"root","runargv":"bash"}, {"runuser":"root","endtime":"2013-12-05T14:52:13Z","id":"c0a8108a52a0931d5541","_version_":1453669846119088128,"starttime":"2013-12-05T14:52:13Z","replay_link":"http://pbuild:25348/iolog?file=/tmp/iolog.root.jVruz1&foreground=White&background=Black&pause=1000&inputhistory=5&fontsize=10&submitButton=View+I/O+Log","runcommand":"bash","name":"/tmp/iolog.root.jVruz1","runhost":"pbuild","user":"root","runargv":"bash"}, {"runuser":"root","endtime":"2013-12-05T14:52:58Z","id":"c0a8108a52a0934a558B","_version_":1453669852501770240,"starttime":"2013-12-05T14:52:58Z","replay_link":"http://pbuild:25348/iolog?file=/tmp/iolog.root.cKyxun&foreground=White&background=Black&pause=1000&inputhistory=5&fontsize=10&submitButton=View+I/O+Log","runcommand":"bash","name":"/tmp/iolog.root.cKyxun","runhost":"pbuild","user":"root","runargv":"bash"}]}
```

## Java Implementation of REST API

Full Java example sources are provided to allow developers to quickly interface with the Privilege Management for Unix & Linux REST API. The sources are developed with JDK 7 and Eclipse and an example project is provided in the **examples/java/PBULAPI** directory (use import project from the Eclipse menu). We recommend JUnit 4 is installed and configured to run the provided test suite.

- **org/json/\*** contains the [www.json.org](http://www.json.org) simple java JSON implementation, and is included verbatim.
- **com/beyondtrust/pbul/\*** contains all of the example code to call the REST API, including:
  - **PBULException**: An exception used throughout the whole package
  - **PBULSession**: Keeps the session information to implement the REST API, including the host URI, application ID, and key. It is used by the objects below to setup and call the REST API.
  - **PBULUtil**: Provides miscellaneous methods required by the implementation
  - **PBULType**, **PBULArray** and **PBULObject**: Types defined to provide the data types required to access the settings file
  - **PBULEvents**: Provides access to the event logs
  - **PBULiologs**: Provides access to iologs, including listing, searching, and retrieving
  - **PBULkey**: Provides access to retrieve and create **pb.key** files
  - **PBULlicense**: Provides details of the licensing on the host
  - **PBULpolicy**: Provides two main methods to access the policy files, whether they are normal pb scripts, or CSV format
  - **PBULsolr**: Provides a front-end to the SOLR option provided in Privilege Management for Unix & Linux 8
- The **test** folder provides a complete test suite containing test cases that call each of the provided methods and can also be used as examples.

# X Window System Session Capturing

## Introduction

The X Window System (also called X or X11) is the most common graphical display system for UNIX and Linux platforms. The user runs an X Server that renders the graphical applications, or X Clients, and interprets keyboard and mouse events and other input and output events. Each X Client is configured to connect most commonly using TCP/IP either on a local host, across an IP network or even across the Internet.

The X11 capture feature provides two areas of functionality:

- Encrypts X Windows communications to enhance security
- Provides a full session capture of every graphical session so the session can be logged and audited

To automatically allow X Clients to run, two items must be in place to locate the X Server and then authenticate to the service:

- The environment variable **DISPLAY**
- Authentication key

These items are commonly configured by the X Server into the users environment when they log into the host. After you verify the items are in place, you can start using X11 forwarding.

## DISPLAY Variable

The environment variable **DISPLAY** provides:

- The X Server location in the form of an IP address, host name, or fully qualified DNS domain name.
- A display number that indicates the TCP/IP port that the X Server is listening on.

## Example

<code>DISPLAY=192.168.1.1:0.0</code>	Example of IPv4 and display 0
<code>DISPLAY=myhost:1.0</code>	Host name and display 1
<code>DISPLAY=myhost.mydomain.com:0.0</code>	Fully qualified address and display 0
<code>DISPLAY=[::1]:0.0</code>	IPv6 display 0

Each display on the X Server has its own display number, zero denotes TCP/IP port 6000, one is 6001, etc. This allows X Servers that have multiple displays to address each individually.

## Authentication Key

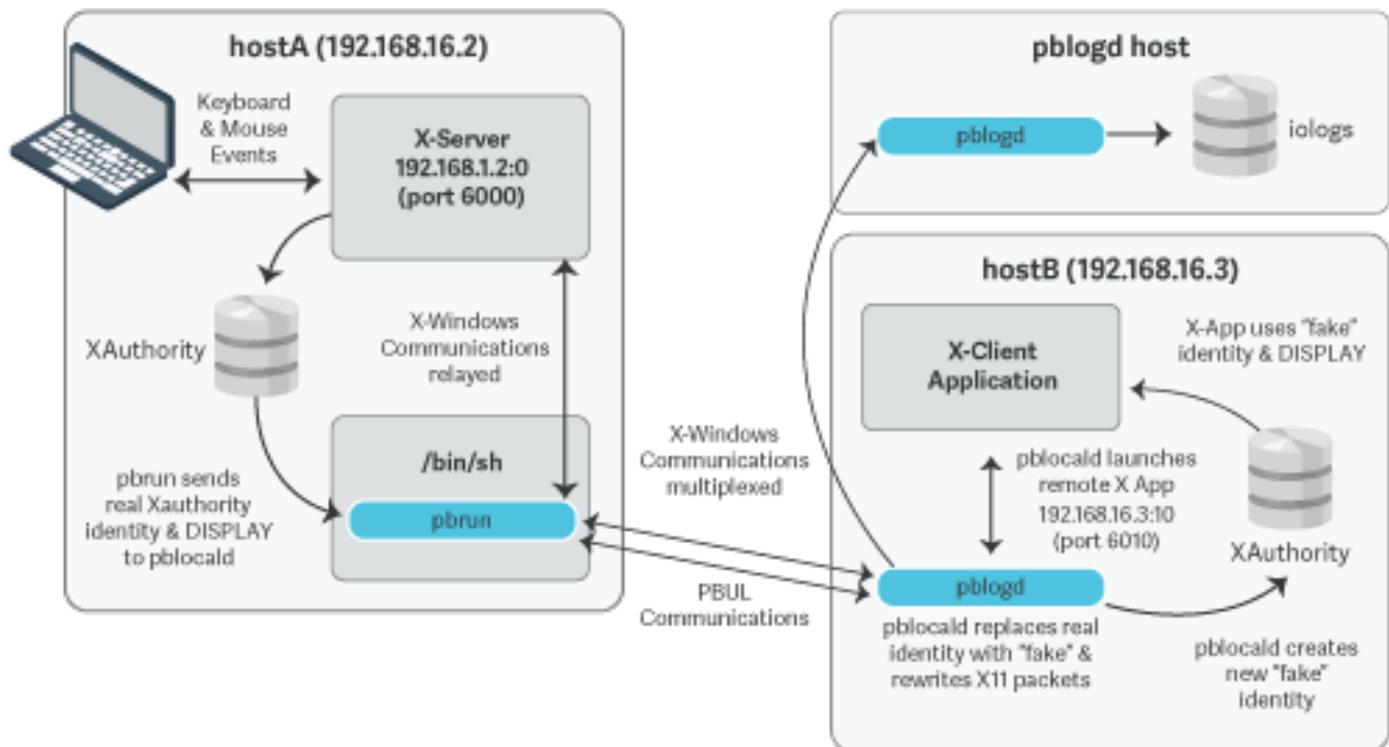
This pre-shared key authenticates each application. By default, a list of the keys is located in **\$HOME/.Xauthority**, and can be viewed and modified using the **xauth** command.

## Example Entry

```
$ xauth list
pbuild/unix:16MIT-MAGIC-COOKIE-1 2c7ca46175aec0e4539b9e2119acff0d
```

The key is generally a randomly generated number created when the X Server session is created, and then used throughout the session by the X Clients.

## Architecture Overview



## X11 capture policy settings

When you run **pbrun -X** from the command line, by default, you can use the X11 forwarding, and the remote process will be configured automatically to allow the X11 Client applications to run.

- **xwinforward (true or false):** Allow or deny X11 forwarding.
- **xwinreconnect (true or false):** The X11 tunnel will be created between **pbrun** and **pblogd** to allow effective and efficient communications between the two ends of the tunnel. However, if there are networking considerations this option specifies that the tunnel is created using the existing Privilege Management for Unix & Linux network optimizing policy settings (for example, **noreconnect**).

If X11 forwarding is enabled it is only a matter of setting an iolog and the full X11 session will be captured.

## Viewing Session Capture Output

You can run **pbreplay** to output the captured X11 events. Events such as creating and destroying windows, textual window updates, text input, and mouse clicks will be displayed as a summary alongside any output from the parent process.

In Privilege Management for Unix & Linux V8.5, **pbreplay** has a **-X** option added that you can use with the **-a** option to output the captured X11 events.

### Example

```
pbreplay -o -aX <path/to/iolog>
```



**Note:** You can use the following command to output all captured data. However, a large amount of data will be displayed.

```
pbreplay -o -aXV <path/to/iolog>
```

An example of the summarized X11 output:

```
pbreplay -o -aX /tmp/iolog.8TO9HF
[root@pbuild src]# gnome-terminal
{"request":"Session","cookie":"3dab3c6c01deb7c2e1109a96d830570b","proto":"MIT-MAGIC-COOKIE-1"}
{"reply":"Session","maj_ver":11,"min_ver":0}
{"request":"CreateWindow","chan":1,"window-id":98566145,"parent":612,"x":10,"y":10,"width":10,"height":10}
{"request":"ChangeProperty","chan":1,"window-id":98566145,"property":"WM_NAME","type":"STRING","value":"gnometerminal"}
{"request":"ChangeProperty","chan":1,"window-id":98566145,"property":"WM_ICON_NAME","type":"STRING","value":"gnome-terminal"}
{"request":"CreateWindow","chan":1,"window-id":98566146,"parent":98566145,"x":65535,"y":65535,"width":1,"height":1}
{"request":"ChangeProperty","chan":1,"window-id":98566145,"property":"WM_CLIENT_MACHINE","type":"STRING","value":"pbuild"}
{"request":"ChangeProperty","chan":1,"window-id":98566145,"property":"WM_COMMAND","type":"STRING","value":"gnometerminal"}
{"request":"ChangeProperty","chan":1,"window-id":98566145,"property":"WM_CLIENT_MACHINE","type":"STRING","value":"pbuild"}
{"request":"CreateWindow","chan":1,"window-id":98566147,"parent":612,"x":65436,"y":65436,"width":1,"height":1}
{"request":"ChangeProperty","chan":1,"window-id":98566147,"property":"WM_NAME","type":"STRING","value":"Fake Window"}
{"request":"Session","cookie":"3dab3c6c01deb7c2e1109a96d830570b","proto":"MIT-MAGIC-COOKIE-1"}
{"reply":"Session","maj_ver":11,"min_ver":0}
{"request":"CreateWindow","chan":2,"window-id":102760449,"parent":612,"x":65516,"y":65516,"width":10,"height":10}
{"request":"Session","cookie":"3dab3c6c01deb7c2e1109a96d830570b","proto":"MIT-MAGIC-COOKIE-1"}
{"reply":"Session","maj_ver":11,"min_ver":0}
{"request":"DestroyWindow","chan":1,"window-id":98566147}
{"request":"CreateWindow","chan":1,"window-id":98566148,"parent":612,"x":0,"y":0,"width":658,"height":438}
{"request":"ChangeProperty","chan":1,"window-id":98566148,"property":"WM_
```

```
NAME", "type": "STRING", "value": "Terminal"}
{"request": "ChangeProperty", "chan": 1, "window-id": 98566148, "property": "WM_ICON_
NAME", "type": "STRING", "value": "Terminal"}
{"request": "CreateWindow", "chan": 1, "window-
id": 98566149, "parent": 98566148, "x": 65535, "y": 65535, "width": 1, "height": 1}
{"request": "ChangeProperty", "chan": 1, "window-id": 98566145, "property": "WM_
NAME", "type": "STRING", "value": "Terminal"}
{"request": "ChangeProperty", "chan": 1, "window-id": 98566148, "property": "WM_CLIENT_
MACHINE", "type": "STRING", "value": "pbuild"}
{"request": "ChangeProperty", "chan": 1, "window-id": 98566148, "property": "WM_ICON_
NAME", "type": "STRING", "value": "ctaylor@pbuild:~/pb/850a/pb/src"}
{"request": "ChangeProperty", "chan": 1, "window-id": 98566148, "property": "WM_
NAME", "type": "STRING", "value": "ctaylor@pbuild:~/pb/850a/pb/src"}
{"event": "ButtonPress", "chan": 1, "button": 1}
{"event": "KeyPress", "chan": 1, "keysym": "l"}
{"event": "KeyPress", "chan": 1, "keysym": "s"}
{"event": "KeyPress", "chan": 1, "keysym": "Return"}
{"request": "ChangeProperty", "chan": 1, "window-id": 98566148, "property": "WM_ICON_
NAME", "type": "STRING", "value": "ctaylor@pbuild:~/pb/850a/pb/src"}
{"event": "KeyPress", "chan": 1, "keysym": "e"}
{"event": "KeyPress", "chan": 1, "keysym": "x"}
{"event": "KeyPress", "chan": 1, "keysym": "i"}
{"event": "KeyPress", "chan": 1, "keysym": "t"}
{"event": "KeyPress", "chan": 1, "keysym": "Return"}
{"request": "DestroyWindow", "chan": 1, "window-id": 98566148}
```