



# BeyondTrust

## **Privileged Identity Install Guide**

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# BeyondTrust Privileged Identity Installation

BeyondTrust Privileged Identity helps you secure, manage, and administer credentials for privileged users and IT vendors. With Privileged Identity, you can discover, maintain, and rotate passwords for privileged accounts to improve security and compliance.

This guide is designed to walk you through the initial setup and configuration of your Privileged Identity components. It covers prerequisites, software installation, and configuration steps for each component. Should you need any assistance, please contact [support.beyondtrust.com](mailto:support.beyondtrust.com).

## Privileged Identity Installation Prerequisites

In this section, we'll cover the installation prerequisites for Privileged Identity. Based on your starting host system configuration, your actual installer experience may vary.

### Recommended Knowledge

While we provide documentation and support to set up and configure Privileged Identity along with the various technologies it uses, product admins should have knowledge in the following areas:

- Microsoft SQL Server and all target databases
- IIS web server technologies
- Network administration
- System administration

### Product Requirements

Privileged Identity is an n-tier product, with individual components operating exclusively of each other. While the different components can be hosted on a single system, we recommend that you distribute them across multiple systems as resources permit. When deployed across multiple hosts, loss of the management console would have no functional effect on the web app or web service, just as loss of the web app or web service would not affect the management console.

Privileged Identity requires a Microsoft SQL Server database to store program data. All component host servers should be patched, secured, and configured according to your corporate patching strategy to help ensure that the password store will not be compromised.

The primary components are:

- **Management Console:** Primary administrative interface for general configuration of the software



For more information, please see "[Host System Requirements](#)" on page 7.

- **Web Service:** Used by various components, including the web app, to perform programmatic access and management of the product
- **Web Application:** Primary user interface to retrieve managed credentials or establish sessions
- **Database:** Data store where managed passwords and most program configurations are stored



**Note:** All software components require communication with the database.

Privileged Identity is supported in a physical, virtual (cloud), or physical-virtual mixed environment. If any components will be shared on a single host, then simply combine the requirements.

The database should be placed on a separate system to keep the encrypted data segregated from the encryption key.

Additional components include the following:

- **Deferred Processing Service:** Used with scheduled jobs and automatic retry options (included in download package)
- **Zone Processors:** Used to manage segregated, distributed, and untrusted networks



**Note:** Zone processors are a licensed feature of Privileged Identity.

- **Integration Components:** Additional connectors used by zone processors, remote web services, and web applications to integrate with email, help desk systems, syslog output, etc. (included in **IntegrationComponents.msi**)
- **Cross-Platform Support Library:** Used to manage and discover non-Windows-based systems and devices (e.g., Linux, Unix, iOS) from zone processors (included in **CrossPlatformSupportLibrary.msi**)
- **Email Server:** (Optional) Used to send email notifications



**Note:** Configuration of an email server (including enabling SSL and establishing a certificate trust) is done outside Privileged Identity.

- **IIS Media Services:** (Optional) Used to stream recordings of sessions run through application launching (included in download package)



## **IMPORTANT!**

*A poorly configured virtual host can impede the software's ability to work. Make sure that the recommended resource allotments for each component have been met, and if possible, allow for dynamic increases in memory and storage. Supported host virtualization platforms are Hyper-V Server 2012 R2 or later, VMware ESX, and VMware Workstation.*

## Host System Requirements

In this section, we'll cover the server requirements for the various component host systems.

### Management Console and Deferred Processing Host Requirements

#### Platform and Hardware Requirements

The Privileged Identity software is a 32-bit application that runs in a WOW64 environment on 64-bit systems. For a production install of Privileged Identity, you must have a Windows Server operating system. Privileged Identity is fully supported on a physical server or virtual machine. All service pack levels and editions are supported except where specifically noted.

Minimum Requirements	Suggested Configuration
Windows Server 2012 R2 or later	The most current version of Windows Server
2GB of RAM	2GB of RAM for the software 4GB of RAM for the program database
~1GB of hard drive space to install	4GB of hard drive space to install and for local log files
 <b>Note:</b> This does not include space required by log files, which are enabled by default and can consume large amounts of space over time.	
Intel or AMD multi-core system	Intel or AMD processors with 4 or more CPU cores
Microsoft .NET Framework 4.5.2 or later	The most recent version of Microsoft .NET Framework from the 4.x family
	 To download the most recent version of .NET, please see <a href="https://dotnet.microsoft.com/download">https://dotnet.microsoft.com/download</a> .
Windows Management Framework 4.0 or later	The most recent version of Windows Management Framework
	 To download Windows Management Framework 5.1, please see <a href="http://www.microsoft.com/en-us/download/details.aspx?id=54616">www.microsoft.com/en-us/download/details.aspx?id=54616</a> .



**Note:**

- When managing COM on Windows 2000 target systems, there will be inconsistencies with Remote COM management interfaces, as your host operating system will not match. This is by Microsoft's security design.
- Take note of any components which will manage databases other than Microsoft SQL Server. This should include the management console as well as any deferred or zone processors. These components must have the most recent 32-bit OLE DB providers installed, typically available from the database provider.
- To integrate System Center Service Manager (SCSM) or System Center Operations Manager (SCOM), you must obtain the appropriate SDK binaries from the SCSM or SCOM installation directory and place them into the



*Privileged Identity installation or zone processor directory.*

- *A poorly configured virtual host can impede the software's ability to work. Make sure that the recommended resource allotments for each component have been met, and if possible, allow for dynamic increases in memory and storage. Supported host virtualization platforms are Hyper-V Server 2012 R2 or later, VMware ESX, and VMware Workstation.*
- *For lab environments, Windows 10 Professional 64-bit will suffice. Workstation-class operating systems are not supported in production environments.*

## Required Server Components

You may need to install IIS on the management console host system and zone processor host systems, even if the web app will not be installed on those systems. Some IIS components are required to install the web app to a remote server and to manage remote IIS installations.



For more information about installing these required components, please see "[Install Server Components](#)" on page 17.

## Web Application Host Requirements

The Privileged Identity web application provides access to managed credentials and other functionality using a web browser.

Because the web app is deployed as an IIS web application, you must install certain components of IIS on the host server. The web app requires IIS 8.5 or above, which, in turn, requires Windows Server 2012 R2 or above (we recommend using the most current version of Windows Server).



**Note:** *These requirements differ from those for the web service host.*



For more information, please see "[Install Server Components](#)" on page 17.

The management console can push the web application to the same system or to a remote web server.

## Web Service Host Requirements

The Privileged Identity web service is required by the web app, PowerShell, and session recording.

You must install certain components of IIS and application server roles on the host server. The web service requires IIS 8.5 or above, which, in turn, requires Windows Server 2012 R2 or above. We recommend using the most current version of Windows Server.



**Note:** *These requirements differ from those for the web app host.*

Also, a valid SSL certificate is highly recommended. Certificate and authentication configuration affect browser support.

**IMPORTANT!**

*If the web service is hosted at a different URL than the web app, CORS support (Cross-Origin Resource Sharing) must also be enabled in the web service's **web.config** file, and additional browser configuration may be required.*

## Database Requirements

A Microsoft SQL Server database is required at the time of Privileged Identity installation and serves as the software's storage and configuration data store. This database stores management sets, system information, account information, stored passwords, event sinks, answer files, email files, and more.

You can implement a new instance on an existing database server, or you can set up a new database server altogether. We recommend not sharing database instances with other applications. We also recommend placing the database on a system separate from other Privileged Identity components to keep the encrypted data segregated from the encryption key.

### Supported SQL Versions for Production Environments

We recommend using the most current version of SQL Server available. If you must use an older version, any version from SQL Server 2012 or later is supported, including Azure SQL Database.



**Note:** Microsoft Azure SQL Database requires Privileged Identity to use the latest version of the Microsoft SQL Native Client (not supplied with product download).

Both 32-bit and 64-bit versions of Microsoft SQL Server are supported. Standard and Enterprise editions are supported.

We also recommend installing SQL Server Native Client Version 11 or higher on all of the servers hosting the following PI components:

- Primary and any secondary Admin Consoles
- PI Web Services and Web App Instances
- Data Store
- Zone Processors
- All Deferred Processors (stand-alone or on the same server with a Admin Console)
- All other servers running scripts, customizations, or integrations that connect to the PI Data Store (SQL Server)

The latest version of the SQL Server Native Client can be found at:  
<https://www.microsoft.com/en-us/download/details.aspx?id=50402>.

### Supported SQL Versions for Test Environments Only

Microsoft SQL Server Express is a lightweight version of SQL Server that is available for free download from the Microsoft web site. SQL Express should be used for testing scenarios only. If you must use SQL Server Express for testing, any version from SQL Server 2012 Express or later is supported.



#### IMPORTANT!

*Using SQL Express will impact performance, scalability, and high availability options, and disaster recovery options.*

SQL Express configures itself to a random port number during installation. The port number is required to complete the installation of Privileged Identity. See Microsoft documentation for details.

### Components Requiring Data Store Access

The following components require access to the database:

- Management Console
- Web Service
- Deferred Processor / Zone Processors

### Data Store Authentication

The following methods may be used to authenticate to a Microsoft SQL database:

- Local SQL Account Authentication / Explicit Database Authentication
- Integrated Windows Authentication

Whichever method you configure in the management console at the time of component deployment will also be the method used by the web application, the deferred processor, and the zone processors.

While you may use either authentication method, we recommend Integrated Windows Authentication, as this allows for additional logging and permits more granular control over who can access stored information. If you choose SQL authentication instead, all access to the database server happens in the context of the SQL account rather than the account of the user performing the action.

Whichever method you choose, you must provide the SQL account, the Windows user account, or the Windows group with access to the Privileged Identity database.

### Data Store Permissions

If using a dedicated instance of Microsoft SQL, grant:

- **SYSADMIN** = server role
- or
- **Control Server** = database server right

This allows granted users the rights to perform all actions within that instance of SQL, including creating databases, storing procedures, and using all other features in the main application, as well as performing backup and restoration.

This allows granted users the rights to perform all actions with that instance of SQL, including:

- Creating databases
- Storing procedures
- Using all features in the main application
- Performing backup and restoration

If you don't want or are not permitted to grant **SYSADMIN** or **Control Server** to the SQL instance, then the database administrator must create the Privileged Identity database beforehand. The SQL account or Windows user/group must be granted the following roles/rights over the Privileged Identity database:

- **DBO** = user role
- or
- **db\_datareader** = user role
- **db\_datawriter** = user role
- **db\_ddladmin** = user role
- **EXECUTE** = database permission
- **CREATE TABLE** = database permission required during install and upgrade
- **CREATE VIEW** = database permission required during install and upgrade

If you are using explicit database permissions rather than granting **SYSADMIN** or **DBO**, then once the account has been granted the **db\_** roles above, you must grant the remaining permissions using SQL statements such as **GRANT EXECUTE TO username**.

Additionally, Privileged Identity can use the performance recommendations made by SQL Server for defragmentation, auto-index creation, etc. To do so, the SQL account or Windows user/group must be granted **View Server State** on the host SQL server.



**Note:** If **View Server State** is not granted, a database administrator must regularly tune the product database, or performance will decrease over time.

## Service Account Requirements

The service accounts that run each component have different requirements in terms of security and access within your environment and within the Privileged Identity software. Because of these different requirements, we recommend using multiple service accounts to separately perform the specific functions of the software, minimizing permissions granted for any component service account. Alternatively, you may use the same service account for all functions of the software if doing so better meets your business needs.

### Web Service Identity

Privileged Identity uses a COM application for its interactions from the web service server to the application database. This application requires the use of a privileged account. The account can be configured as a **NetworkService** if using explicit database authentication (SQL account), though it should be configured as a domain member when using Integrated Windows Authentication to the database. If using a named identity, the account should have the following rights and memberships:

- Administrator of the web server host system (required)
- Domain user (recommended when authenticating domain users or working with domain groups)
- Log on as a batch job
- DBO rights for the application database (if using integrated authentication)

**Note:**

*If a single implementation of Privileged Identity will manage multiple trusting domains and if you use Active Directory for user authentication or Integrated Windows Authentication to the database, then the COM identity must be a trusted user for the target domains. Otherwise, you must manually configure an authentication server entry with explicit credentials for that domain.*

*The COM application must be configured to run as a user; this account can be automatically managed by Privileged Identity.*

### Deferred Processor / Zone Processor Service Identity

Privileged Identity performs all scheduled jobs, such as password change jobs or password verification reports, by using a service on the management console host system or by using a standalone service called a zone processor. This application requires the use of a privileged account. The account should be a domain member (as applicable) and should have the following rights and memberships:

- Administrator of the management console host system
- Log on as a service
- DBO rights for the application database (if using integrated authentication); system admin of the database not required
- Administrative rights over target managed systems



**Note:** *If the service account/interactive user account cannot be an administrator of the target systems, then you must configure an alternate admin account for use by the software. If possible, avoid the use of alternate admin accounts when managing COM and DCOM objects. Also avoid scheduled tasks, as these interfaces do not allow for impersonation.*



For more information, please see the [Privileged Identity Admin Guide](http://www.beyondtrust.com/docs/privileged-identity/documents/pi-admin.pdf) at [www.beyondtrust.com/docs/privileged-identity/documents/pi-admin.pdf](http://www.beyondtrust.com/docs/privileged-identity/documents/pi-admin.pdf).

**IMPORTANT!**

*The account used to run the deferred processing service cannot manage itself. If you manage this account through a scheduled job, then any job being run by that processor at that time is stopped mid-process. This leaves the job in a locked and incomplete state, requiring an administrator to resolve the issue. This also causes all other scheduled jobs to stop running until an administrator manually starts the service.*

*An alternative to using a named service account for the scheduling service is to configure the service to run as **LocalSystem** or as a **Microsoft Managed Service Account (MSA)**. This negates password management requirements for the service.*

*However, you must also grant permissions to the database for the computer account (**ComputerAccountName\$**) and ensure that the computer account is seen as an administrator of all managed systems. If the computer account is added to a new group in Active Directory to provide these administrative rights, the computer must be restarted.*

**Syslog Forwarder Service Identity**

The syslog forwarder captures syslog or MSMQ UDP output and forwards the traffic using TCP or TCP with SSL to a target collector. This program requires a Windows service to run. The account can be a local user account or domain account and must be granted **Log on as a service**.



For more information, please see the [Privileged Identity Admin Guide](http://www.beyondtrust.com/docs/privileged-identity/documents/pi-admin.pdf) at [www.beyondtrust.com/docs/privileged-identity/documents/pi-admin.pdf](http://www.beyondtrust.com/docs/privileged-identity/documents/pi-admin.pdf).

## Port Requirements

The following ports may be used by Privileged Identity. Actual port usage will vary based on the options used and the systems managed. The port direction defined below is relative to the Privileged Identity component.



**Note:** The following ports are the standard ports for the various protocols. These ports may have been changed on the target systems. It is the Privileged Identity administrator's responsibility to determine if any of the target ports have been changed and to reflect that changed port when password change jobs or account discovery jobs are performed.

Port	Direction	Description
22	TCP, outbound, SSH	Used to manage SSH-based devices.
23	TCP, outbound, Telnet	Used to manage non-Windows devices that support Telnet.
25/465/587	TCP, outbound, SMTP	Used to send email. Only required if email notifications will be sent from Privileged Identity.
80/443	TCP, inbound, HTTP/S	Used to access the web application and web service.
88	TCP/UDP, outbound, Kerberos	Used by the jump server when authenticating with Kerberos.
135 & Ephemeral ports	TCP/UDP, outbound, RPC port mapper service	Used for most Windows COM/DCOM-based operations. The remote DCOM management port and ephemeral ports are typically provided by granting access to <b>DLLHOST.EXE</b> in the <b>%systemroot%\system32</b> directory. Ephemeral ports vary by target Windows operating systems. <ul style="list-style-type: none"> <li>• COM/DCOM/MTS</li> <li>• Internet Information Services (IIS)</li> <li>• Scheduled Tasks (iTask interface)</li> <li>• SQL Server Reporting Services action account (SSRS)</li> <li>• SCOM RunAs accounts</li> </ul>
161	TCP, outbound, SNMP	Used during system/network discovery operations and device management functions.
389/636	TCP, outbound, LDAP/LDAPS	Used for LDAP-compliant directories such as Active Directory.
443	TCP, outbound, HTTPS	Used for ESXi native management, as well as various cloud service providers and SAML/OAUTH authentication providers.
445	TCP, outbound, SMB	Used for Windows Server.
464	TCP/UDP, outbound, Kerberos	Used by the jump server when authenticating with Kerberos.
514	UDP, outbound, syslog	Used to communicate to logger systems such as ArcSight, QRadar, Splunk, syslog, etc.
623	UDP, outbound, IPMI	Used to manage lights-out devices such as Dell DRAC, HP iLO, etc.
1025	TCP, outbound, Teradata	Used to discover and manage Teradata databases.
1433	TCP, outbound, MS SQL Server	Used to connect product components to the Microsoft SQL Server data store.
1521	TCP, outbound, Oracle	Used to discover and manage Oracle databases.
3306	TCP, outbound, MySQL	Used to discover and manage MySQL databases.

Port	Direction	Description
3389	TCP, outbound and inbound, Remote Desktop Protocol (RDP)	Used for remote connections to target servers (automatic sessions) as well as inbound to the application launch server.
Port 5000	TCP, outbound, Sybase	Used to discover and manage Sybase ASE databases.
Port 5432	TCP, outbound, PostgreSQL	Used to discover and manage PostgreSQL databases.
Port 50000	TCP, outbound, DB2	Used to discover IBM DB2 databases.

Other ports may be required depending on the application being managed. If your setup uses additional external items or processes, additional ports are required. Please refer to the following table for known port connection requirements:

Application	Direction
BMC Remedy	TCP/UDP, outbound, BMC_AR_Port
HP Service Manager	TCP, outbound, HPSM Port
Microsoft SharePoint Server	TCP, outbound, the SharePoint administrative port
Microsoft System Center Configuration Manager	TCP, outbound, typically Microsoft file and printer sharing or remote management ports
Oracle WebLogic	TCP, outbound
IBM WebSphere	TCP, outbound
Others	Check your integration component port requirements

Additional ports may be required based on target system configuration or Privileged Identity configuration. For example, an SSH target listening on port 5555 must accept connections from Privileged Identity, and Privileged Identity must communicate out on that port to the target. Similarly, if the web service or web application is on a non-default port for its HTTP/S configuration, the firewalls must be configured to allow communication on those ports.

## Install Server Components

In this section, we'll detail how to install and configure required server components. Consider your network and determine where you would like which components of Privileged Identity to be installed. Then follow the steps below for each installation, including the components required to fulfill the server's purpose.

The installation routine initiates with a prerequisite checker to help you install the prerequisites. Following these directions allow you to install the prerequisites without going through the checker.



To enable Remote COM access, please follow the instructions below as well as "[Further Steps to Enable Remote COM Access](#)" on page 20.

### Use PowerShell to Install Required Server Components on Windows Server 2016 or 2012

To enable **Remote IIS Management** using the PowerShell command line interface, enter the following line:

```
Install-WindowsFeature Web-Mgmt-Console
```

In the command above, `Web-Mgmt` is the component required to manage Windows Server.

To enable **Remote COM Access** using PowerShell, enter:

```
Install-WindowsFeature AS-Ent-Services
```

To enable **Web App Hosting** using PowerShell, enter:

```
Install-WindowsFeature Web-Default-Doc,Web-Static-Content,Web-Http-Redirect,Web-Http-Logging,Web-Stat-Compression,Web-Windows-Auth,Web-Mgmt-Console
```

In the command above, `Web-Windows-Auth` is an optional parameter which enables the web service to support Integrated Windows Authentication.

To enable **Web Service Hosting** using PowerShell, enter:

```
Install-WindowsFeature AS-Http-Activation,Web-Windows-Auth
```

In the command above, `Web-Windows-Auth` is an optional parameter which enables the web service to support Integrated Windows Authentication.



**Note:**

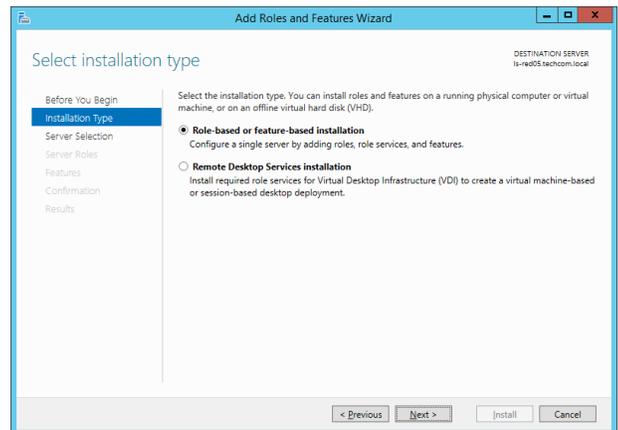
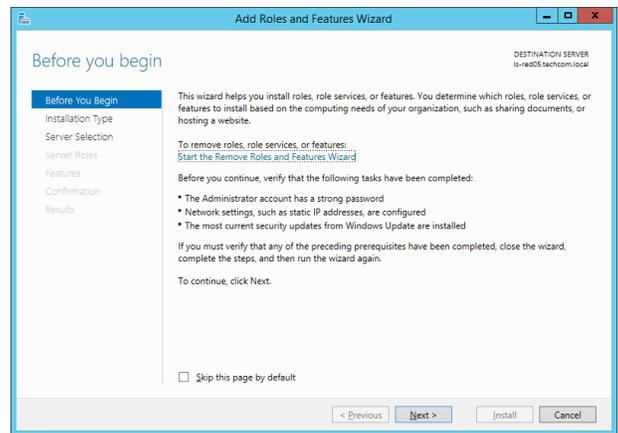
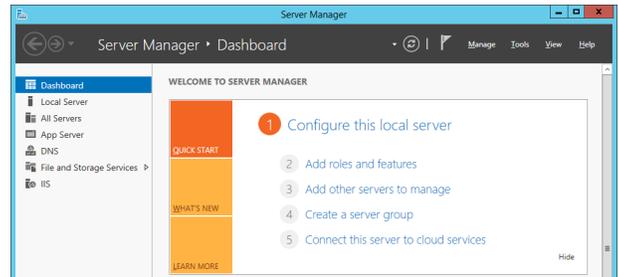
*If you want more than one feature on the same system, you may combine the parameters in one line. For example:*

```
Install-WindowsFeature Web-Mgmt-Console,AS-Ent-Services,AS-Http-Activation,Web-Windows-Auth
```

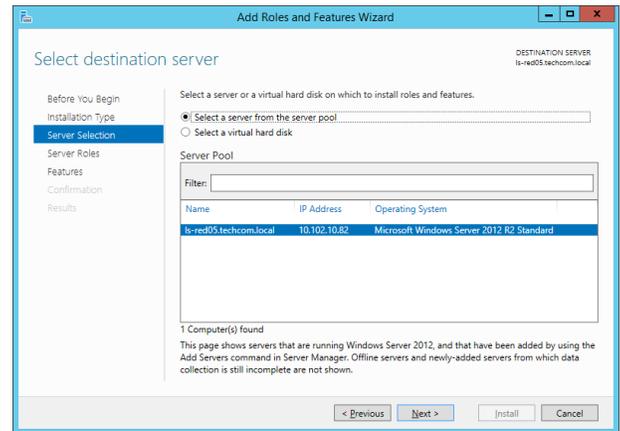
## Use the GUI to Install Required Server Components on Windows Server 2016 or 2012

To install server requirements using the user interface:

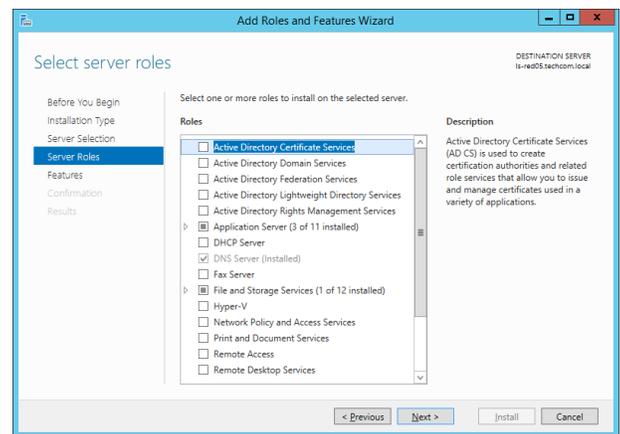
1. On each host server, open **Server Manager**.
2. From the dashboard, click **Add roles and features**.
  
3. On the **Before You Begin** screen, click **Next**.
  
4. On the **Installation Type** screen, select **Role-based or feature-based installation**. Click **Next**.



5. On the **Server Selection** screen, select your host server (or remote host server if managing a core installation), and then click **Next**.



6. On the **Server Roles** screen, select components to install based on how this server will be used.
  - a. To enable **Remote IIS Management** and **Web App Hosting**, select **Web Server (IIS)**.
  - b. To enable **Remote COM Access** and **Web Service Hosting**, select **Application Server**.



**Note:** If any of the above selections prompts you to add required features or services, do so.

7. Click **Next**.
8. On the **Features** screen, click **Next**.
9. On the **Web Server Role (IIS)** screen, click **Next**.
10. On the **Role Services** screen, select components to install based on how this server will be used.
  - For **Remote IIS Management**, select **Management Tools > IIS Management Console** to manage IIS.
  - For **Web Service Hosting**, select **Web Server > Security > Windows Authentication** to support Integrated Windows Authentication.
  - For **Web App Hosting**, select:
    - **Common HTTP Features**
      - **Default Document**
      - **Static Content**
    - **Health and Diagnostics > HTTP Logging:** (Optional) Used for troubleshooting
    - **Performance > Static Content Compression**
    - **Security:** Items are optional unless needed for your use case
      - **Request Filtering:** Allows you to restrict clients from making certain requests of the web server, such as limiting the size of requests or prohibiting access to certain URLs.
      - **Client Certificate Mapping Authentication:** Install if users are provisioned user certificates via Active Directory and if user-certificate-based authentication is required. This requires additional IIS configuration.



For more information, please see "[Configure SSL on IIS](#)" on page 22.

- **IIS Client Certificate Mapping Authentication** - Install if users are provisioned user certificates and if mapping and certificate authentication should be performed in IIS rather than Active Directory. This requires additional IIS configuration.



For more information, please see "[Configure SSL on IIS](#)" on page 22.

- **IP and Domain Restrictions**: Allows you to restrict source IP addresses and domain names from making requests of the web server.
  - **URL Authorization**: Allows you to restrict URLs and HTTP methods. This can increase security when used in conjunction with Integrated Windows Authentication.
  - **Windows Authentication**: Allows you to use Integrated Windows Authentication. This may require additional IIS configuration.
- **Management Tools > IIS Management Console**



**Note:** If any of the above selections prompts you to add required features or services, do so.

11. Click **Next**.
12. On the **Application Server** screen, click **Next**.
13. On the **Role Services** screen, select components to install based on how this server will be used.
  - a. For **Remote COM Access**, select **COM Network Access**.
  - b. For **Web Service Hosting**, select **Windows Process Activation Service Support > HTTP Activation**.



**Note:** If any of the above selections prompts you to add required features or services, do so.

14. Click **Next**.
15. On the **Confirmation** screen, validate your selections, and then optionally check **Restart the destination server automatically if required**.
16. Click **Install**.
17. After installation, you must restart any management consoles, deferred processors, and zone processors which were running when this process began. In **Server Manager**, also restart any stopped services.

## Further Steps to Enable Remote COM Access

Privileged Identity requires Remote COM to discover and manage COM applications on remote systems, as well as to push the web app and the web service to remote systems.

In each of these cases, if Remote COM access is disabled on the target system, Privileged Identity will fail to perform the requested function and will log an error message.

In addition to enabling Remote COM access, you must ensure that your firewall permits the required traffic from the management console host system and zone processor host systems, or a similar error will occur.

Rule	Program to Allow	Local Address	Remote Address	Protocol	Local Port	Remote Port
COM In	%systemroot%\system32\dlhhost.exe	Any	Host IP	Any	Any	Any
COM Port Mapper In	Any	Any	Host IP	TCP	135	Any
IIS In	%windir%\system32\inetrv\inetinfo.exe	Any	Host IP	Any	Ephemeral Ports	Any
COM Port Mapper In	Any	Any	Host IP	TCP	135	Any

Unless otherwise configured, communication begins on port 135 (RPC Port Mapper), which then negotiates a target ephemeral port through which Privileged Identity performs the requested work. Ephemeral port ranges are initially determined by Microsoft and are specific to the target Windows system. However, administrators may change these ports.



**Note:**

While the sections above detail how to enable Remote COM access using PowerShell or the GUI, you may also enable Remote COM by modifying the registry:

1. Run **regedit.exe**.
2. Select the subkey **HKEY\_LOCAL\_MACHINE\SOFTWARE\Microsoft\COM3**.
3. Right-click the key **Remote Access Enabled**, and then select **Modify**.
4. In the **Edit DWORD Value** dialog, type **1**, and then click **OK**.

## Configure SSL on IIS

To encrypt traffic between the web server and the client browser, as well as to protect privileged passwords while they are in transit, you must configure SSL. Privileged Identity does not come with a pre-installed certificate. Rather, you must obtain a certificate from a public certificate authority, from an internal private certificate authority, or by using a free utility. You can also use a self-signed certificate or create one in IIS.

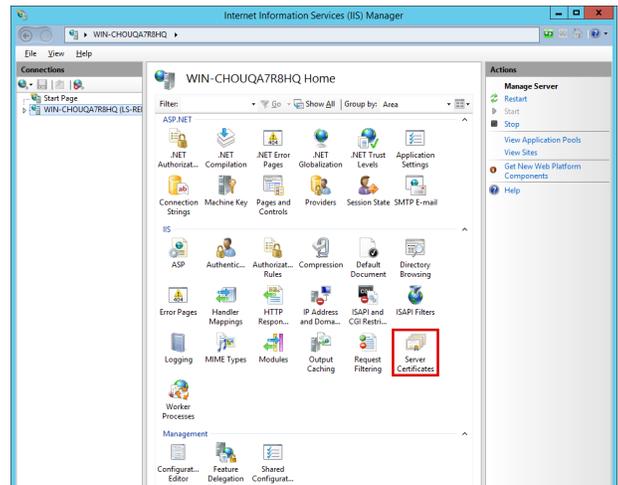
### IMPORTANT!

*Because SSL and early versions of TLS have certain security flaws, Microsoft recommends disabling SSL v3 and earlier and forcing the use of TLS 1.2.*

 For more information, please see this Microsoft article on disabling older versions of SSL and TLS at <https://portal.msrc.microsoft.com/en-us/>.

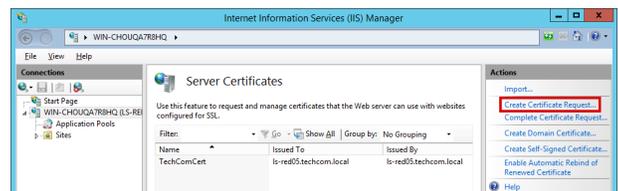
## Create an SSL Certificate

1. On the web app host server, open **Internet Information Services (IIS) Manager**.
2. From the **Connections** pane, select your server node.
3. From the center pane, open **Server Certificates**.
  - To create a request to an external certificate authority, go to **"External Certificate Authority"** on page 22.
  - To create a request to an internal certificate authority, go to **"In-House Certificate Authority"** on page 24.
  - To create a self-signed certificate, go to **"Self-Signed Certificate"** on page 25.

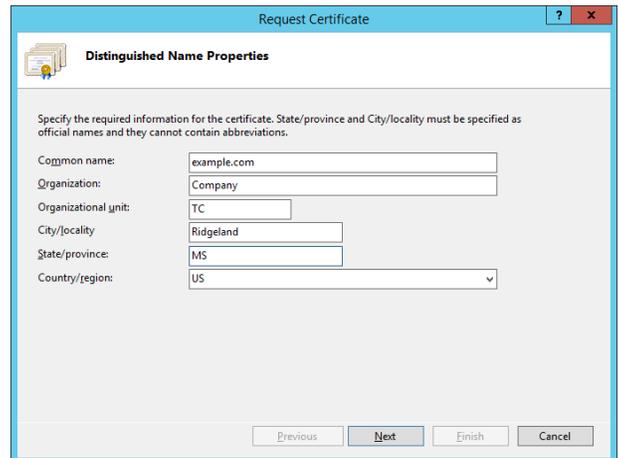


## External Certificate Authority

4. To create a certificate request to a third-party certificate authority, select **Create Certificate Request** from the **Actions** pane.



- On the **Distinguished Name Properties** dialog, enter the **Common name** (the name of the server as entered in a browser). Fill in all fields, and then click **Next**.



**Distinguished Name Properties**

Specify the required information for the certificate. State/province and City/locality must be specified as official names and they cannot contain abbreviations.

Common name:

Organization:

Organizational unit:

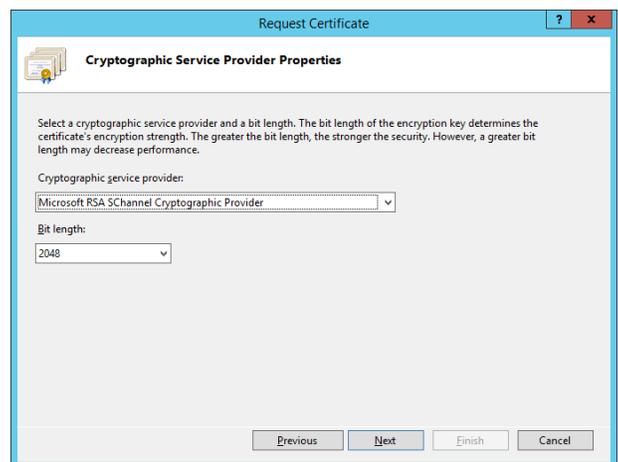
City/locality:

State/province:

Country/region:

Previous Next Finish Cancel

- Select the appropriate **Cryptographic service provider**.
- Set the **Bit length** to **2048** bits or higher to maintain compatibility with modern browser and systems.
- Click **Next**.



**Cryptographic Service Provider Properties**

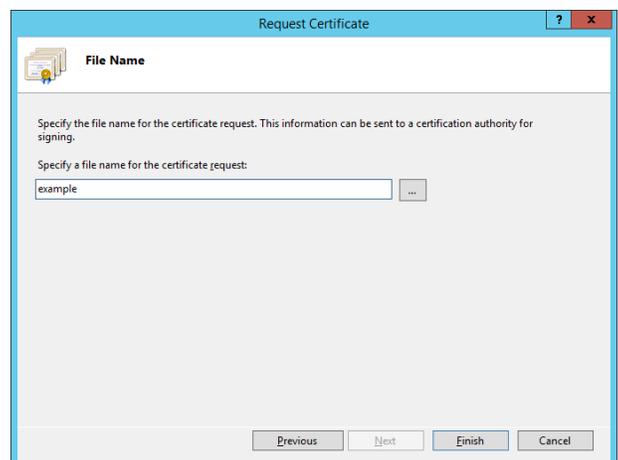
Select a cryptographic service provider and a bit length. The bit length of the encryption key determines the certificate's encryption strength. The greater the bit length, the stronger the security. However, a greater bit length may decrease performance.

Cryptographic service provider:

Bit length:

Previous Next Finish Cancel

- Enter a name for the certificate request file, and then click **Finish**.



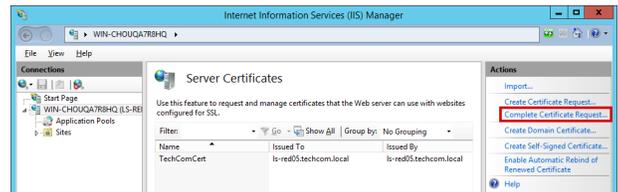
**File Name**

Specify the file name for the certificate request. This information can be sent to a certification authority for signing.

Specify a file name for the certificate request:

Previous Next Finish Cancel

10. You must now send the certificate request file to the certificate authority. Once they have signed your certificate and returned it to you, select **Complete Certificate Request** from the **Actions** pane.
11. Browse to the signed certificate file.
12. In **Friendly Name**, enter a name for easy identification.
13. Select **Web Hosting** as the certificate store, and then click **OK**.
14. The certificate is added to the **Server Certificates** list.

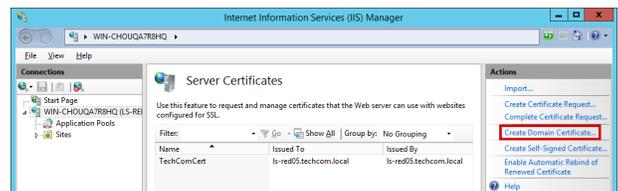


## In-House Certificate Authority

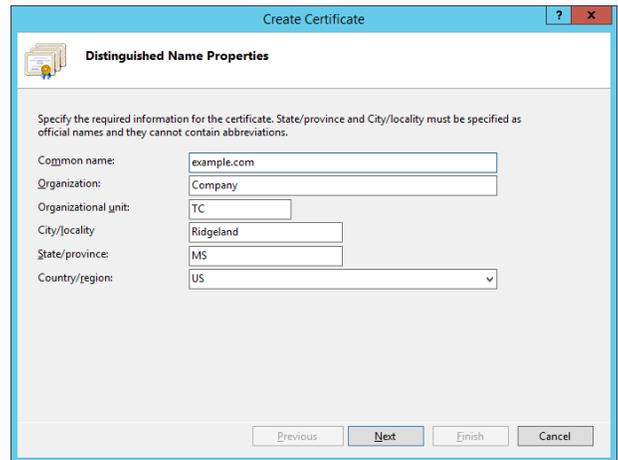
### IMPORTANT!

*Domain certificates are intended for use only with members of your internal Windows domain. Otherwise, you should use a certificate signed by a trusted root certificate authority.*

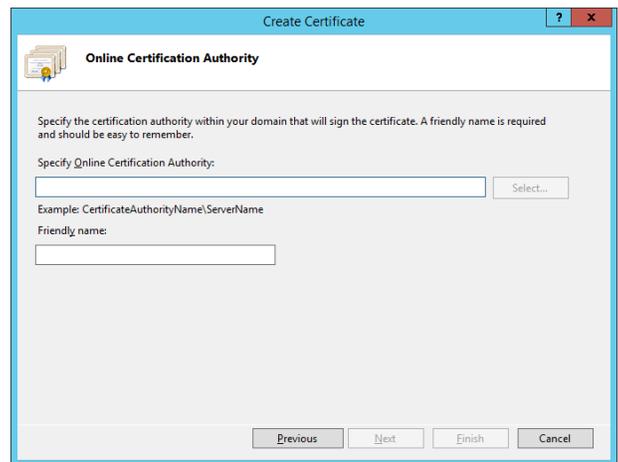
15. To create a certificate request to an in-house certificate authority, select **Create Domain Certificate** from the **Actions** pane.



- On the **Distinguished Name Properties** dialog, enter the **Common name** (the name of the server as entered in a browser). Fill in all fields, and then click **Next**.



- In **Specify Online Certification Authority**, enter or search for the path of a certificate authority in your Windows domain.
- In **Friendly name**, enter a name for easy identification.
- Click **Finish**.
- The certificate is added to the **Server Certificates** list.

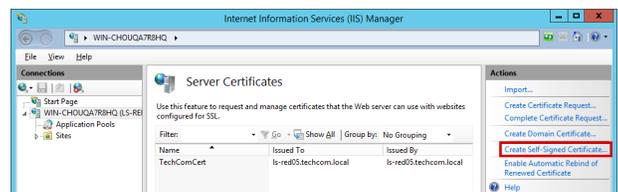


## Self-Signed Certificate

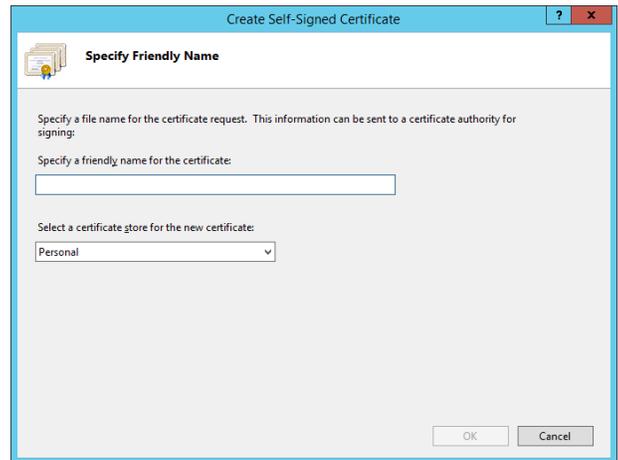
### ! IMPORTANT!

*We do not recommend using a self-signed certificate in a production environment, as no other system will trust that certificate. Some components and systems do not work with untrusted certificates. A self-signed certificate must be distributed and installed on every system that will connect to the web app or web service. Otherwise, those components won't work and will generate a certificate error every time they're attempted. Instead, you should use a certificate signed by a trusted root certificate authority.*

- To create a self-signed certificate, select **Create Self-Signed Certificate** from the **Actions** pane.

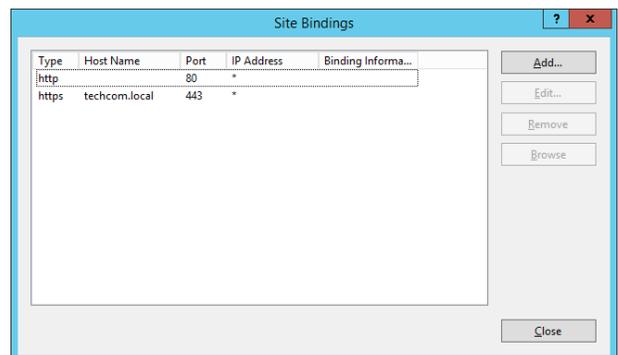
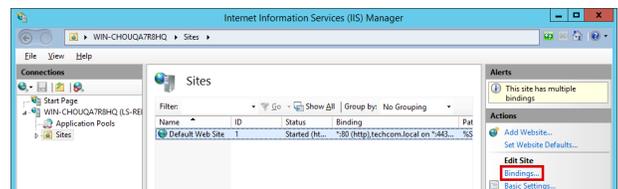


22. Enter a name for easy identification, and then click **OK**.
23. The certificate is added to the **Server Certificates** list.

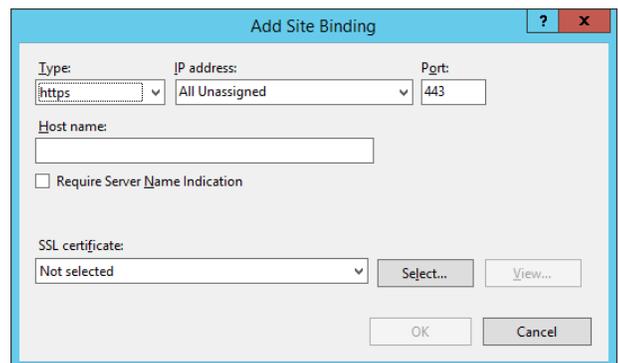


### Configure the Web App to Use Your Certificate

1. On the web app host server, open **Internet Information Services (IIS) Manager**.
2. From the **Connections** pane, expand your server node, and then click **Sites**.
3. From the center pane, select the web site that hosts your Privileged Identity web app.
4. From the **Actions** pane, select **Bindings**.
5. From the **Site Bindings** dialog, click **Add**.

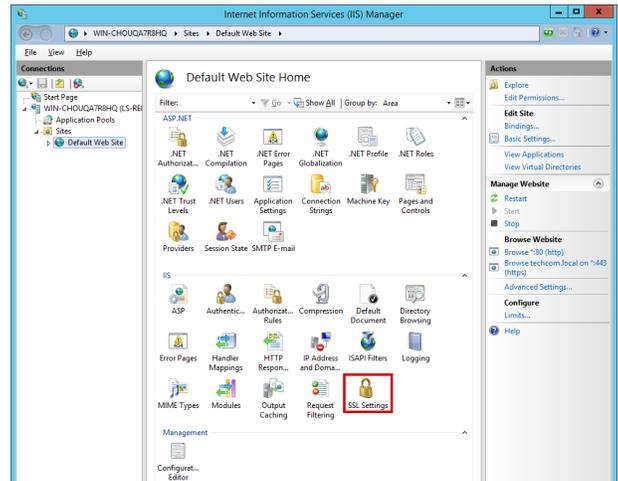


6. From the **Type** dropdown, select **https**.
7. From the **IP address** dropdown, select an IP or select **All Unassigned**.
8. You may leave **Port** as the default unless your network settings require you to change it.
9. Enter the **Host name** for your site.



 **Note:** If you changed the **Port**, you must include it in the URL as **https://address:port\_###/**.

10. If you need to include a virtual domain as part of SSL negotiation, you may check **Require Server Name Identification**.
11. Select the appropriate certificate from the **SSL certificate** dropdown.
12. Click **OK**.
13. HTTPS binding is now appended to the web site. Click **Close**.
14. To require the web site to use SSL, select your site node from the **Connections** pane of the IIS manager.
15. In the **IIS** section of the center pane, open **SSL Settings**.



16. Select **Require SSL**, and then click **Apply**.



## Managed System Requirements

In this section, we'll cover many of the required services and expected configurations for target managed computers and devices. These requirements are generally the same: a credential able to connect and perform the desired management function.

### IMPORTANT!

*For credentials you'll include in password rotation, you must know your password policy requirements. Otherwise, Privileged Identity could attempt to set passwords which don't match the requirements of your policy, and if those changes succeed, problems will occur later.*

*For example, a device could allow the command to include special characters such as an @ symbol, but when the command is processed on the device, the @ symbol could be parsed as a string delimiter. This could either cause the entire command to fail or else report success but lock you out of management. **Please be aware of your devices and their limitations.***

### Windows Requirements

- **File and print services** for Microsoft networks (installed and enabled by default)
- **Server service** (installed and enabled by default)
- **Remote registry** (optional; required to gather further system information such as MAC address, DCOM applications, etc.)

If you plan to use Privileged Identity to propagate, manage, or discover any of the following items, enable each respective requirement to support management via the native API:

- **COM/MTS**: Requires application server role with network COM access
- **DCOM**: Requires remote registry service
- **IIS**: Requires IIS management components, the application server role, and network COM access
- **WMI**: For SQL Server reporting services account; requires SCOM SDK binaries (from the SCOM server) to be placed in the Privileged Identity installation directory

 Enabling remote access to COM and IIS requires additional configuration steps on the target systems. For more information, please see "[Install Server Components](#)" on page 17.

 For information on port requirements, please see "[Port Requirements](#)" on page 15.

### Linux/Unix/OSX Requirements

- **Current SSH port**: Required for password change and account enumeration
- **Login password or SSH key**: Required for the login account and possibly for the account being managed (operation-specific)
- **Low-powered login account**: (Optional) Used if root accounts are not allowed SSH access to the target system

Some distributions of Solaris, AIX, and other Linux/Unix distros may require password authentication to be enabled in the `/etc/ssh/sshd` config file. If this is required but not enabled, a password change job results in errors, saved in the log. To enable

password authentication, open the `/etc/ssh/sshd` config file and set **Password Authentication** to **Yes**. Then restart the SSH daemon. The restart method is distro-specific. Here are some examples of various restart commands:

- FreeBSD: `/etc/rc.d/sshd restart`
- Solaris: `svcadm restart network/ssh`
- Suse: `rcsshd restart`
- Ubuntu: `sudo /etc/init.d/ssh restart`
- Red Hat/Fedora/CentOS: `/etc/init.d/sshd restart` OR `service sshd restart`

### Cisco Requirements

- **Login account username and password**
- **Current password of the enabled account**
- **SSH or Telnet port if changed from the default**

### IPMI Requirements

- **Root or admin-level login account username and password**

### SSH/Telnet Devices Requirements

Actual requirements vary based on target type and embedded operating system.

- **Login account username and password** or **SSH key**
- **SSH port** or **Telnet port** if changed from the default



For information about modifying the XML files used for SSH/Telnet targets, please see the [Privileged Identity Admin Guide \(PDF\)](https://www.beyondtrust.com/docs/privileged-identity/documents/pi-admin.pdf) at [www.beyondtrust.com/docs/privileged-identity/documents/pi-admin.pdf](https://www.beyondtrust.com/docs/privileged-identity/documents/pi-admin.pdf).

### Other Platform Requirements

Other platforms have requirements specific to their implementation, configuration, and defined policies. Please see your target system's documentation for servicing requirements.

## Managed Database Requirements

To manage a database through Privileged Identity, you must install the appropriate database provider on the host system that will perform the management tasks. Database providers may be downloaded from the database manufacturer.



**Note:** Privileged Identity requires 32-bit database providers. 64-bit providers are not supported.

The following databases require specific providers to allow you to manage their identities from the Privileged Identity host system.



**Note:** Windows comes with a Microsoft SQL Server provider. However, the SQL Server Native Client may be required for some specific configurations, requiring you to download the SQL Server Native Client provider. We recommend using the most current version of SQL Server Native Client. Using SQL Server Native Client 10 can result in undesirable behavior.

- **IBM DB2:** Install **ENU\x86\DB2OLEDBV5\_x86.msi** from [www.microsoft.com/en-us/download/details.aspx?id=52676](http://www.microsoft.com/en-us/download/details.aspx?id=52676)
- **Microsoft SQL Server:** Install **ENU\x86\sqlncli.msi** from [www.microsoft.com/en-us/download/details.aspx?id=50402](http://www.microsoft.com/en-us/download/details.aspx?id=50402)
- **MySQL:** Install **mysql-connector-odbc-8.0.12-win32.msi** from [dev.mysql.com/downloads/connector/odbc/](http://dev.mysql.com/downloads/connector/odbc/)
- **Oracle:** Install **Oracle Provider for OLE DB** from [www.oracle.com/technetwork/database/windows/downloads/utilsoft-087491.html](http://www.oracle.com/technetwork/database/windows/downloads/utilsoft-087491.html)
- **PostgreSQL:** Install the latest **x86** provider from [www.postgresql.org/ftp/odbc/versions/msi/](http://www.postgresql.org/ftp/odbc/versions/msi/)



**Note:** The links above offer guidelines for installing the required providers. Some vendors may require a login, a license agreement, or other prerequisites to download the provider. BeyondTrust is not responsible for third-party installations. You are responsible for all licensing and use restrictions surrounding these providers.

After you've installed the proper 32-bit OLE DB provider, it is available to Privileged Identity and is visible in the **Add Target** dialog when you add a new database target.

The rights required to change a target account's password vary from database to database. They also vary depending on the target account being changed. You may need other information, such as instance, service name, or port. Refer to your database provider's documentation for the most up-to-date description of rights required to change various identities. The sections below comprise a partial list of possible rights required for various databases.

### IBM DB2 Requirements

For accounts associated with an IBM DB2 instance, the rights required depend on whether the database is hosted on Windows or Linux/Unix. DB2 has no local account store but instead references accounts from the host or related directories. If DB2 is hosted on Windows, follow the process for a typical Windows password change job. If DB2 is hosted on Linux/Unix, follow the process for a typical Linux/Unix password change job.

To enumerate accounts in a DB2 database instance (account store view), the login account requires:

- **CONNECT TO DB**
- **GRANT SELECT on SYSIBM.SYSDBAUTH**

**Note:**

*Privileged Identity can enumerate the local accounts associated with a DB2 instance. This process requires you to install the Microsoft-supplied OLE DB provider for DB2.*

*However, changing DB2 account passwords does not require a specialized provider, because DB2 uses the database host system's local account store rather than providing its own internal account store.*

## Microsoft SQL Requirements

Microsoft SQL can leverage explicit SQL accounts or integrated authentication accounts. Accounts using integrated authentication are local computer accounts or accounts from a trusted domain. For either of these account types to manage account passwords within SQL, the following rights must be granted to the desired account or group:

- **GRANT VIEW ANY DEFINITION**
- **GRANT CONTROL SERVER**

The interactive login account and the deferred processing account require these rights to change passwords and enumerate accounts within the SQL database. Rights must be granted to a Windows user or group for Integrated Windows Authentication. The database instance name and port (if different from the default) are required.



**Note:** *If the **SYSADMIN** right is granted, no other rights are required on the Microsoft SQL Server.*

## MySQL Requirements

A login account is required to configure a MySQL password change job. This login account must have sufficient rights to change the target account's password. Assuming the login account can connect to the specified MySQL service and target database, the following global privilege must be granted to the login account:

- **UPDATE**

To enumerate the user accounts in a MySQL instance (account store view), the following global privilege must be granted to the login account for the appropriate database:

- **SELECT**

## Oracle Requirements

A login account is required to configure an Oracle password change job. This login account must have sufficient rights to change the target account's password. Assuming the login account can connect to the specified Oracle service (and instance, if applicable), the following right must be granted to the login account:

- **ALTER USER**

To enumerate the user accounts in an Oracle instance (account store view), the following right must be granted to the login account:

- **SELECT ANY DICTIONARY**

## PostgreSQL Requirements

A login account is required to configure a PostgreSQL password change job. This login account must have sufficient rights to change the target account's password. Assuming the login account can connect to the specified PostgreSQL service (and instance, if

applicable), the following right must be granted to the login account:

- **ALTER ROLE**

To enumerate the user accounts in a PostgreSQL instance (account store view), the following right must be granted to the login account:

- **SELECT**

# Install Privileged Identity Software

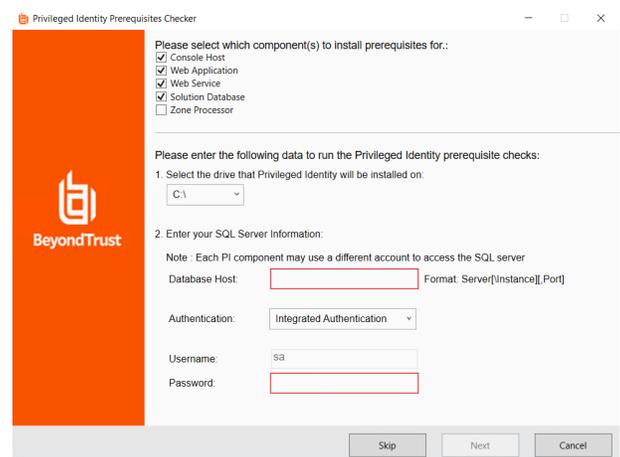
In this section, we'll cover how to install Privileged Identity and its components.

- "Install the Management Console" on page 33
- "Configure the Program Database" on page 37
- "Register the Privileged Identity Instance" on page 41
- "Install the Web Application" on page 42
- "Install the Web Service" on page 46

## Install the Management Console

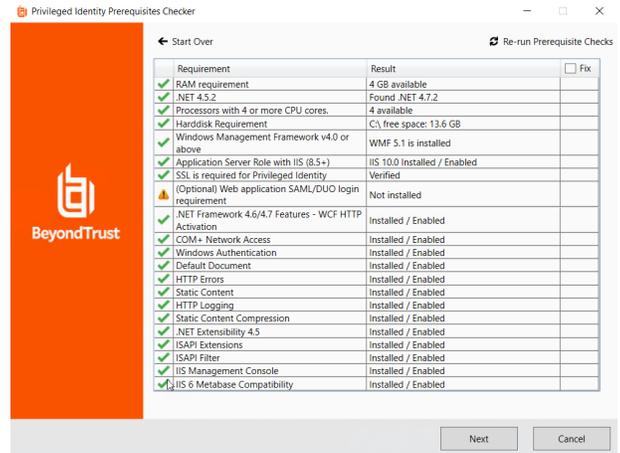
 Before you install the management console, make sure your server meets the prerequisites as defined in "[Management Console and Deferred Processing Host Requirements](#)" on page 7.

1. Launch the Privileged Identity installer. You should have received this from BeyondTrust Support or from the [Support Portal](#).
2. In the prerequisites checker, select the components that will be installed on this machine.
3. From the dropdown, select the drive where Privileged Identity will be installed.
4. Enter the information you will use to connect to the SQL server.
  - **DataSource String:** Enter the string used to connect to the data source in the form of **Server\Instance.Port**.
  - **Authentication:** Select whether to use integrated authentication or SQL Authentication.
  - **Username and Password:** Enter the credentials used to connect to the SQL server.
5. Click **Next**.

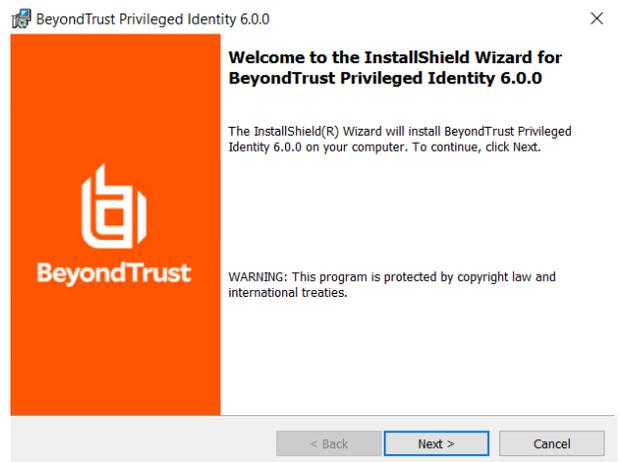


 **Note:** Each component may use a different account to access the SQL server.

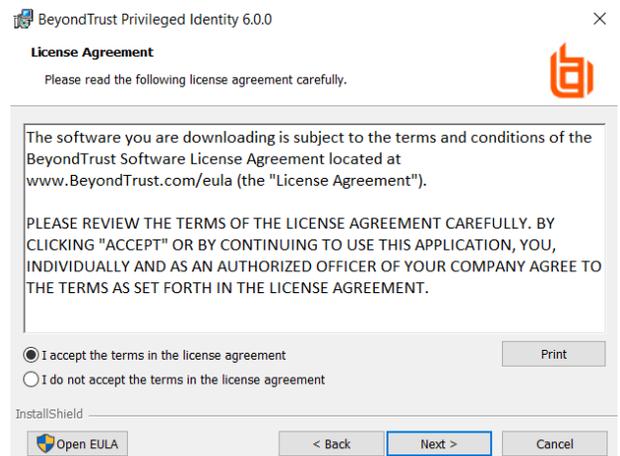
6. The checker runs a series of tests to let you know of any inadequate resources before beginning the installation process.
7. You can resolve any issues and then click **Re-run Prerequisite Checks**.
8. When ready, click **Next**.



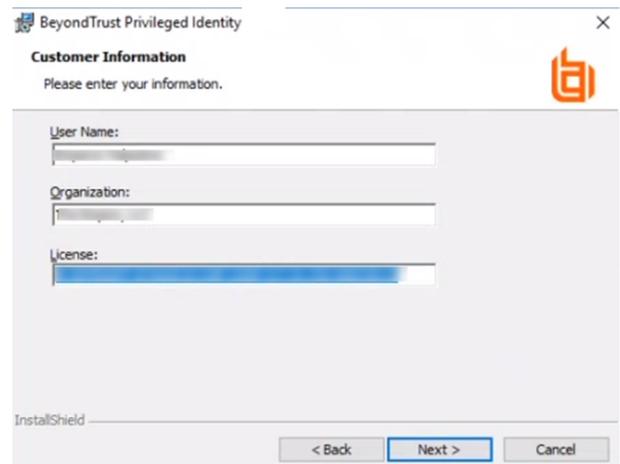
9. On the welcome screen click **Next**.



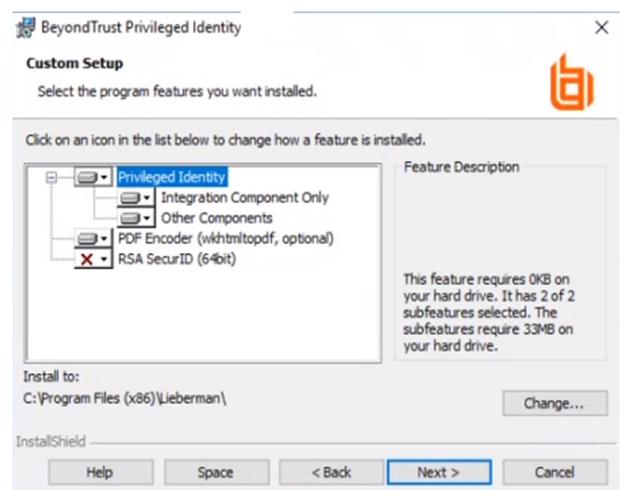
10. Read the license agreement. If you agree, accept it, and then click **Next**.



- Enter your name, organization name, and license key, and then click **Next**.



- Select which features to install:
  - BeyondTrust Privileged Identity:** (required) Installs the Privileged Identity software.
  - PDF Encoder:** (recommended) Allows you to turn compliance reports into PDF documents.
  - RSA SecurID:**
    - If RSA multi-factor authentication is required to access the management console but this machine will NOT host the web application, install this option.
    - If this machine will host the web application, leave this option unchecked. The RSA agent is installed automatically when the web application is installed.

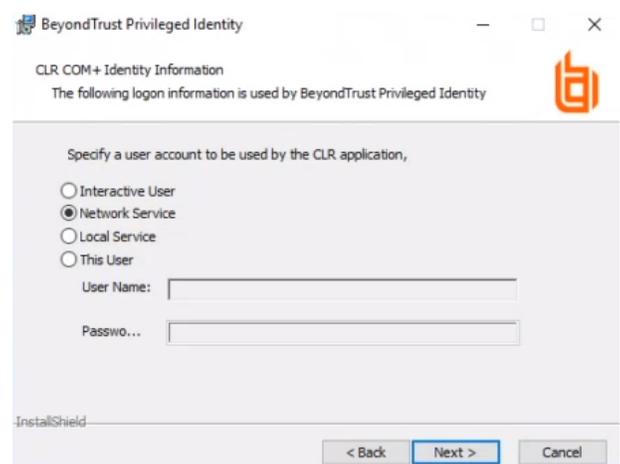


- To change the installation location, click **Change**.
- To make sure you don't exceed your available disk space, click **Space**.
- Click **Next**.
- Choose which identity should run the Common Language Runtime (CLR) application. The default is **Network Service**.

The CLR COM identity provides Privileged Identity with network and local system access to various cloud services. Individual account stores (Azure, AWS, ESX, etc.) are configured with specific connection credentials when they are enrolled.

Options for the identity are:

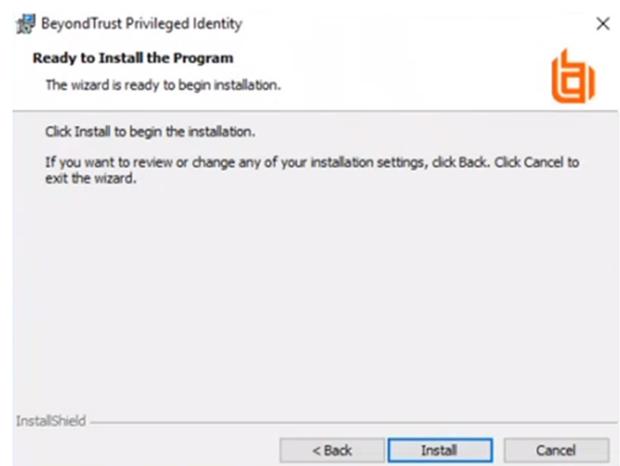
- Interactive User:** Use the same login information as the calling identity. This is an administrator-level account, as the calling identity will be either the admin running the console or the deferred processor service account. This option requires the least configuration but provides far more privileges than are required.



- **Network Service:** (Recommended) Use the system's NetworkService account. This does not require you to manage a password or grant additional rights, although in some cloud management cases, you may need to grant additional permissions on the file system.
- **Local Service:** Use the system's LocalService account. This does not require you to manage a password or grant additional rights, although in some cloud management cases, you may need to grant additional permissions on the file system. The LocalService account has many more rights than NetworkService.
- **This User:** Use a specified username and password. This user could be a local account that is configured to never authenticate to any other machine in the network (unlike NetworkService or LocalService), but it is another account whose credential you'll need to manage. You must grant this account **Logon as a batch** rights. In some cloud management cases, you may need to grant it additional permissions on the file system.

17. Click **Next**.

18. On the **Ready to Install the Program** screen, click **Back** to make any needed changes or **Install** to begin the installation.

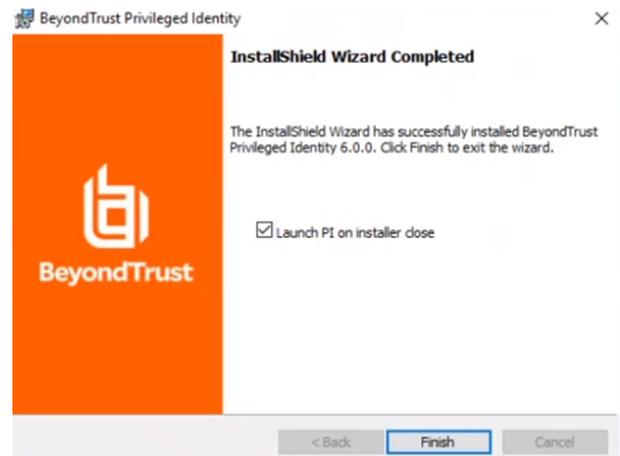


19. When you receive confirmation that the application has been successfully installed, click **Back** to make any needed changes or **Finish** to complete the installation.

The first time Privileged Identity launches, the program database setup wizard begins.



For more information, please see "[Configure the Program Database](#)" on page 37.



## Configure the Program Database

The first time you launch Privileged Identity, a setup wizard helps you configure various components of the Privileged Identity database. All of the component steps are optional except program data store configuration.



**Note:** If you need to run this setup wizard again, select **Settings > Re-Run Setup Wizard** in the management console.

1. On the **Database Setup** screen, click **Change Settings** to create or connect to the database Privileged Identity will use for its primary data store.

2. Complete the fields in the **Database Connection Information** section.



**Note:** If you need to change this information later, select **Settings > Data Store Configuration > Basic Configuration** from the management console.

3. After you've successfully connected to your database, complete the fields in the **Database Settings** section.
  - a. **Name of the existing database to use:** Select a database instance to use, or click **Manage Database Instances** to view all found instances, to create a new database instance, or to delete an existing instance.

b.



### IMPORTANT!

*Deleting a database instance removes it from the data store entirely, not just from this interface. A deleted database instance cannot be restored.*

- c. **Use an explicit (non-default) schema:** This determines the context under which Privileged Identity will create database objects. We recommend checking this option and entering **DBO** in the field.

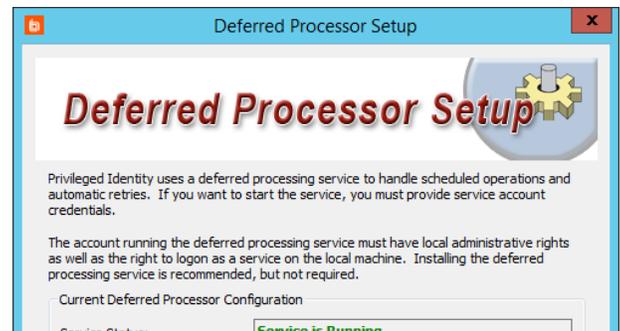
If you leave this unchecked, then data is added under the context of your connected account. If this account is not in the **sysadmin** role, SQL Server creates a schema with your account name and creates all objects in that context. While this works for a single user or when using database native authentication, this option does not work well when using integrated security where connecting users are not sysadmin-level users.


**IMPORTANT!**

*If you switch schemas, then any data already added will be removed. Be very careful about switching schemas if you've already begun using this database for this or other applications.*

4. Enter **Advanced Settings** (optional).
  - a. **Set explicit connection limit:** This limits the number of connections made to the target database host. While this slows down job processing, it can improve stability when the database host is under-provisioned.
  - b. **Maximum number of active DB connections during normal operations:** Set how many connections can be made at once.
  - c. **Overwrite the default database timeout value:** Set how long Privileged Identity should wait for data to be returned from the database before the call times out. While 30 seconds should typically be enough, you may need to increase the timeout to handle high-latency, low-bandwidth links or while maintaining your database.
5. Click **OK**. Privileged Identity will now create all required views, stored procedures, and tables on the database. If no issues occur, the **Database Setup** dialog reappears, with **Settings are Valid** appearing in green.

6. Configure the deferred processor. The deferred processor performs all scheduled actions within Privileged Identity. Supply a service account in the form of **Domain\Account Name**, and then enter its password. This account must have local administrative rights, as well as the right to log in as a service on the local machine.



**Note:** *If you don't have an account available at this time, click **Next** to skip this step.*



For more information about the deferred processor account requirements, please see "[Deferred Processor / Zone Processor Service Identity](#)" on page 13.



**Note:** *If you need to change this information later, select **Settings > Application Components** from the management console, and then select **Deferred Processor Service** from the dropdown.*

7. Click **Install/Start Service**. Privileged Identity attempts to grant **Logon as a Service** to the account. If the process succeeds, you'll see **Service is Running** in green.



**Note:** *If there are problems connecting to the database or granting rights, or if the account is not a local admin, the service fails to start. You can fix the issues now or after install.*

8. Click **Next**.

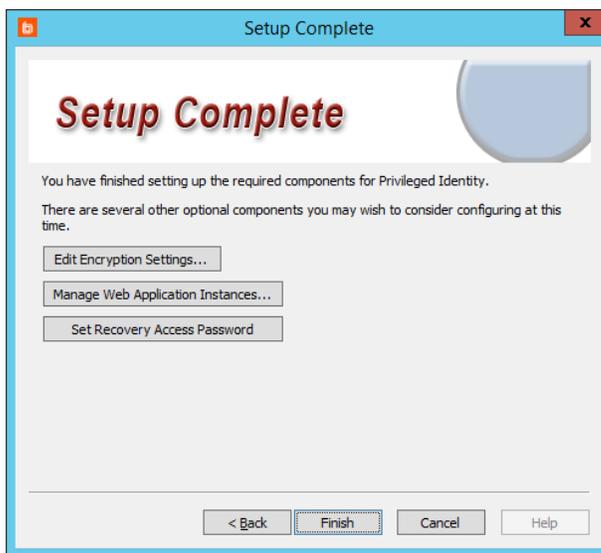
9. Enter the **Email Setup** information to set up Privileged Identity to send email. Click **Change Settings** to start the setup.

 **Note:** If you don't need Privileged Identity to send emails or if you don't have email server settings available at this time, click **Next** to skip this step.

 **Note:** If you need to change this information later, select **Settings > Email Settings** from the management console.

10. On the

**Setup**

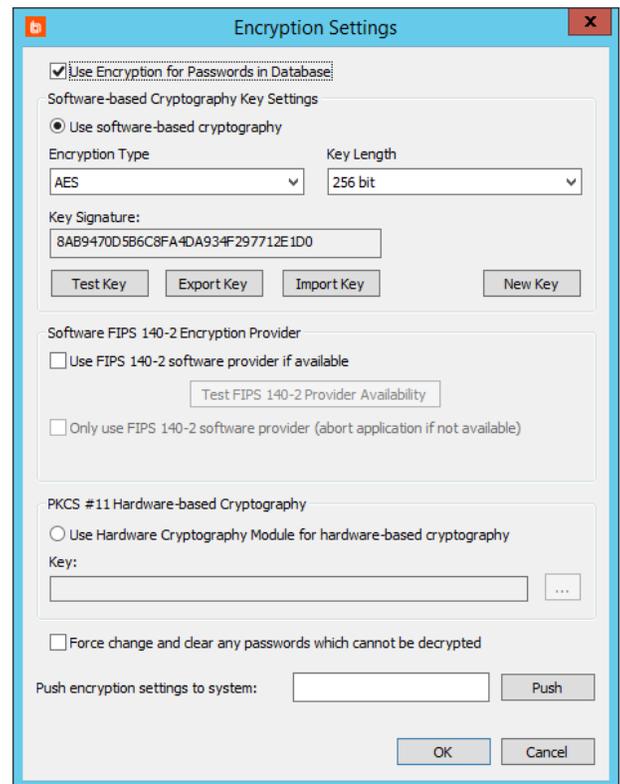


**Complete** screen, click **Edit Encryption Settings**.

 **Note:** If you need to change this information later, select **Settings > Encryption Settings** from the management console.



11. We highly recommend that you check **Use Encryption for Passwords in Database**.
12. Select the encryption type appropriate to your environment: Software-based, Software FIPS 140-2, or PKCS #11 Hardware-based. If you're unsure which to use, select **Use software-based cryptography**, with an **Encryption Type** of **AES** and a **Key Length** of **256 bit**.



13. Click **OK**.

 For details about encryption settings, please see "[Configure Encryption Options](#)" on page 57.

14. We recommend that you skip managing web application instances at this time, as not all web site options are enabled until you've completed registration. Furthermore, the web app requires the web service, which you have not yet configured.

 For information on installing the web app, please see "[Install the Web Application](#)" on page 42.

15. Click **Set Recovery Access Password** to change the default password.

 **Note:** You can change this password later by selecting **Manage > View Stored Managed Passwords** from the management console. If the password has not been set, you'll receive a prompt to set the password. Otherwise, from the **Stored Passwords** dialog, select **Access > Change Recovery Access Password**.

16. Click **Finish**.

## Register the Privileged Identity Instance



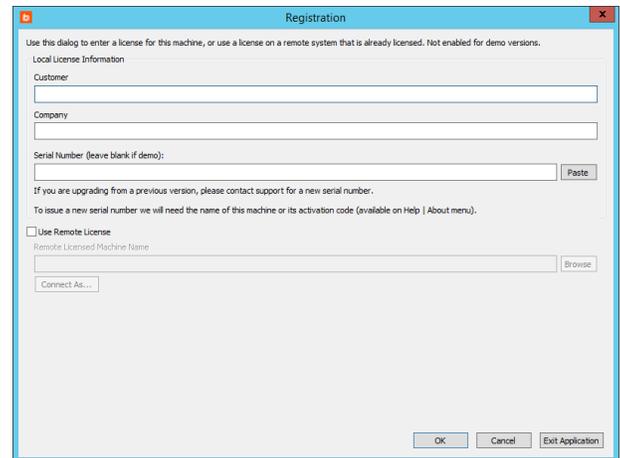
### IMPORTANT!

Register your Privileged Identity software on only the primary licensed console. Do not register any secondary or high-availability consoles. Doing so would lose all licensing information from the primary console, reverting it to demo mode.



**Note:** If you're using a demo license, you don't need to register at this time. Your demo software will be fully functional for 30 days and capable of managing up to 10 systems.

1. To register your software, select **Help > Register** from the management console.
2. Enter your name and your company name, and then enter your license key in the **Serial Number** field.
3. Alternatively, check **Use Remote License**.
  - a. Select or add a remote license server, and then click **OK**.
  - b. Click **Connect As** to select an alternate administrator account.
4. Click **OK**.



The screenshot shows a 'Registration' dialog box with the following fields and options:

- Local License Information**
  - Customer: [Text Field]
  - Company: [Text Field]
  - Serial Number (leave blank if demo): [Text Field] [Paste]
- Use Remote License** (checkbox, currently unchecked)
  - Remote Licensed Machine Name: [Text Field] [Browse]
  - Connect As...: [Text Field]

Buttons at the bottom: OK, Cancel, Exit Application.

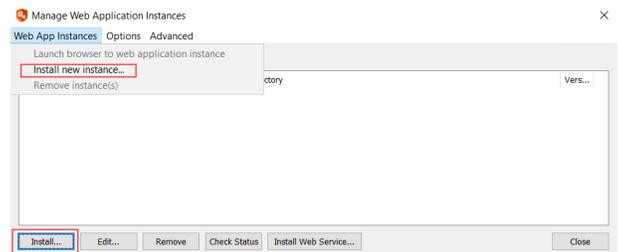
## Install the Web Application

The Privileged Identity web application is the primary method for accessing stored credentials, whether managed or static, as well as auditing access to those credentials. The web app also provides features such as the file store, the personal password store, privilege escalation, and job management. In this section, we'll cover installation of the web app from the management console.



For information on the web app host requirements, please see "[Web Application Host Requirements](#)" on page 8.

1. From the **Actions** pane, click **Manage Web App**.
2. On the **Manage Web Application Instances** dialog, click **Install** or select **Web App Instances > Install new instance** from the menu.



3. On the **Install Web Application** dialog, select the target installation system.
  - **Local system** is the computer you're currently working on.
  - If you choose **Remote System**, enter the remote system's fully qualified domain name.
  - Click **Check System Compatibility**. This checks that IIS and the file system are accessible on the target system, and that remote registry and Remote COM access are possible. Resolve any access errors before continuing.
  - You will receive prompt to specify connection credentials. To use the currently logged in user account, click **No**. To specify a different account, click **Yes**, then enter the access credentials and click **OK**.
4. If the system compatibility check completes successfully, the **Web Interface Files** section is filled in automatically. If you need to change any of this information, the following are the details:
  - **Install to target website**: All root web sites on the target server are listed here. Choose the root web site to host the web application.
  - **Web files destination path**: This is where the web application files will be copied. The path is resolved from IIS on the target server, which defaults to `%inetpub%\wwwroot\PWCWeb`.
5. Click **Install**.
6. You may receive a *COM Account Confirmation* warning. This appears if the COM account specified on the installation dialog is different from the currently logged in user. The warning asks you to be sure that the account specified has data store access. If it does not, the web app will fail to function until the access issue is resolved.

If you are sure about the account information, click **Yes** to continue. Alternatively, click **No** to change to a different account.

7. When the web application install is complete, a success prompt appears. Click **OK**.

Privileged Identity

 **Web Application Installed**

Successfully installed web application on target system [redacted].

OK

8. You are prompted to launch a browser to the web application. Click **No**.

Privileged Identity

 **Launch Browser to Web Application Instance**

Would you like to launch a web browser to the web application?

Note: You will be automatically logged into the web application using the auto-created management account, and will be able to perform all web application operations.

Yes

No

9. Click **Close**.

The **Manage Web Application Instances** dialog in the management console is populated with a list of all known web applications.

## Supported Browsers

The web app has been tested with:

- Internet Explorer 11
- Microsoft Edge
- Google Chrome
- Mozilla Firefox
- Apple Safari
- Konqueror
- Opera

Following are known caveats when working with these browsers.

### Internet Explorer

- On Windows Servers with **Internet Explorer Enhanced Security Mode** enabled, the web app will not work unless its URL is added as a trusted site.
  1. In Internet Explorer, select **Tools > Internet Options > Security**.
  2. Select the **Trusted sites** icon.

3. Click **Sites**.
  4. Add your web app URL to the list (e.g., <https://server.example.int>).
  5. After closing the options, refresh your browser. The web app should now appear.
- CORS support is available only on Internet Explorer 10 or later. To enable CORS, you may need to set this option:
    1. In Internet Explorer, select **Tools > Internet Options > Security**.
    2. Select the appropriate internet zone.
    3. Click **Custom Level**.
    4. Under **Miscellaneous**, enable **Access data sources across domains**.

### Microsoft Edge, Konqueror, Opera

- This browser does not support the ActiveX control needed to launch RDP sessions.
- This browser does not support the ClickOnce extension needed to support application launching.

### Google Chrome

- The IE Tab extension is required to support the ActiveX control needed to launch RDP sessions. This is currently supported only by Chrome for Windows.
- Only Chrome for Windows supports the ClickOnce extension needed to support application launching.
- SSL certificates that do not include a properly formatted subject alternative name are shown as insecure sites. This causes the user extra prompts and will likely break access to the web service, required for web app functionality.
- For Chrome to support Integrated Windows Authentication in scenarios where cross-origin requests (CORS) must be used, you must launch Chrome with the following flags:

```
--disable-web-security --user-data-dir=SOMEDIRECTORY
```



**Note:** Chrome will display a security warning. You can ignore this warning.

### Mozilla Firefox

- This browser does not support the ActiveX control needed to launch RDP sessions.
- Only Firefox for Windows supports the ClickOnce extension needed to support application launching.
- For Firefox to allow Integrated Windows Authentication, the operating system must be joined to a trusted domain, and the following configuration must be made to the browser's profile:
  - For Kerberos authentication: **network.negotiate-auth.trusted-uris**
  - If Kerberos ticket passing is required: **network.negotiate-auth.delegation-uris**
  - If NTLM authentication is allowed: **network.automatic-ntlm-auth.trusted-uris**

For the Kerberos exchange, define the domain name. If your domain name were **example.int**, you would enter **.example.int** (notice the leading dot).

- When the web app and web service are on separate machines and work with cross-origin requests (CORS), Firefox may not function properly when using Integrated Windows Authentication.

## Apple Safari

- This browser does not support the ActiveX control needed to launch RDP sessions.
- This browser does not support the ClickOnce extension needed to support application launching.
- CORS support is available only on Safari 9 or later.

## Install the Web Service

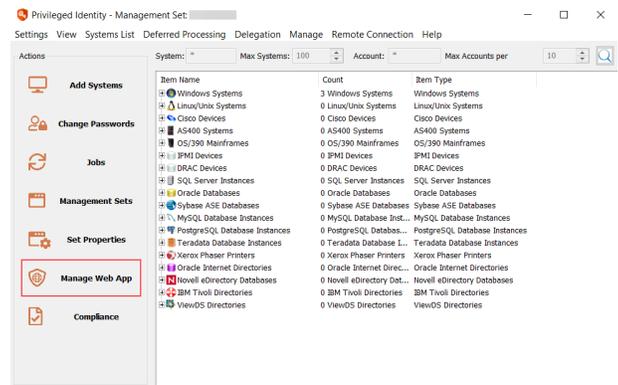
Starting with Privileged Identity version 5.5.2, the web service is a requirement for the web application to function. In prior versions, the web service was an optional component used only for PowerShell cmdlets, application launcher, session recording, and API access.

You must install the web service locally to its host; it cannot be pushed to a target system from the management console.

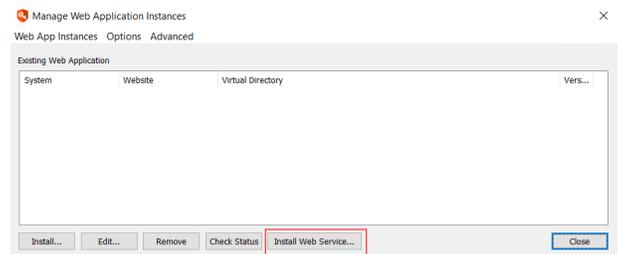
To install the web service on a separate host, copy the manual installer to the remote host and run it there. The manual installer is found in the installation directory, typically **C:\Program Files (x86)\Lieberman\Roulette\SupplementalInstallers\ERPMSWebService.exe**. Follow the steps below to complete the install wizard.

To install the web service on the same machine as the management console:

1. From the **Actions** pane, click **Manage Web App**.

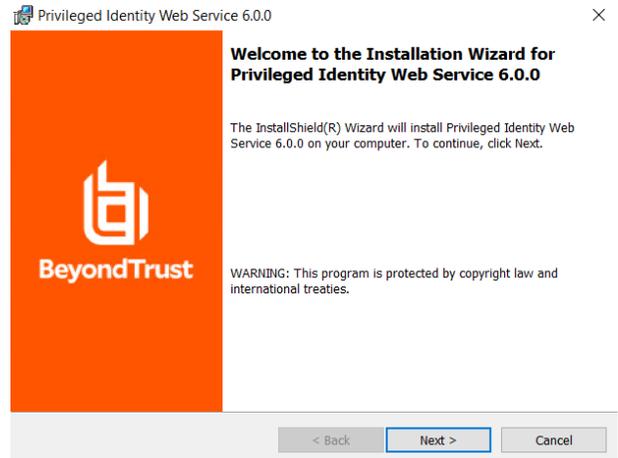


2. In the **Manage Web Application Instances** dialog, click **Install Web Service**.



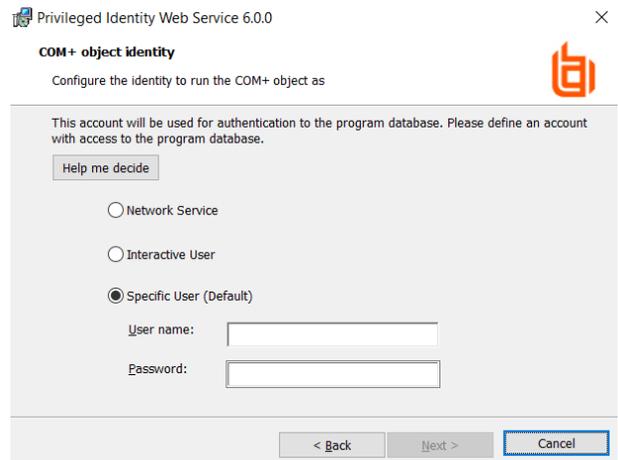
Follow the below steps to complete the install using the wizard:

1. On the welcome page, click **Next**.



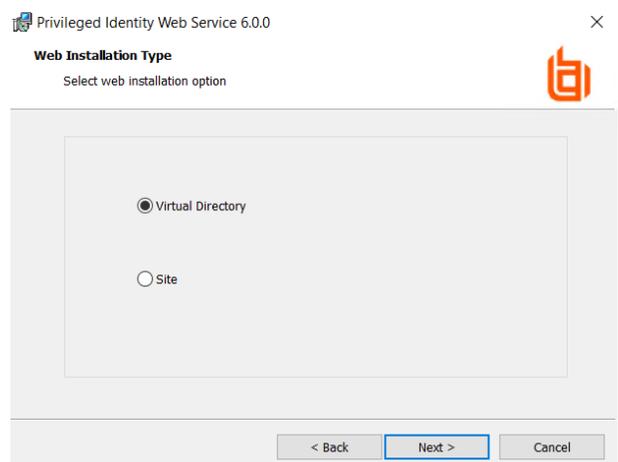
2. On the **COM+ Object Identity** screen, choose an appropriate identity and click **Next**. Valid identity options are:

- **Network Service:** Choose this option when using database native authentication mode to connect to the database (for example, SA).
- **Interactive User:** (not recommended) Choose this option when you want the user calling the web service to pass their authentication token to the database. This works when using **Integrated Windows Authentication** but requires considerably more security configurations in the program data store.
- **Specific User:** (recommended, default) Choose this option when using **Integrated Windows Authentication** to the database or when you want to minimize rights granted to the COM application. This is the most compatible option. Supply the **User name** as **DomainNameUsername**.

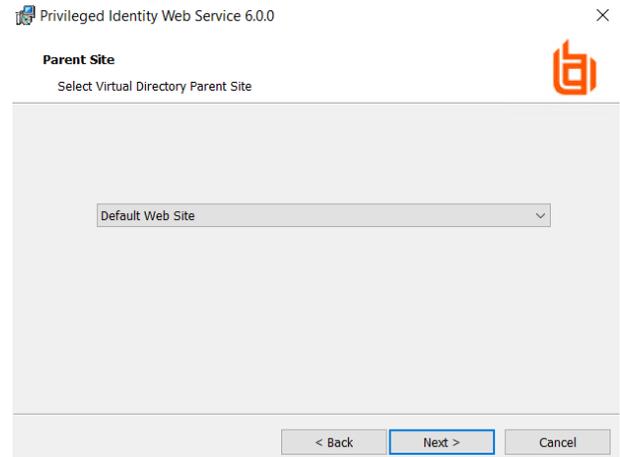


3. On the **Web Installation Type** screen, select the location in the local IIS instance to install the web service to, and then click **Next**. Valid options are:

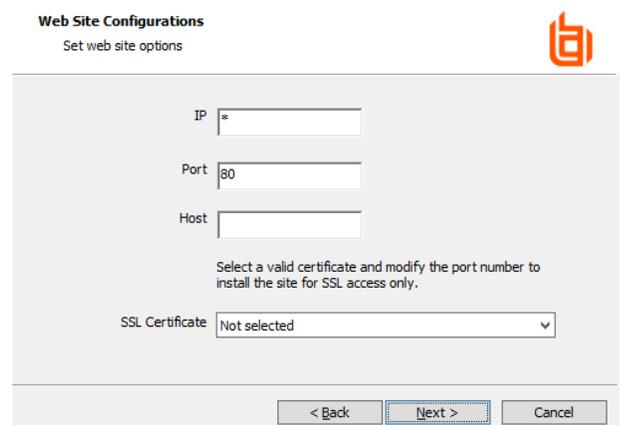
- **Virtual Directory:** (recommended, default) This installs the web service to a virtual directory called **ERPMWebService**, located under the parent web site you'll select next. This is the safest option to choose for both security and configuration reasons.
- **Site:** Choose this option to install the web service to the root web site. If there are multiple root web sites configured on the host, you will be presented with a selection of root web sites to choose from.



- If you chose **Virtual Directory** on the **Web Installation Type** screen, select a web site on **Parent Site** screen, and then click **Next**.

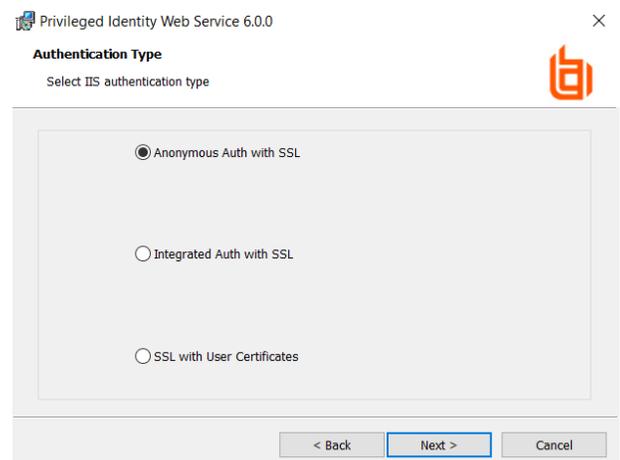


- If you chose **Site** on the **Web Installation Type** screen, configure site options on the **Web Site Configuration** screen.



- On the **Authentication Type** screen, select the authentication method for connecting to the web service, and then click **Next**. Valid methods include:

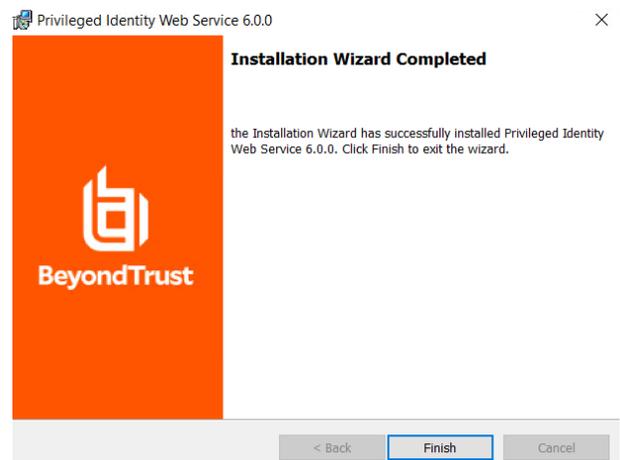
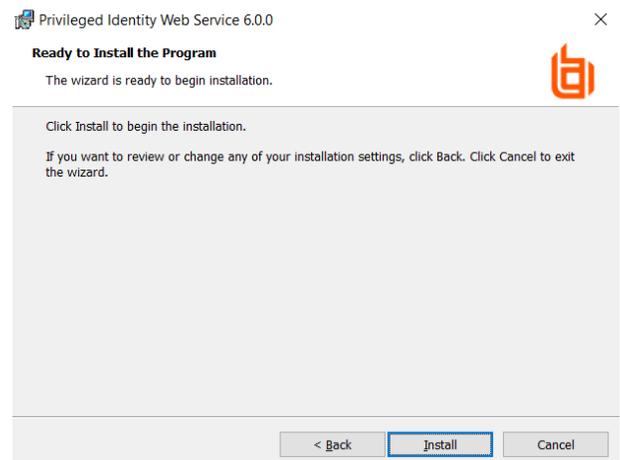
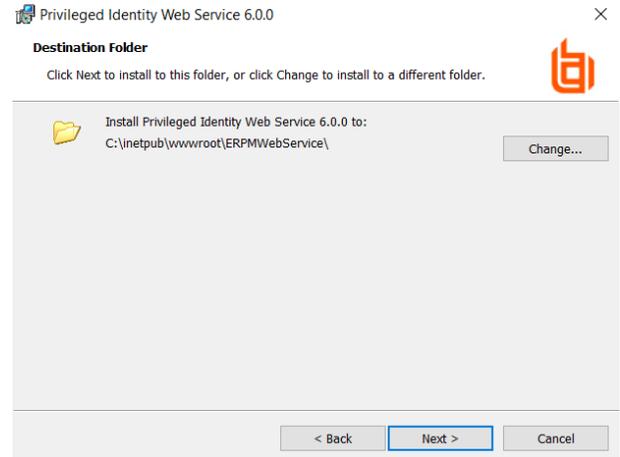
- Anonymous Auth with SSL:** Choose this when SSL is configured but Integrated Windows Authentication is not used.
- Anonymous Auth without SSL:** (not recommended) Choose this when neither Integrated Windows Authentication nor SSL are used. Application Launcher will not work with this configuration.
- Integrated Auth with SSL:** Choose this when SSL and Integrated Windows Authentication are used.
- Integrated Auth without SSL:** Choose this when Integrated Windows Authentication is used but SSL is NOT configured. Application Launcher will not work with this configuration.
- SSL with User Certificates:** Choose this when users must supply a user-based certificate (smart card, biometrics, etc.) to authenticate to the web site and web service. This causes more overhead in the overall configuration and may cause problems with some features.



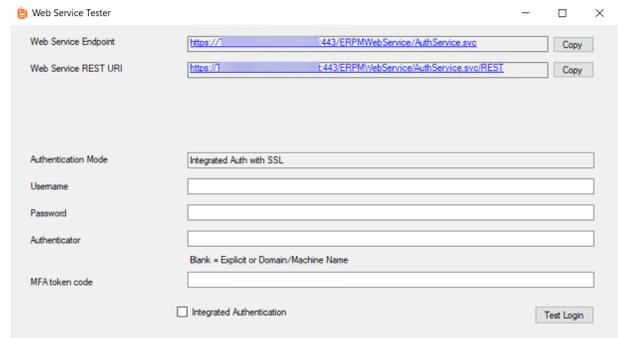
- On the **Destination Folder** screen, choose where to install the web service, and then click **Next**. The default location is **%inetpub%\wwwroot\ERPWebService**, which automatically grants all permissions required for proper hosting. Changing the location may require additional configurations on the web server.

- Click **Install**.

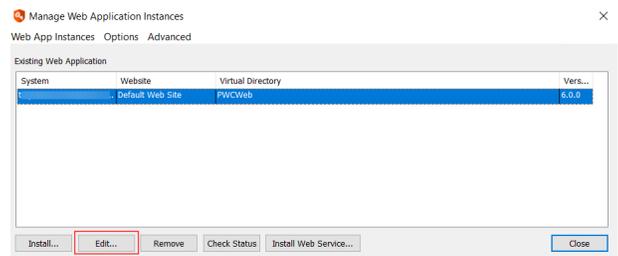
- Click **Finish** to exit the install wizard. The web service page and web service tester launches.



10. From the **Web Service Tester**, make note of the **Web Service REST URI**, as it is required when configuring the web application. At this point, the web service will be non-functional, as it also requires settings. If the web service and web app are installed on the same host, the web service requires no further configuration. Close the **Web Service Tester**.

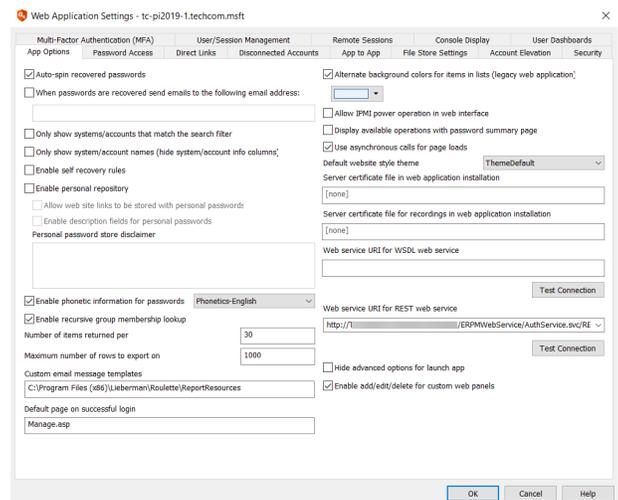


11. On the **Manage Web Application Instances** dialog, select the web app, and then click **Edit**.



12. When prompted to confirm settings overwrite, click **Yes**.

13. On the **App Options** tab, find **Web service URI for REST web service endpoint** at the lower right of the dialog. Paste in the web service REST URI.



 **Note:** If you have installed the web service on the same machine as the web app using the default settings, the web service REST URI is virtually the same as the web app URL.

For example, let's say your server uses SSL on port 443 and your SSL certificate uses the fully qualified domain name of the server (**server.example.int**). The web service adds onto that (**/erpwebsevice/authservice.svc/REST**), making the URI **https://server.example.int/erpwebsevice/authservice.svc/REST**.

If you were behind a load balancer and the name of the load balanced cluster was **securestore.example.com**, the web service URI would be **https://securestore.example.com/erpwebsevice/authservice.svc/REST**.

14. Click **Test Connection** to verify the settings.

15. Click **OK**. When prompted that the settings have updated, click **OK** again.

16. If the Privileged Identity web applications are behind a load balancer, the **WebServiceConfig.json** file located at `...\\inetpub\\wwwroot\\PWCWeb\\assets\\` must specify the load balanced web service URI. For example:  
`{"WebServiceAddress":"https://FullyQualifiedWebServer/ERPMSvc/AuthService.svc/REST"}`.
17. If you are load balancing the websites and using either SAML authentication or DUO MFA, you must install Microsoft .NET Core Runtime - 3.1.1, as well as updating the **appsettings.json** files located at `...\\inetpub\\wwwroot\\SAML` and `...\\inetpub\\wwwroot\\DUO` with the load balanced web service URI.

**IMPORTANT!**

*If you install to a virtual directory, the install process creates a virtual directory called **ERPMSvc**. This directory inherits the authentication settings, SSL settings, and other settings from the parent web site. If the parent site is configured to use anonymous authentication and the web service installer is configured to use Integrated Windows Authentication, the virtual directory is created with faulty settings. To correct this, you must open IIS and reconfigure the authentication settings after install.*

**IMPORTANT!**

*If you install the web service on a machine that is NOT also hosting the web app, you must export the web app settings from the management console and import them onto the web service host. Otherwise, the web service will fail to load. To export the settings from the management console:*

1. Click **Manage Web App** from the left action pane.
2. Select the desired web application instance from the list.
3. From the top tools menu, select **Advanced > Export web app registry config**. This exports a regedit file; save this locally.
4. You are prompted to generate the file for 64-bit Windows. Click **Yes**.
5. Copy the registry export to the target web service host and double-click the file to import it.

*These steps provide the web service with the necessary information to connect to the data store, the hardware security module, the encryption key, and other settings. Any time these settings change on the web app host, you must repeat these steps.*

**IMPORTANT!**

*If the web service and web app have different host systems, and if the systems are accessed through different URLs (specifically the protocol, server name, or port), your web browser will block access to the web service, causing processes to malfunction.*

*To resolve this, enable cross-origin resource sharing (CORS). After you install the web service, open **web.config** and set **EnableCORS** to **true**.*

*Your specific browser may require additional configuration and may not work in all configurations. Please refer to your browser's documentation for more information on enabling CORS support.*



For more information, please see the following:

- "Web Service Host Requirements" on page 8
- "Service Account Requirements" on page 13
- "Final Setup Steps" on page 53

## Final Setup Steps

After the web app and web service are installed, you may need to take additional steps, depending on the options enabled or desired. This section contains details about further setup steps you may need to perform.

- CORS Support: ["Enable Cross-Origin Resource Sharing" on page 53](#)
- Databases - ["Connect to High-Availability and Cloud Databases" on page 54](#)
- Encryption: ["Configure Encryption Options" on page 57](#)
- Redirects: ["Configure URL Redirects" on page 60](#)
- SMTP: ["Configure SMTP Email Settings" on page 61](#)
- SSL: ["Require SSL" on page 67](#)
- User Certificates: ["Require User Certificates" on page 68](#)
- Windows Authentication: ["Enable Integrated Windows Authentication" on page 69](#)

### Enable Cross-Origin Resource Sharing

If the web service and web app have different host systems, and if the systems are accessed through different URLs (specifically the protocol, server name, or port), your web browser will block access to the web service, causing processes to malfunction.

To resolve this, enable cross-origin resource sharing (CORS). After installing the web service, open its **web.config** file (typically found at **C:\Program Files (x86)\Lieberman\Roulette\ERPWebService\web.config**), and set **EnableCORS** to **true**.

**CORSDomain** controls the source domain allowed for CORS support. The initial value is an asterisk (\*), which allows references from any web server. To limit communication to a particular domain, change the asterisk to your domain name. For example:

```
<add key="CORSDomain" value="example.int" />
```

This example sets **Access-Control-Allow-Origin** to **example.int**. Requests from servers in other domains will not be allowed.



**Note:** Only one **CORSDomain** value can be specified at a time.



**Note:** Your browser may require additional configuration. CORS may not work in all configurations.

### About CORS

CORS is defined in [RFC6454](https://www.rfc-editor.org/info/rfc6454) (<https://www.rfc-editor.org/info/rfc6454>). This specification defines that a resource is considered the same origin if it uses the same scheme (protocol), host, and port. If your web app and web service are installed on the same host, are both accessed by HTTPS, and both use the same default port (443), they are considered to be of the same origin, and your browser will not block communication to either component. If any of these elements is different, the browser blocks communication to the web service from the web app, which prevents operations such as password retrieval.

Controls for browser behavior surrounding CORS vary by browser.



For more information, please see ["Supported Browsers" on page 43](#), and refer to your browser's documentation on enabling CORS support.

## Connect to High-Availability and Cloud Databases

For high availability and redundancy, you can set up the Privileged Identity program database using mirrored databases, database availability groups (SQL AlwaysOn), or Azure SQL.

To access database settings:

From the management console, select **Settings > Data Store Configuration > Basic Configuration**.

If you change any database settings, you must restart the deferred processor. You must also update the web app configuration:

1. Select **Manage Web App** from the left action pane of the management console.
2. Right-click the web site instance.
3. Select **Replace instance options with default web application options**.



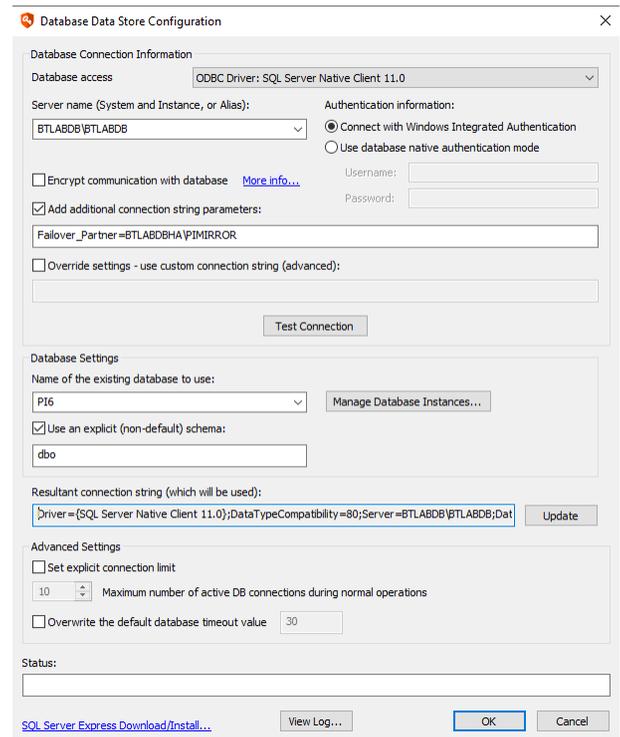
The sections below give details for setting up specific database configurations. For instructions about fields that are non-specific to these configurations, please see "[Configure the Program Database](#)" on page 37.

### Mirrored Databases

To connect to a mirrored instance of Microsoft SQL Server, make the following specific configurations:

- **Database access:** Select **ODBC Driver: SQL Server Native Client**. You must also manually install this provider on all web app servers, web service servers, and deferred and zone processor hosts. Otherwise, they will be unable to connect to the database.
- **Server name:** Enter the name of the primary (currently active) database partner.
- **Add additional connection string parameter:** Modify the following parameter with your mirrored server name:
 

```
Failover_Partner=SECONDARY_SERVER_NAME;
```
- Click **Update** near the bottom of the screen, and then review the updated connection string.



## SQL AlwaysOn

To connect to a SQL Server database configured using SQL AlwaysOn, make the following specific configurations:

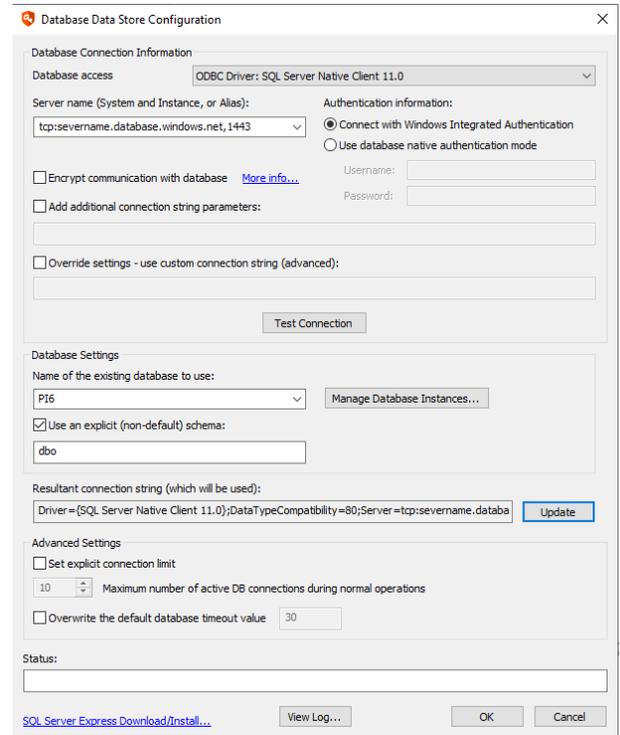
- **Database access:** Select **ODBC Driver: SQL Server Native Client**. You must also manually install this provider on all web app servers, web service servers, and deferred and zone processor hosts. Otherwise, they will be unable to connect to the database.
- **Server name:** Enter the name of the availability group listener (AGListener), prefaced with the protocol. For example:

```
tcp:AGListenerName
```

- **Add additional connection string parameter:** Add the following connection string parameter:

```
MultiSubnetFailover=True;
```

- Click **Update** near the bottom of the screen, and review the updated connection string.



**Database Data Store Configuration**

Database Connection Information

Database access: ODBC Driver: SQL Server Native Client 11.0

Server name (System and Instance, or Alias): tcp:servername.database.windows.net,1443

Authentication information:
 

- Connect with Windows Integrated Authentication
- Use database native authentication mode

 Username:   
 Password:

Encrypt communication with database [More info...](#)

Add additional connection string parameters:

Override settings - use custom connection string (advanced):

Database Settings

Name of the existing database to use: PI6

Use an explicit (non-default) schema: dbo

Resultant connection string (which will be used): Driver={SQL Server Native Client 11.0};DataTypeCompatibility=80;Server=tcp:servername.databa

Advanced Settings

Set explicit connection limit

10 Maximum number of active DB connections during normal operations

Overwrite the default database timeout value 30

Status:

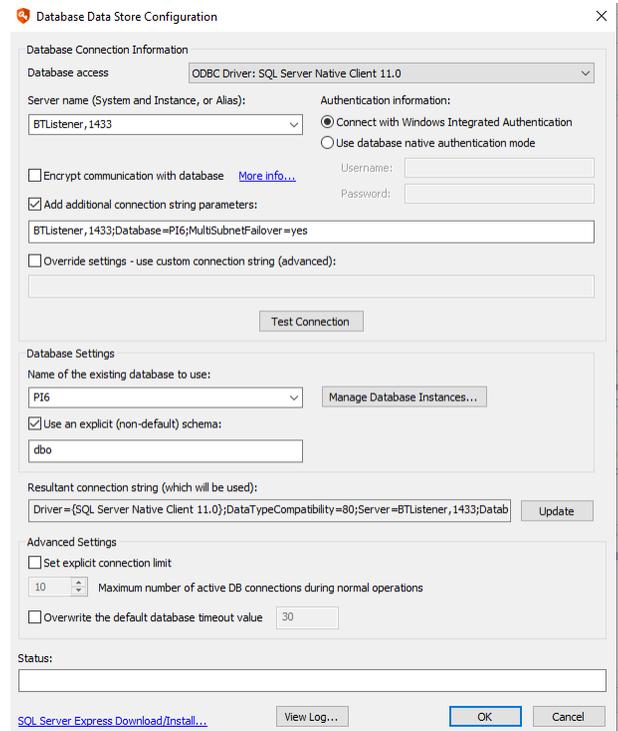
[SQL Server Express Download/Install...](#)

## Azure SQL

To connect to a SQL Server database configured using Azure SQL, make the following specific configurations:

- **Database access:** Select **ODBC Driver: SQL Server Native Client**. You must also manually install this provider on all web app servers, web service servers, and deferred and zone processor hosts. Otherwise, they will be unable to connect to the database.
- **Server name:** Enter the name of your Azure SQL instance, prefaced with the protocol. For example:  

```
tcp:servername.database.windows.net
```
- Click **Update** near the bottom of the screen, and review the updated connection string.



## Configure Encryption Options

To configure Privileged Identity to work with software-based or hardware-based encryption, first select **Settings > Encryption Settings** from the management console.

### ! IMPORTANT!

*When you change encryption settings, be sure to update the web app and web service settings. Otherwise, they will attempt to use invalid encryption mechanisms and will fail to access stored credentials and data.*

## Configure Software-Based Encryption

When you select **Use software-based cryptography**, the generated key is unique to your installation. With an **Encryption Type** of **AES**, select a **Key Length** of 128, 192, or 256 bits.

To change the key, click **New Key**. After you confirm the change, the **Key Signature** updates. When recovering stored passwords, you can match the current key signature against the password's key signature to ensure that it was encrypted with the same key.

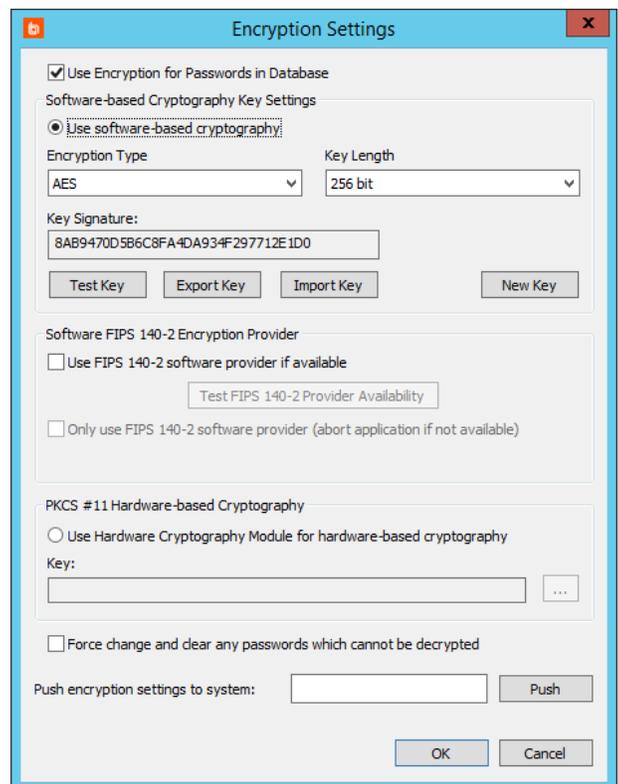
### ! IMPORTANT!

*When you change encryption settings, passwords are decrypted and re-encrypted with the new key. **You must manually update the web app settings to reflect the new encryption key.***

You may also test the validity of the current encryption key, export the current key, or import a different key. Exporting writes a registry file (.reg) with the encrypted key settings. You can later import these settings to the same system or to a different system by using the import feature or by double-clicking on the registry file.

### ! IMPORTANT!

*Be careful when saving, importing, and exporting encryption keys. In the event of disaster recovery, if the key is lost, you cannot recover any passwords that have been encrypted with that key. Be sure to export your key and keep it in a secure location.*



## Software FIPS 140-2 Encryption Provider

While the software encryption algorithms are FIPS algorithms, you may be required to use external FIPS 140-2 encryption modules if you are working with certain government organizations. The encryption code is the same for both methods; the FIPS 140-2 method simply uses the encryption procedures in a way that is compatible with the FIPS certification.

FIPS 140-2 requires you to use a certified stand-alone module. The Crypto++ library that Privileged Identity uses leverages the exact same cryptography code as a certified module. In the built-in case, the code is compiled into the software (not a certified use); in the certified case, the code is used through a call to an external, certified DLL. The certified use case is actually slightly less secure, as it is susceptible to replacement of the external DLL, whereas changing the built-in cryptography would require modifying the software itself, invalidating the digital signature.

To enable FIPS 140-2 certified encryption, download and install the module from your provider, which should contain the necessary add-on components, including the Crypto++ library. Then, check **Use FIPS 140-2 software provider if available**.

Choose what to do if the provider is not available. If you check **Only use FIPS 140-2 software provider**, the process will abort. Otherwise, the process will switch to the internal code.



For more information about FIPS 140-2 certification, please see <https://csrc.nist.gov/publications/detail/fips/140/2/final>.

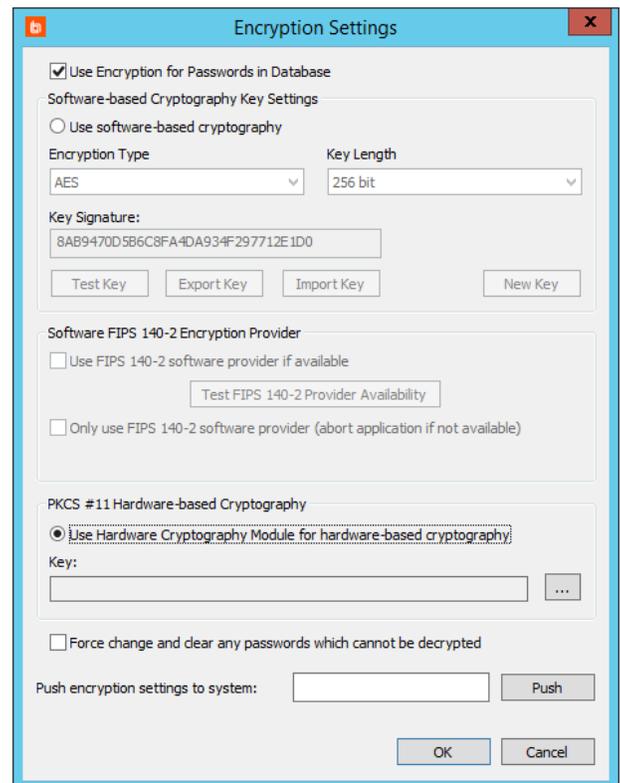
## Configure Hardware-Based Encryption

Hardware-based cryptography offloads the encryption process from the software and its host to an external device. You can use any hardware security module (HSM) that uses a PKCS #11 interface and supplies a 32-bit provider.

HSM technology is used by the government, military, and intelligence industries to protect against the security risks of conventional encryption software. In software-based solutions, even when keys are encrypted, software debuggers can potentially locate and access the encryption key, allowing critical data to be compromised. With an HSM, there is no record of keys stored in memory. Instead, keys are stored in a secure device, physically located inside an external piece of hardware.

To configure hardware-based encryption, select **Use Hardware Cryptography Module for hardware-based cryptography**, and follow the steps below:

1. Click the ellipses (...) to open the **PKCS #11 Interface to HCM Settings** dialog.



- In **Interface library DLL path**, provide the path to the DLL that supports the HSM device.



**Note:** When you install the hardware encryption device, it places a DLL on the host computer. This is required to interface with Privileged Identity.

- If your device supports multi-threaded access, check **Initialize library for multi-threaded access** to improve performance.
- Click **Load and Verify Library**. The **Library Description** field will be automatically filled.
- Select a **Hardware Slot/Token**. The **Slot/Token Description** field will be automatically filled.
- If the hardware devices requires a **PIN**, enter it now.
- Under **Key and Encryption Method**, fill the fields required by your device.
  - Select the **Key** from the dropdown. If no key exists and you have sufficient access, click **Create** to create a new key.
  - Select the **Encryption Mechanism** from the dropdown.
- Click **OK**.

## Finish Configuring Encryption

If you check **Force change and clear any passwords which cannot be decrypted**, Privileged Identity examines all passwords in the password store and clears any passwords which cannot be decrypted using the current settings. This clears erroneous data from the database when the correct encryption key is unavailable. This is a single-use option. After this option is selected and the dialog is confirmed, the operation takes place; the next time this dialog is opened, the option will no longer be selected.

If you want to copy these settings to another system, enter the system's connection details, and then click **Push**.



**Note:** BeyondTrust is unable to provide support for your specific hardware security module (HSM). All support for your specific HSM must be handled by your HSM provider.

## Configure URL Redirects

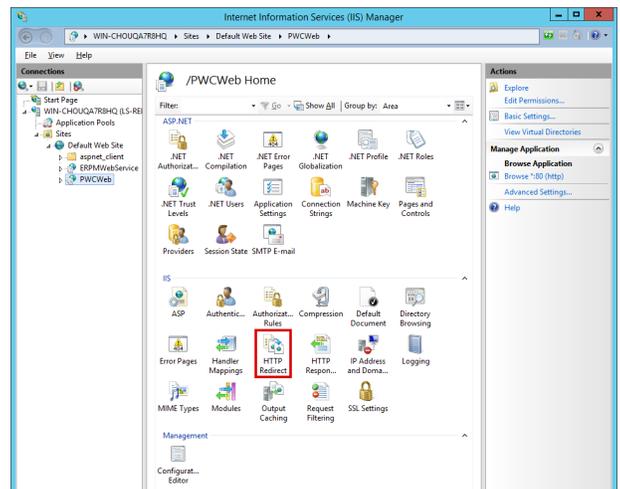
When you're installing or upgrading to a virtual directory, the virtual directory inherits the settings of the parent web site. Thus, if the parent web site is configured with a redirect, the virtual directory is also configured with a redirect. This can cause a redirect loop, in which the user can never connect to the web app or web service.



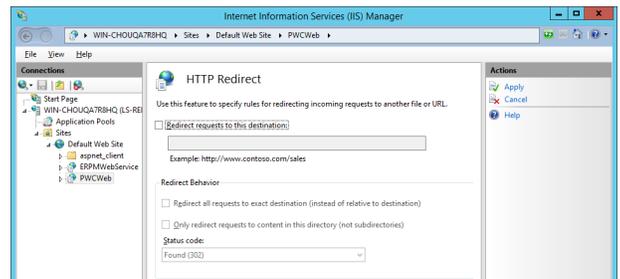
**Note:** URL redirects are not configured by default in IIS. They are used to redirect one address to another. For example, an attempt to reach the root web site using HTTP could redirect to the proper virtual directory with HTTPS.

To remove the redirect from the virtual directory:

1. On the host server, open **Internet Information Services (IIS) Manager**.
2. Expand your server node, then **Sites**, and then your web site.
3. Select your virtual directory. The default for the web app is **PWCWeb**, and the default for the web service is **ERPMSWebService**.
1. From the center pane, open **HTTP Redirect**.



2. Clear all redirect options.
3. Click **Apply**.



**Note:** Other options to control switching from HTTP to HTTPS include:

- Using the Microsoft IIS URL Rewrite Module
- Creating a new default login page and configuring that page as the default document for the web site or virtual directory

## Configure SMTP Email Settings

Privileged Identity can send email via SMTP for reporting and alerting purposes. You must have access to an SMTP server. To configure Privileged Identity to send emails, first select **Settings > Email Settings** from the management console.

### General Settings

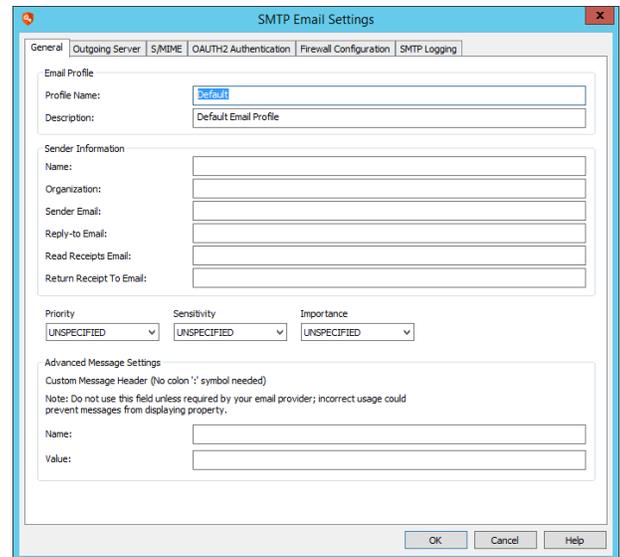
#### Email Profile

- **Profile Name:** You can create multiple email profiles, but only one can be used at a time.
- **Description:** Enter a short description of this profile.

#### Sender Information

This information is sent in the header of each email and appears to the recipient. Some email servers reject messages that don't have the proper address information for these fields.

- **Name:** Enter the "from" name for the email.
- **Organization:** Enter the name of your organization.
- **Sender Email:** Enter the "from" address for the email.
- **Reply-to Email:** Enter the address that replies should be sent to.
- **Read Receipts Email:** (Optional) Enter the address that read receipts should be sent to. A read receipt prompts the user to send a delivery status notification as soon as they open the email. If the recipient approves the receipt to be sent, their email client sends a reply to this address.
- **Return Receipt To Email:** (Optional) Enter the address that delivery receipts should be sent to. A delivery receipt requests the receiving mail server to send a delivery status notification as soon as it receives the email.



#### Priority, Sensitivity, and Importance

- **Priority:** (Optional) Choose if emails should be sent with a status of **Unspecified**, **Normal**, **Urgent**, or **Non\_Urgent**.
- **Sensitivity:** (Optional) Choose if emails should be sent as **Unspecified**, **Personal**, **Private**, or **Company\_Confidential**.
- **Importance:** (Optional) Choose if emails should be sent with an importance of **Unspecified**, **High**, **Normal**, or **Low**.

#### Advanced Message Settings

### ! IMPORTANT!

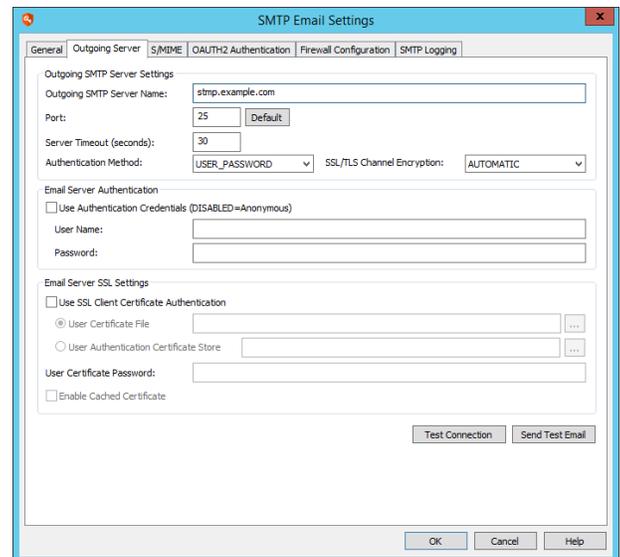
*Don't confuse this section with email subject lines. This section allows you to write custom MIME headers, which are added to the email before the body of the message appears. Do not enter any information in this section unless you need special headers and are comfortable writing MIME headers for email.*

- **Name:** Enter the attribute name to include in the message header.
- **Value:** Enter the attribute value to include in the message header.

## Outgoing Server Settings

### Outgoing SMTP Server Settings

- **Outgoing SMTP Server Name:** Enter the DNS or IP address of the mail server.
- **Port:** Set the port through which to connect to the mail server.  
Port 25 is standard for email, although it may be port 465 or 587 for SSL/TLS-encrypted email. Click **Default** to reset it to 25.
- **Server Timeout:** Set the number of seconds to wait for email to send.
- **Authentication Method:** Select the authentication method your mail server is configured to use. Incorrect method settings can prevent connection to a mail server even if the credentials are correct.
  - **USER\_PASSWORD:** Basic username and password as defined below.
  - **CRAMMD5:** Challenge-response authentication; protects passwords in transit.
  - **NTLM:** Challenge-response authentication; never sends a user password.
  - **SASLPLAIN:** Challenge-response authentication; does not protect the password in transit.
  - **KERBEROS:** Kerberos authentication with the email server.
  - **XOAUTH2:** OAuth authentication; requires configuration of the **OAuth2 Authentication** tab.
- **SSL/TLS Channel Encryption:** If using SSL/TLS encryption, choose the option that your SMTP server is configured to use.
  - **AUTOMATIC:** Negotiate with the email server to find a supported SSL/TLS or plain-text method. Not all email servers support negotiation.
  - **IMPLICIT:** The mail server expects the initial connection to be already encrypted with SSL/TLS.
  - **EXPLICIT:** The mail server does not require the initial connection to be encrypted with SSL/TLS but may use SSL/TLS after the connection is initiated.
  - **NONE:** Use when automatic negotiation does not work and SSL/TLS is not configured on the email server.



### Email Server Authentication

- **Use Authentication Credentials:** The username and password to connect to the mail server. If your mail server allows anonymous authentication, you can leave this unchecked.

### Email Server SSL Settings

- **Use SSL Client Certificate Authentication:** Select this option if your SMTP server is configured to use SSL encryption. SSL encryption allows both logon credentials and data to be encrypted during the SMTP transaction. The server must be set up to use SSL encryption for this option to work.
- **User Certificate File:** Enter the path to the security certificate file.
- **User Authentication Certificate Store:** Enter the path to the certificate store, if configured.

- **User Certificate Password:** If required, enter the password to your certificate file.
- **Enable Cached Certificate:** Select if you want to allow the certificate information to be cached.

## Test Options

- **Test Connection:** Verify that you can connect to the SMTP server and that the server accepts the configured credentials. This option completes the handshake with the server, but it does not send mail.

The program log records the transaction details:

```
SetMailServer error: 11001, [11001] Host not found
```

```
Failed to fill SMTP settings
```

```
Failed to send email message error: Host not found.
```

- **Send Test Email -** Send a test email.

## S/MIME Settings

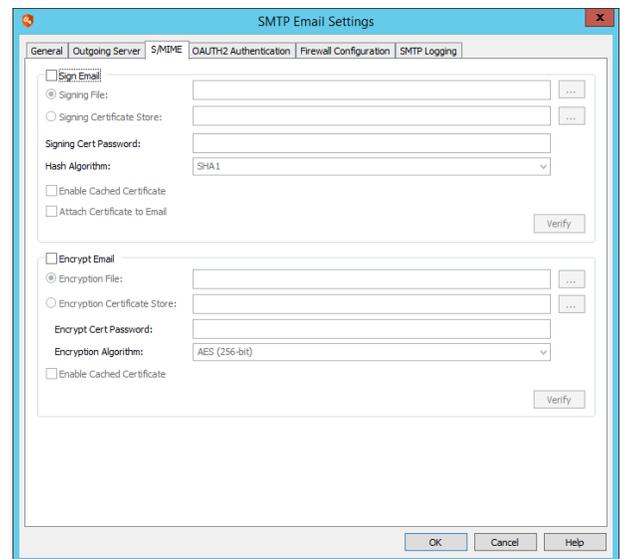
### Sign Email

- **Sign Email:** Select this option to digitally sign outgoing email using Secure Multi-Purpose Internet Mail Extensions (S/MIME). This allows recipients to verify that the email was not tampered with.



**Note:** If Privileged Identity cannot read the signing file you select, this check box will be automatically cleared the next time you open this dialog. To make sure the signing certificate file is valid, be sure to click **Verify** before closing these settings.

- **Signing File:** Browse for a certificate located in the file store.
- **Signing Certificate Store:** Choose from a list of certificates held in the certificate store.
- **Signing Cert Password:** If applicable, enter the password used while exporting the certificate.
- **Hash Algorithm:** Choose the algorithm used to prepare the message digest for signature.
- **Enable Cached Certificate:** Select this option to allow the certificate to be cached in the program database; clear this option if the certificate should be loaded from the path specified above. You might want to enable this option if signing fails because you're running components on different servers, which can't access the required certificate locally.
- **Attach Certificate to Email:** If you select this option, the certificate used to sign the message is encoded and included in the message signature.
- **Verify:** Click to test that the email can be successfully signed.



### Encrypt Email

- **Encryption File:** Select this option to encrypt outgoing email with the recipient's public key. The recipient must have the corresponding private key to decrypt the email.


**IMPORTANT!**

If you use Secure Multi-Purpose Internet Mail Extensions (S/MIME) to encrypt email, you must have an enterprise public key infrastructure (PKI). Only messages sent to recipients in your organization's address list can be encrypted. Recipients who do not have a certificate cannot read encrypted messages.

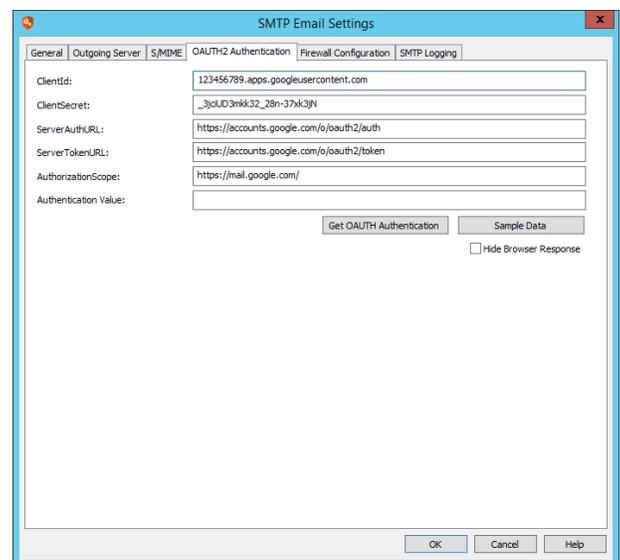


**Note:** If Privileged Identity cannot read the encryption file you select, this check box will be automatically cleared the next time you open this dialog. To make sure the encryption file is valid, be sure to click **Verify** before closing these settings.

- **Encryption File:** Browse for a certificate located in the file store.
- **Encryption Certificate Store:** Choose from a list of certificates held in the certificate store.
- **Encrypt Cert Password:** If applicable, enter the password used while exporting the certificate.
- **Encryption Algorithm:** Choose the algorithm used to encrypt the email.
- **Enable Cached Certificate:** Select this option to allow the certificate to be cached in the program database; clear this option if the certificate should be loaded from the path specified above. You might want to enable this option if signing fails because you're running components on different servers, which can't access the required certificate locally.
- **Verify:** Click to test that the email can be successfully encrypted.

## OAuth2 Authentication Settings

- **ClientId:** Enter the ID of the OAuth client that was assigned when you registered Privileged Identity with the authorization server.
- **ClientSecret:** Enter the client secret that was created when you registered Privileged Identity.
- **ServerAuthURL:** Enter the URL of the authorization server.
- **ServerTokenURL:** Enter the URL used to obtain the access token.
- **AuthorizationScope:** (Optional) Enter the scope request or response parameter used during authorization. If the scope is not set, the authorization server will use the default access scope as determined by the server. To request a specific access scope, set this to a space-separated list of strings as defined by the authorization server.
- **AuthenticationValue:** Provide an authentication value if required by your authorization server.
- **Get OAUTH Authentication:** Click to start the authorization process. A browser window opens to the OAuth authentication page you specified so that you can complete the authentication flow.
- **Sample Data:** Click to populate the configuration fields with sample data for a demo application.



The screenshot shows the 'SMTP Email Settings' dialog box with the 'OAUTH2 Authentication' tab selected. The fields are filled with the following values:

- ClientId: 123456789.apps.googleusercontent.com
- ClientSecret: \_3jclUD3mkk32\_28n-37xk3jN
- ServerAuthURL: https://accounts.google.com/o/oauth2/auth
- ServerTokenURL: https://accounts.google.com/o/oauth2/token
- AuthorizationScope: https://mail.google.com/
- Authentication Value: (empty)

Buttons at the bottom include 'Get OAUTH Authentication', 'Sample Data', 'OK', 'Cancel', and 'Help'. A checkbox for 'Hide Browser Response' is also present.

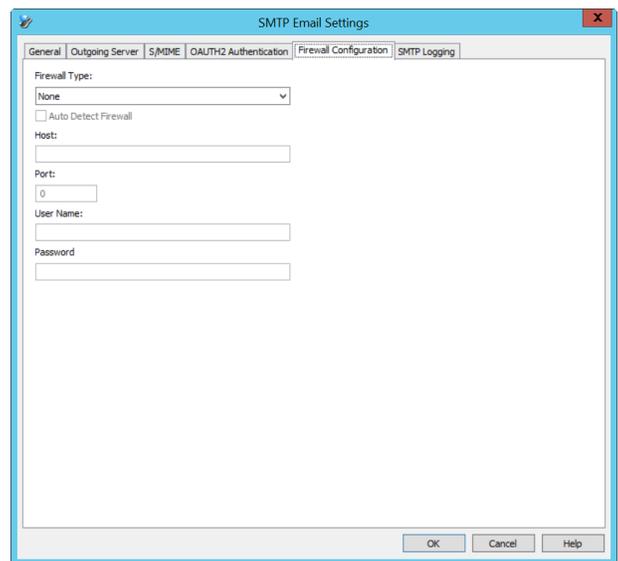

**IMPORTANT!**

Clicking **Sample Data** will overwrite your form entries.

- **Hide Browser Response:** Click to suppress the confirmation pop-up that indicates successful authentication.

## Firewall Configuration

- **Firewall Type:** If necessary, configure settings to connect to your SMTP server through a firewall. Select the type of firewall to connect through.
  - **None:** (Default) The client connects directly to the mail server.
  - **Tunnel:** Bypasses the local router and connects the email client directly to the email server.
  - **SOCK S4:** Basic proxy connection with no additional security that supports TCP.
  - **SOCK S5:** Basic proxy connection that combines TCP and UDP support and allows for domain name resolution (DNS).
- **Auto Detect Firewall:** Select this option if you want to automatically detect and use firewall system settings, if available.
- **Host:** (Optional) Enter the domain name or IP address of the firewall. If you provide the domain name, a DNS request will set this property to the corresponding address.
- **Port:** The TCP port of the firewall host is set automatically based on the selected firewall type, but you can edit it for non-default configurations.
- **User Name:** If the firewall requires authentication, enter a username.
- **Password:** If the firewall requires authentication, enter the password for the provided username.

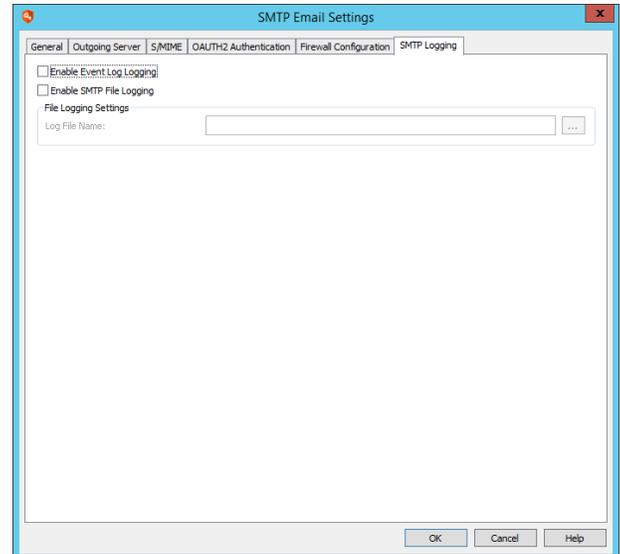


## SMTP Logging Settings

- **Enable Event Log Logging:** Select this option if you want Privileged Identity to write SMTP log events to the Windows event log. This can be helpful in troubleshooting problems with SMTP traffic.
- **Enable SMTP File Logging:** Select this option if you want Privileged Identity to write SMTP application log events to a text file. This can be helpful in troubleshooting problems with SMTP traffic.

## File Logging Settings

- **Log File Name:** Enter the path to the .txt file where you want SMTP events to be logged.

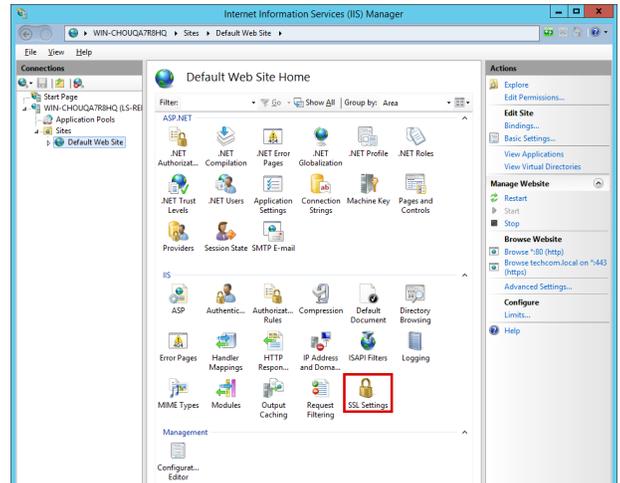


## Require SSL

When you're installing or upgrading to a virtual directory, the virtual directory inherits the settings of the parent web site. Thus, if the parent web site is not configured to require SSL, then your virtual directory does not require SSL.

To require SSL on your virtual directory:

1. On the host server, open **Internet Information Services (IIS) Manager**.
2. Expand your server node, then **Sites**, and then your web site.
3. Select your virtual directory. The default for the web app is **PWCWeb**, and the default for the web service is **ERPWebService**.
4. From the center pane, open **SSL Settings**.



5. Select the check box **Require SSL**.
6. Click **Apply**.

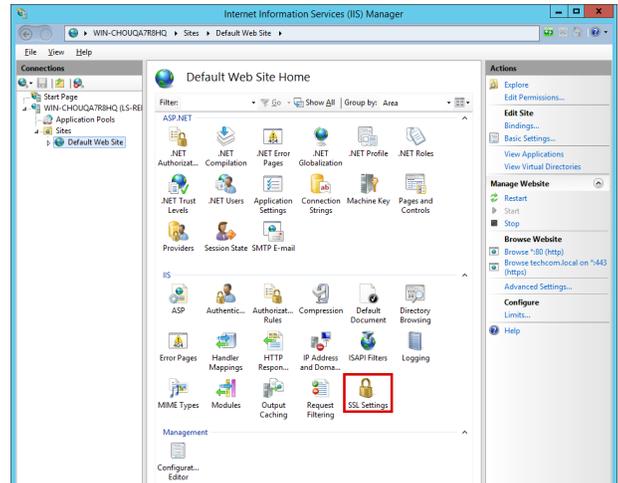


## Require User Certificates

When you're installing or upgrading to a virtual directory, the virtual directory inherits the settings of the parent web site. Thus, if the parent web site is not configured to require user certificates, then your virtual directory does not require user certificates.

To require user certificates on your virtual directory:

1. On the host server, open **Internet Information Services (IIS) Manager**.
2. Expand your server node, then **Sites**, and then your web site.
3. Select your virtual directory. The default for the web app is **PWCWeb**, and the default for the web service is **ERPWebService**.
4. From the center pane, open **SSL Settings**.



5. Select the check box **Require SSL**.
6. Under **Client certificates**, select:
  - **Accept**: Allows users to pass a user certificate but also allows those who do not have a certificate. Select this option if some users require certificates but you are unsure if all have certificates.
  - **Require**: All users must supply a valid user certificate to access this site.
7. Click **Apply**.

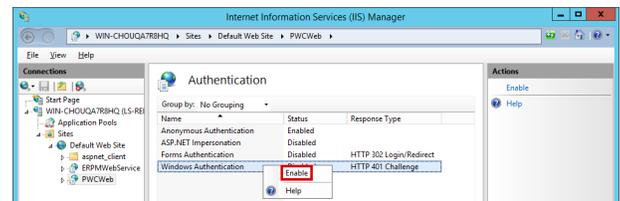
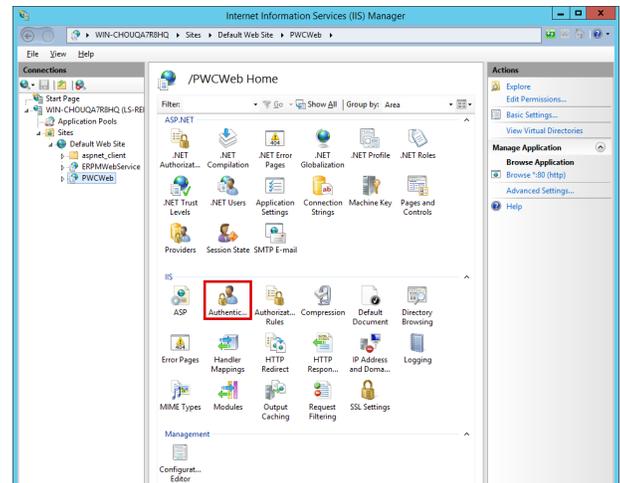


## Enable Integrated Windows Authentication

When you're installing or upgrading to a virtual directory, the virtual directory inherits the settings of the parent web site. Thus, if the parent web site is not configured to use Integrated Windows Authentication (or is misconfigured by also enabling another form of authentication), then your virtual directory inherits those same undesired settings.

To require Integrated Windows Authentication on your virtual directory:

1. On the host server, open **Internet Information Services (IIS) Manager**.
2. Expand your server node, then **Sites**, and then your web site.
3. Select your virtual directory. The default for the web app is **PWCWeb**, and the default for the web service is **ERPMWebService**.
4. From the **IIS** section of the center pane, open **Authentication**.
5. Right-click on **Windows Authentication** and select **Enable**.
6. If any other forms of authentication are enabled, right-click on those methods and disable them.



**Note:** Your browsers may require additional configuration, as described below.

### Internet Explorer

For Internet Explorer to allow Integrated Windows Authentication, the URL must be seen as being part of the local intranet rather than the internet or a trusted network. Internet Explorer will automatically recognize a location as being in the intranet zone only if its location is entered with its short name rather than its fully qualified domain name (FQDN).

If you access the web app and web service using their short names, your Integrated Windows Authentication configuration should be complete, SSL certificates permitting. If you access the web app and web service using their FQDNs, Internet Explorer will not treat these as intranet-zone items, and Integrated Windows Authentication will fail.

To allow Integrated Windows Authentication when using FQDNs, each user must have the web app and web service FQDNs added to the intranet zone in Internet Explorer. You may use a group policy to push out the proper settings.

To add the FQDNs to a single user's intranet zone:

1. Select **Tools > Internet Options > Security**.
2. Select the **Local intranet** icon.

3. Click **Sites**.
4. Add your web app and web service FQDNs to the list.

### Google Chrome

Recent versions of Chrome support Integrated Windows Authentication when run from a Windows host, without further configuration required.

For Chrome to support Integrated Windows Authentication in scenarios where cross-origin requests (CORS) must be used, you must launch Chrome with the following flags:

```
--disable-web-security --user-data-dir=SOMEDIRECTORY
```



**Note:** Chrome will display a security warning. You can ignore this warning.

### Mozilla Firefox

For Firefox to allow Integrated Windows Authentication, the operating system must be joined to a trusted domain, and the following configuration must be made to the browser's profile:

- For Kerberos authentication: **network.negotiate-auth.trusted-uris**
- If Kerberos ticket passing is required: **network.negotiate-auth.delegation-uris**
- If NTLM authentication is allowed: **network.automatic-ntlm-auth.trusted-uris**

For the Kerberos exchange, define the domain name. If your domain name were **example.int**, you would enter **.example.int** (notice the leading dot).



**Note:** These settings may be lost between Firefox upgrades.



**Note:** When the web app and web service are on separate machines and work with cross-origin requests (CORS), Firefox may not function properly when using Integrated Windows Authentication.