CYBERARK

CyberArk University

Privileged Account Security Install & Configure, v10.x

Exercise Guide

Contents

Important Notice

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Acknowledgements

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org/).

This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).

This product includes software written by Tim Hudson (tjh@cryptsoft.com).

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Introduction

Using Skytap

Before beginning exercises here are a few tips to help you navigate the labs more effectively.

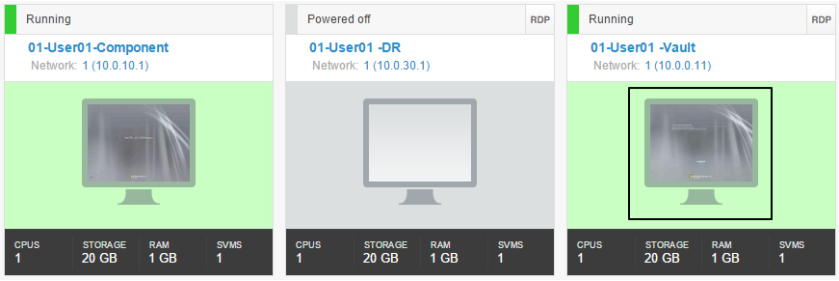
There are two ways to access the virtual machines: directly via the browser or through RDP.

- Click directly on the screen icon to access the virtual machine directly in your browser
- Click on the **RDP** button in the upper right-hand corner of the VM box.

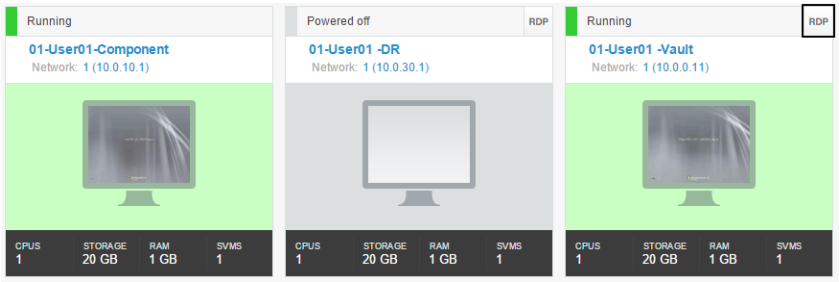
If you are using any keyboard other than a standard US, then it is strongly recommended that you use an RDP connection rather than the HTML 5 client directly in the browser. When using RDP, all you need to do is set the keyboard language in Windows and everything should work fine.

Go to the section for ***International Users*** for instructions on changing the keyboard.

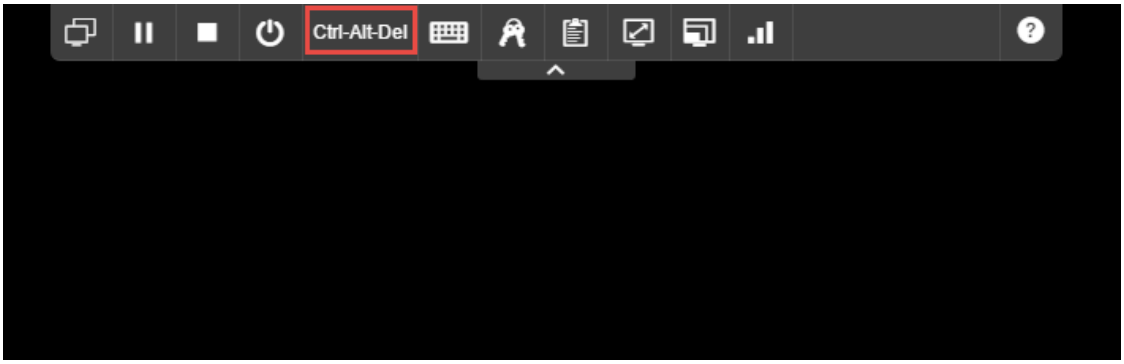
1. Click the large monitor icon to connect with the HTML 5 client.



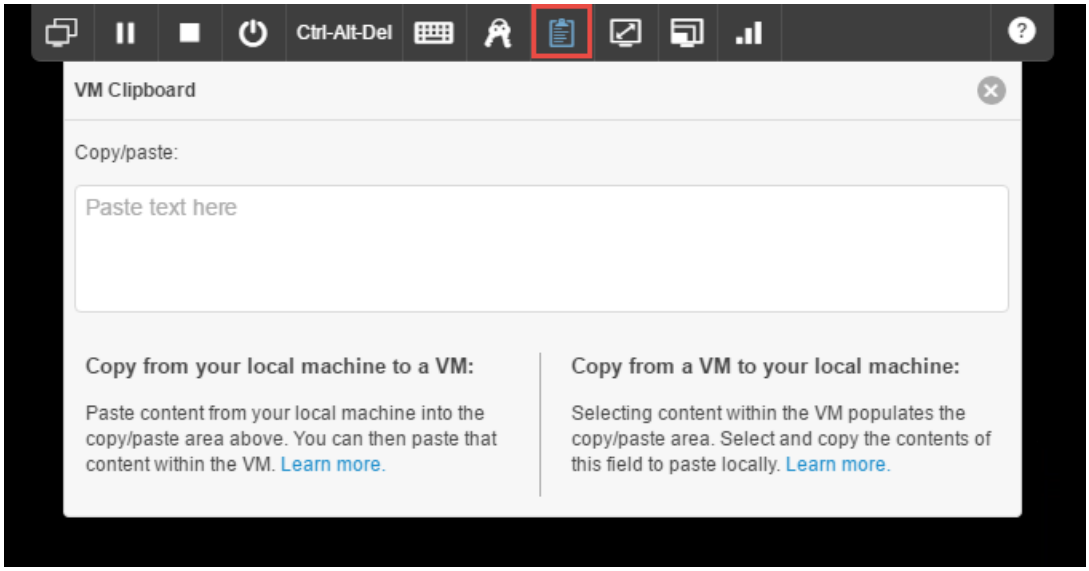
2. If HTML does not work try direct RDP. Inform your instructor if you do this, because some actions will not work as shown in the book.



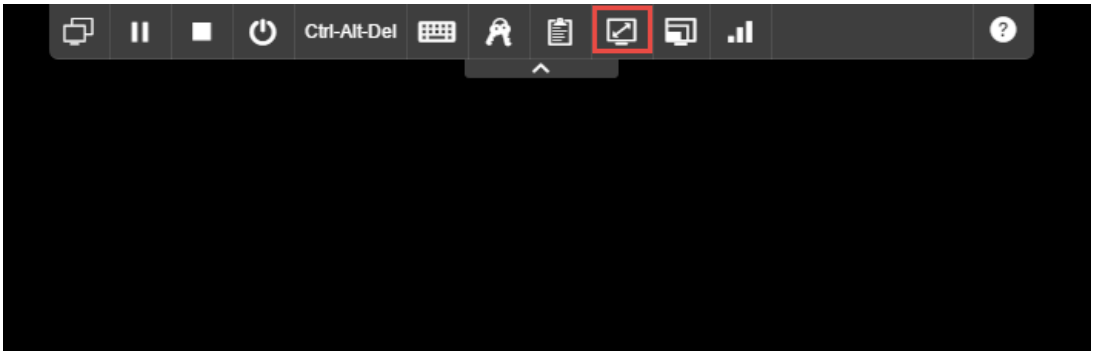
3. Use the **Ctrl-Alt-Del** button on the tool bar to send a Ctrl-Alt-Del to the machine.



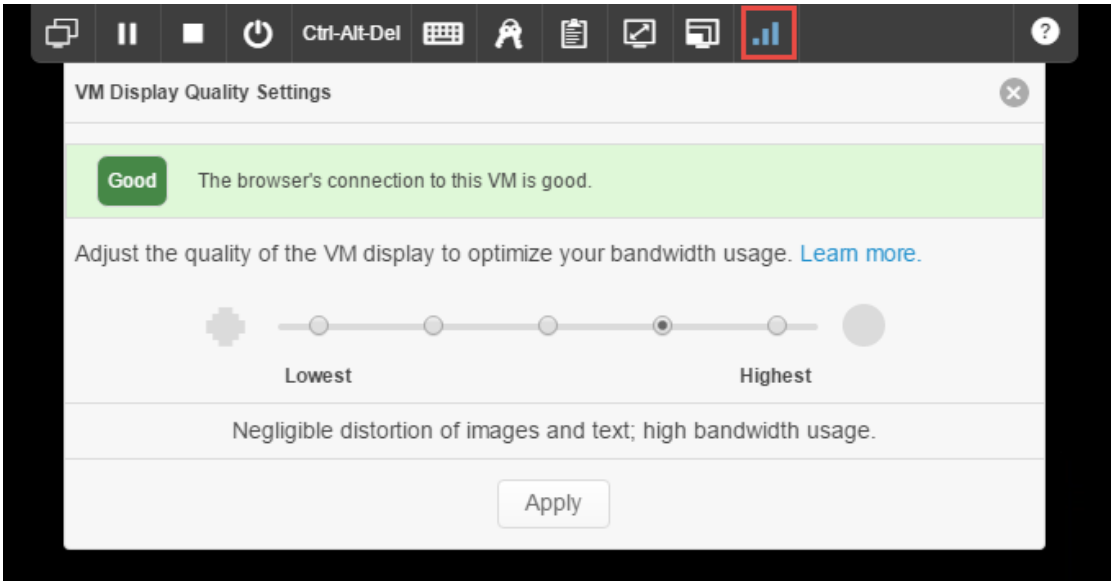
4. The clipboard icon will allow you to copy and paste text between your computer and your lab machine.



5. The full screen icon will resize your lab machine to match your computer's screen settings to avoid scrolling.



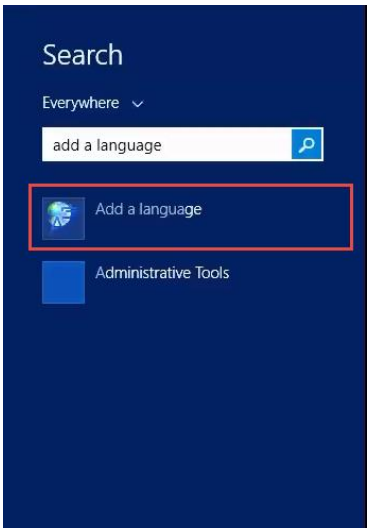
6. You may need to adjust your bandwidth setting on slower connections.



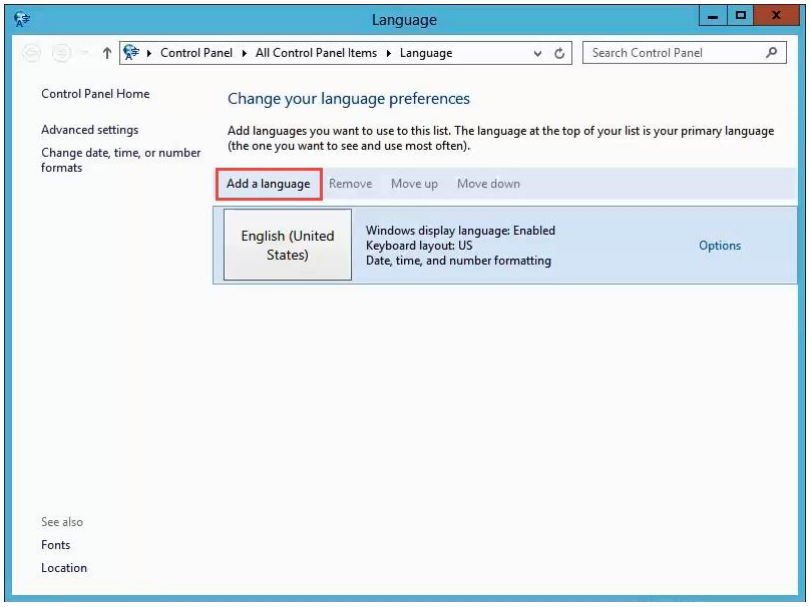
International Users

By default, the lab machines are configured to us a US English keyboard layout. If you use a machine from a country other than the US, you may experience odd behavior from your lab machines. The solution is to install the keyboard layout for your keyboard on our lab machines. Follow the process below to find and configure the correct keyboard layout for your keyboard.

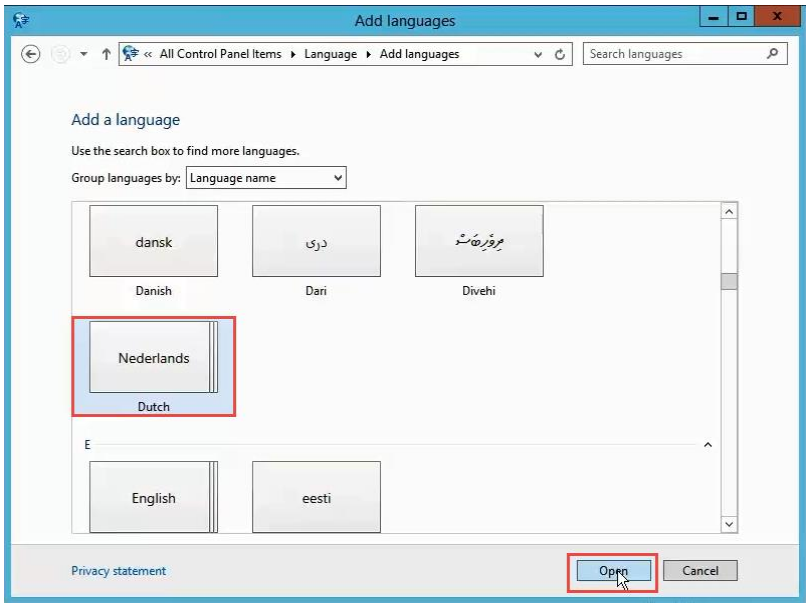
7. From the *Start Menu* launch "Add a language."



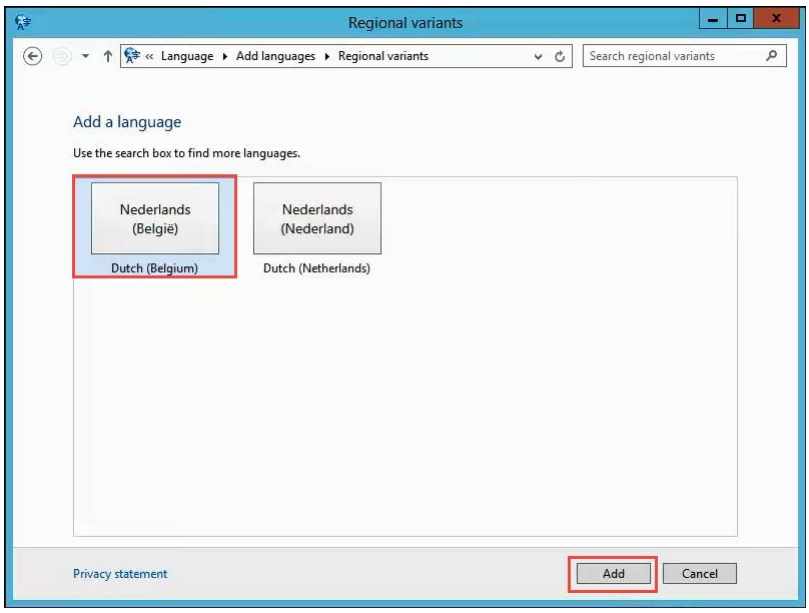
8. Click “Add a language.”



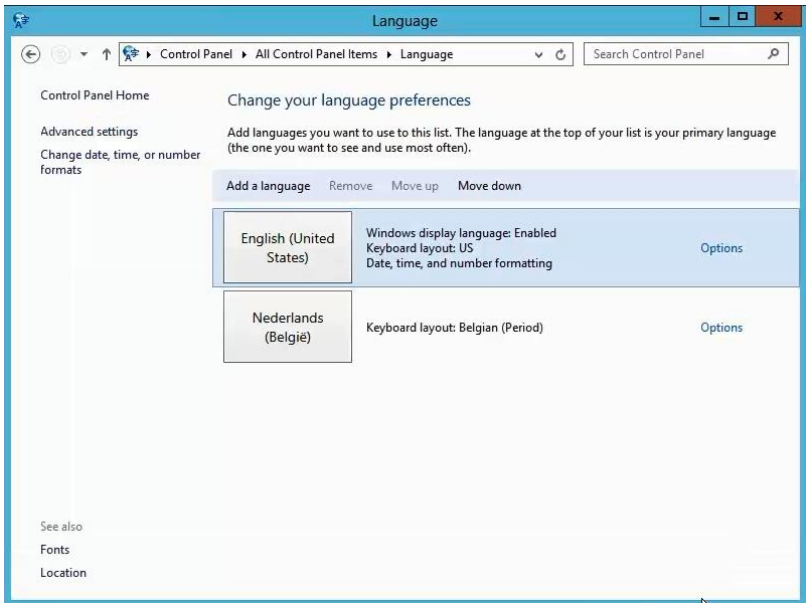
9. Select your language. Click **Open**.



10. Select your specific locality or dialect. Click **Add**.



11. With the option *English (United States)* selected, click the **Move down** button. This will make your language the default. Don't remove US English altogether as your instructor may need it if he/she connects to your machine.



Note:	If you use an alternate keyboard layout (e.g. AZERTY, Dvorak) you can click options next to your language to install that. Otherwise, close the **Language** window.

12. In the system tray, click **ENG**, then choose your keyboard layout. You may switch back and forth between keyboard layouts. Your instructor may need to switch back to ENG to help you with exercises, occasionally.

Scenario

CyberArk Demo Inc. ("the Customer") has just purchased CyberArk's **Privileged Account Security** (PAS). This document details the Customer's specific requirements regarding the use of PAS in their environment:

Network	Server Name	IP Address
Windows *Domain:* cyber-ark-demo.local	DC01	10.0.0.2
	DomainMember	10.0.10.50
Unix / Linux	CentOS-target	10.0.0.20
	Load Balancer	10.0.0.5
	RADIUS	10.0.0.6
CyberArk PAS	Vault01A	10.0.10.1
	Comp01a	10.0.20.1
	Comp01b	10.0.21.1
	DR	10.0.14.1
	PSMP	10.0.1.16

You are required to install and implement the PAS solution to support the customer's specific requirements. You will be given access to CyberArk's documentation in order to complete your task. You may use the detailed installation guide provided by the trainer or the formal CyberArk installation guide. The Installation guide provided by the trainer should be used in the training environment only. In real-life deployments you must always use CyberArk formal documentation.

Unless specified otherwise, the default password for all privileged accounts and servers in the customer's network is **Cyberark1**

EPV Instructions

The Customer has purchased CyberArk's EPV solution to protect and manage their privileged accounts. End users are required to authenticate to CyberArk using two factor authentication.

In the following sections you will be required to:

1. Install a standalone Vault
2. Install 2 CPMs (one for managing Windows accounts and one for managing Unix and Oracle)
3. Install 2 PVWAs in a load balanced environment
4. Integrate CyberArk with the Customer's LDAP, SMTP and SIEM solutions
5. Implement 2FA based on LDAP, RADIUS, Windows and PKI methods
6. Vault and manage the Customer's privileged accounts

Vault Installation

This exercise provides detailed instructions on installing the **CyberArk Digital Vault** server and client software and is broken down into three sections:

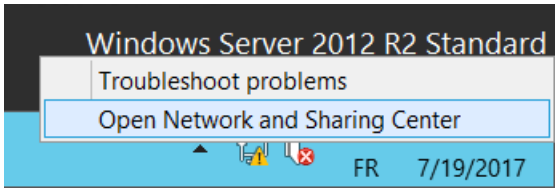
- Before Installation
- Vault Server Installation
- PrivateArk Client Installation

Before Installation

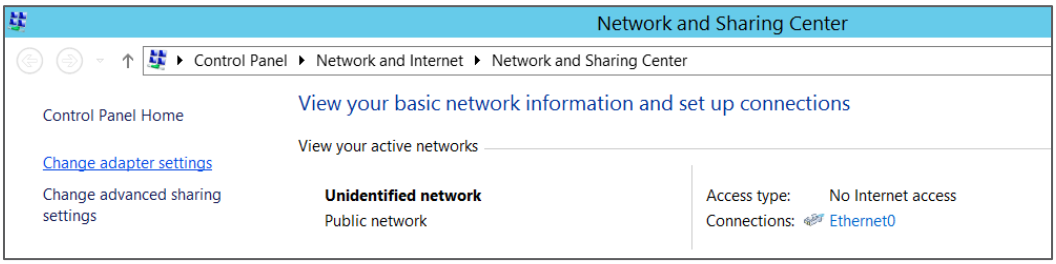
Objective:	A stand-alone **Vault** server only requires TCP/IPv4 for network communication. In preparation to install the **Vault** server software, we will first remove all networking protocols not required for **Vault** functionality

1. Connect to your **Vault01A** server as *Administrator*. Initially, this should not require a password.

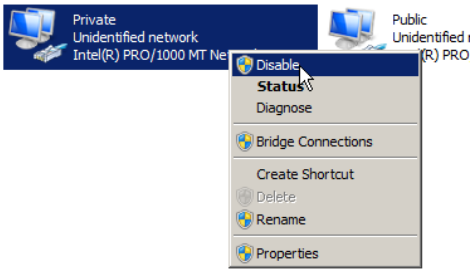
2. Right click the **Network** icon in the system tray and select *Open Network and Sharing Center*.



3. Click **Change adapter settings**.

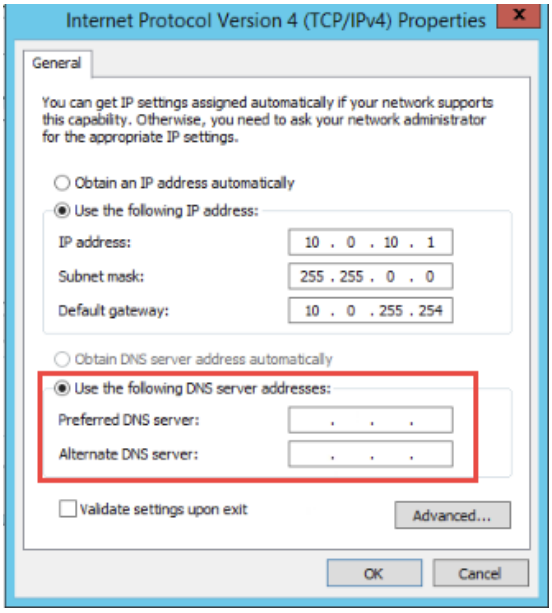


4. If there are two network adapters, right-click the one labeled **Private** and click **Disable**. This adapter isn't needed for this class and we should always disable unnecessary interfaces.

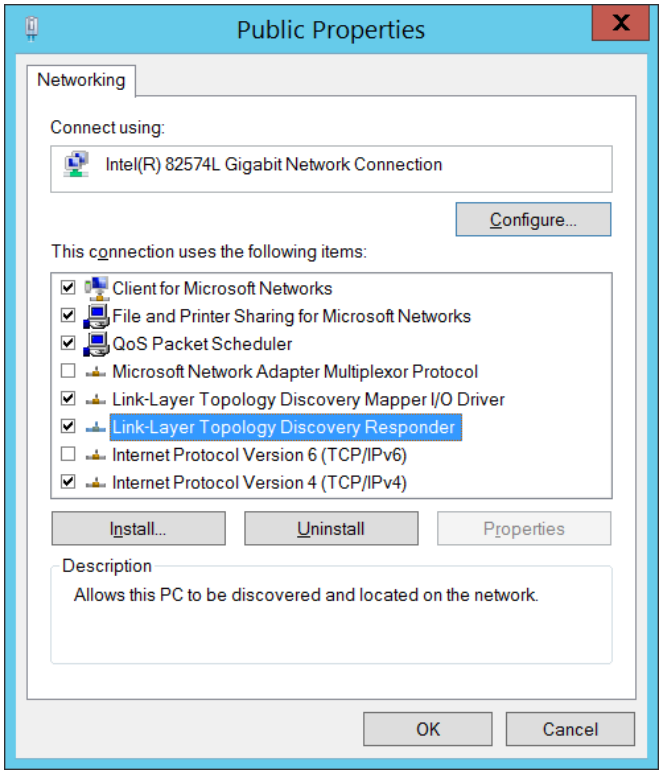


5. Double-click the **Public** network adapter.

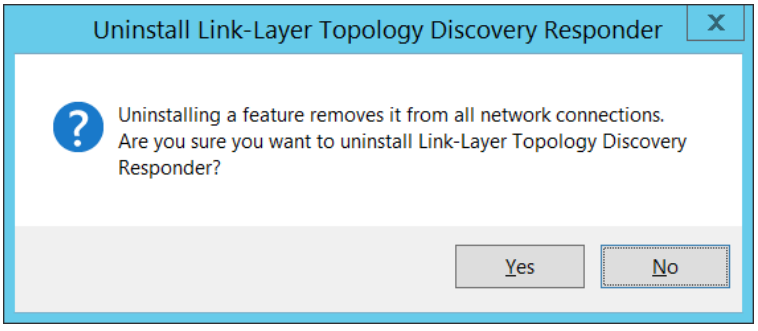
6. Select the **Properties** button and de-select the check box for Internet Protocol Version 6 (TCP/IPv6).
7. Select Internet Protocol Version 4 (TCP/IPv4*)* and select Properties. Confirm that no DNS server addresses are defined. Select OK and return to Public Properties.



8. Select the *Link-Layer Topology Discovery Responder* and press the **Uninstall** button.



9. Press **Yes** to confirm.



10. Working from the bottom up, uninstall all of the remaining items, **except for** *Internet Protocol Version 4 (TCP/IPv4)***.** *Internet Protocol Version 6 (TCP/IPv6)* cannot be removed, so uncheck its box instead.

11. Uninstall the *Client for Microsoft Networks* **last**.

12. After uninstalling *Client for Microsoft Networks***,** press **Yes** to allow the server to reboot.

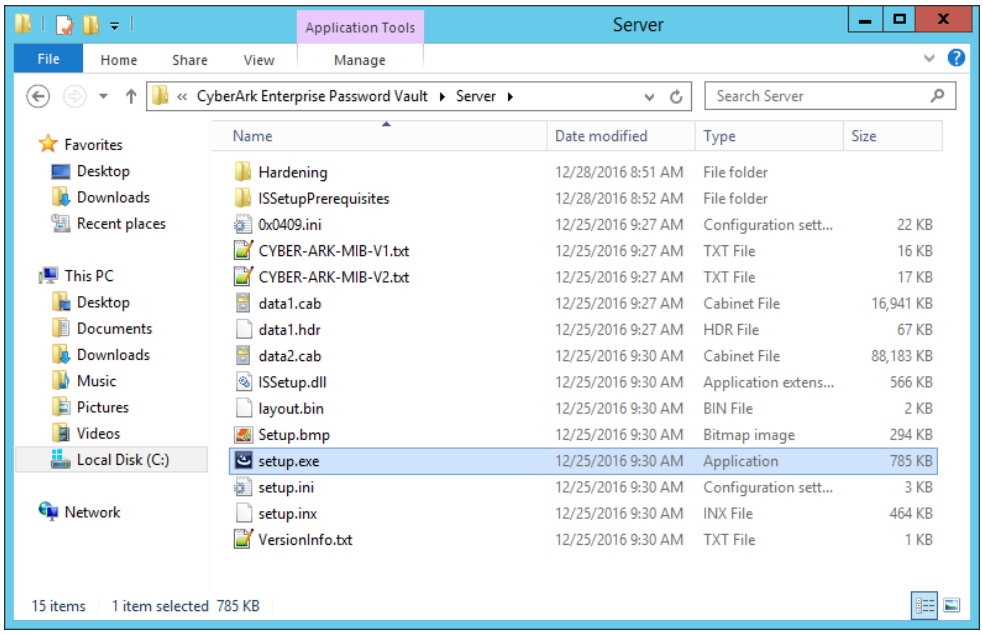
Vault Server Installation

Objective:	This exercise provides detailed, step-by-step instructions on installing the **CyberArk Digital Vault** server and **Private Ark Client** software. On the lab server, the following directories contain the required files to complete the installation:

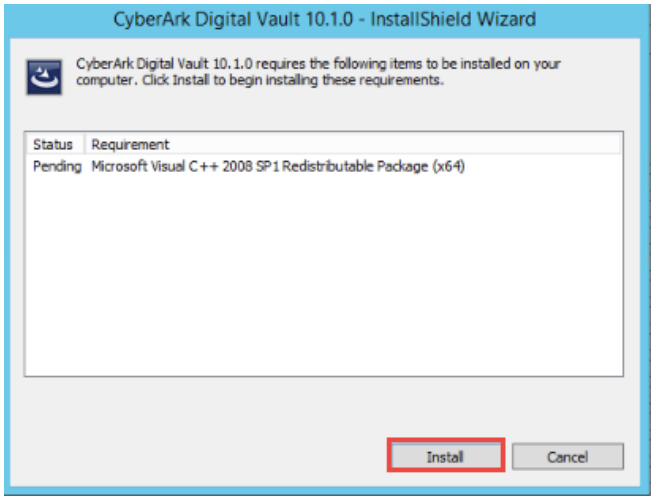
- Installation files --> *C:\CyberArk Installation Files*
- License --> *C:\CyberArk Installation Files\License*
- Operator CD contents --> *C:\PrivateArk\Keys*

1. After the reboot, go to *C:\CyberArk Installation Files\CyberArk Enterprise Password Vault\Server*.

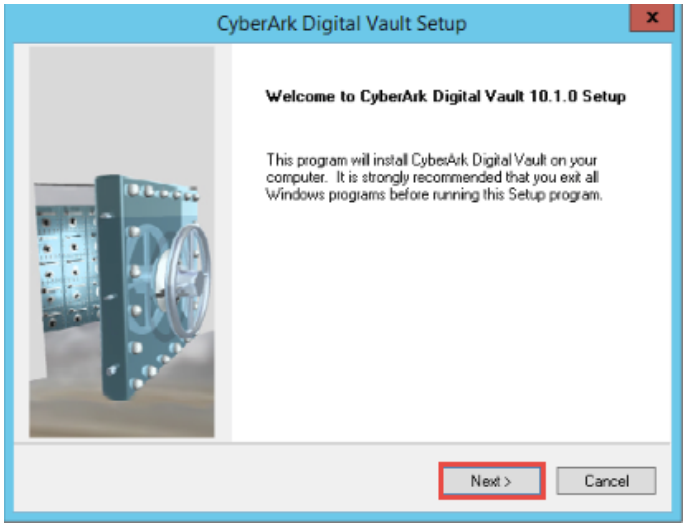
2. Double-click the **setup** icon.



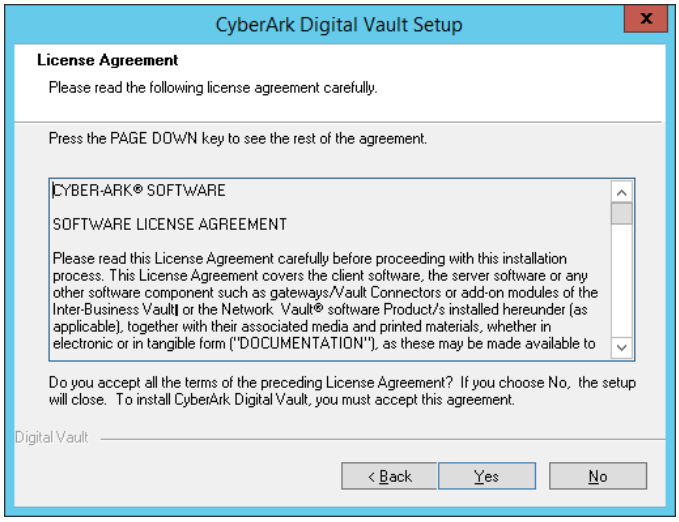
3. The *CyberArk Digital Vault InstallShield Wizard* will open with a message regarding C++ SP1 Redistributable Package. Click **Install**.



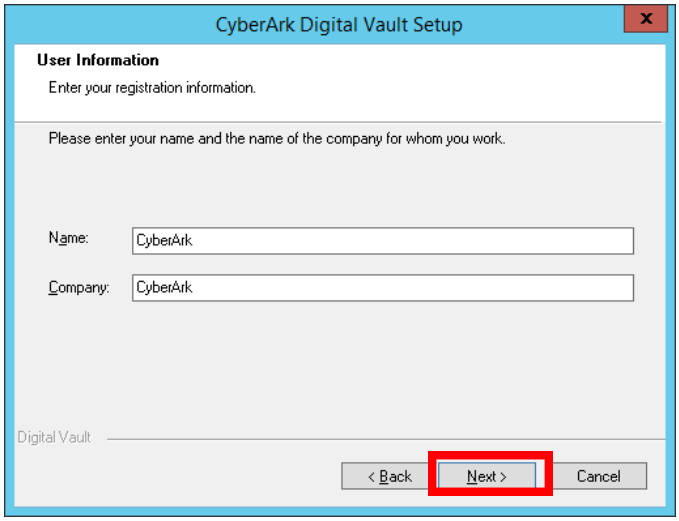
4. Press **Next** to continue.



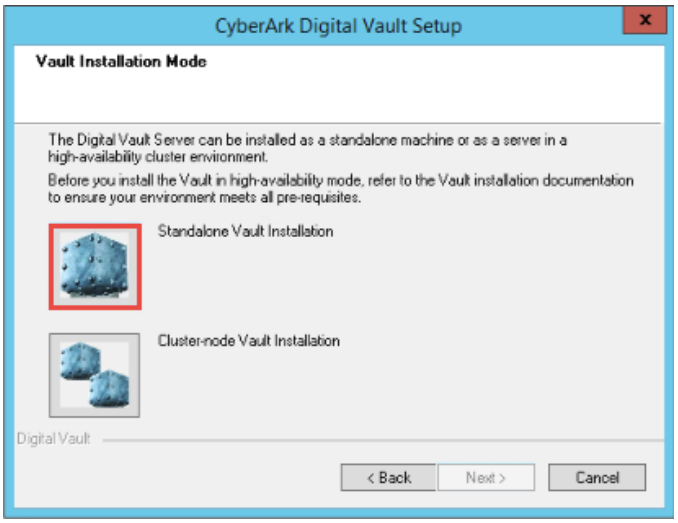
5. Press **Yes** to accept the license agreement.



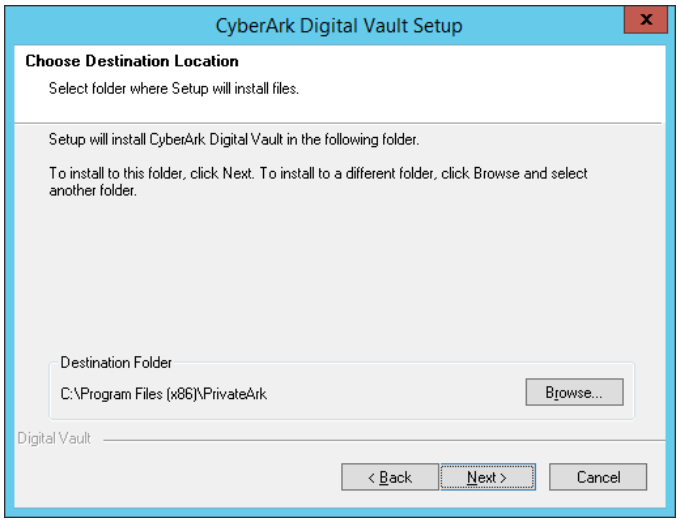
6. Enter *CyberArk* in the **Name** and **Company** fields.



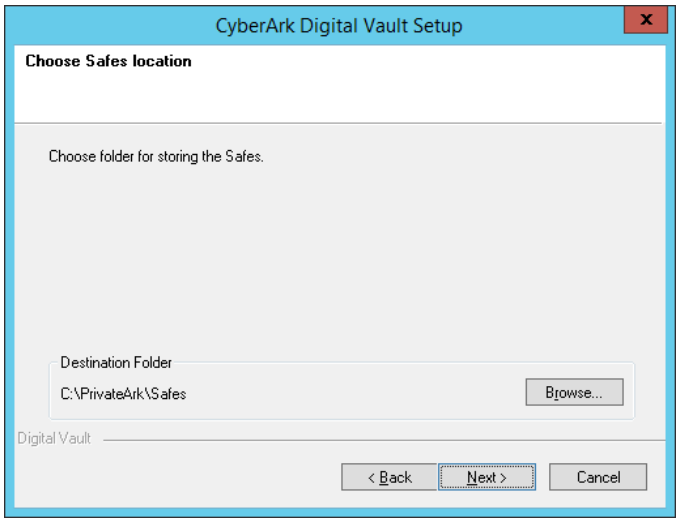
7. Press the **Standalone Vault Installation** button to install the **Vault** on a standard, stand-alone server.



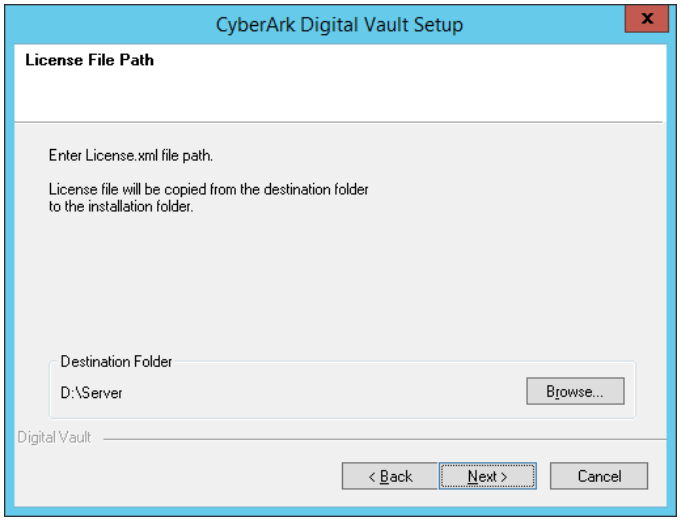
8. Press **Next** to accept the default installation location.



9. Press **Next** to accept the default **Safes** location, which is where the password data will be stored.

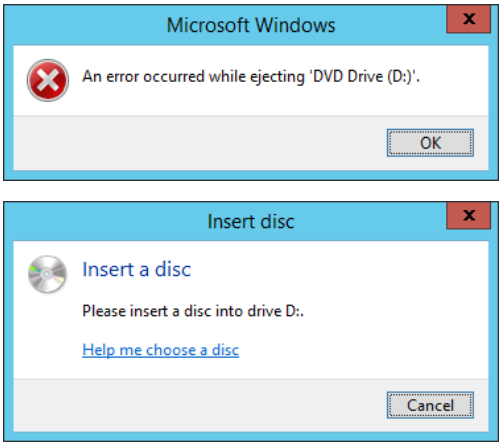


10. Press **Browse** to select a custom license file path.

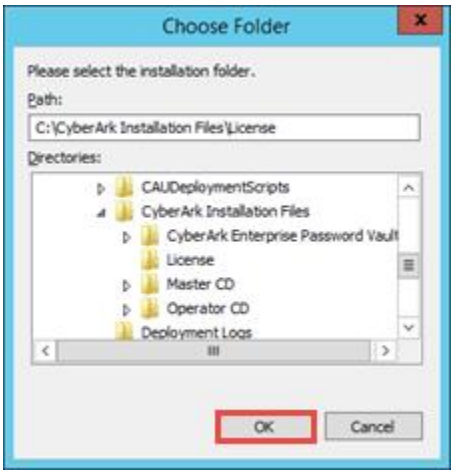


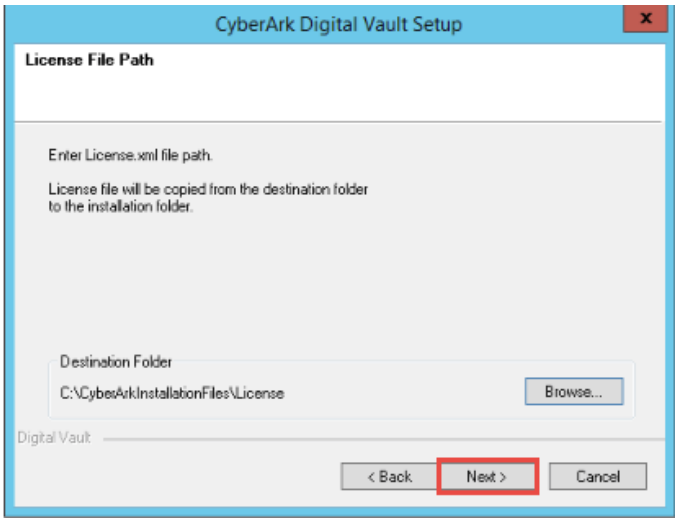
11. Click **OK** and then **Cancel** on the **Insert disc** pop-up to browse to the correct location.

Note:	Because the software is configured to look for the license file on the DVD drive by default, you will probably receive an error message regarding the *D:* drive.

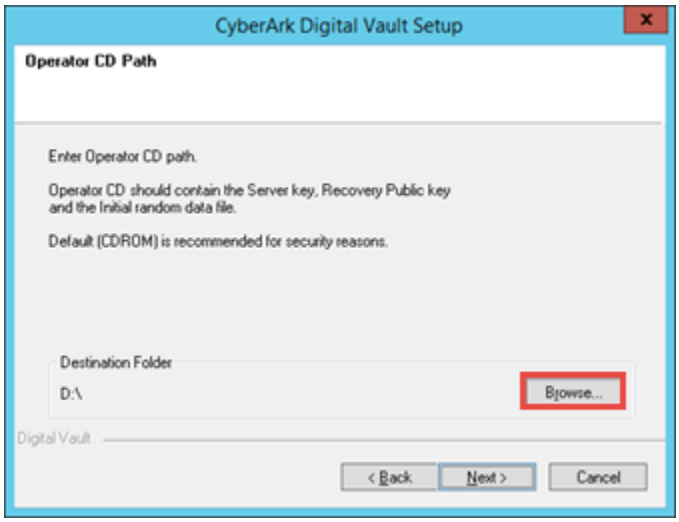


12. In the **Choose folder** pop-up, browse to *C:\CyberArk Installation Files\License*, press **OK** and then press **Next**.

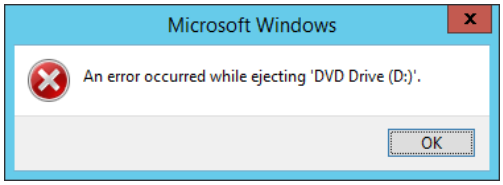


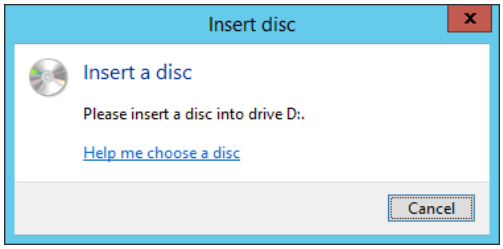


13. The same procedure is required for the Operator CD. Press **Browse** to select a custom Operator CD path.



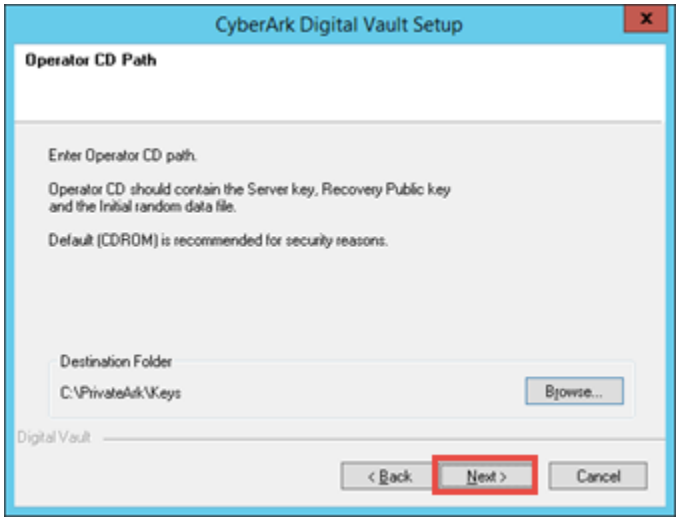
14. You will receive the same error message regarding the *D:* drive. Click **OK** and then **Cancel** on the **Insert disc** pop-up to browse to the correct location.





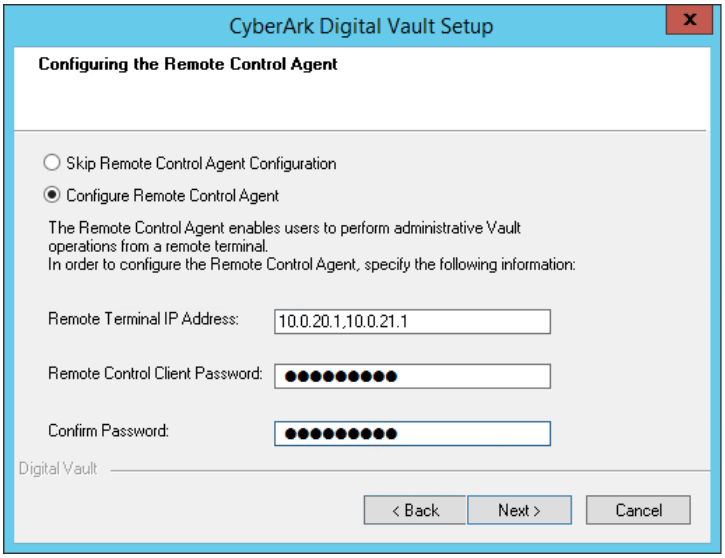
15. Browse to the *C:\PrivateArk\Keys* directory and click **OK** and then and press **Next**.

Note:	The contents of the Operator CD have already been copied here. These files must be accessible to the ***PrivateArk Server*** service in order to start the **Vault**. A Hardware Security Module (HSM) is the recommended method for key storage. If these files are to be stored on the file system, it is highly recommended that the keys and encrypted files be stored on separate media. Also, the keys should be stored in a folder on an NTFS drive which is protected by OS Access Control.



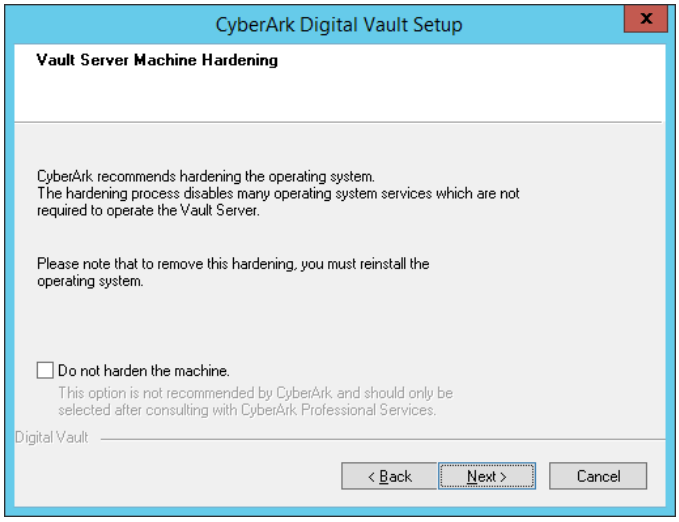
Note:	**If the Vault is installed on a virtual machine**, storing Operator CD files on the file system is not recommended due to the lack of physical security.

16. Enter the IP address(es) of your ***Component*** servers in the **Remote Terminal IP Address** field – *10.0.20.1,10.0.21.1* and *Cyberark1* – in the password fields and press **Next**.

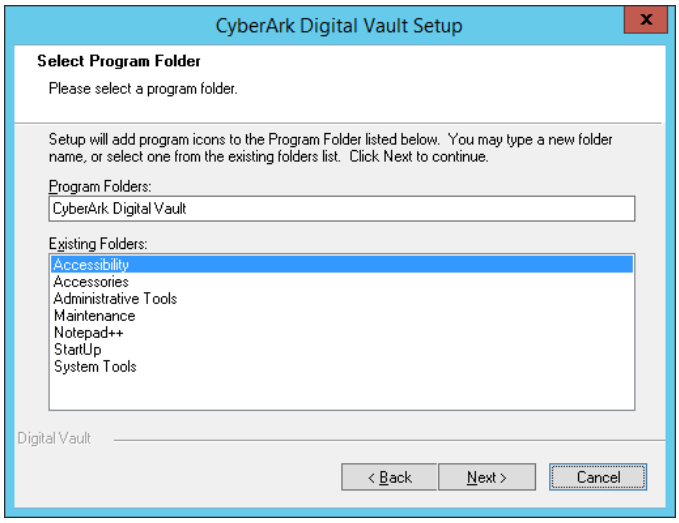


NOTE:	The **Remote Control Agent** allows you to perform administrative functions on the **Vault** server from the specified remote machine. This is useful when you do not have console access to the **Vault** server. It is also required if you would like to enable the **Vault** to send SNMP traps.

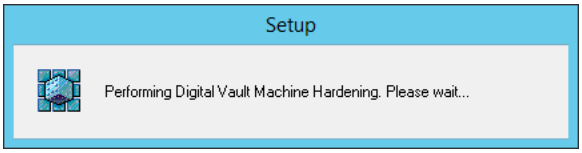
17. Press **Next** to allow **CyberArk** to harden the CyberArk Digital Vault machine.



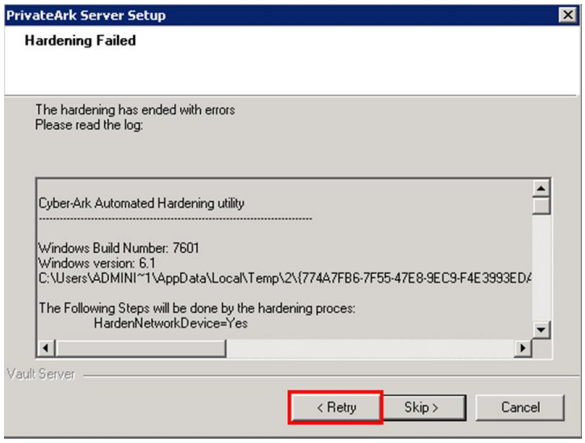
18. Press **Next** to accept the default *Program Folder*.



The **Performing Vault Server Machine Hardening** window will appear. This will take a few minutes.

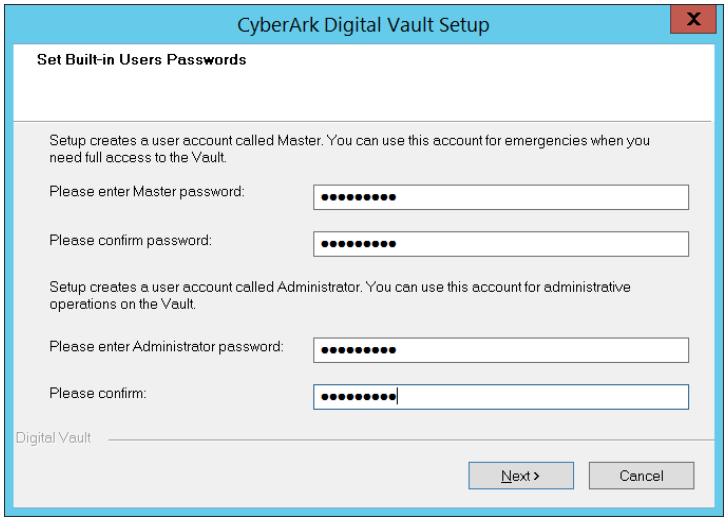


19. In the **SkyTap** environment, you may receive a message that the hardening failed. If so, press the **Retry** button. In training, a failure is usually caused by a timeout in stopping services because we are using virtual machines with limited resources.



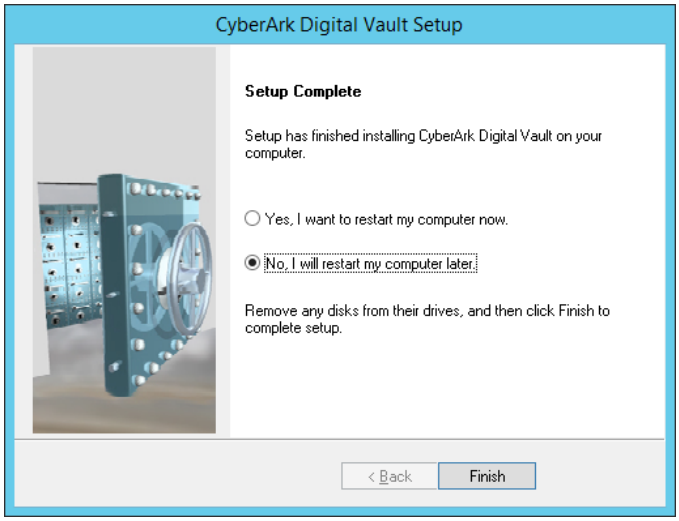
20. Enter *Cyberark1* in all of the password fields and press **Next**.

Note:	We will use the password '*Cyberark1*' everywhere in the training. It is not recommended that you do this in a production environment.



Reminder:	The **Master** user should only be used in emergency situations, has all **Vault** Authorizations, and access to all data within the **Vault**. The Master private key must be accessible to the **Vault** server for a user to login to the **Vault** using the Master password. The Master password and CD should be stored in a physical Safe with limited access. The **Administrator** user has all **Vault** authorizations but no access to data by default.

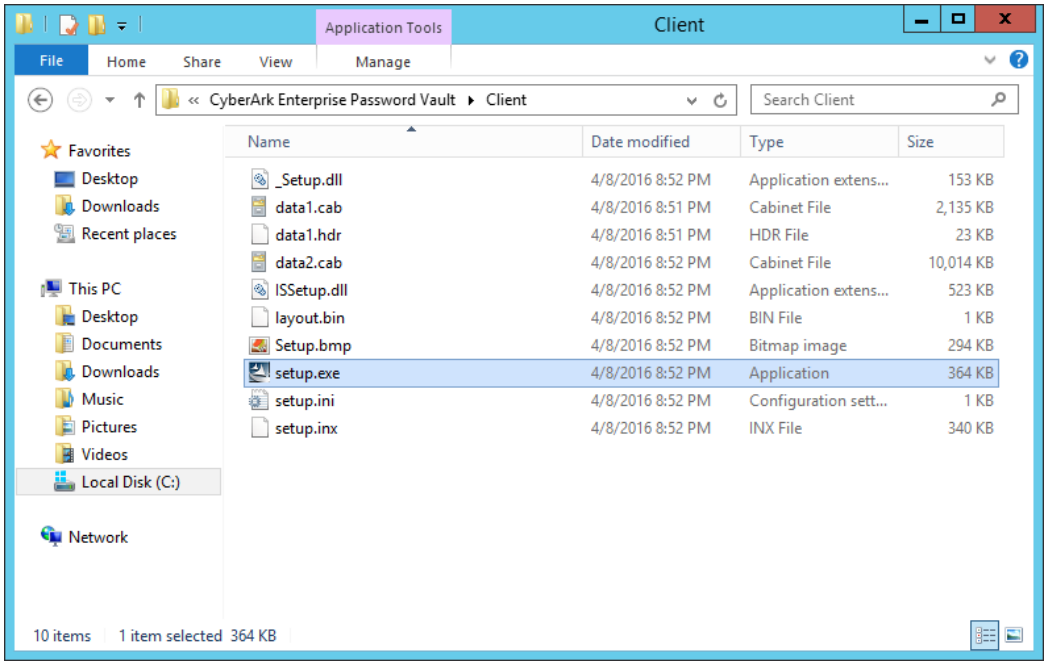
21. Choose *No, I will restart my computer later* and press **Finish**.



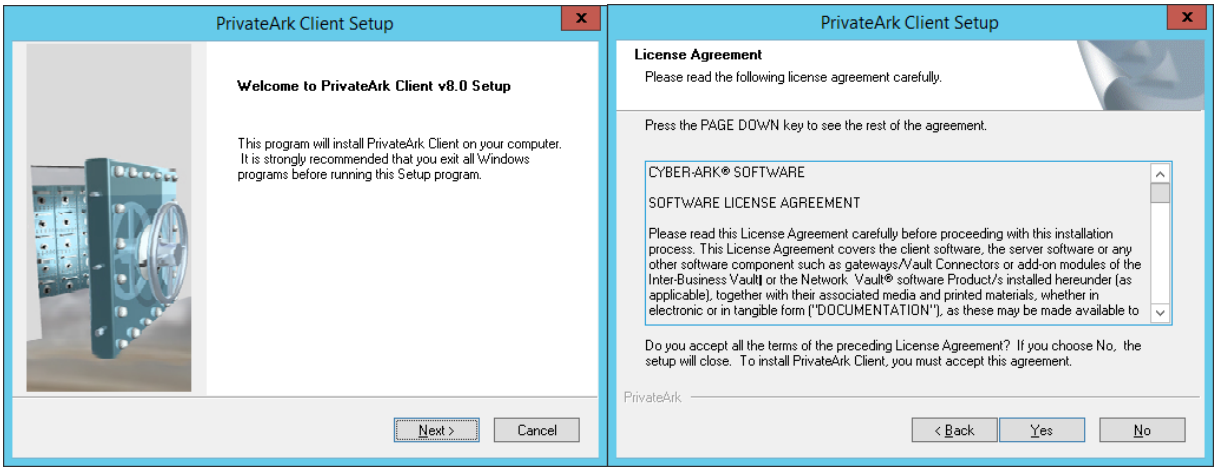
PrivateArk Client Installation

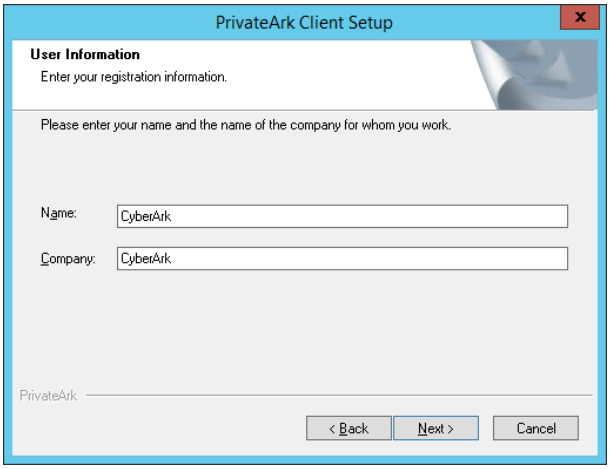
Next, we will install the **PrivateArk Client** on the **Vault** server.

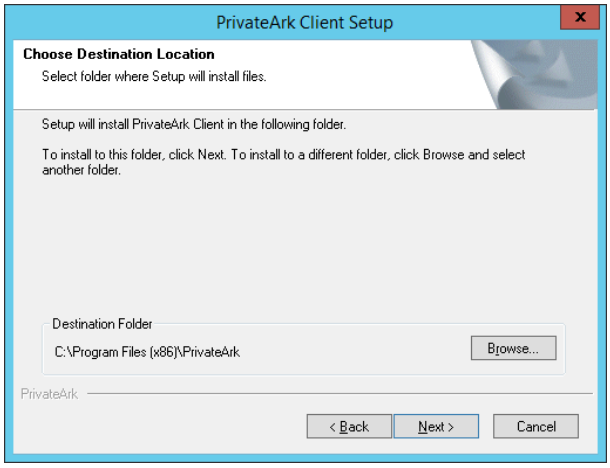
1. Go *to C:\CyberArk Install Files\CyberArk Enterprise Password Vault\Client* and double click *setup.exe*.

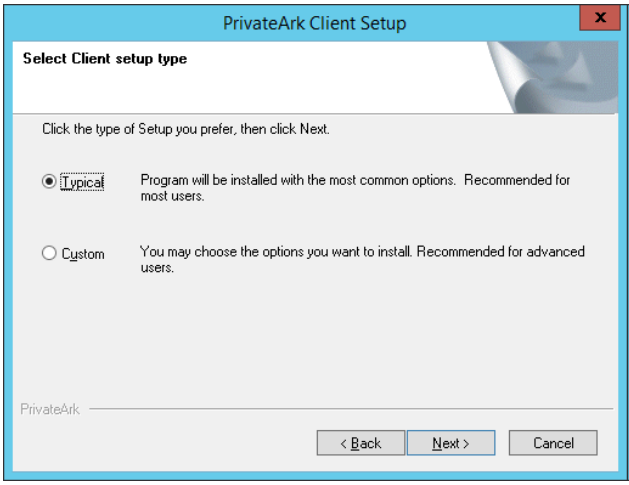


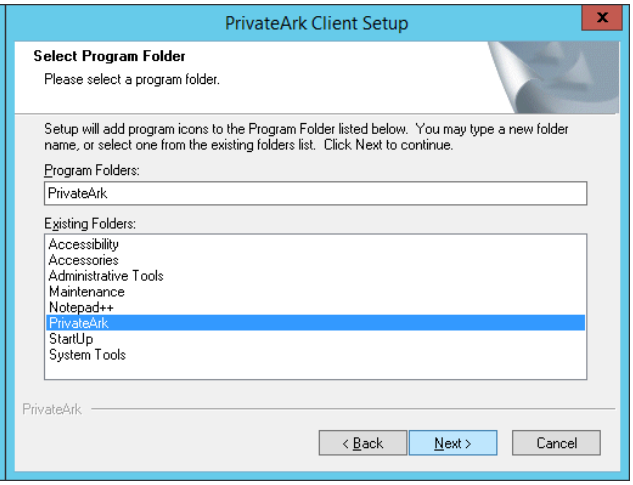
2. Accept the default options in each of the next six windows. If the **User Information** window is blank, enter **Name:** *CyberArk* and **Company:** *CyberArk*.











3. Press **OK** to define your first connection to the **PrivateArk Vault**. This will create a shortcut to your **Vault** within the **PrivateArk Client**.

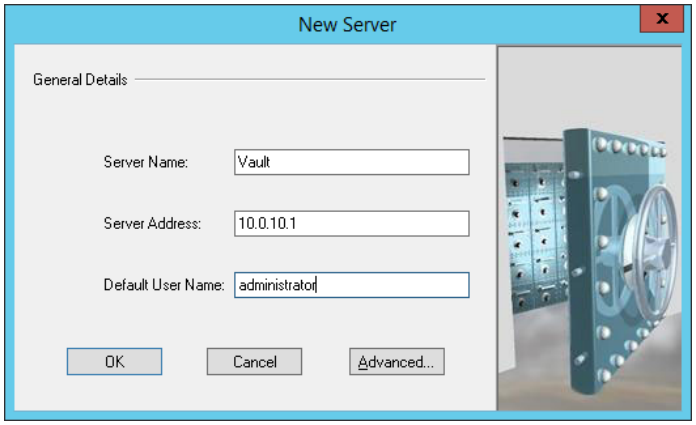
4. Enter the following information:

   Server Name *Vault*

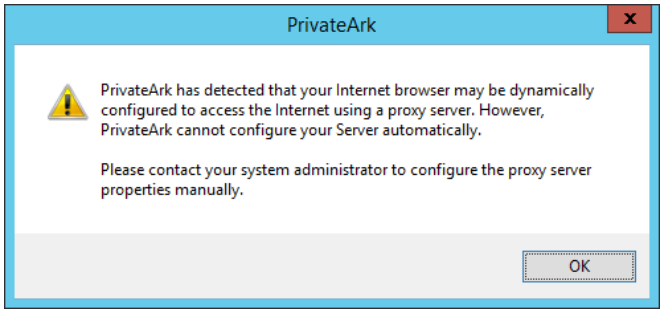
   Server Address *10.0.10.1*

   Default User Name *administrator or leave blank (leaving blank means the client will remember the last logged on user)*

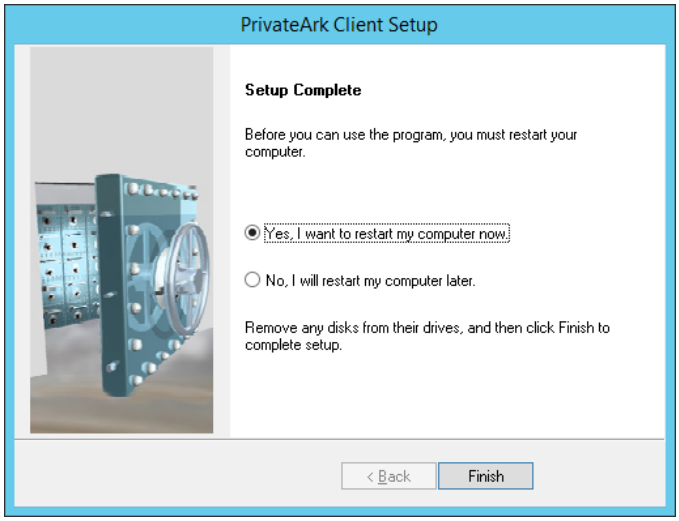
5. Press **OK.**



6. You **may** receive a message regarding your Internet proxy. This is normal for our lab environment. Press **OK** to acknowledge that message.



7. Select *Yes, I want to restart my computer now* and press **Finish**.



8. Login to the **Vault01A** server. The vault hardening process prevents auto-logon so you will be required to enter the Administrator credentials.
9. Double-click the **PrivateArk Server** shortcut on the desktop to open the Server Central Administration utility. Confirm there are no errors, and "ITAFW001I Firewall is open for client communication" message appears.
10. Open Windows Services and check that the following services have been installed and started.
    a. PrivateArk Database
    b. PrivateArk Remote Control Agent
    c. PrivateArk Server
    d. CyberArk Logic Container
    e. Cyber-Ark Event Notification Engine.

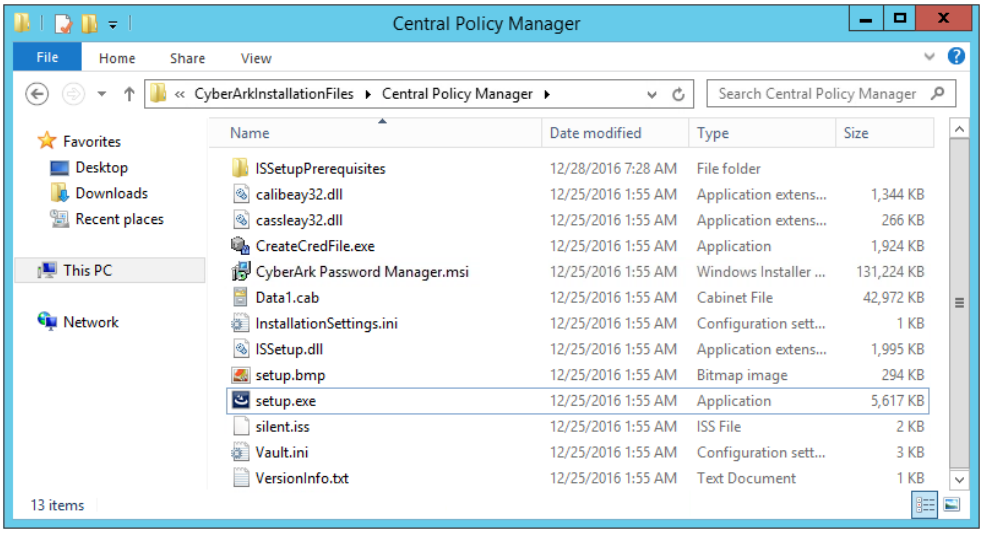
Note:	The **CyberArk Enterprise Password Vault** is now installed. We are ready to begin installing the CyberArk components: the **Central Policy Manager – or CPM** – and the **Password Vault Web Access** – or **PVWA**.

Install CPM (distributed)

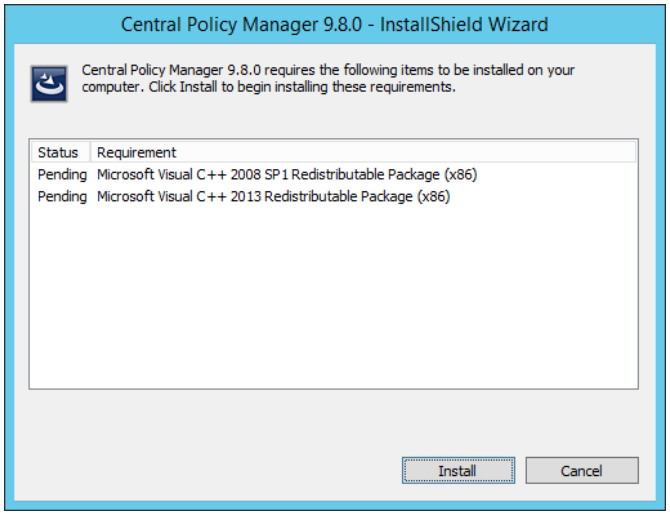
Install 1st CPM

1. Login to your **Component A** (Comp01a) server as administrator.

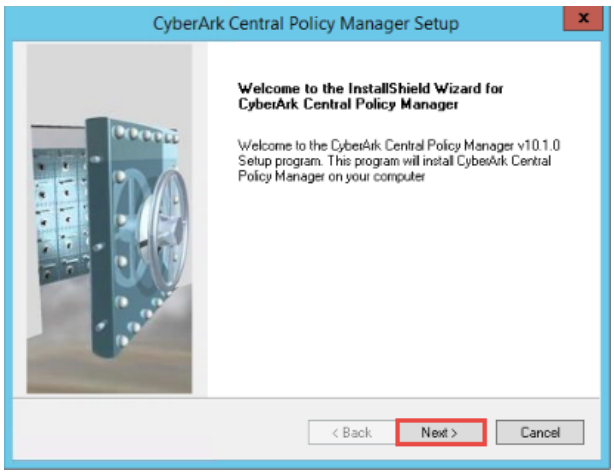
2. Go to ***C:\CyberArkInstallationFiles\Central Policy Manager*** and double-click the **setup.exe** application.

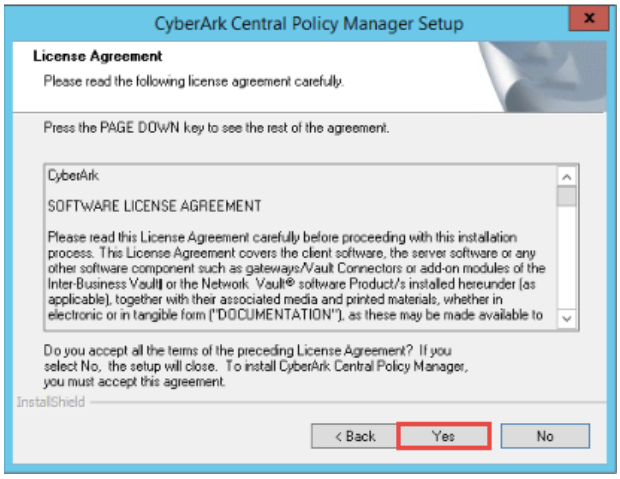


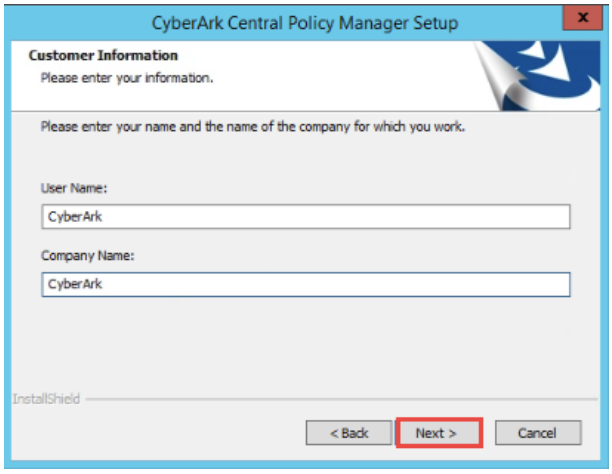
3. Press **Install** to install the required Windows components. This will take a few minutes.

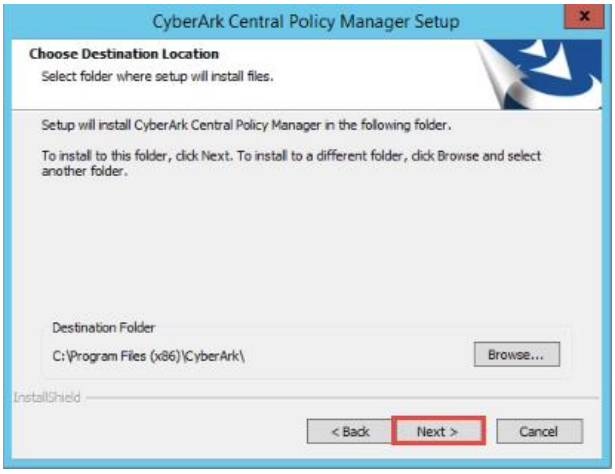


4. Accept the default options on the next four windows, including your company name (e.g. **CyberArk**) on the **Customer Information** page.

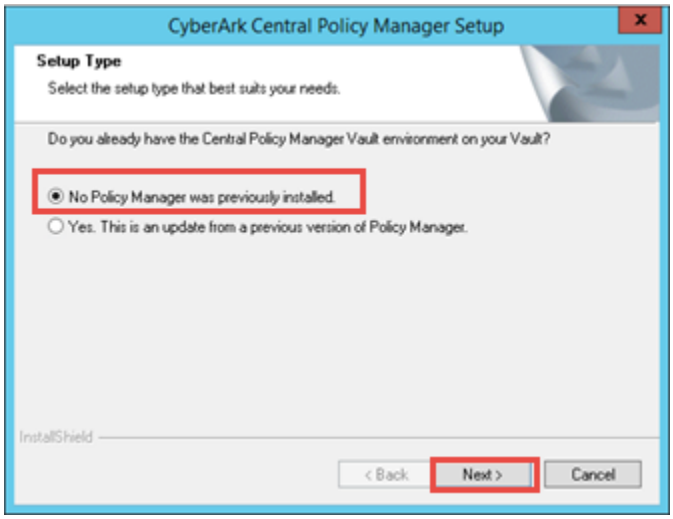






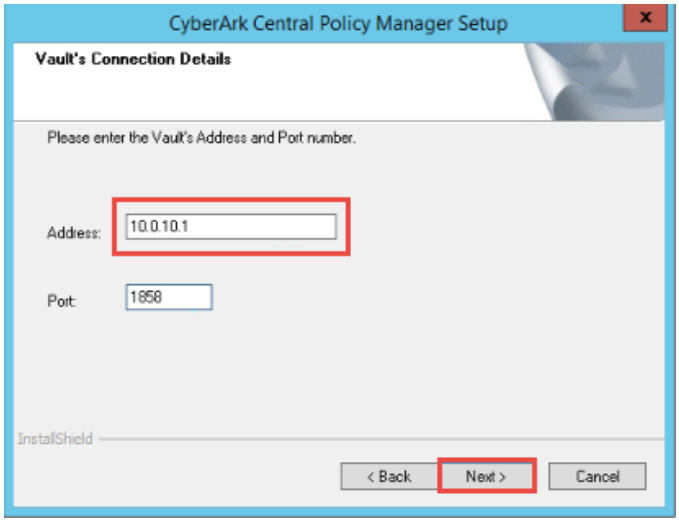


5. Accept the default option, "**No Policy Manager was previously installed"** and press **Next**.

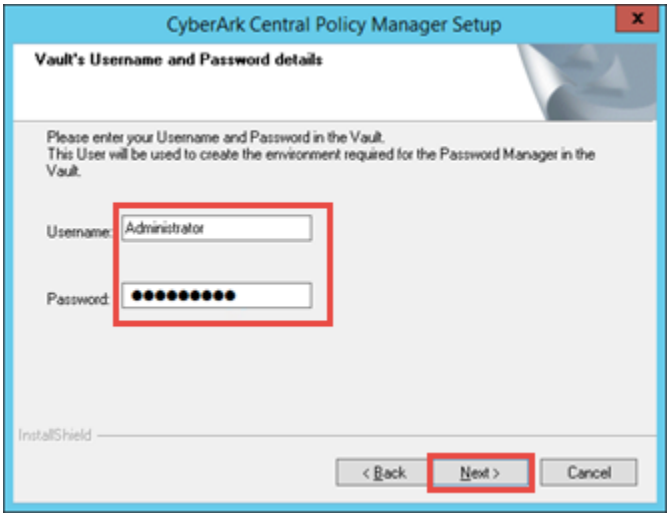


Note:	This question relates to installing **CPM software** using an existing licensed CPM user, not installing an additional CPM that will consume a new license.

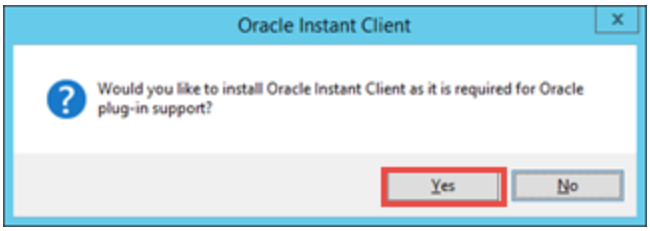
6. Enter the IP Address of your **Vault** (i.e., **10.0.10.1**) and press **Next.**



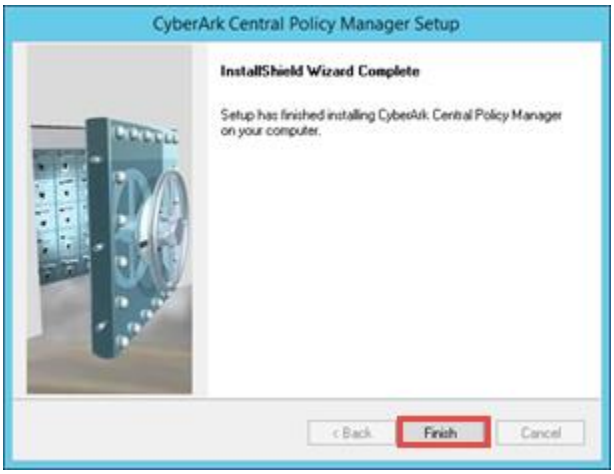
7. Enter **Administrator** as the *Username* and **Cyberark1** for the *Password* and press **Next**



8. Press **Yes** to install the *Oracle Instant Client*



9. Press the **Finish** button



10. Immediately following the CPM installation, review the *CPMInstall.log* file created in "C:\Users\Administrator\AppData\Local\Temp\1". To access this directory, in the File Explorer address window, type %appdata%, then change from Roaming to Local and navigate to the \Temp\1 directory. This file contains a list of all the activities performed when the CPM environment in the Vault is created during the installation procedure.

Note:	The installer has created a CPM user in the vault called *PasswordManager*. We will rename the CPM user later, after we add second CPM.

11. Next, we need to add exceptions to Microsoft Windows Data Execution Prevention utility for the CyberArk utility PMTerminal.exe and Plink.exe. This is necessary to enable the CPM to manage target systems such as Unix/Linux.

12. Right click the Start Menu and select the Run command.

13. Type sysdm.cpl and select Ok.

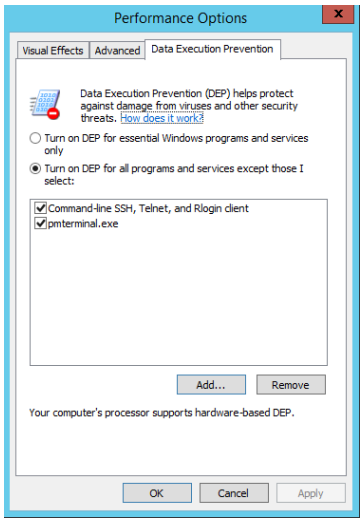
14. Select the Advanced tab, and click the Performance, Settings button.

15. Select the Data Execution Prevention tab and click the Add… button.

16. Navigate in the dialog to "C:\Program Files (x86)\CyberArk\Password Manager\bin"

17. Select Plink.exe and click the Open button

18. Click Add… again, select PMTerminal.exe and click the Open button.

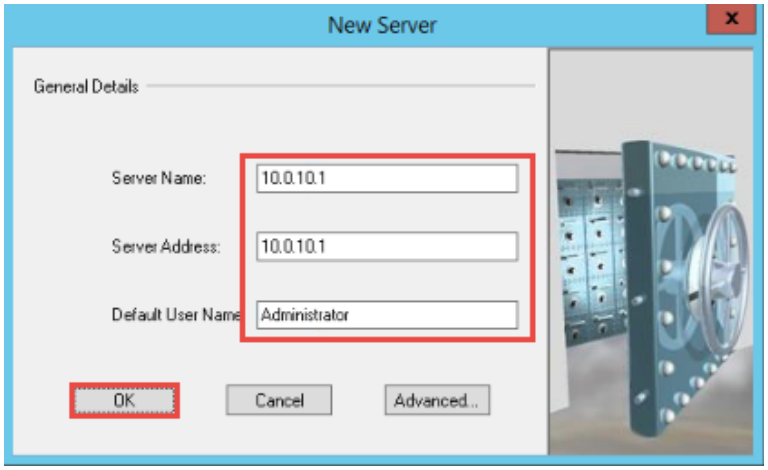


19. Click Ok.

Note: It is not recommended to completely disable Microsoft's Data Execution Prevention (DEP) security feature. Disabling DEP may require an exception to security policy at a customer site and also requires a restart of the Windows Server.

Install the PrivateArk Client on the Component server

Objective:	In this section, you will repeat the steps for installing the **PrivateArk Client**, this time on the Comp01a server, though with one small change. This time, when creating the first connection to the **Vault** server, put the Vault IP address (i.e., **10.0.10.1**) in the *Server Name* field. This will later allow you to connect to the **PrivateArk Client** via the **PSM**.



Following the CPM Installation

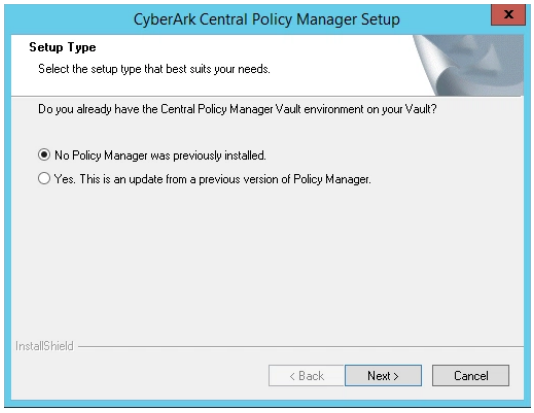
After the server restarts, login to the Comp01a server and review the following.

1. Navigate to "C:\Program Files (x86)\CyberArk\Password Manager\Logs". Check the *pm.log* and *pm_error.log* file for errors.
2. Check the **CPM** services are installed and running.
   a. CyberArk Password Manager Service.
   b. CyberArk Central Policy Manager Scanner.

Install 2nd CPM

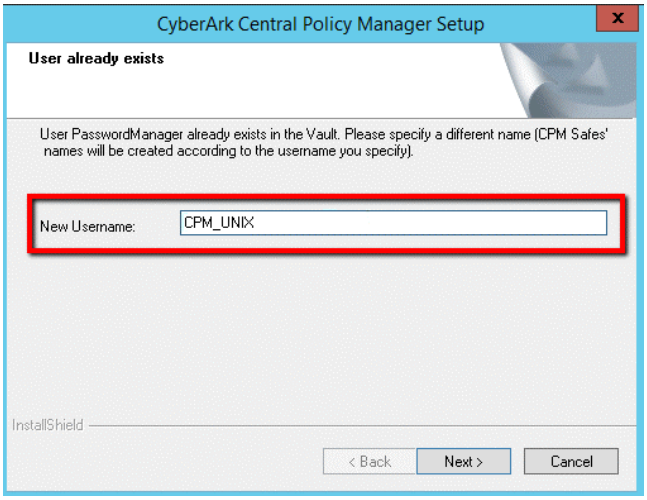
Objective:	You will now repeat the steps in **Install 1st CPM**, but pay very careful attention to the instructions. There are slight differences in the installation on the second component server.

1. Log into your **Component B (Comp01b)** server as *Administrator* and launch *setup.exe* for the **CPM**. Select the default "**No Policy Manager was previously installed"** when asked if a CPM environment exists.



Note:	This question relates to installing **CPM software** using an existing licensed CPM user, not installing an additional CPM that will consume a new license.

2. This time, the installer will ask you to specify a username for this CPM (Since another CPM has already been installed on this Vault). Enter **CPM_UNIX** in the *New Username* field, then complete the installation.



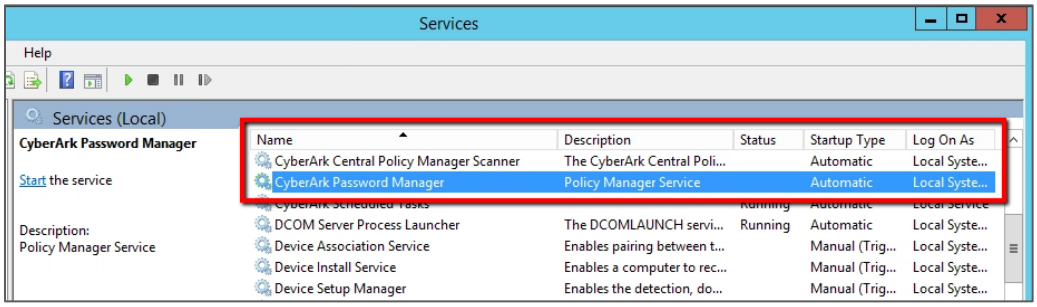
Reminder:	When the installer completes, don't forget to configure exceptions for PMTerminal.exe and Plink.exe in the Microsoft's Data Execution Prevention (DEP) security feature.

Install the PrivateArk Client on the Comp01b server

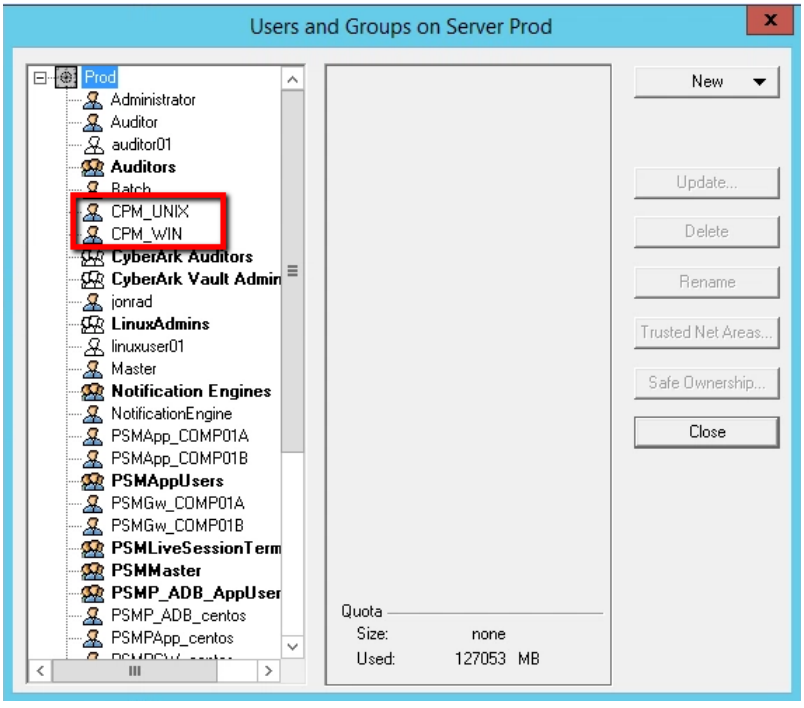
Objective:	In this section, you will repeat the steps on page 39 to Install the PrivateArk Client, this time on the Comp01b server.

Rename 1st CPM

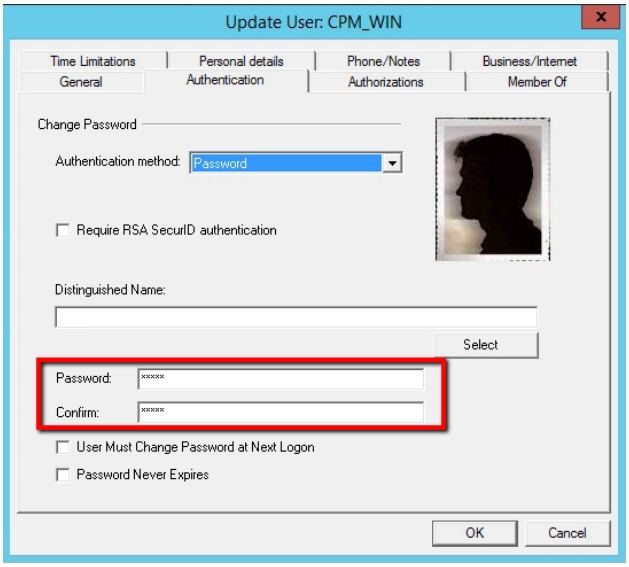
1. Log on to the **Comp01A** Server, and stop both CPM Services.



2. Launch the **PrivateArk Client** and log in as *Administrator*. In **Tools > Users and Groups**, find the **PasswordManager** user and press **F2** to rename. Rename the user as **CPM_WIN**.



3. Click **Update** and reset the user's password to *Cyberark1* on the **Authentication** tab.



4. Rename the following safes in the **PrivateArk Client**:

Old Name	*New Name*
PasswordManager	**CPM_WIN**
PasswordManager_ADInternal	**CPM_WIN_ADInternal**
PasswordManager_info	**CPM_WIN_info**
PasswordManager_workspace	**CPM_WIN_workspace**

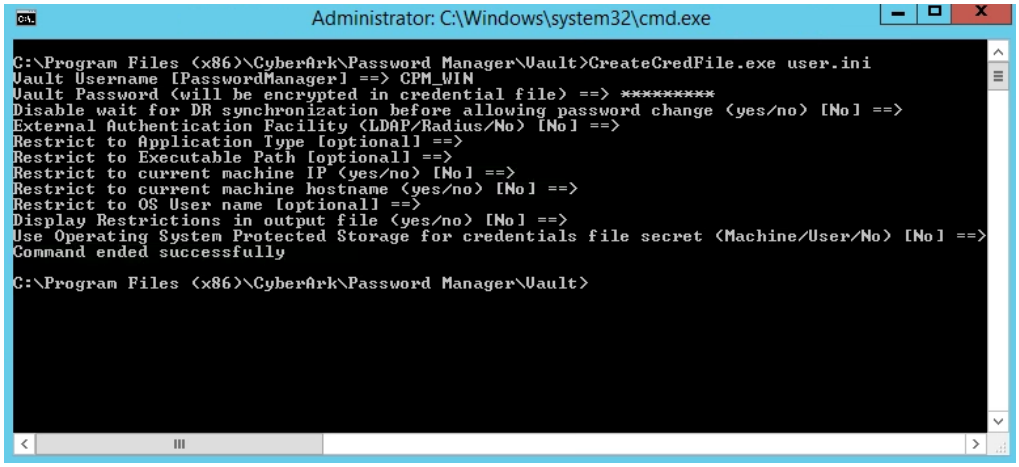
Note: Open (**SHIFT**+**ENTER**) each safe individually and then press **F2** on the *Safe Icon* to rename. This is easier if you switch from **Icon** view to **Details** view. **DO NOT** rename ***PasswordManager_Pending*** or ***PasswordManagerShared*****.**

5. Logoff the **PrivateArk Client**.
6. Open a command prompt and navigate to ***C:\Program Files (x86)\CyberArk\Password Manager\Vault***. Run the following command:

   `CreateCredFile.exe user.ini`

7. Enter the *Vault Username* and *Password* for the new CPM user at the prompts. Press **Enter** to accept the default for the remaining prompts.

Username:	**CPM_WIN**
Password:	**Cyberark1**



8. **S**tart the **CPM** Services. Check the *pm.log* and *pm_error.log* files to verify they start successfully and without errors. The *pm.log* file should begin with log entry “CACPM117I Starting Password Manager 10.1.0 (10.1.0.12)”, followed by a listing of each active platform, e.g., “CACPM670I Effective policy updated. ID: 2, Policy ID: 2, Platform Name: Unix via SSH"

Install PVWA (load balanced)

Objective:	Install the PVWA on the **Component** servers in preparation for configuring them in a load-balanced environment. It is important to perform these tasks ***in the order they are presented here***.

In this chapter, you will perform the tasks in the following order:

- **PVWA Pre-requisites**
- **Use HTTP over SSL (PVWA)**
- **Install 1st PVWA**
- **Install 2nd PVWA**
- **Hardening the CyberArk CPM and PVWA Servers**
- **Configure the External Load Balancer for the PVWA servers**

PVWA Pre-requisites

1. Complete the following pre-requisite tasks on both Comp01a and Comp01b servers. Prior to installing PVWA you must first install the Web Server Role (IIS) on both of your **Component** servers. In the **Server Manager**, select **Add Roles and features** and add the **Web Server (IIS)** role with the following **Role Services**:

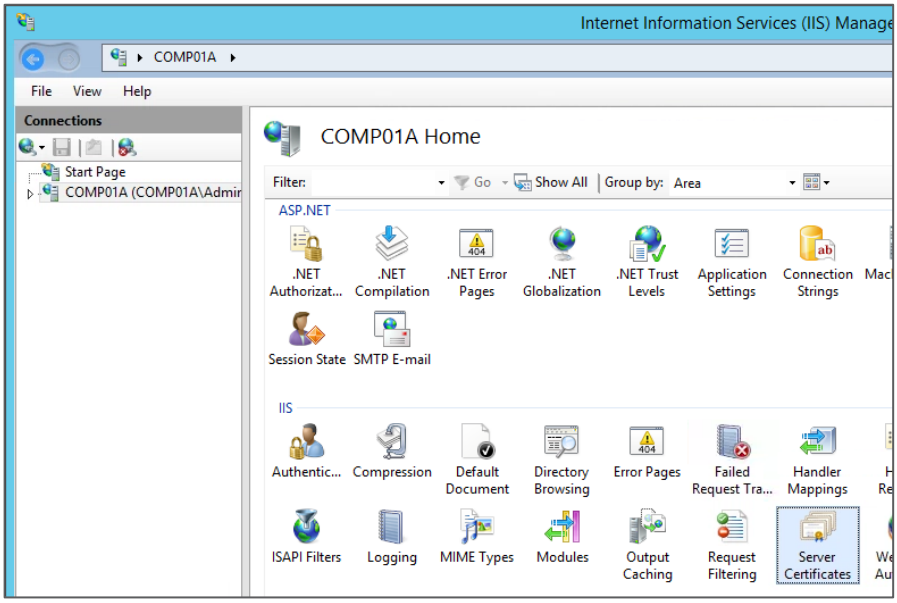
Service	Features
Common HTTP:	All features
Health and Diagnostics:	HTTP Logging Request Monitor
Security:	Request Filtering Basic Authentication Windows Authentication
Application Development:	.NET Extensibility 4.5 ASP ASP.NET 4.5 ISAPI extensions ISAPI filter
Management Tools:	All features

Use HTTP over SSL (PVWA)

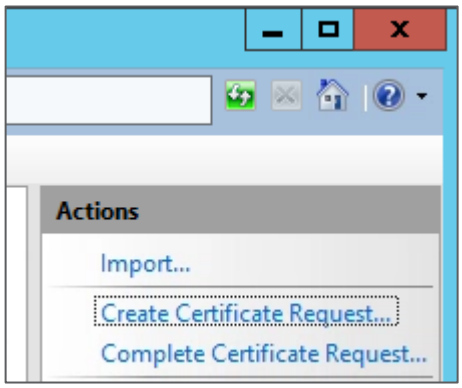
Objective:	In this section we will configure IIS to require connections over SSL by issuing a certificate for the component servers. This part is also a prerequisite for later authentication sections. **Must be completed on Comp01a and Comp01b servers.**

1. Begin by launching **IIS Manager** (INETMGR) on your **Component** server.

2. On the Connections column, click on the server name and double-click the **Server Certificates** icon.

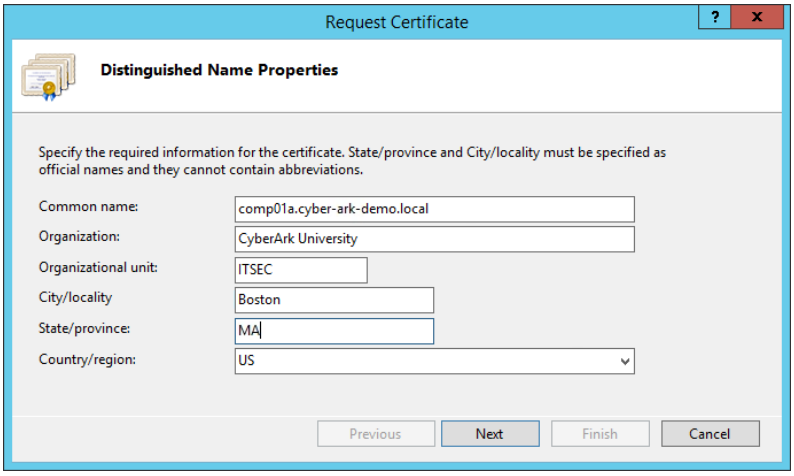


3. Click **Create Certificate Request…**



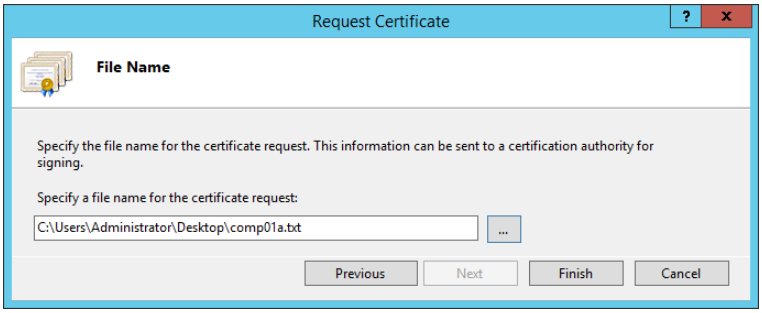
4. Enter the following values into the certificate request and click next. Ensure that you update the common name with the actual name of the component server, i.e., Comp01a or Comp01b.

Common name:	comp01a.cyber-ark-demo.local
Organization:	CyberArk University
Organizational Unit:	ITSEC
City/Locality:	Boston
State/Province:	MA
Country/region:	US

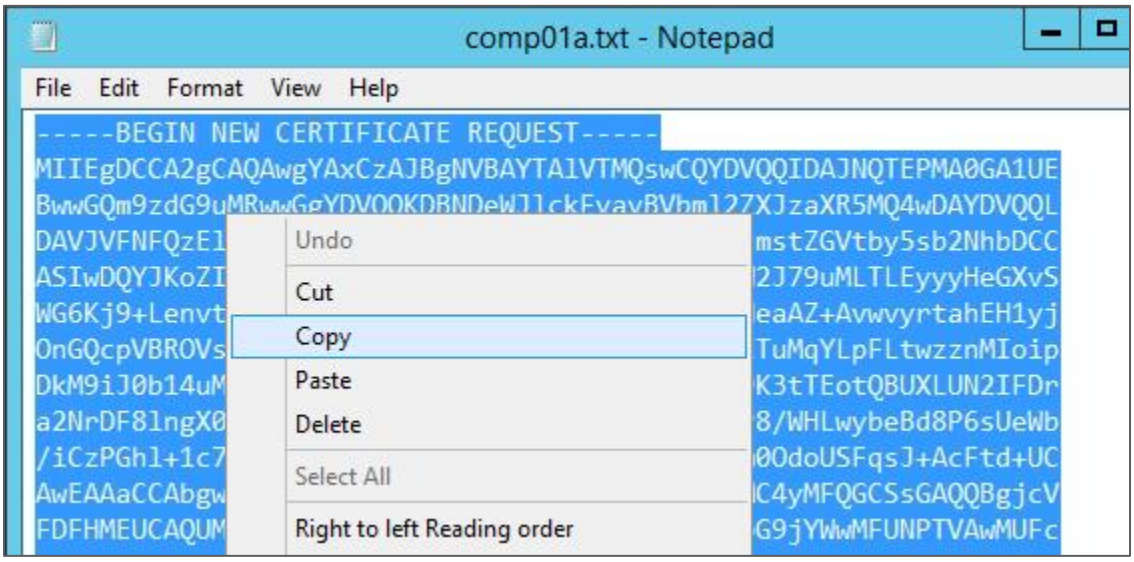


5. Choose **Microsoft RSA SChannel Cryptographic Provider** as the service provider and a bit length of **2048**, then click **Next**.

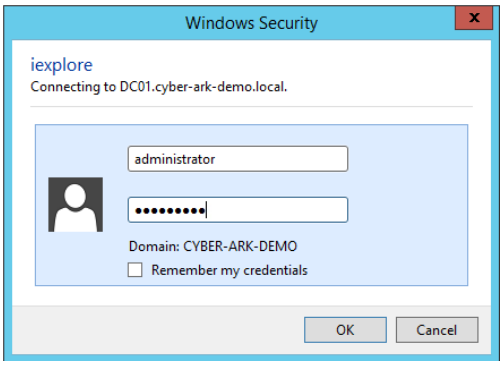
6. Save your certificate request to the desktop as **comp01a.txt or comp01b.txt,** as is appropriate and click **Finish**.



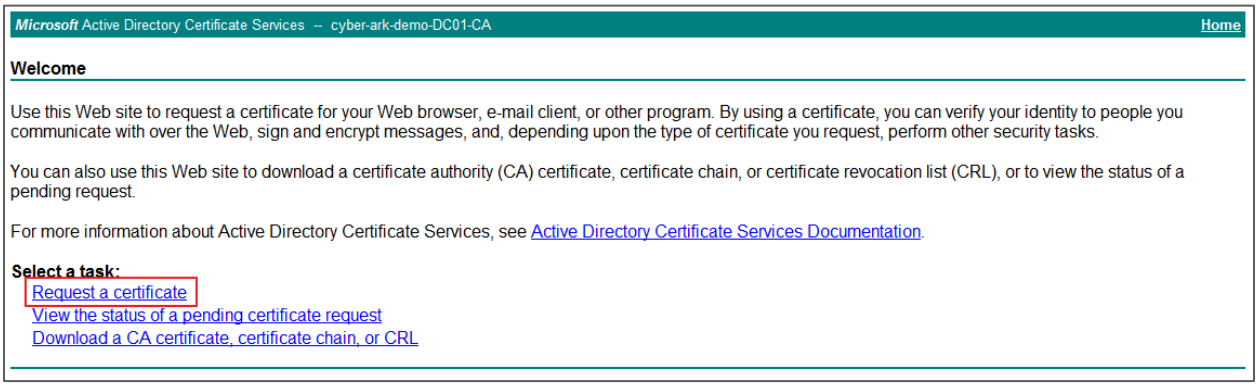
7. Open the .txt file created in the previous step in notepad. Copy the entire contents of the file to your clipboard.



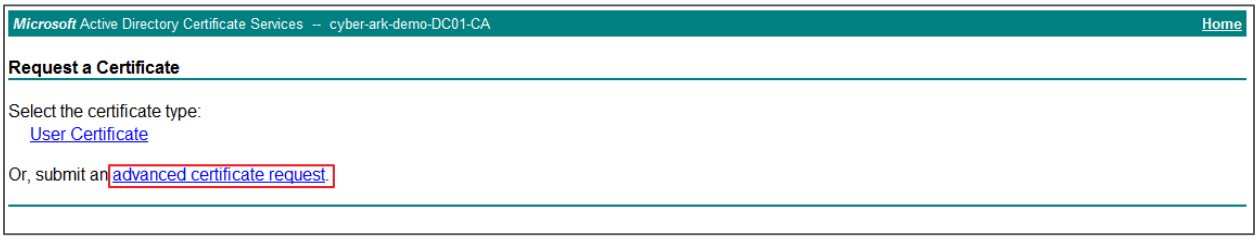
8. Browse to https://dc01.cyber-ark-demo.local/certsrv in **Internet Explorer** and login as *Administrator / Cyberark1*. There is a shortcut in the browsers Favorites Bar, called CA.



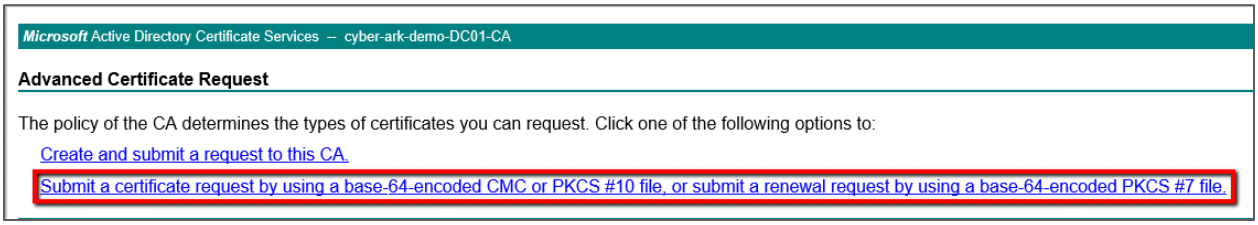
9. Click **Request a certificate**.



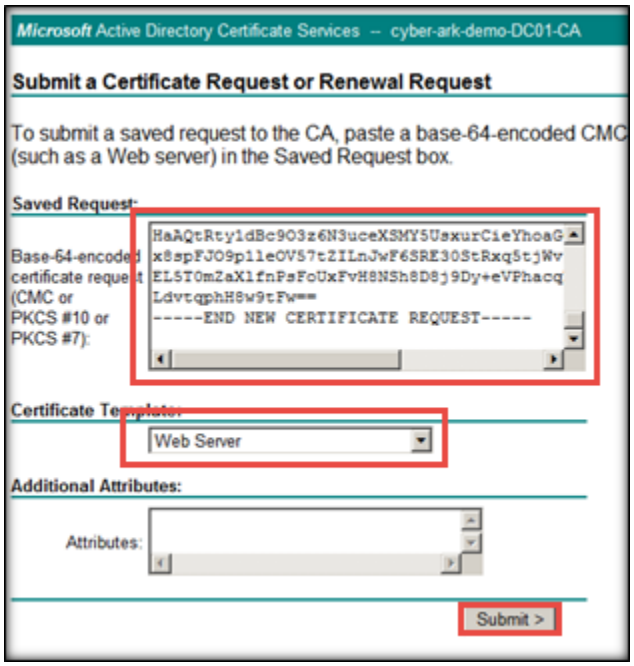
10. Click **advanced certificate request**.



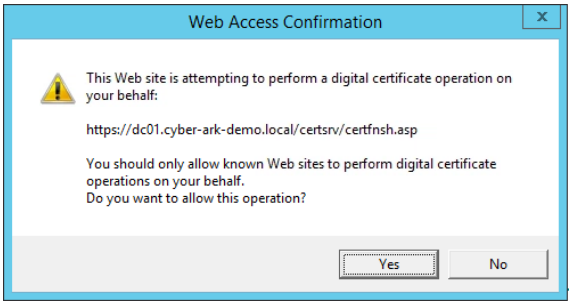
11. Choose the second option **Submit a certificate request by using a base-64-encoded CMC**…



12. In the saved request filed paste in the entire contents of the .txt file created earlier. Choose **Web Server** for the *Certificate Template* and Click **Submit**.

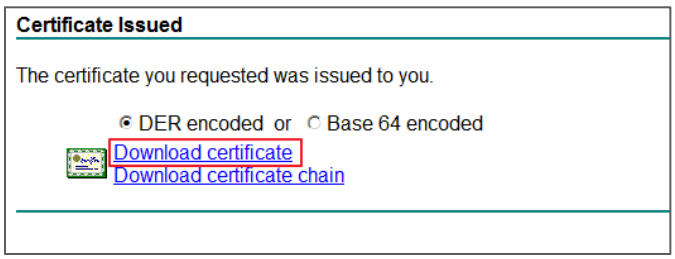


13. Click **Yes** when prompted to allow the website to perform a certificate operation.



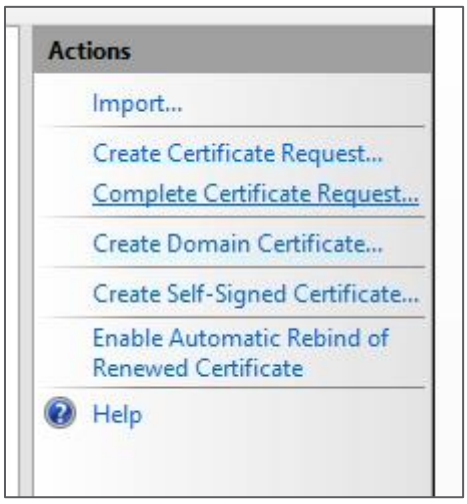
Note:	Our Certificate Authority (CA) will automatically issue a certificate immediately. Some production CAs may require a manual approval process before certificates are issued, which could delay obtaining a certificate.

14. Leave **DER encoded** selected and click **Download Certificate**.

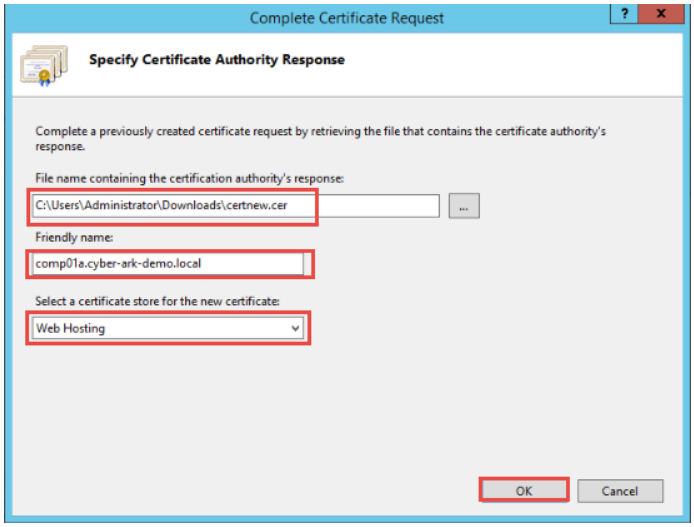


15. Click **Save** to store the certificate in your **Downloads** folder.

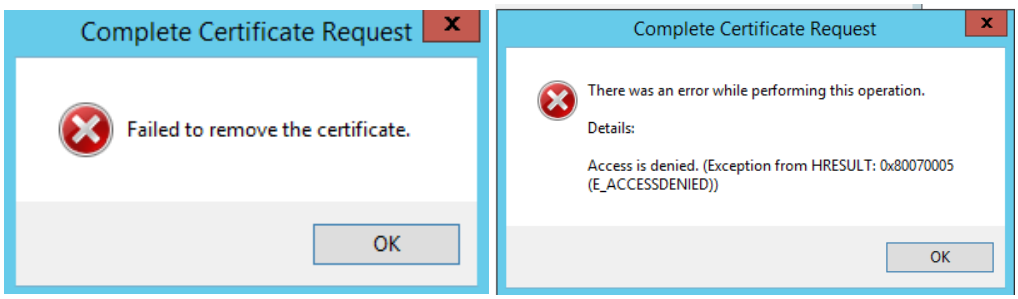
16. Return to the IIS Manager and click **Complete Certificate Request...**



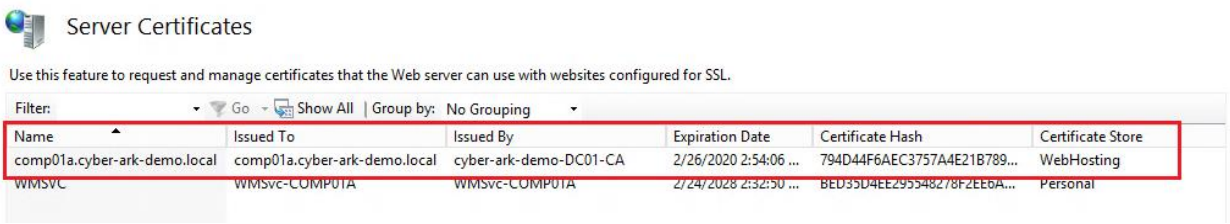
17. Select the .cer file downloaded in the previous step, in the *Friendly name* field enter the Common Name (e.g. **comp01a.cyber-ark-demo.local**) you used in the certificate request and select **Web Hosting** as the *certificate store*, then click **OK**.



18. You will receive the following 2 errors (this is normal in our environment) click **OK for each** then **Cancel**. Close the errors and verify that you can see the new certificate in the list after pressing **F5**.



19. If successful, you will see the new certificate listed, as shown in the graphic here. Skip step 20 and go directly to step 21.



Note:	You will need to make sure that the certificate is in fact placed in the ***Web Hosting*** certificate store and not in the ***Personal*** store. There appears to be an issue with the way Microsoft is importing the signed certificates. You can move the certificate by opening a Microsoft Management Console (mmc.exe), adding a **Certificates** snap-in for the Local Computer, and then just cutting and pasting the certificate into the appropriate store.

20. If the certificate does not immediately appear in the list of certificates, open an explorer window, right-click the **certnew.cer** file in the *Downloads* folder and select **Install Certificate.**

    a. In the *Certificate Import Wizard* window, select **Local Machine** as the Store Location and click **Next**.

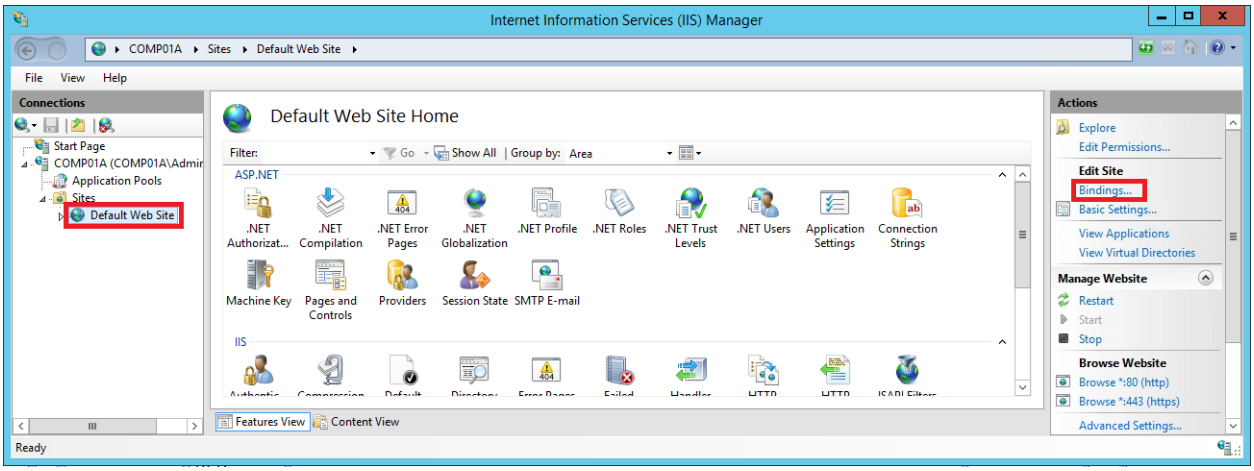
    b. Select **Place all certificates in the following store**.

    c. Click the **Browse** button and select the **Web Hosting** certificate store.

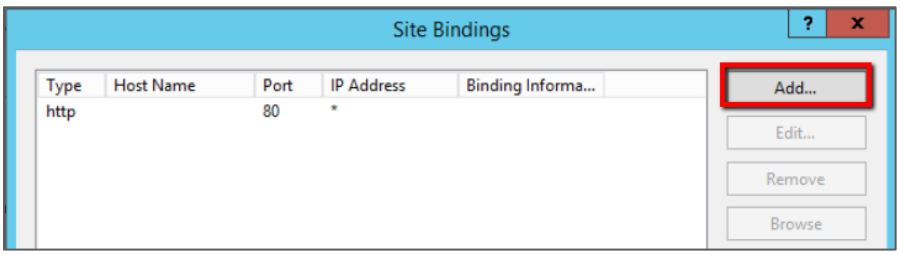
    d. Click **Next** to proceed.

    e. Select **Finish**

21. In the **IIS Manager** drill down to the **Default Web Site**, and click **Bindings…**

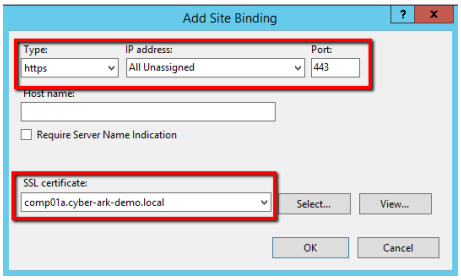


22. Click on **Add…**

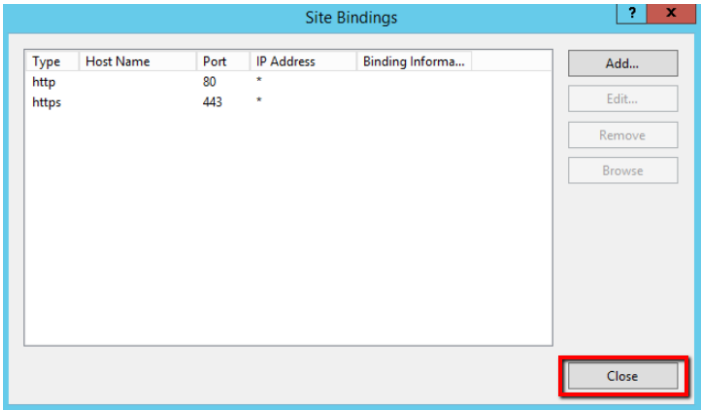


23. Enter the following properties and click **OK**.

Type:	**https**
IP address:	**All Unassigned**
Port	**443**
SSL Certificate:	Choose your certificate from the drop-down menu. (e.g. **comp01a.cyber-ark-demo.local)**



24. Click **Close**.



25. Go to **Default Web Site Home** and double click **SSL Settings** (golden padlock). Select *Require SSL* and click **Apply** in the **Actions** menu.

26. Validate the IIS installation. This is an important step to confirm that the IIS server is functioning correctly prior to the **PVWA** software installation. Open Internet Explorer and attempt to connect to the default web site on each component server with http and https URL's. What is the expected behavior of each?

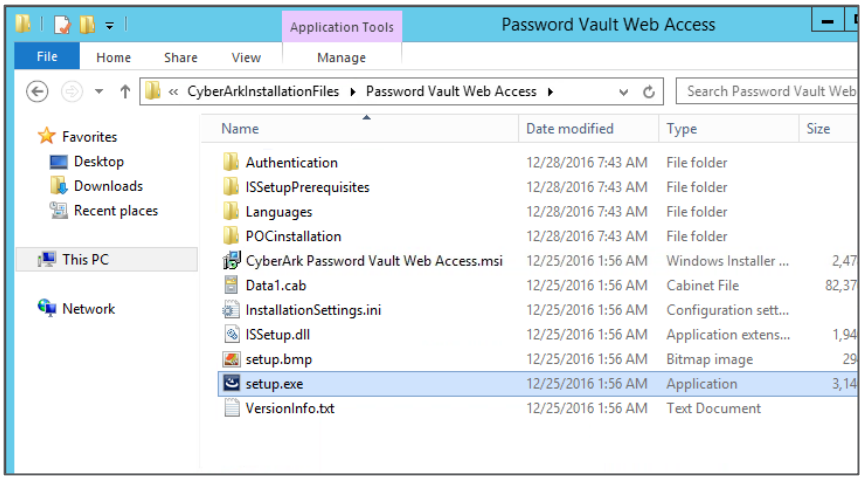
    a. http://comp01a.cyber-ark-demo.local/

    b. https://comp01a.cyber-ark-demo.local/

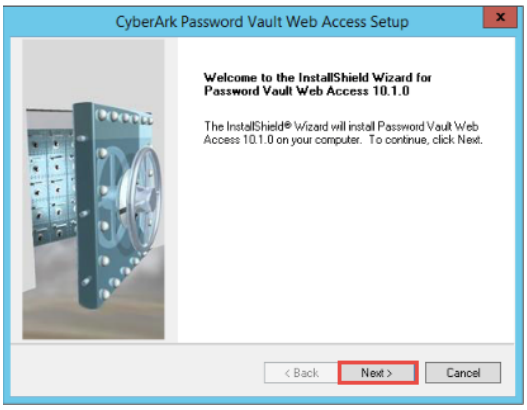
Install 1st PVWA

Objective:	Install the **PVWA** on Comp01a.

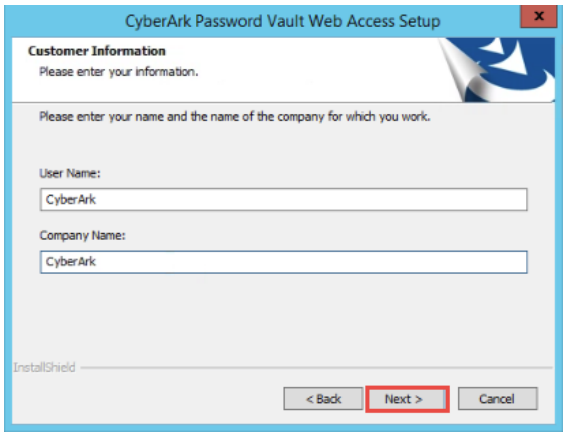
1. On the **Comp01A** server, go to *C:\CyberArkInstallationFiles\Password Vault Web Access* and double click *setup.exe*.

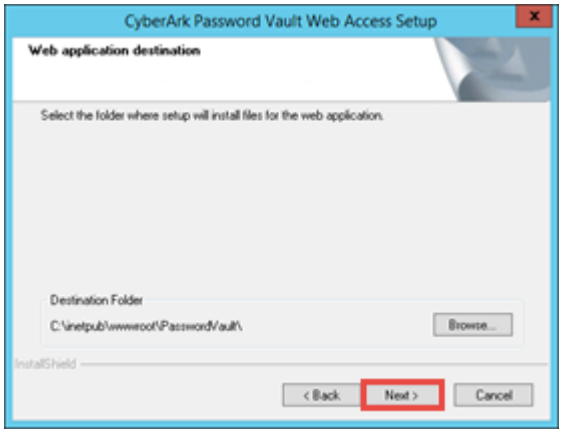


2. Press the **Next** button, then click **Yes** to agree to the license agreement.

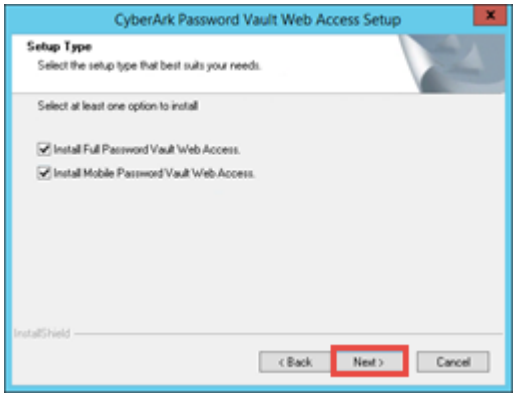


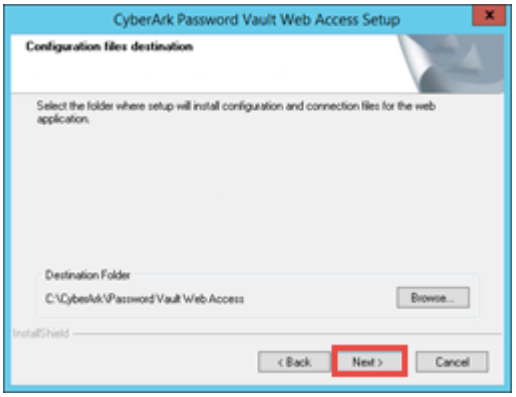
3. Enter a *User name* and *Company name*, press **Next**, then press **Next** to accept the default Web application destination.



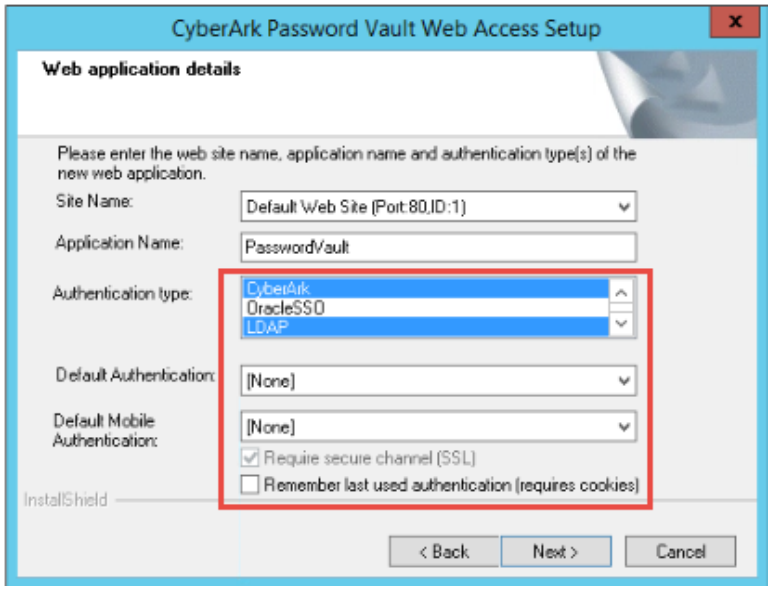


4. Press **Next** to accept the default **Configuration files destination** and press **Next** to accept both **Setup Type** options.



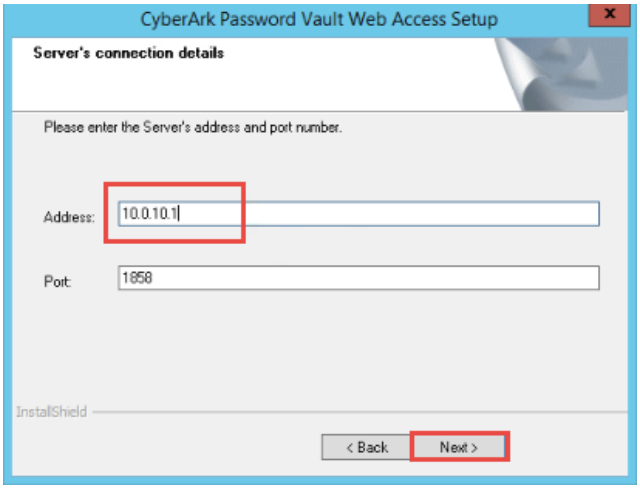


5. On the Web application details window, select **CyberArk** and **LDAP** as the *Authentication Type*. Choose **None** in *Default Authentication* and *Default Mobile Authentication* fields and confirm that "**Require secure channel (SSL)"** is selected and cannot be edited.

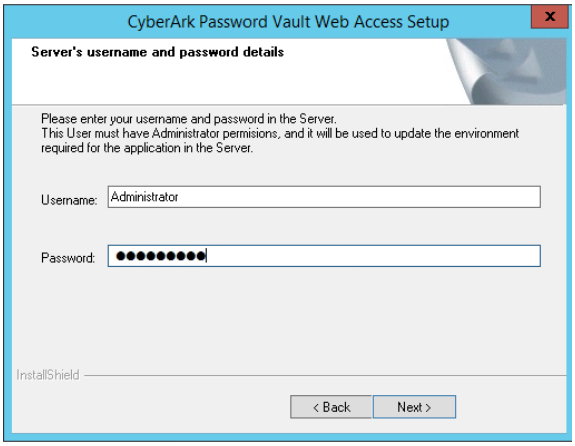


6. Enter **CPM_UNIX,CPM_WIN** in the *CPM User* field and press **Next.**

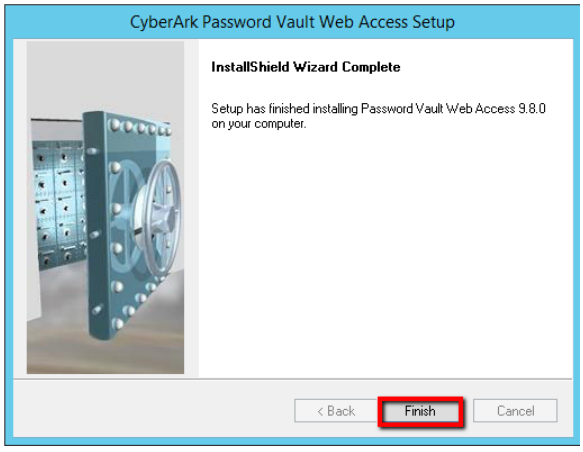
7. Enter your Vault IP (e.g. **10.0.10.1**) and press **Next.**



8. Leave **Administrator** as the username and enter **Cyberark1** as the password, then click **Next**



9. Press the **Finish** button



10. Validate the **PVWA** installation:

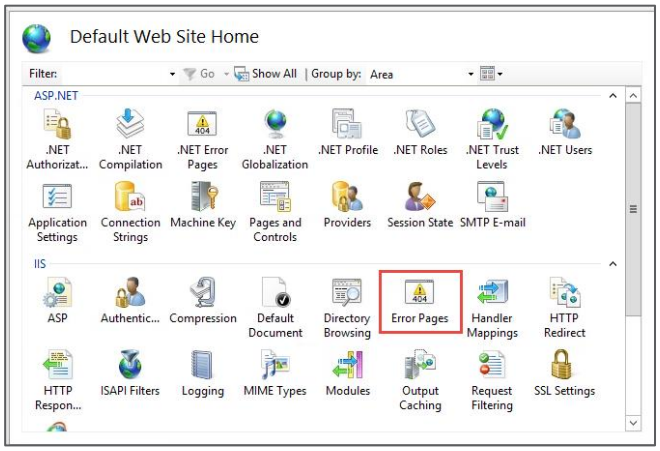
    a. Check the *PVWAInstall.log* in directory *C:\Users\Administrator\AppData\Local\Temp\1.*

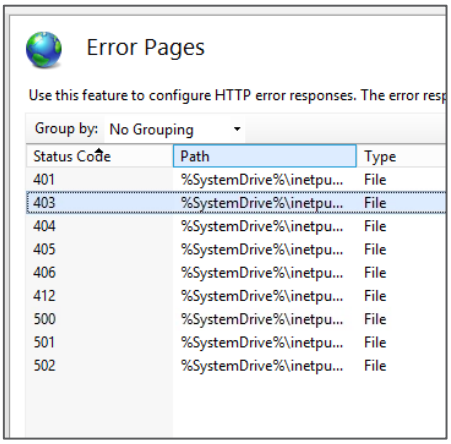
b. Open Internet Explorer and confirm that the **PVWA** login page is displayed. This step validates that the **PasswordVault** application is communicating with the PrivateArk Server. Use URL “https://comp01a.cyber-ark-demo.local/PasswordVault”

Next, we will configure an IIS response to a 403 error code, effectively redirecting HTTP traffic to HTTPS (443). We will also prevent browser access to the default web site.

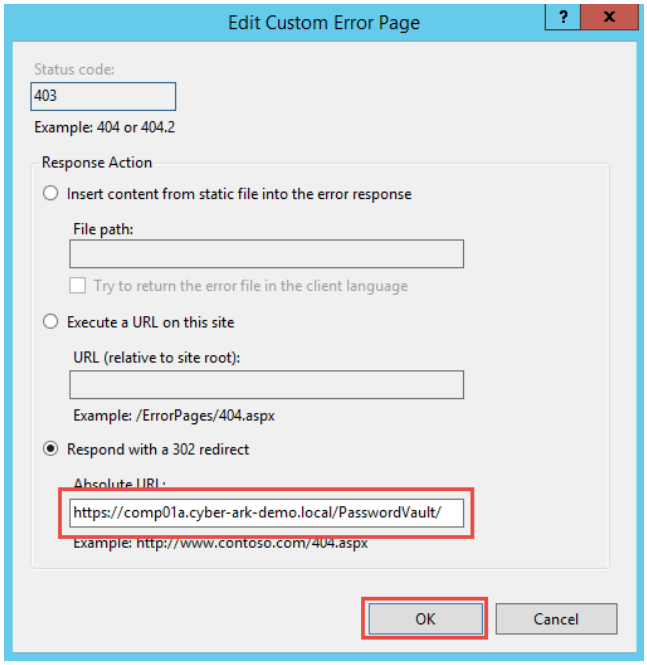
1. Open **Internet Information Service (IIS) Manager**

2. Navigate to the **Default Web Site Home**, select **Error Pages** and then double-click the **403** status code.





3. Select **Respond with a 302 redirect** and type the full URL to the PVWA web site (e.g. **https://comp01a.cyber-ark-demo.local/PasswordVault/**) then click **OK**. Be sure to update the URL with the FQDN of the current server.



4. In INETMGR, navigate to **Default WebSite**, double click **Default Document**. Move *Default.asp* to the top.

5. Add an IIS redirect to prevent users from accessing the default web site. Using Notepad, create a new text file named default.asp in directory "c:\inetpub\wwwroot". Ensure the file extension is .asp and not .asp.txt. Add the following content to the file.

   a. `<% Response.Redirect "/PasswordVault/" %>`

6. Run IISRESET and test.

   a. Open a browser and make sure you can login to the PVWA using https (**https://comp01a.cyber-ark-demo.local/passwordvault/**).

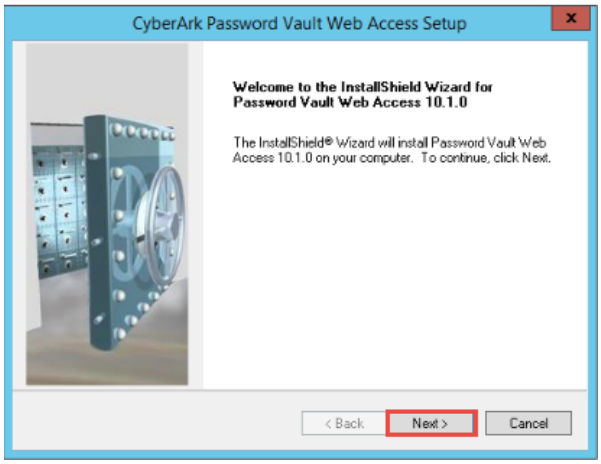
   b. Test IIS redirection with an attempt to access the default web site, and connecting to the /PasswordVault application using HTTP. Also attempt to connect to the default web site on each component server.

   c. Make sure to test from the other component server. IIS will not redirect local requests.

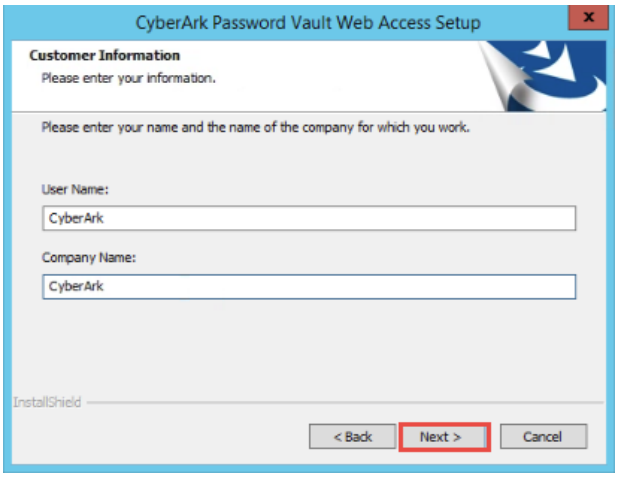
Install 2nd PVWA

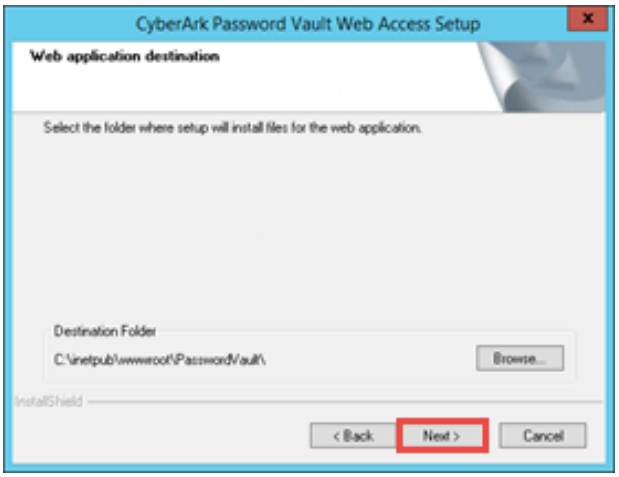
1. Login to **Comp01b** server. Navigate to *C:\CyberArkInstallationFiles\Password Vault Web Access* and double click ***setup.exe***.

2. Press the **Next** button, then click **Yes** to agree to the license agreement.

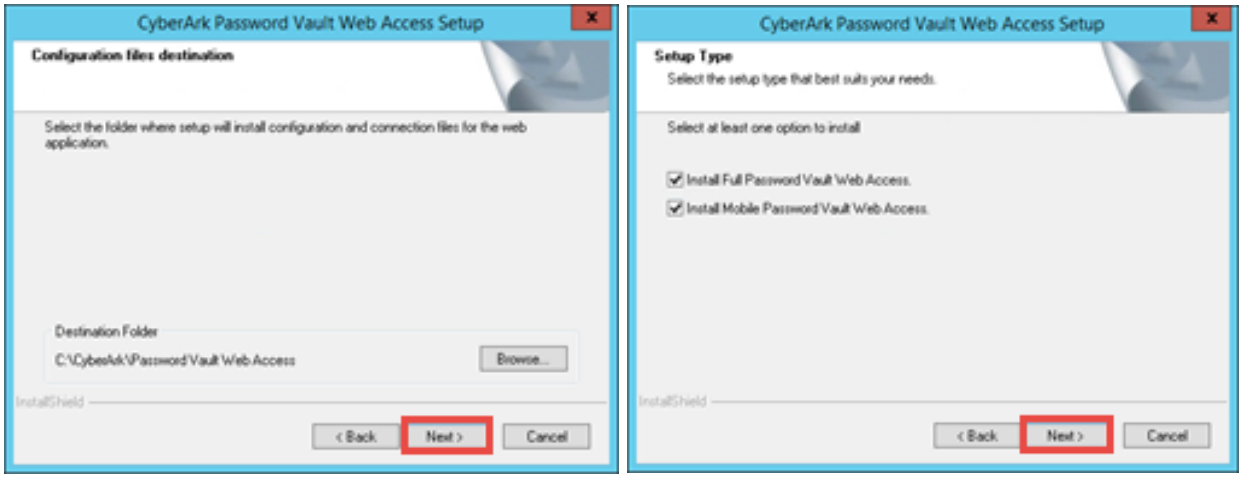


3. Enter a *User name* and *Company name*, press **Next**, then press **Next** to accept the default Web application destination.

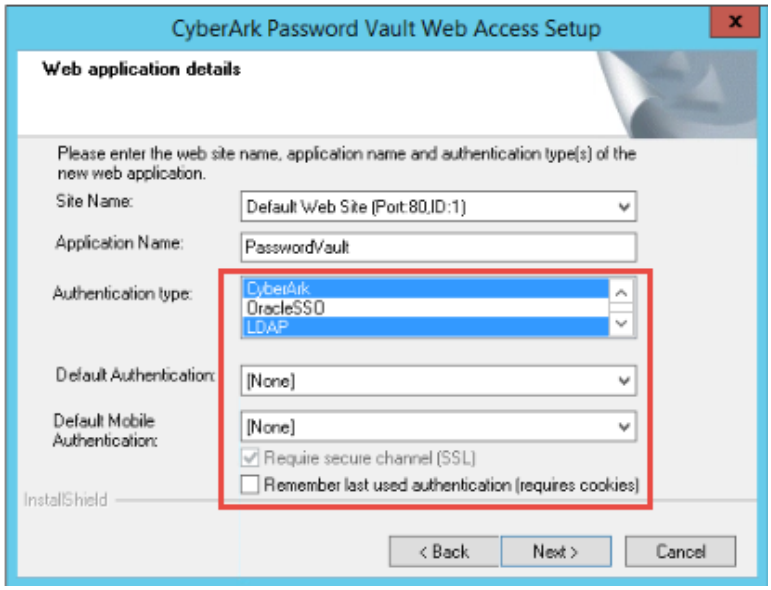




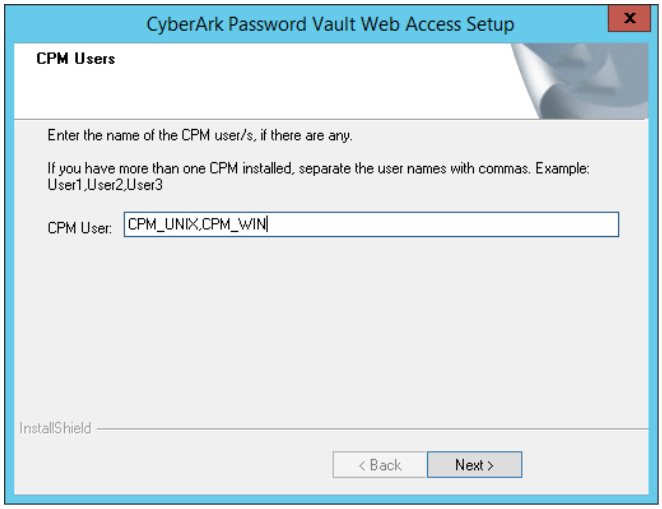
4. Press **Next** to accept the default Configuration files destination and press **Next** to accept both **Setup Type** options.



5. On the **Web application details** window, select **CyberArk** and **LDAP** as the *Authentication Type*. Choose **None** in *Default Authentication* and *Default Mobile Authentication* fields and confirm that **Require secure channel (SSL)** is checked.



6. Enter **CPM_UNIX,CPM_WIN** in the *CPM User* field and press **Next**.



7. Validate the PVWA installation.

   a. Check the PVWAInstall.log in directory “C:\Users\Administrator\AppData\Local\Temp\1”

   b. Open Internet Explorer and confirm that the PVWA login page is displayed. This step validates that the PasswordVault application is communicating with the PrivateArk Server. Use URL “https://comp01b.cyber-ark-demo.local/PasswordVault/”

8. Configure the IIS 403 error page redirecting HTTP traffic to HTTPS (443), and add an IIS redirect to prevent users from accessing the default web site, as you did on the first component server. However make sure to redirect using the specific FQDN of the current Comp01b server, in the URL (i.e., **https://comp01b.cyber-ark-demo.local/PasswordVault**).

9. Run IISRESET and test.

   a. Open a browser and make sure you can login to the PVWA using https (**https://comp01a.cyber-ark-demo.local/passwordvault/**).

   b. Test IIS redirection with an attempt to access the default web site, and connecting to the /PasswordVault application using HTTP.

   c. Make sure to test from the other component server. IIS will not redirect local requests.

Hardening the CyberArk CPM and PVWA Servers

Hardening the component servers is a combination of automatic and manual procedures. The instructor has provided the "Hardening the CPM and PVWA Servers" guide for this class. This document is used as a reference during these exercises.

We will not be implementing automatic hardening via GPO in this lab, but we will be reviewing the documentation and implementing a few manual hardening procedures.

General Configuration for all Deployments

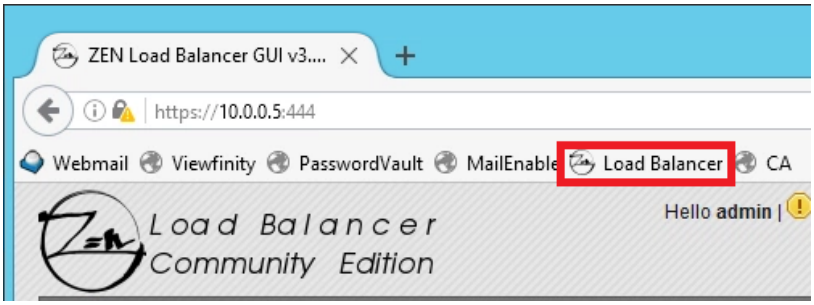
Review section "General Configuration for all Deployments" for guidance on recommended security practices for hardening the CyberArk components in your organization. Many of these recommendations may already be standard practice for many companies.

IIS Hardening (PVWA Only)

1. Search on "IIS Hardening (PVWA Only)" and execute the following listed procedures to harden Comp01a and Comp01b servers. Restart the servers as needed.
    a. Shares (Skip this step)
        i. Because this lab will co-host PSM and PVWA, we cannot disable the Administrative Shares.
    b. Application Pool
    c. Web Distributed Authoring and Versioning (WebDAV)
    d. MIME Types (Recommend making a backup copy of applicationHost.config prior to changes)
    e. SSL/TLS Settings
        i. Disable SSL V2.0, v3.0 and TLS 1.0 and TLS 1.1.
        ii. Enable TLS 1.2
        iii. Be certain to enable .NET Framework to use TLS1.2

Configure the External Load Balancer for the PVWA servers

1. Open a browser on the **Comp01a** server to log on to the **Load Balancer** using the address: https://10.0.0.5:444 (*User Name*: **admin**/*Password:* **admin**). You should also be able to find a bookmark on your browser. Prior to performing this step, make sure that your Load Balancer is powered on.



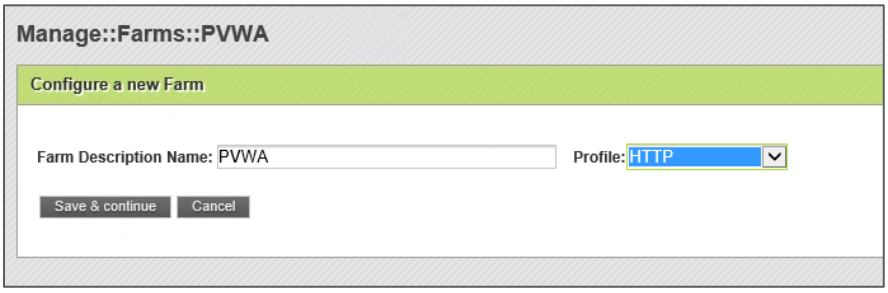
2. First, go to "**Settings** > **Interfaces**", then click on the "**add virtual network interface"** button.

3. Set the *Name* to **eth0:1** and *Addr* to **10.0.22.1,** then click on the "Save Virtual Interface" option, located in the Actions column as shown below.

4. Next, Click on **Manage** > **Farms** to configure a new farm.

5. Enter *PVWA* in the **Farm Description Name** field and change the Profile type to **HTTP**.

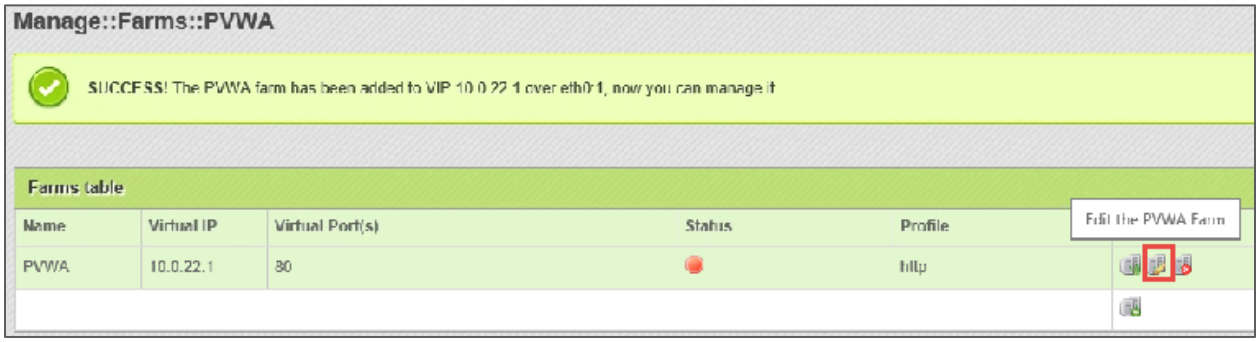
6. Click on **Save and Continue.**



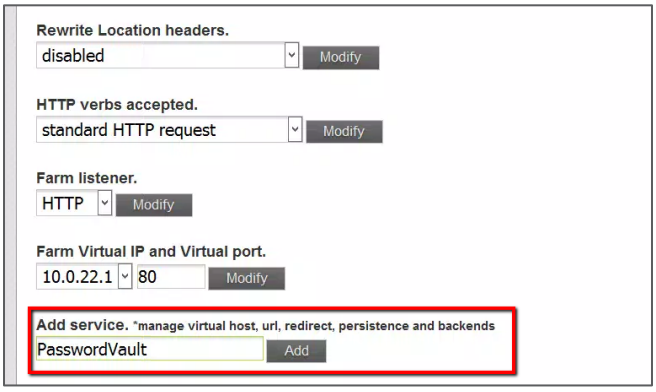
7. Select the new interface **eth0:1->10.0.22.01** in *Virtual IP*, enter **80** as the *Virtual Port* for the farm and click **Save**.

8. Next, click on "**Edit the PVWA Farm**".

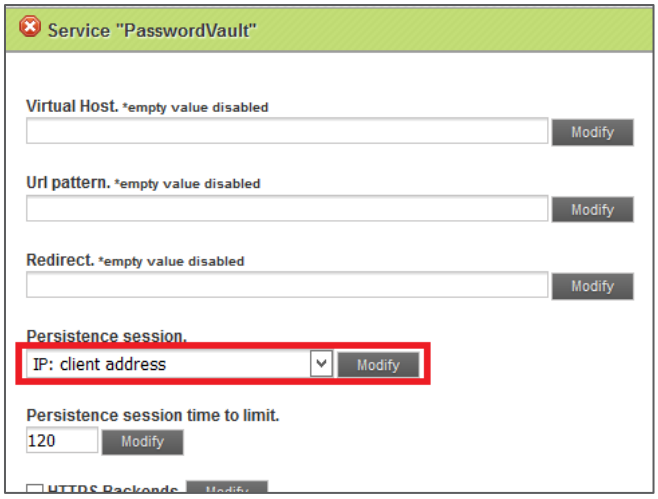
Note:	The Farm Management window may open in a separate browser window.



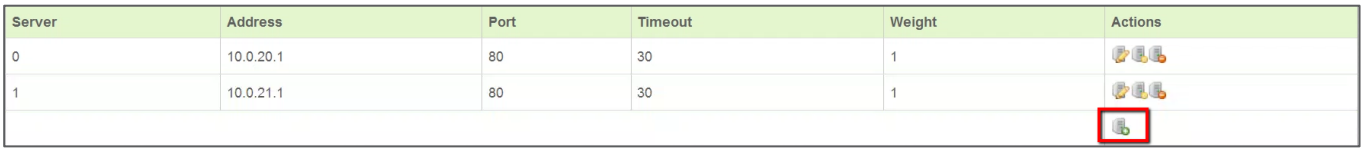
9. Scroll down to *Add Service*. Enter **PasswordVault** as the name and click **Add**.



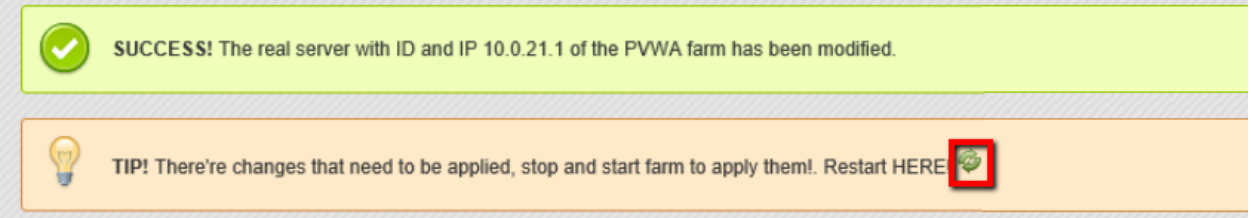
10. Scroll down to section “Service “PasswordVault”. Change *Persistence Session* to IP**: client address** and click **Modify**.



11. Next, scroll down to add the real servers (IP addresses for Comp01A and Comp01b, e.g. **10.0.20.1** and **10.0.21.1**, *Port*: **80**, *Timeout*: **30**, *Weight*: **1**).

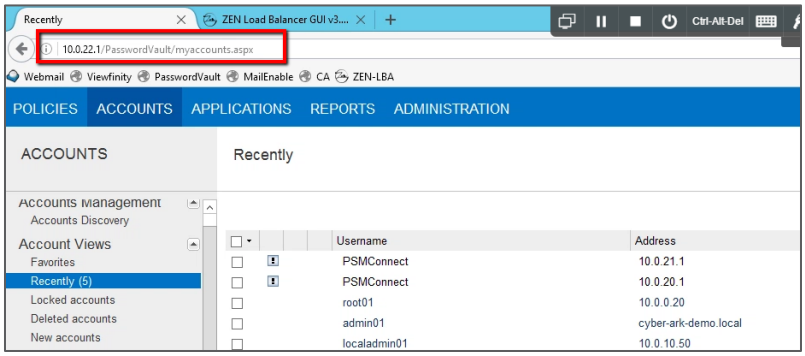


12. Scroll back to the top of the screen and click the link labeled “Restart HERE!” to restart the farm to apply all the changes.



13. Make sure the status of the farm changes to "*up*" after you save the configurations and restart the farm:

14. Next, use the browser to login to **the PVWA using the virtual IP of the farm, e.g. http://10.0.22.1/PasswordVault. As there is no SSL certificate on the load balancer, do not use *https* for the VIP, but note that the IIS redirects** configured earlier will redirect the http request to HTTPS.



15. Try opening multiple sessions.

    a. You may discover that the ZEN LB'er does not alternate every connection. This is a ZEN issue that we will not attempt to resolve in this lab exercise.

    b. You can test the LB'er by stopping the World Wide Web Publishing service on either PVWA server, then attempt to access http://10.0.22.1/passwordvault. The LB'er should direct you to the only available PVWA.

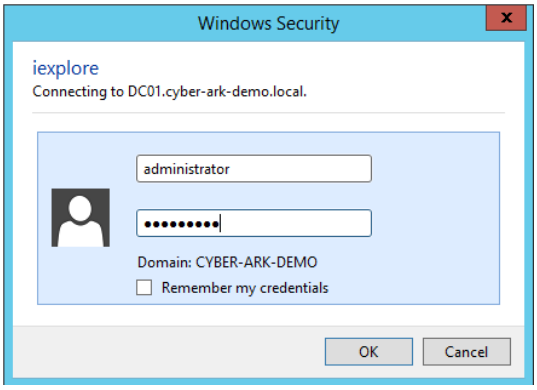
Integrations

LDAP Authentication (over SSL)

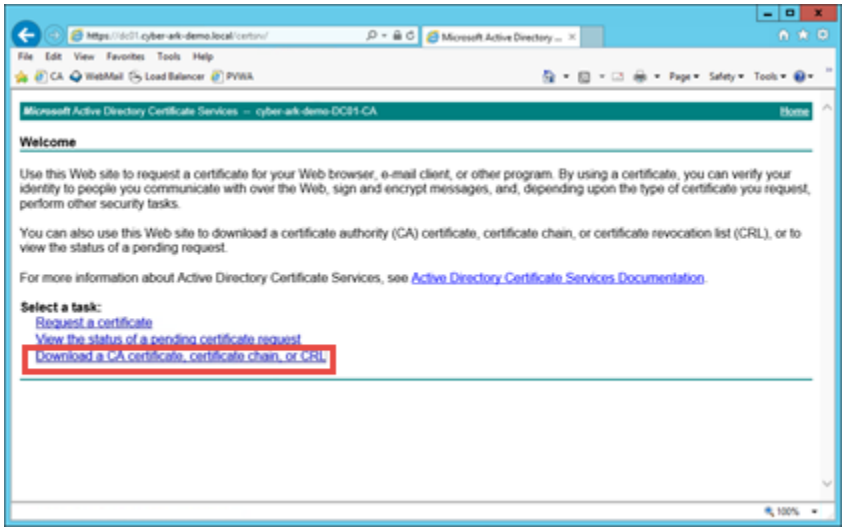
To configure the vault to use LDAP over SSL connections, we first need to acquire, then import the Certificate Authority root Certificate that signed the certificate used by the External Directory, into the Windows certificate store on the Vault Server to facilitate an SSL connection between the Vault and the External Directory.

Please note when integrating with LDAP that the Customer has already created 3 LDAP groups required for the initial directory mappings: ***CyberArk Vault Admins***, ***CyberArk Auditors*** and ***CyberArk Users.*** Once you complete the LDAP integration, you will be able to log on with your administrative user *vaultadmin01* and your auditor user *Auditor01*.

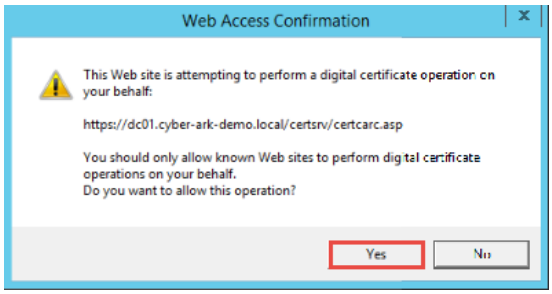
1. On either component server, browse to https://dc01.cyber-ark-demo.local/certsrv. Prior to performing this step, make sure that your DC server is powered on.
    a. Log into the web page as *Administrator/Cyberark1*.



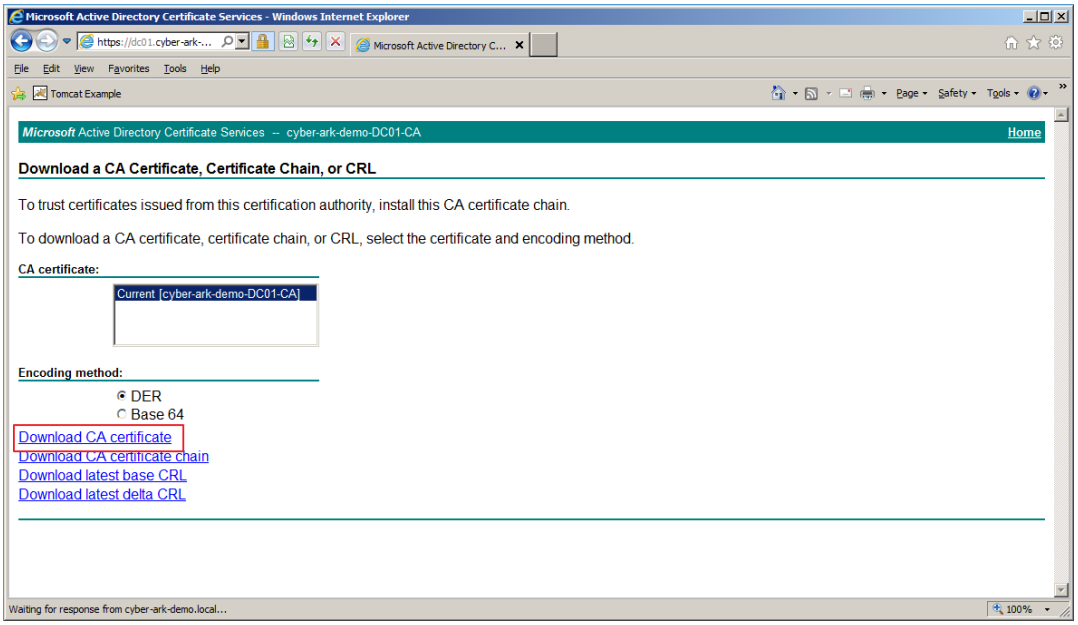
2. Click on Download a CA certificate, certificate chain, or CRL.



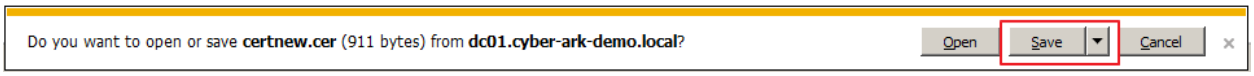
3. Click Yes to allow this operation.



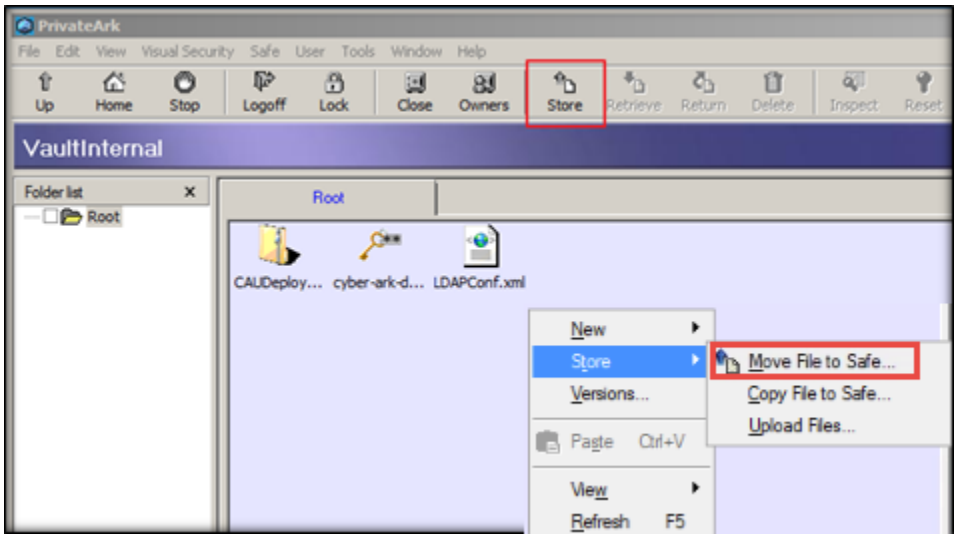
4. Click Download CA certificate.



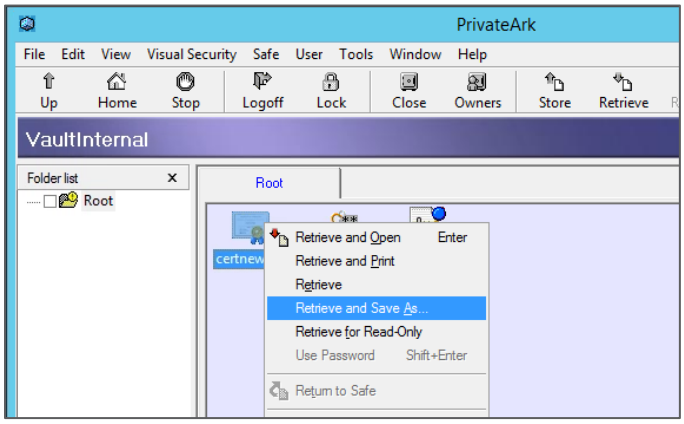
5. Click **Save** to store the certificate in the Downloads folder.



6. Log into PrivateArk Client as Administrator.
7. Open and Enter the VaultInternal safe.
8. Click the Store menu option, or right click in the body of the safe, and select Store, Move File to Safe. Navigate to the Downloads folder and select the file just downloaded, certnew.cer.



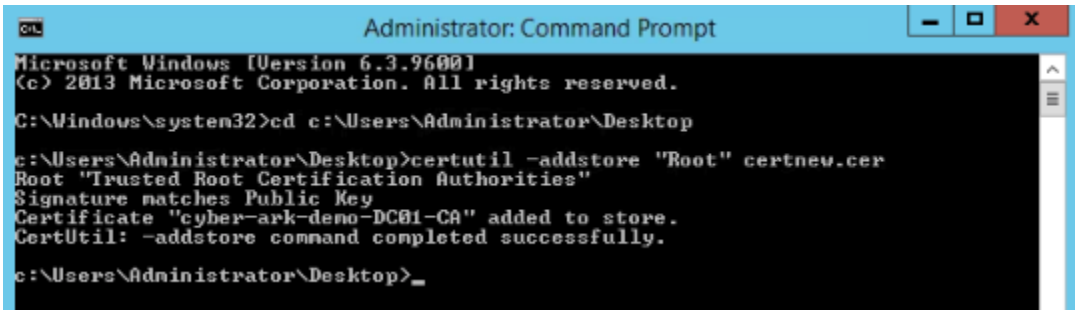
9. Logoff from PrivateArk Client on the Components Server.
10. Log into PrivateArk Client on the Vault server as Administrator.
11. Open and Step into the VaultInternal safe. Right click certnew.cer and click Retrieve and Save As…



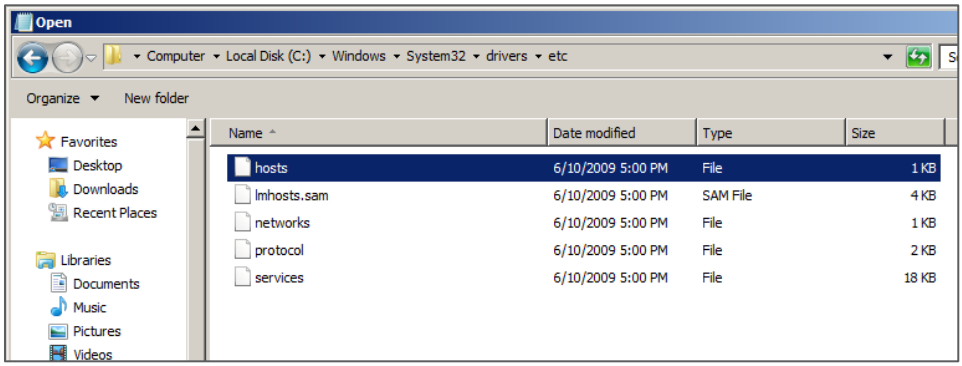
12. Save the file to the Desktop.
13. Right click the Start Menu and select Command Prompt (Admin). Change the current directory to “c:\Users\Administrator\Desktop” and enter the following command.

Note:	Confirm the file name to be accurate.

```
certutil –addstore “Root” certnew.cer
```



14. Remain at the Administrator Command Prompt, and launch Notepad.
15. In Notepad, open C:\Windows\System32\drivers\etc\hosts. Hint: it may be hidden.



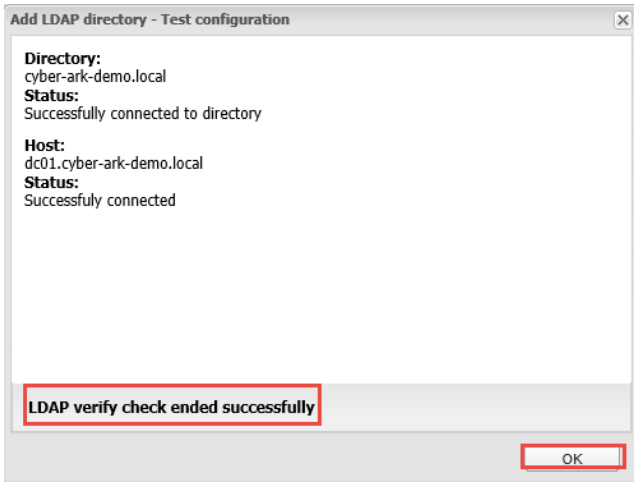
16. Add the following line to the end of the file.

```
10.0.0.2    dc01.cyber-ark-demo.local
```

17. Log off the Vault, and log back onto either Component Server.
18. Login to the PVWA as Administrator using CyberArk authentication.
19. Navigate to the Administration tab and run the Setup Wizard.
20. Select LDAP integration and configure with the following parameters.

Name:	cyber-ark-demo.local
Directory Type:	MicrosoftADProfile.ini
Address:	dc01.cyber-ark-demo.local
Port:	636
LDAP Bind User:	BindAccount
LDAP Bind Password:	Cyberark1
LDAP Base Context:	dc=cyber-ark-demo,dc=local

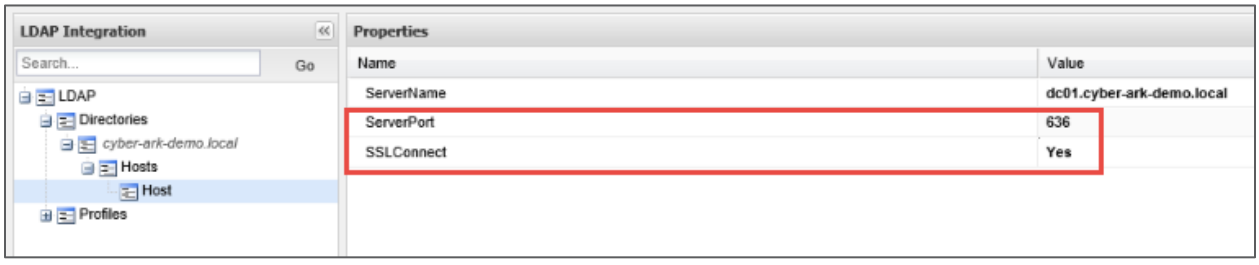
21. Test the connection and if successful, click Save and continue. Troubleshoot as needed.
    a. Tip: Change the Address to the IP Address of DC01, 10.0.0.2 without changing any other parameter and retest. If successful, what might be solution?
    b. Tip: Change the port to 389 without changing any other parameter and retest. If successful, what might be solution?



22. At the 'LDAP Configuration Setup' screen, type the word Cyber in each field, and wait for the vault to query the external directory and display a list of groups that match.
    a. Select the appropriate group for each field.
    b. When complete, click Finish.

Define Vault Admin Group:	CyberArk Vault Admins
Define Auditors Group:	CyberArk Auditors
Define Users Group:	CyberArk Users

23. Login to the PVWA as vaultadmin01/Cyberark1 and navigate to ADMINISTRATION > LDAP Integration.
24. Expand Directories, and select cyber-ark-demo.local.
25. Ensure that parameter SSLConnect is set to Yes.
26. Ensure that each host defined below the directory entry, is configured to ServerPort 636 and SSLConnect=Yes.

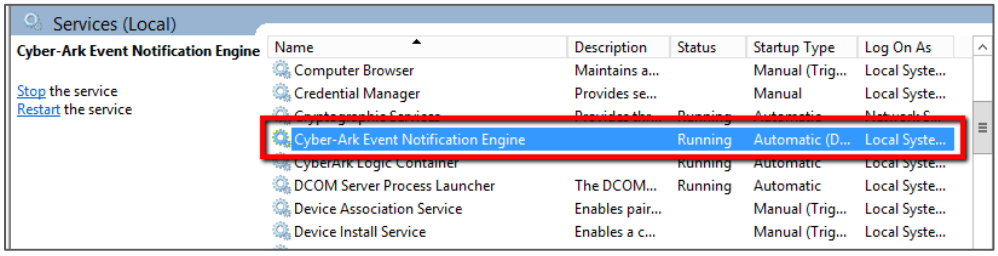


27. Test your LDAP/S integration by logging into PVWA as vaultadmin01/Cyberark1 using LDAP authentication.

SMTP Integration

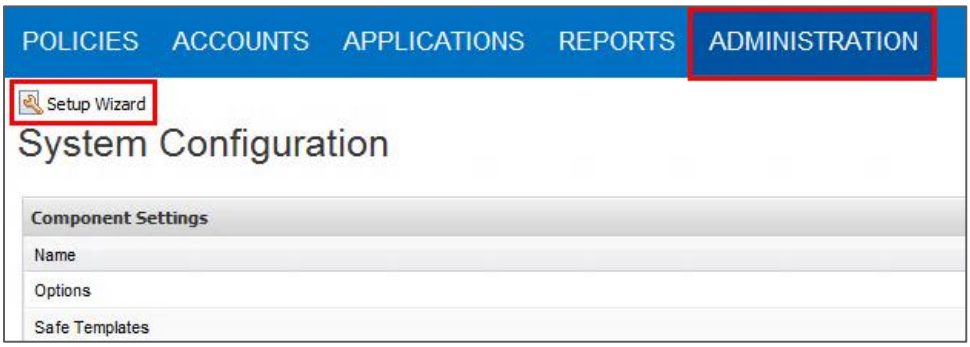
For this section, we are going to login as the *vaultadmin01* (an LDAP user) and configure the SMTP integration. By logging in as *vaultadmin01* you will create the user profile in the **Vault** and allow a test email to be sent to *vaultadmin01*.

Note:	Prior to setting up the SMTP integration, verify that the *CyberArk Event Notification Engine (ENE)* service is running on the **Vault**, otherwise you will not receive the test email.

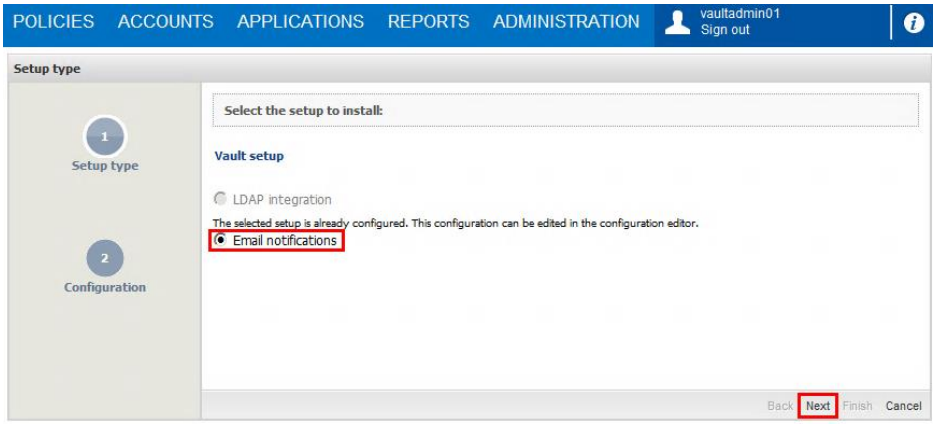


16. On the **Components** Server, launch the **PVWA** and select **LDAP** as the Authentication method. Login as *vaultadmin01*.

17. Go to the **ADMINISTRATION** tab and Press the **Setup Wizard** button.



18. Select *Email Notifications* and click **Next**.

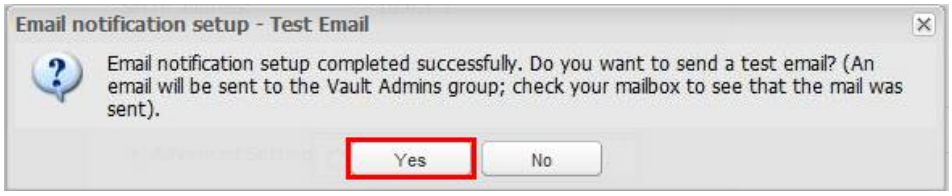


19. Enter the following:

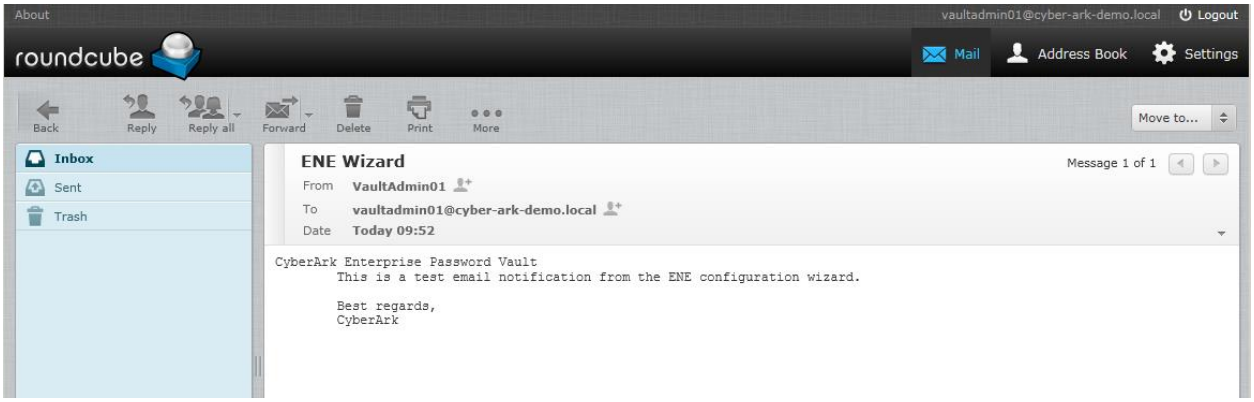
SMTP address:	*10.0.0.2*
Sender Email:	*vaultadmin01@cyber-ark-demo.local*
Sender Display Name:	*VaultAdmin01*
SMTP Port:	*25*
PVWA URL:	*<Accept the default>*

20. Press **Finish**.

21. Press **Yes** to send a test e-mail.

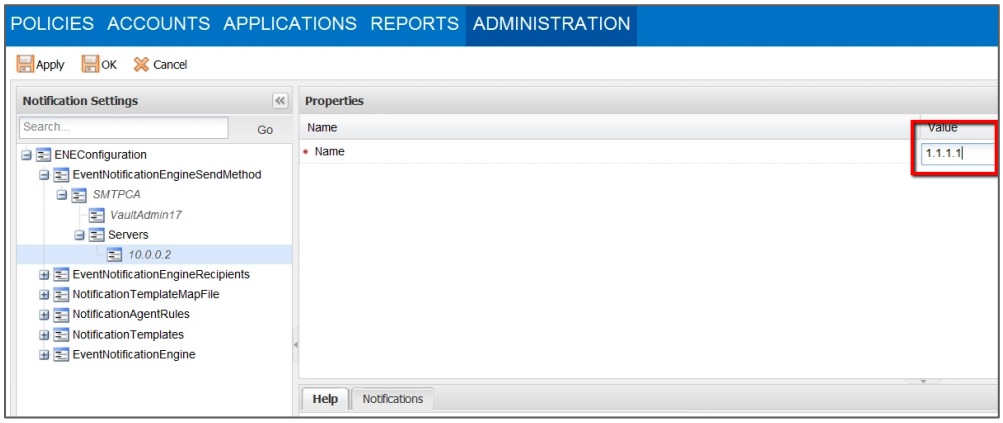


22. On the **Component Server**, browse to the email client at http://cyber-ark-demo.local:8073/webmail/. There should be a link called "Webmail" in the bookmarks bar.
    a. Login as *vaultadmin01* / *Cyberark1*.
    b. Ensure that you receive the email from the ENE Wizard.



23. Close the Webmail application.

Troubleshooting:	If you need to run the wizard again, you can change the IP address of the SMTP server to *1.1.1.1* and save, as shown below.

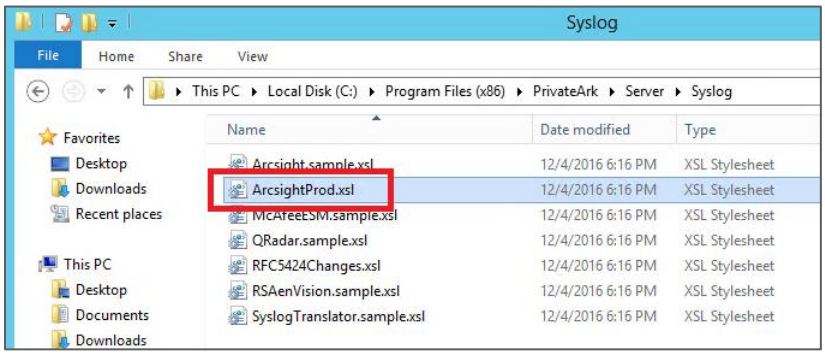


SIEM Integration

For the first part of this exercise we will login to the **Vault** server to prepare the vault to communicate with the SIEM. This section will demonstrate how to forward audit records to a SIEM server, such as *Arcsight* or *enVision*.

Setting up SIEM Integration

1. Login to the **Vault** server as *Administrator / Cyberark1*.
2. Open Windows File Explorer and navigate to:
   C:\Program Files(x86)\PrivateArk\Server\Syslog.
3. Make a copy of the file *Arcsight.sample*.xsl and rename to *ArcsightProd.xsl.*



4. Go to C:\Program Files(x86)\PrivateArk\Server.
   a. Edit the DBPARM.sample.ini file. Copy the entire [SYSLOG] section.
   b. Edit the dbparm.ini file. Paste the entire [SYSLOG] section to the bottom of the file, overwriting the existing [SYSLOG] section.
   c. Edit the [SYSLOG] section as shown below. Be sure to remove the * from the beginning of each line.

```
SyslogTranslatorFile=”Syslog\ArcsightProd.xsl”
SyslogServerIP=10.0.0.20
SyslogServerPort=514
SyslogServerProtocol=UDP
SyslogMessageCodeFilter=0-999
SyslogSendBOMPrefix=NO
UseLegacySyslogFormat=yes
```

Note: The settings above will forward all *syslog* messages to the SIEM server. See the PIM Suite implementation guide for instructions on filtering these messages.

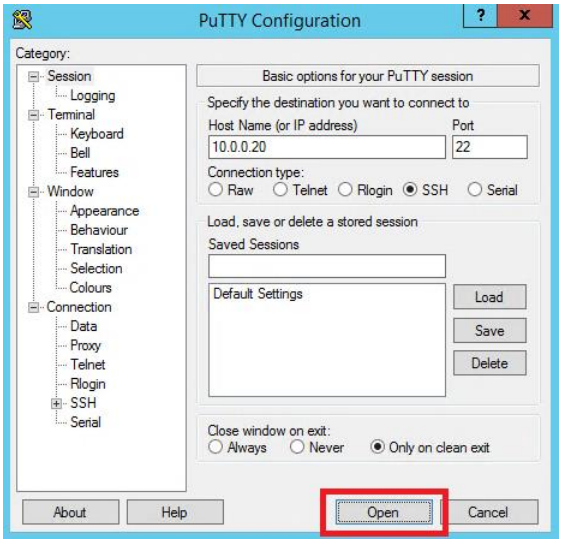
5. Save and exit the file.
6. Restart the PrivateArk Server service to read the changes made to dbparm.ini into memory. It is best to do this from the Server Central Administration applet, on your desktop.
7. If the server fails to start, check for typos in the *dbparm.ini* file.

Note: For this next section of the exercise we will be using the **Component Server**.

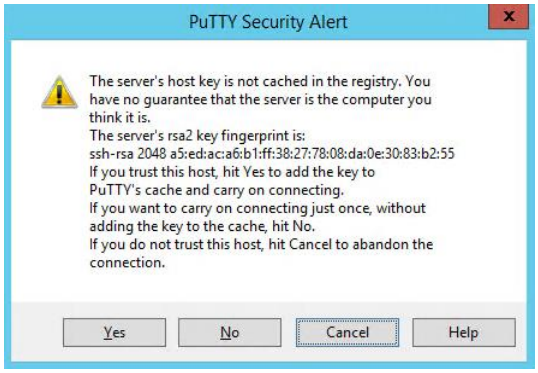
1. Login to either component server.

2. Launch **putty** from the *Windows Taskbar*.

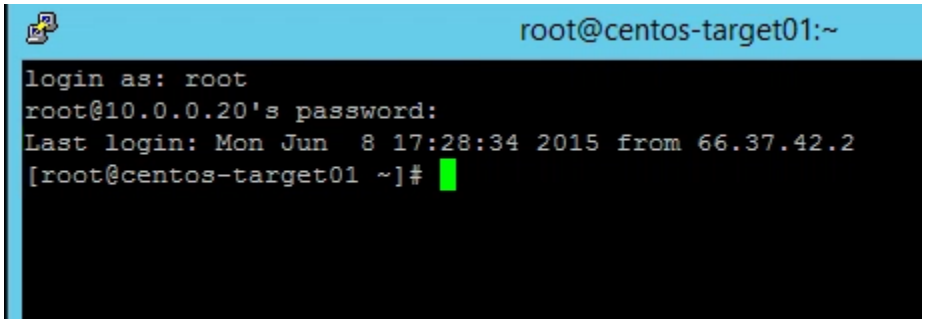
3. Enter *10.0.0.20* as the **Host Name or IP address)** and click **Open** to launch an SSH connection.



4. Click **Yes** to accept the server's key.

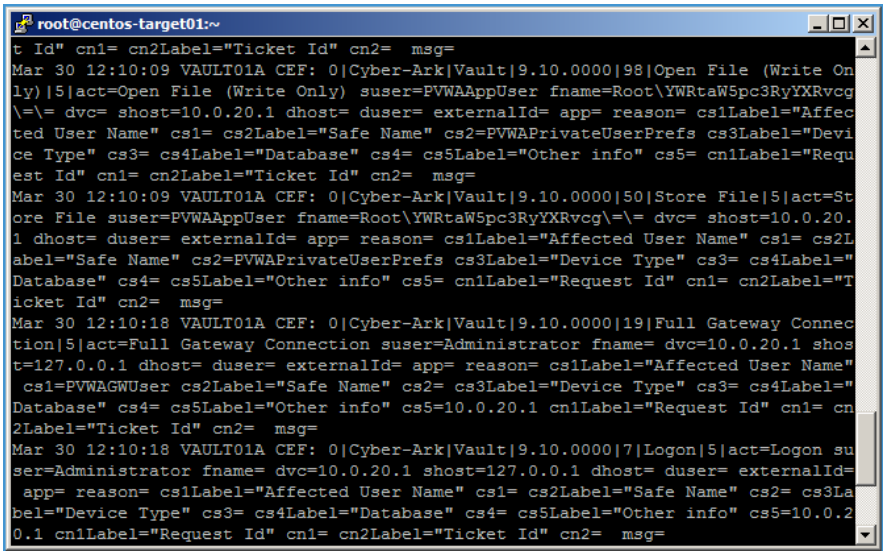


5. Login as *root01* with the password *Cyberark1*. Accept any security warning you may receive.



6. Launch the following command. Be sure to replace *XX* with your user number.

```
cat /var/log/messages | grep VAULT01
```



Note:	If you want to view the running activity log of your **Vault** in this window, you can modify the command and leave this window open with this command running while you work on other exercises and view what activities are logged as you go. To do this, replace “cat” with “tail -f”.

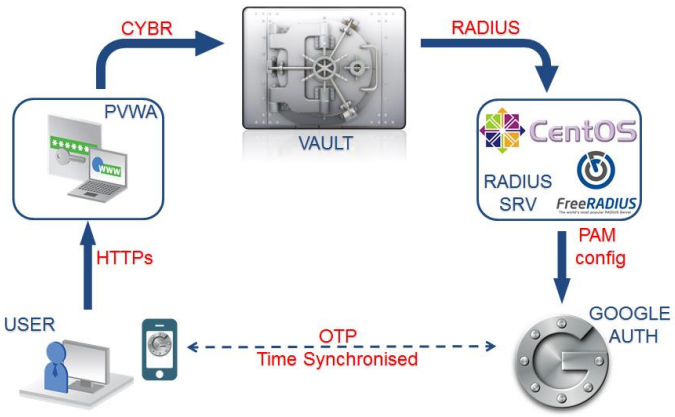
Authentication Types

In this section you will configure multiple authentication methods. Detailed information on authentication can be found in the Privileged Account Security Installation Guide in section "Authenticating to the Privileged Account Security Solution".

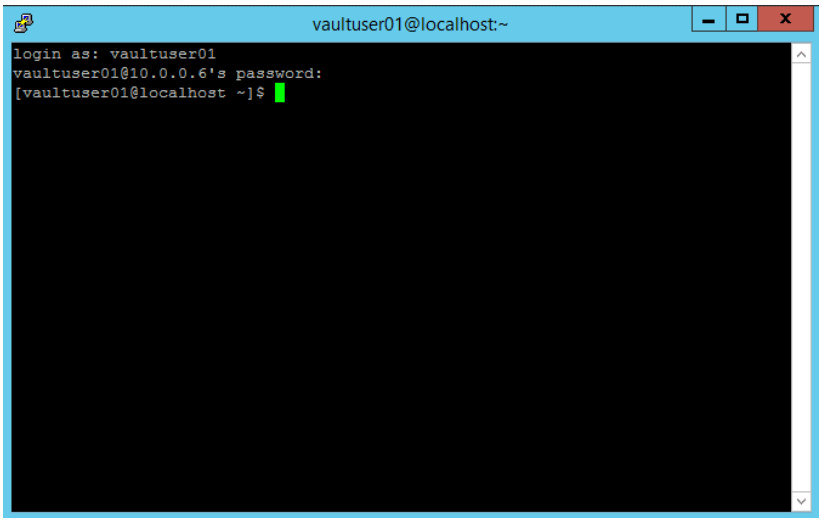
RADIUS Authentication

In this section you will enable RADIUS authentication for the customer, and test 2 Factor Authentication.

NOTE: For this assignment you have the option to download the application "Google Authenticator" to your smartphone. If you do not wish to install the app on your phone you may use the emergency scratch codes that will be provided to you when you register your ***vaultuser01*** user to Google Authenticator.



1. First, launch PuTTY from the Components server and use SSH to connect to the RADIUS server (10.0.0.6) with *vaultuser01/Cyberark1.*



2. Next, run the command “google-authenticator” to register your vaultuser01 account:

```
[vaultuser01@localhost ~]$ google-authenticator

Do you want authentication tokens to be time-based (y/n) y
https://www.google.com/chart?chs=200x200&chld=M|0&cht=qr&chl=otpauth://totp/vaultadmin01@localhost.localdomain%3Fsecret%3D3CLLATZIIKJUZ737
Your new secret key is: 3CLLATZIIKJUZ737
Your verification code is 604700
Your emergency scratch codes are:
  57556538
  55330792
  36858217
  20147572
  18965930

Do you want me to update your "/home/vaultuser01/.google_authenticator" file (y/n) y

Do you want to disallow multiple uses of the same authentication
token? This restricts you to one login about every 30s, but it increases
your chances to notice or even prevent man-in-the-middle attacks (y/n) n

By default, tokens are good for 30 seconds and in order to compensate for
possible time-skew between the client and the server, we allow an extra
token before and after the current time. If you experience problems with poor
time synchronization, you can increase the window from its default
```

```
size of 1:30min to about 4min. Do you want to do so (y/n) n

If the computer that you are logging into isn't hardened against brute-force
login attempts, you can enable rate-limiting for the authentication module.
By default, this limits attackers to no more than 3 login attempts every 30s.
Do you want to enable rate-limiting (y/n) y
```

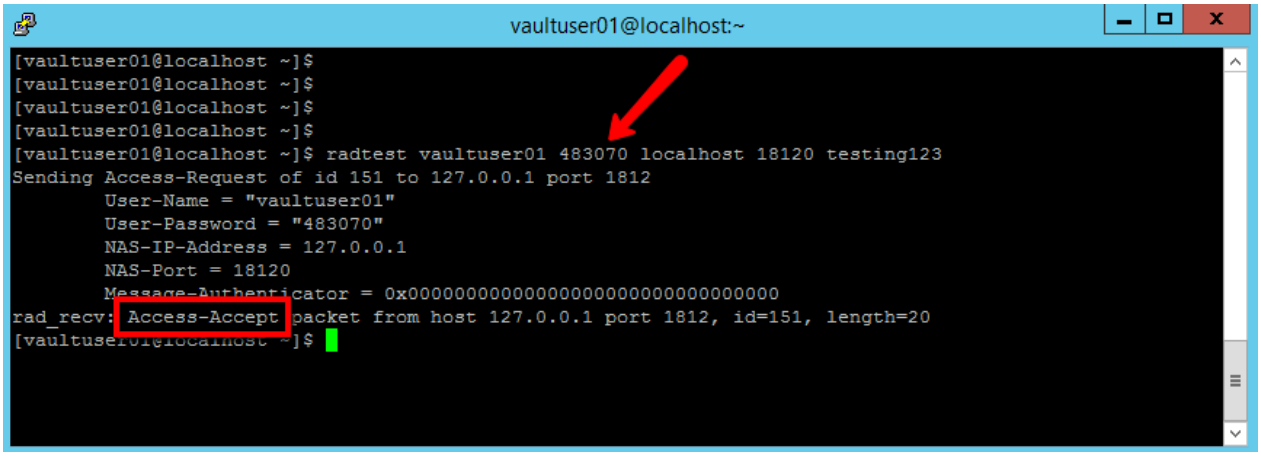
3. Copy the URL displayed by Google Authenticator and paste it into your browser to register this new user on your Google Authenticator App. (Tip: click the top left context menu and select “Copy All to Clipboard”, then paste into Notepad) This app will present you with a new OTP every x seconds to be used to authenticate as this user.627

As mentioned before, if you do not wish to install the app on your phone you may use the emergency scratch codes that were provided to you when you register your *vaultuser01* user to Google Authenticator.63

Simply copy the link from the PuTTy session to the browser. The link will present you a QR code that you can easily scan to setup the new account. Alternatively, you could use the secret key to manually create the account.

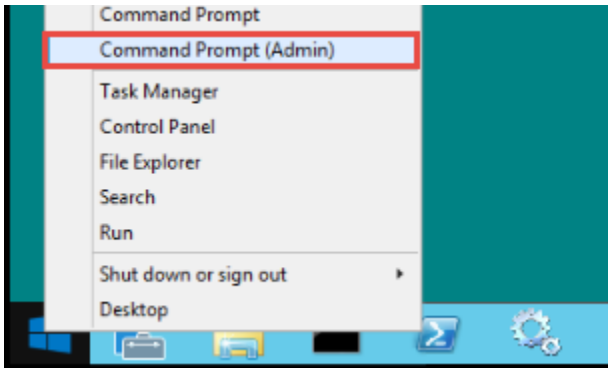
4. To verify the radius integration works locally, use the following command and verify you receive Access-Accept in the reply:

radtest vaultuser01 <token> localhost 18120 testing123



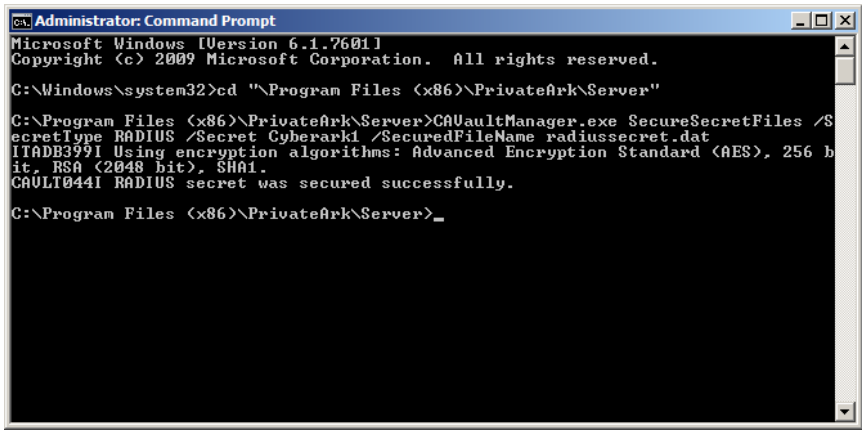
In this lab, the vault server has already been defined as a RADIUS Client at the RADIUS Server. The following steps will enable the vault to authenticate with the RADIUS Server using a RADIUS Secret (Cyberark1) created by the RADIUS Administrator.

5. Save the RADIUS Secret to the encrypted file name, radiussecret.dat. Login to the Vault server and open a command line prompt as administrator.



6. Enter the following commands

```
cd \"Program Files (x86)\PrivateArk\Server"

CAVaultManager.exe SecureSecretFiles /SecretType RADIUS /Secret Cyberark1
/SecuredFileName radiussecret.dat
```



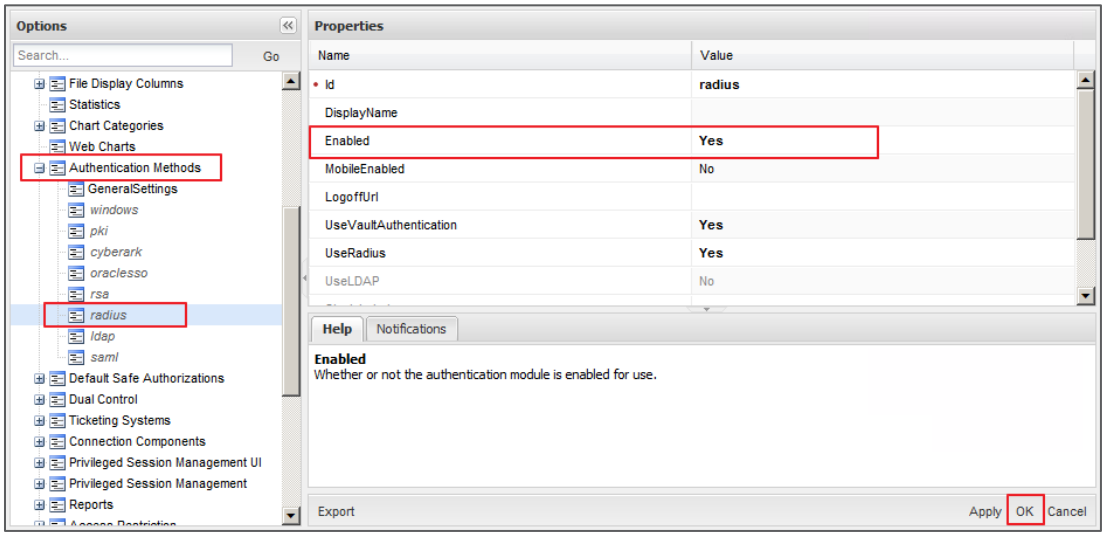
7. Next, open dbparm.ini in notepad and add the following two lines to the end of the file. Save the changes to the dbparm.ini and restart the PrivateArk Server.

```
[RADIUS]
RadiusServersInfo=10.0.0.6;1812;vault01a;radiussecret.dat
```

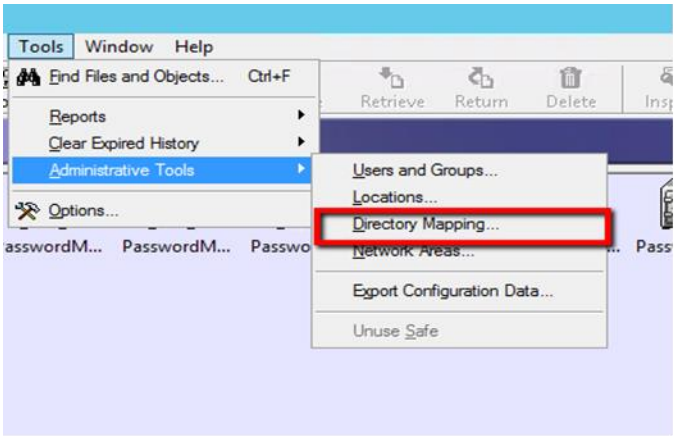
8. Restart the PrivateArk Server service to read the changes made to dbparm.ini into memory. It is best to do this from the Server Central Administration applet, on your desktop.

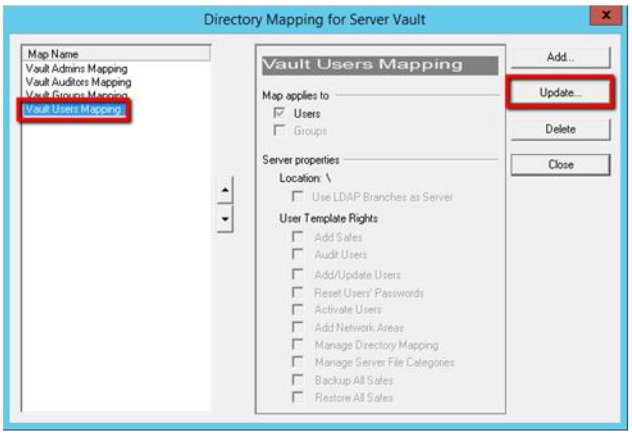
9. Login to the PVWA from a component server, as VaultAdmin01.

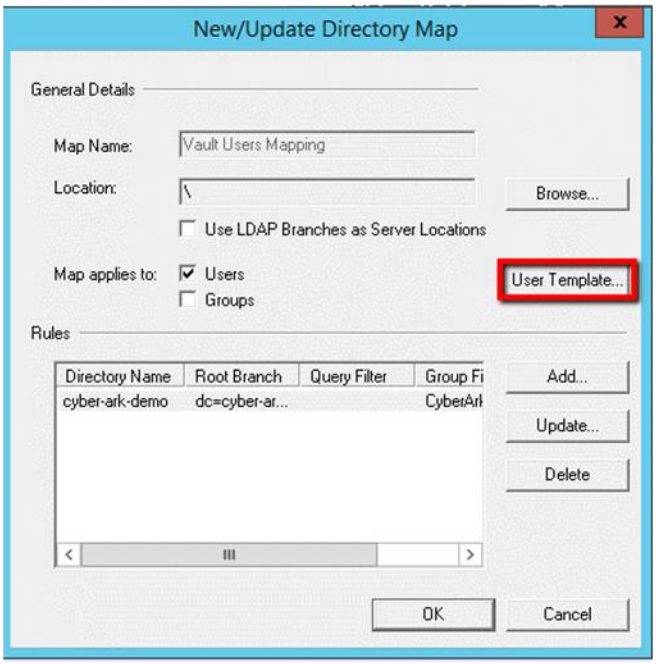
10. Navigate to Administration > Web Options > Authentication Methods > radius and Enable Radius authentication. You can also add a custom entry for “PasswordFieldLabel” to notify the user they need to authenticate using the token.

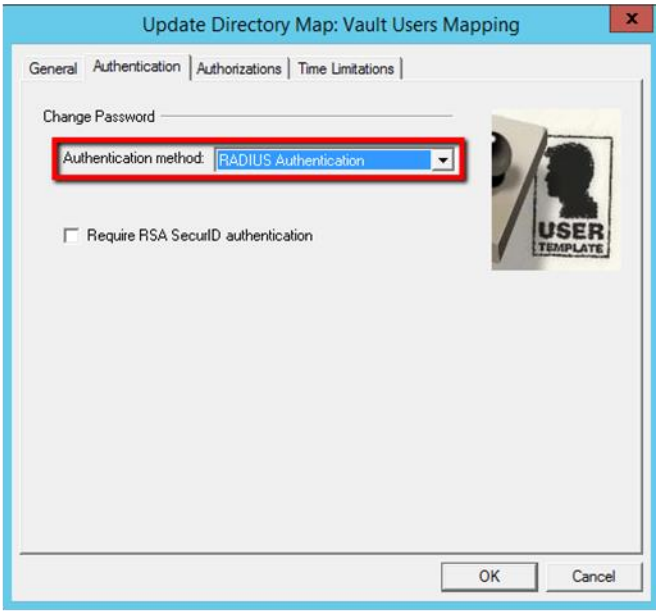


11. Logout of the PVWA.
12. Using the PrivateArk Client, login to the Vault as Administrator.
13. Update the Vault Users Directory Mapping. Edit the User Template, Authentication method to RADIUS Authentication. This will cause all new vault users from that group to use RADIUS.



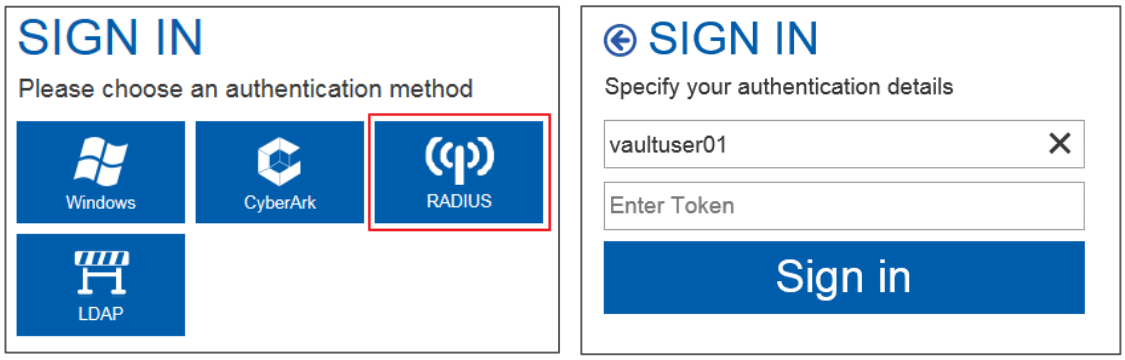






14. Logout of the PrivateArk Client.

15. At the PVWA login, attempt to login as vaultuser01 using RADIUS authentication. Verify you can login using the OTP provided to you by google-authenticator:

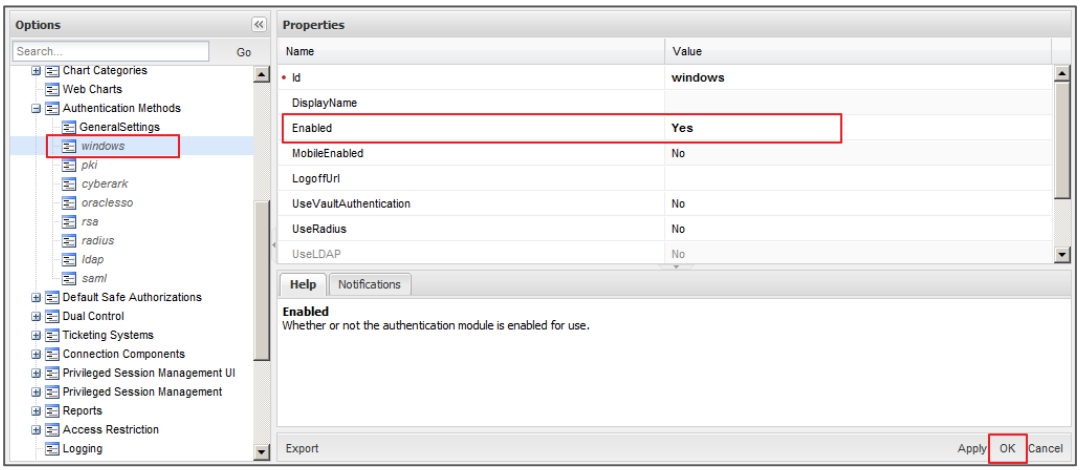


Windows Authentication

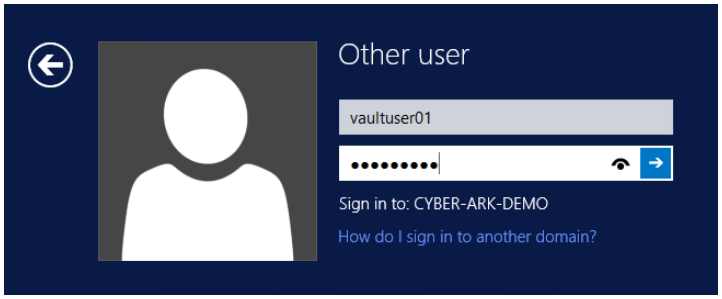
Note:	Windows Authentication for the PVWA is subject to IE security policies and the user experience will be highly dependent on the Intranet and / or Trusted Site settings. The next exercises will be using the vaultuser01 account using LDAP authentication. You should reset the CyberArk Users directory map to require LDAP authentication, and delete the vaultuser01 account from the PrivateArk Client.

1. Login to the PVWA as Vaultadmin01.

2. Navigate to Administration > Options > Authentication Methods > windows and set *Enabled* to Yes.

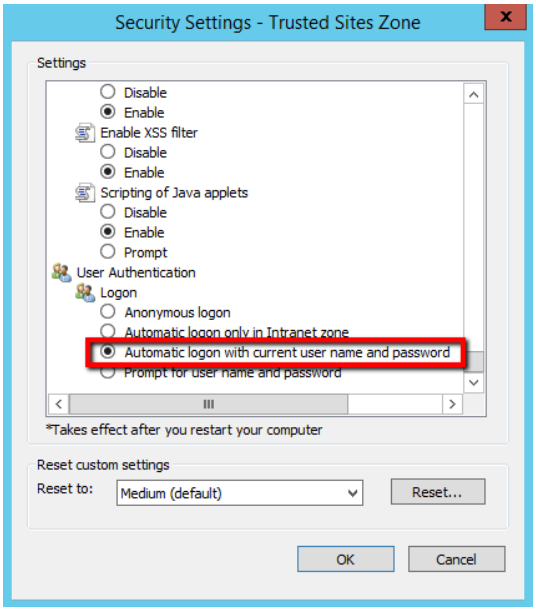


3. Logoff from the components server and login as vaultuser01/Cyberark1. If the Windows Authentication option is not available, run an IISRESET.



4. Browse to the PVWA via the load balanced VIP (10.0.22.1) or (http://comp01X.cyber-ark-demo.local/passwordvault/) and choose the Windows Authentication Method.

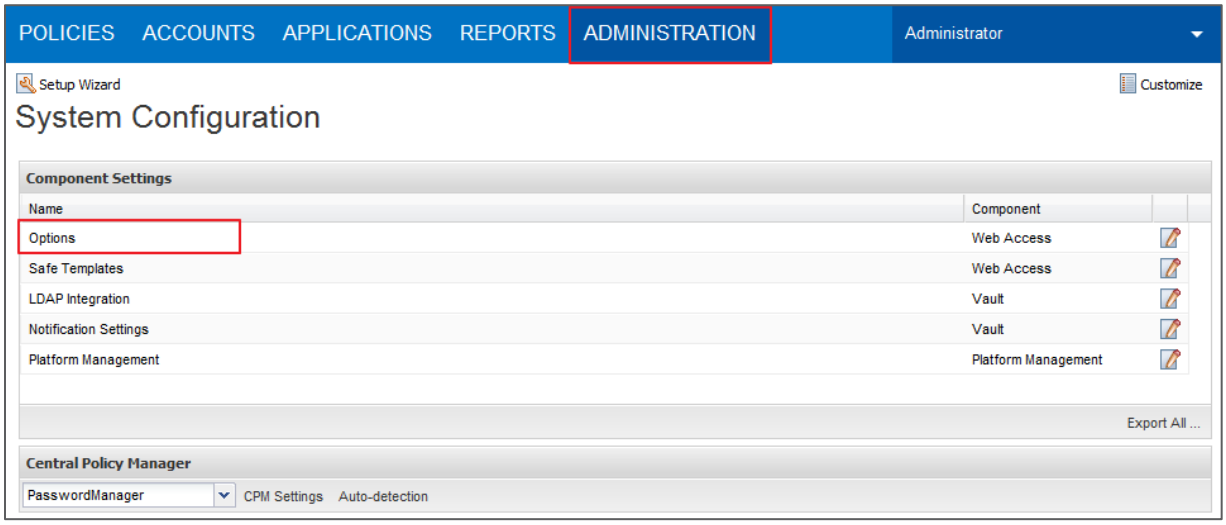
Note:	You may still be prompted for credentials depending on the Security Settings for the Intranet or Trusted Sites zone. To use Windows authentication as single sign-on, add the URL of the PVWA to the list of trusted sites and change the browser's security settings for Trusted Sites as follows:



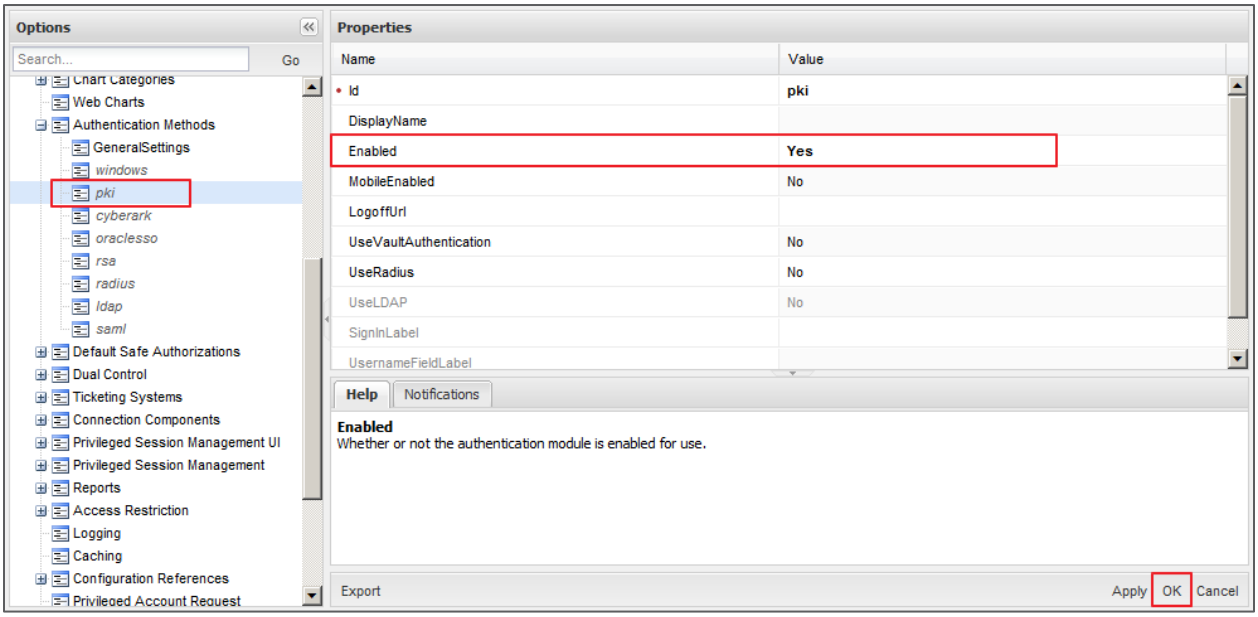
PKI Authentication

PKI authentication allows the user to authenticate via Digital Certificate that can be stored on a SmartCard or USB token. In this lab, we will provision a Digital Certificate that will be stored in the users Personal Certificate Store in Windows.

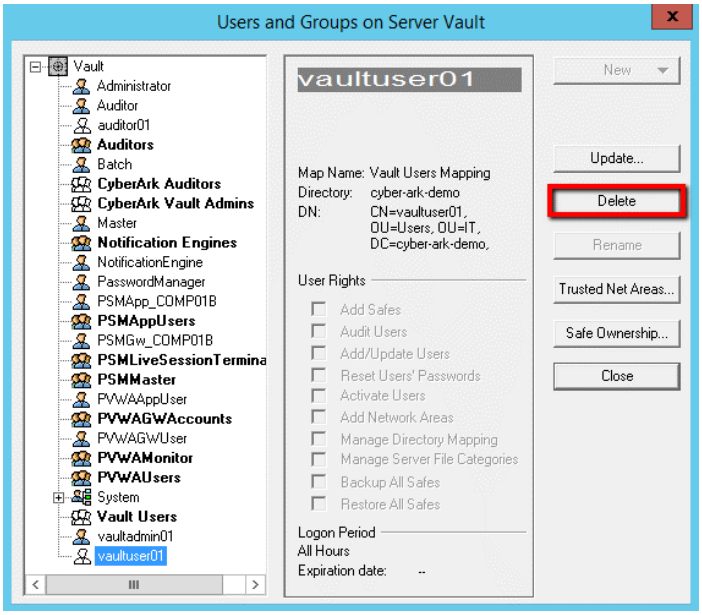
1. Login to the PVWA as Vaultadmin01. Open the Web Options Configuration.



2. Navigate to Authentication Methods > pki and Enable PKI authentication.

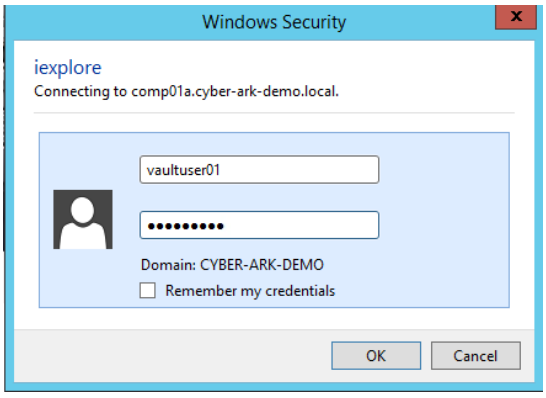


3. Login to the PrivateArk client as administrator and delete your vaultuser01 user:

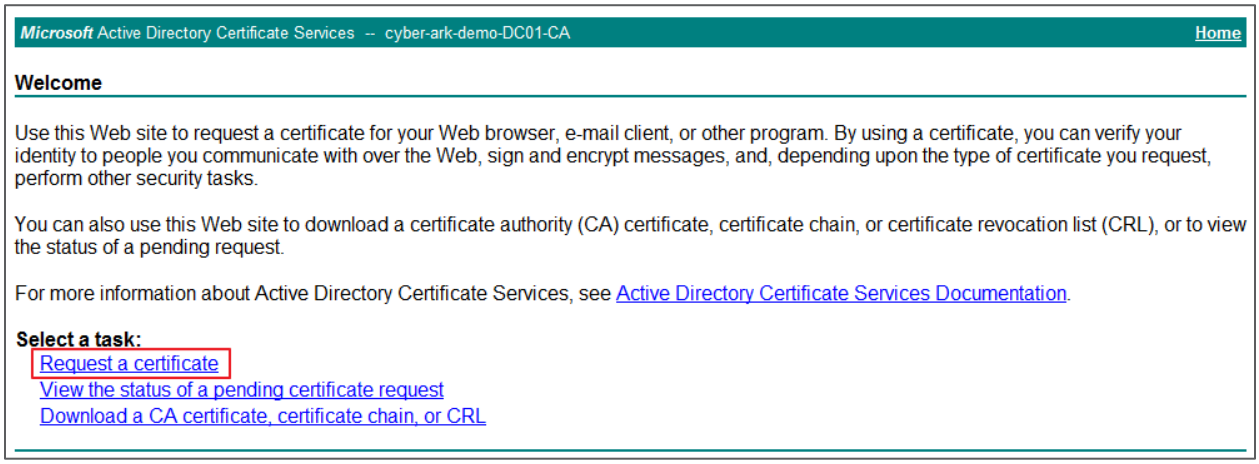


4. Log off of the components server and log back in as vaultuser01.

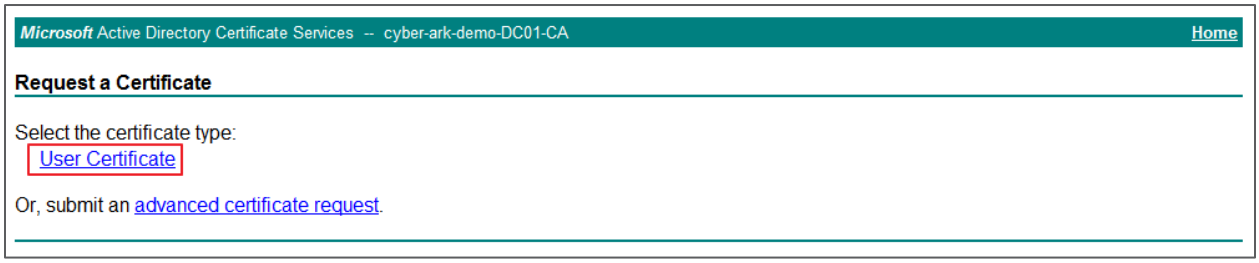
5. Using Internet Explorer (not FF or Chrome) browse to https://dc01.cyber-ark-demo.local/CertSrv. If prompted login as vaultuser01/Cyberark1.



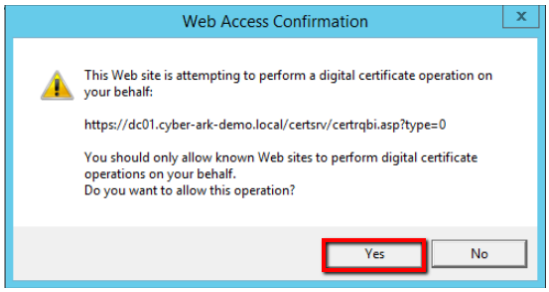
6. Click Request a certificate.



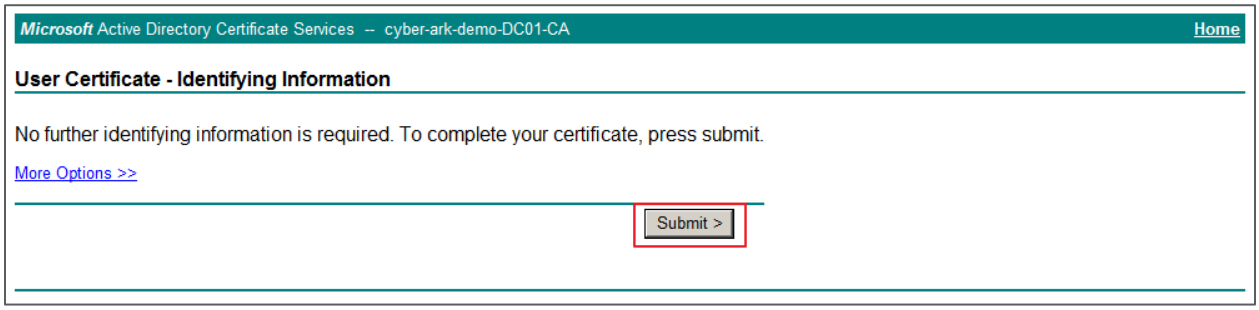
7. Click User Certificate.



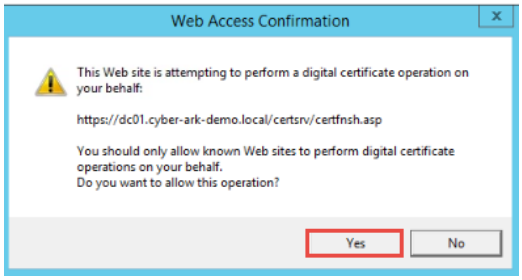
8. Click yes to the warning.



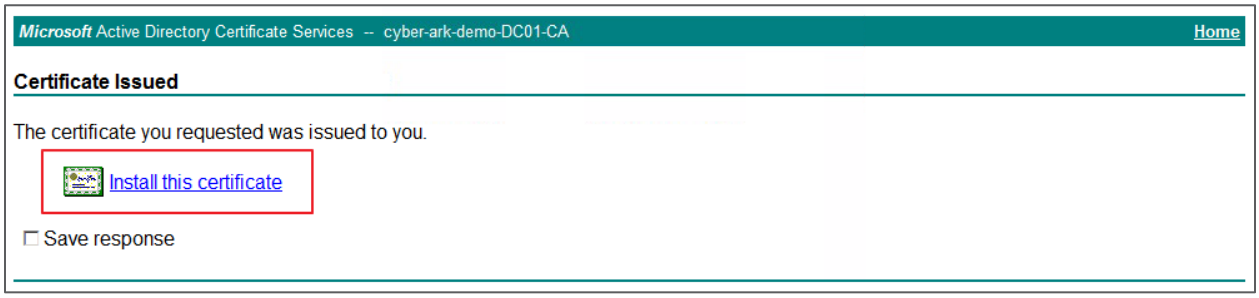
9. Click Submit.



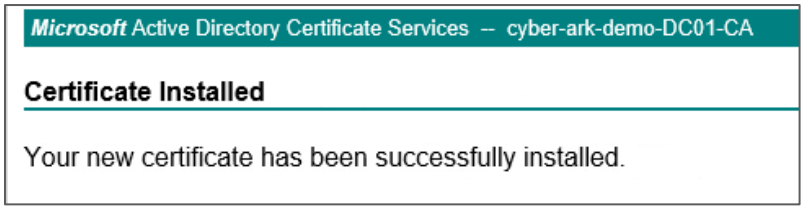
10. Click yes to the warning.



11. Click Install this certificate.



12. You should receive the following successful message.

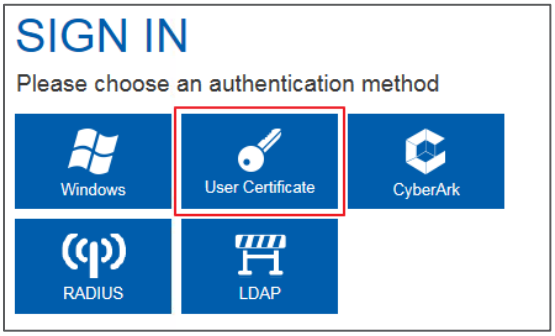


13. Browse to the PVWA using the LB'er VIP or at URL http://comp01X.cyber-ark-demo.local/passwordvault/ and choose User Certificate authentication.

14. A note on the behavior of PKI Authentication using IE on Windows.

    a. If the URL is in the Intranet Zone and the certificate is valid, the user will be authenticated successfully and passed directly to the accounts page.

    b. If the URL is in the Trusted Sites Zone and the certificate is valid, the user will be prompted to confirm the certificate.

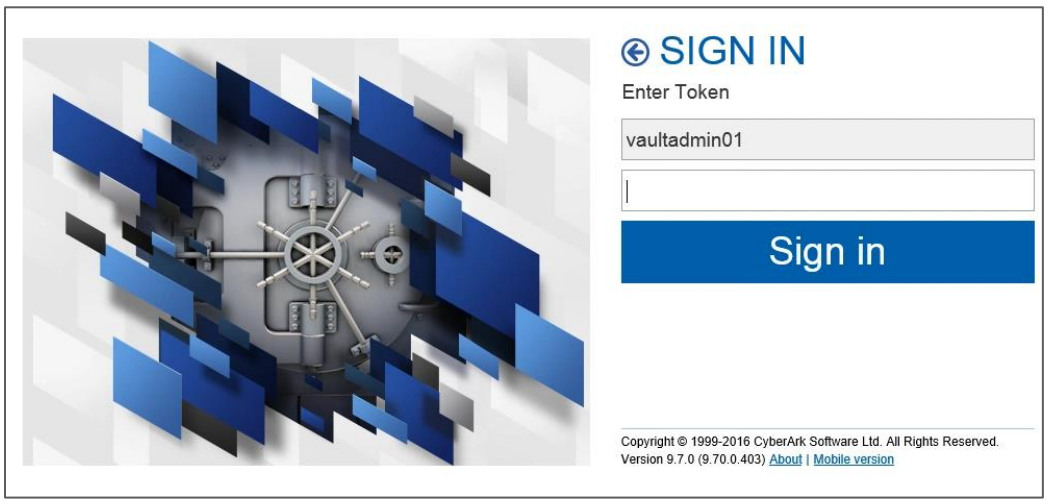


Two Factor Authentication (2FA)

Now that you have tested the different types of authentication, try to use a combination of two methods (ONE IIS + ONE Vault) to enforce a Two Factor Authentication policy for vaultadmin01. To accomplish this you must combine a primary and a secondary authentication method.

In CyberArk There are 2 groups of authentications.

PVWA (IIS) level or Primary authentication	• Windows, Oracle SSO, PKI (Client Certificate) RSA, SAML.
Vault level or Secondary authentication	• CyberArk • LDAP, RADIUS



EPV Implementations

In this section you will create several accounts and **CPM** usages according to the customer's requirements. Please read the requirements set out by the customer carefully.

Windows Requirements

- The Customer has one Domain Controller (10.0.0.2) and one windows server in the domain (10.0.10.50).
- The domain administrator account is ***admin01***.
- The local administrator account on the domain member (10.0.10.50) is ***localadmin01*** (the password for the local admin account is unknown).
- On the domain member there is a scheduled task (***SchedTask01***) that runs under the ***localadmin01*** user and is programmed to send the vault administrator (***vaultadmin01***) an email every time it runs.
- Note that although the scheduled task runs under the credentials of localadmin01, only admin01 has permissions to change the password for SchedTask01.
- In order to run the scheduled task run the following command:
  - schtasks /run /s 10.0.10.50 /tn schedtask01.
- winadmin01 is a member of the WindowsAdmins group in LDAP. Members of the WindowsAdmins group should be given permissions on all Windows accounts.

UNIX Requirements

- The Customer has one Linux server (10.0.0.20).
- The root account on the server is called ***root01***.
- The account *linuxadmin01* is a member of the *LinuxAdmins* group in LDAP.
- Members of the *LinuxAdmins* group must be granted permissions on all the Linux accounts.

Database Requirements

- The Linux server mentioned above (10.0.0.20) also hosts an oracle database.
  - database name is ***xe***.
  - The port is ***1521***.
  - The root account on the database is called ***dba01***.

In addition, there is an application on the Linux server that connects to the Oracle database ***using*** the ***dba01*** credentials. The credentials are stored in the text file ***/var/opt/app/app01.ini***. When the **CPM** changes the password for *dba01*, it must also change the password stored in the ***app01.ini*** file. Note that only *root01* has permissions to change the password in the file.

- *OracleAdmin01* is a member of the **OracleAdmins** group in LDAP. Members of the **OracleAdmins** group should be granted permissions on all oracle accounts.

Based on the requirements mentioned above:

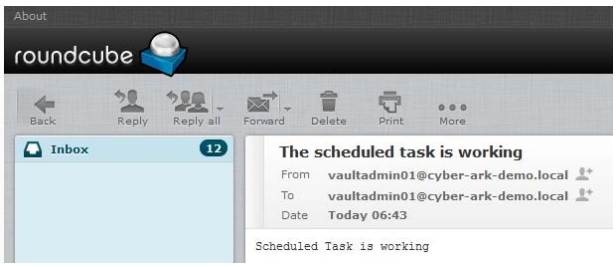
1. Add the required privileged accounts to the system, including their dependencies. You will need to create the proper Safes and duplicate the relevant platforms in order to do so. You may add accounts manually or by using the accounts discovery mechanism (Hint: Accounts Discovery can detect Windows dependencies automatically).

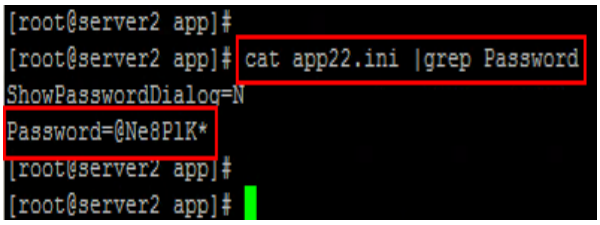
2. Windows accounts should be managed by CPM_WIN and all Linux and DB accounts should be managed by CPM_UNIX. Use the CPMs to change the passwords (reconcile if needed).

3. Make sure all dependencies are changed:

   a. ***localadmin01*** - run the scheduled task and verify *vaultadmin01* receives the email;

   b. ***dba01*** - verify that the password in ***app01.ini*** is updated[1][2].





4. Assign the LDAP users and/or groups the required permissions on the relevant safes ensuring the users (winadmin01, linuxadmin01 and oracleadmin01) can access the relevant accounts.

[1] Hint: add the INICofigFile usage in the Oracle platform and make sure the "SearchForUsages" parameter in the platform is set to YES
[2] use *root/Cyberark1* to login to the UNIX server to verify the password in app01.ini changed.

Install PSM/PSMP

The Customer has purchased CyberArk's **Privileged Session Management** (PSM) in order to monitor and record and activity related to privileged accounts in the network:

PSM	2 servers (PSM Farm IP: **10.0.22.1**)
PSMP (SSH Proxy)	1 server (**10.0.1.16**)

Note: The customer requires that connections to all Windows and Oracle accounts be done via Load Balanced PSM Servers. Connections to the UNIX devices can be done via the Load Balanced PSM servers, or PSMP.

In the following sections you will be asked to:

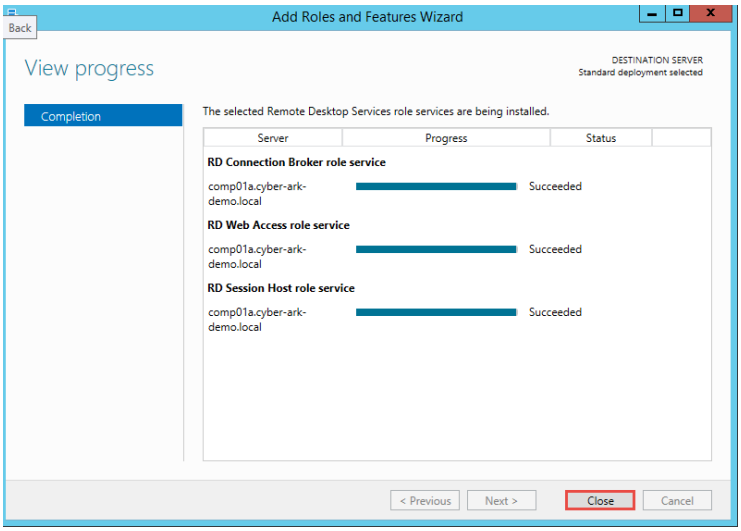
1. Install a standalone PSM
2. Secure and harden the PSM server
3. Enable the PSM and make sure you can connect to all target devices (Windows, UNIX and Oracle).
4. Make sure you can see the relevant recordings for each session.
5. Install the 2nd PSM server and test connections via a load balancer.
6. Install PSMP and make sure you can connect to the UNIX device via the PSMP.

Standalone PSM Installation

PSM Installation

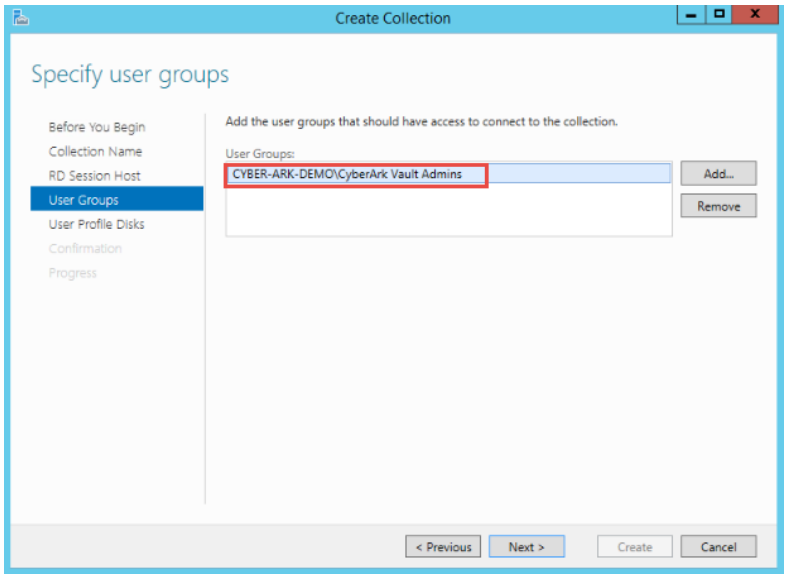
Installation of Microsoft's Remote Desktop Services is a pre-requisite for PSM and must be completed while logged in as a Domain User that is a member of the local administrators group on the PSM Server.

1. Open the PAS Installation Guide v10.1 and proceed to page 154, section RDS on a PSM Server:
2. Sign out of the Comp01A server and sign as domain user Admin01@cyber-ark-demo.local.
3. Follow the instructions to install Remote Desktop Services.
    a. Complete steps 1 through 7.
    b. After the server reboots, ensure that you sign in with the same domain user, Admin01@cyber-ark-demo.local.
    c. Be patient, the installation wizard will restart automatically. Start Server Manager if you have prevented it from starting automatically.
    d. When complete and you see the following Window, proceed to the next step.



4. Complete steps 8 and 9, to create a session collection.
    a. Name the session collection "PSM_servername". So the session collection for server comp01a will be "PSM_comp01a"
    b. Remove CYBER-ARK-DEMO\Domain Users and replace with CYBER-ARK-DEMO\CyberArk Vault

Admins.

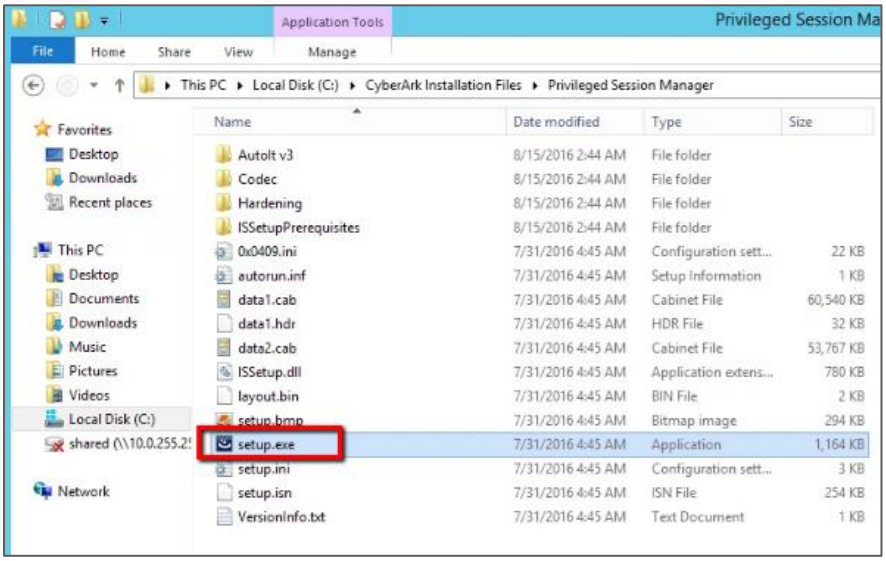


5. Select the collection PSM_comp01A
    a. In PROPERTIES, Choose tasks, Edit Properties.
    b. Navigate to Security and clear the box "Allow connections only from computers running Remote Desktop with Network Level Authentication"
    c. Select OK to save and exit.
6. Close Server Manager

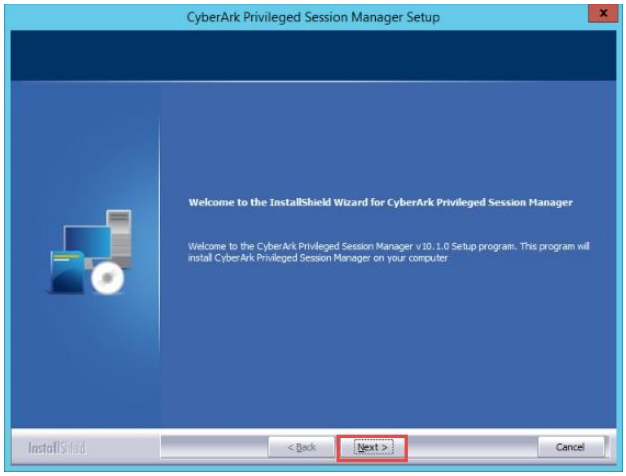
Install the PSM

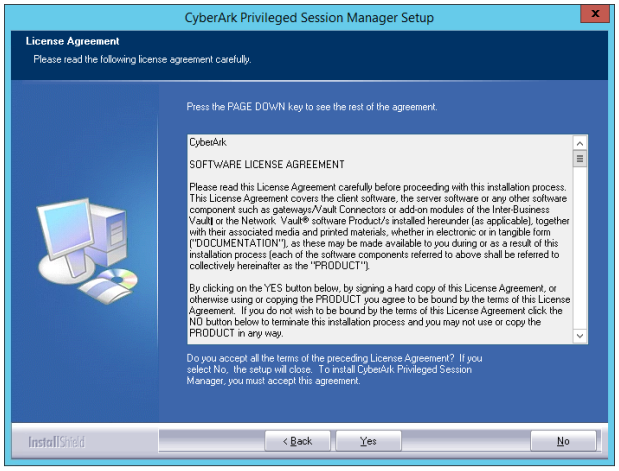
Note:	To enable RemoteApp program features, PSM installation must be completed while logged in as a domain user, with local Administrator rights. Install the PSM logged in as cyber-ark-demo.local\Admin01.

1. Go to ***C:\CyberArkInstallationFiles\Privileged Session Manager*** and double click **setup.exe**

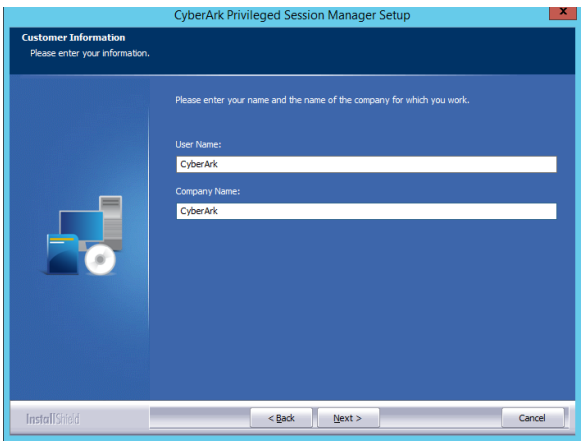


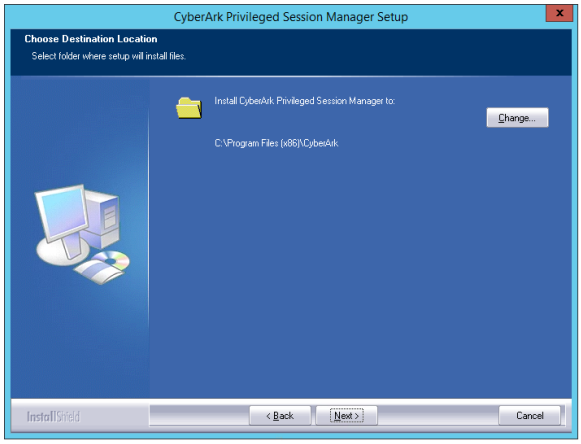
2. Click **Next** on the welcome screen, then **Yes** to agree to the license agreement



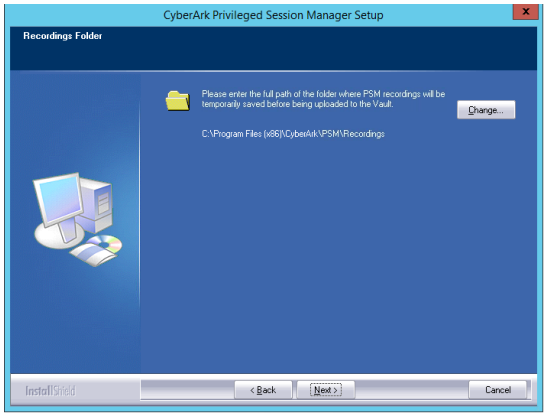


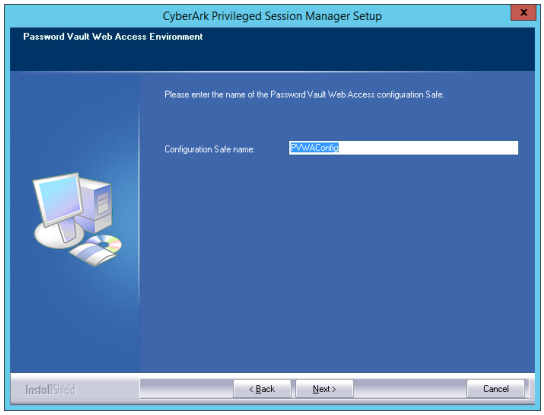
3. Enter a company name, click **Next,** then leave the default destination folder and click **Next**.



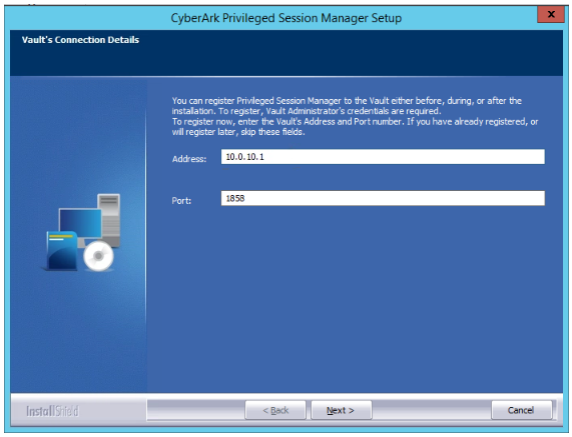


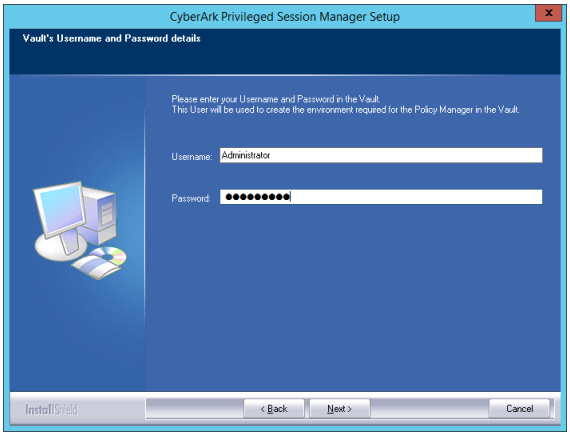
4. Leave the default recordings temporary folder and click **Next**, then leave the default *Configuration safes* name and click **Next**. The first part of the installation now takes place, there will be a short delay until the next screen appears.



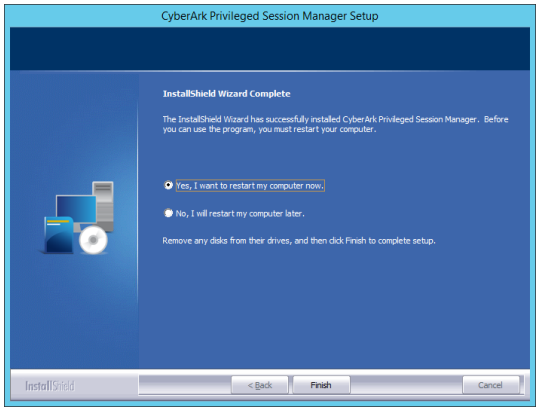


5. Enter the **IP Address** of your vault (i.e., **10.0.10.1**) and click **Next**, then enter the username **Administrator**, password **Cyberark1** and click **Next.**





6. Select “**Yes, I want to restart my computer now”** selected and click **Finish**.



PSM Post Installation and Hardening Tasks

Note:	The following tasks must be performed by an administrator of the Component server, for example, Admin01 or the local Administrator user.

Hardening the PSM

Open the PAS Installation Guide v10.1, and go to page 169 “Post installation tasks” and complete the following sections.

1. Check the installation log files.
2. “Disable the screen saver for the PSM Local Users”
3. “Configure users for PSM sessions”.
   a. Ensure “User cannot change password” and “Password never expires” is selected for both users.
4. “Harden the PSM server machine”.
   a. Continue to page 179 “PSM server hardening workflow”.

Run the Hardening Script

1. Enable PowerShell Scripts on the PSM machine, page 180
   - Note: Run PowerShell as Administrator
2. Modify the PSM Hardening Script, page 181
   - Enable PSM to Connect to Web applications
   - Do not make any other changes to the script.
   - Take note and review the settings defined in this section.
3. Run the PSM Hardening Script, page 181

- Type “Yes” when prompted to remove all member of the RemoteDesktopUsers group
- Open Computer Management and add the “CyberArk Vault Admins” group to the RemoteDesktopUsers group.

4. Review the PSM Hardening Script Output Log File, page 181.
   - Actions taken by the script are detailed in the log.
   - Return the security level for running PowerShell scripts to “restricted”.

After running the Hardening Script, page 182

1. Hide PSM Local Drives in PSM Sessions
   a. Restrict all drives
2. Block Internet Explorer Developer Tools
3. Block Internet Explorer context menu
   a. Restrictions key must be added.
   b. NoBrowserContextMenu DWord parameter must be added

Configure AppLocker Rules

1. Verification before running the AppLocker Script.
   - Note: Run PowerShell as Administrator
2. Run the AppLocker Script.
   - Review the sections of the PSMConfigureAppLocker.xml.
   - Locate the Microsoft IExplore processes section.
     1. Add the following line to support PSM-SSH connections.

<Application Name="Java" Type="Exe" Path="C:\Program Files (x86)\Java\jre1.8.0_101\bin\ssvagent.exe" Method="Hash" />

Note:	The above line can be found on your component servers in file, “C:\3rd Party Installation Files\AppLocker-Rules-Examples.xml”

2. Remove the comments from this section to enable Microsoft Internet Explorer.
3. After the changes, the Microsoft IExplore processes section should look like the following image.

```
<!-- Microsoft IExplore processes -->
<Application Name="IExplore32" Type="Exe" Path="c:\Program Files (x86)\Internet Explorer\iexplore.exe" Method="Publisher" />
<Application Name="IExplore64" Type="Exe" Path="c:\Program Files\Internet Explorer\iexplore.exe" Method="Publisher" />
<Application Name="Java" Type="Exe" Path="C:\Program Files (x86)\Java\jre1.8.0_101\bin\ssvagent.exe" Method="Hash" />
```

- Manually confirm the executable paths in each line that begins with “Application Name=” in this section.

Run the Automatic PSM AppLocker Configuration Script

```
PS C:\Windows\system32> cd 'C:\Program Files (x86)\CyberArk\PSM\Hardening'
PS C:\Program Files (x86)\CyberArk\PSM\Hardening> .\PSMConfigureAppLocker.ps1
CyberArk AppLocker's configuration script ended succesfully.
PS C:\Program Files (x86)\CyberArk\PSM\Hardening>
```

3. Return the Security Level for Running PowerShell after Running the AppLocker Script.

Note:	Review “Automatic hardening in 'In Domain' deployments”. We will not be executing these procedures in the lab but you should review and become familiar with them.

Go to “(Optional) Configure the PSM Server Machine for Web Applications”

We have already run the hardening script with parameter $SUPPORT_WEB_APPLICATIONS=true, but there are still settings that need to be configured. In this section beginning on page 221, configure the following:

“To Configure the PSM Server Machine for Web Applications”, skip procedures 1 and 2 and complete only the following procedures.

3. Disable IE Enhanced Security Configuration.
4. Configure the Internet Explorer First Run settings.

Deactivate UAC on the PSM Server

This step is required to support PSM Web Applications

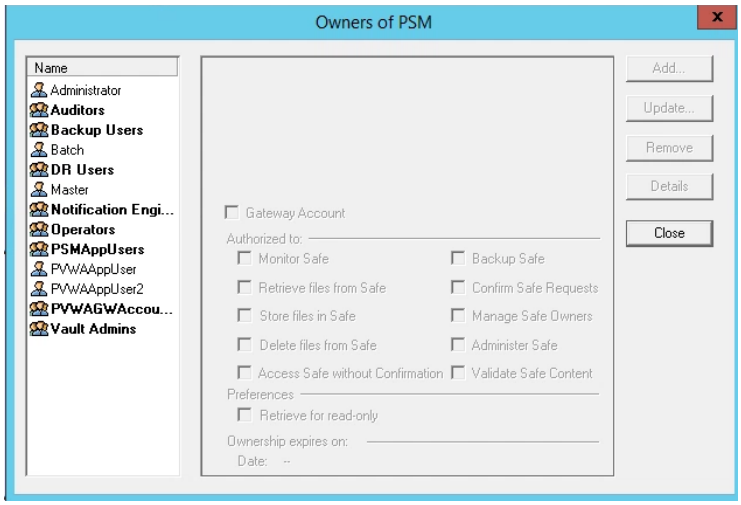
1. From the Start Menu, run “Regedit.exe”.
2. Navigate to "HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\policies\system".
3. Update “EnableLUA" from 1 to 0.
4. Restart the PSM Server.

PSM Testing and Validation

Note:	Before testing the connections via the PSM we also need to grant **PVWAAppUser1** permissions on the relevant PSM Safes, otherwise connections from the 2nd PVWA will not work.

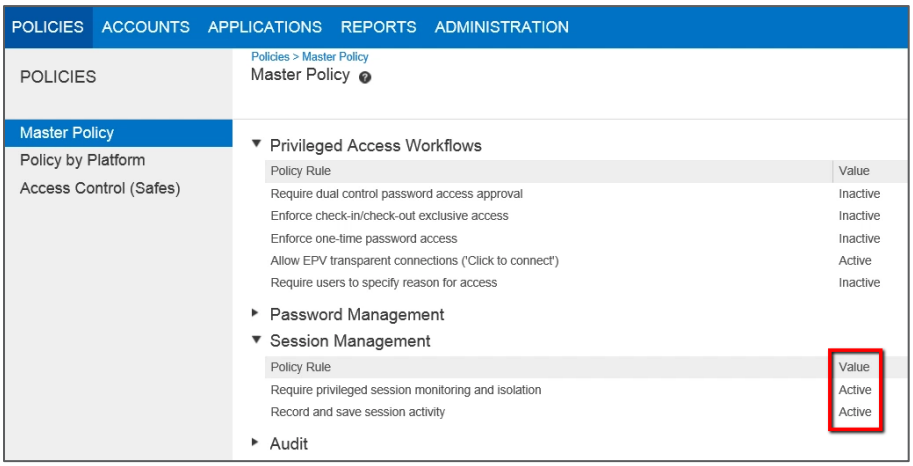
1. Before you can grant PVWAAppUser1 permissions on the PSM safes, you must first add the built-in CyberArk Administrator user to the **PSMMaster** group. After adding Administrator to the **PSMMaster** group, add PVWAAppUser1 to the following safes with permissions as described below.

Safe	Permissions
PSM	**List Files**, **Retrieve Files** and **Update Files**
PSMLiveSessions	**List Files**
PSMSessions	**Create Files**
PSMUnmanagedSessionAccounts	**List Files**, **Create Files**, **Update Files**, **Update File Properties**, **View Owners**, **Use Password**, **Create/Rename Folder** and **Manage Safe Owners**



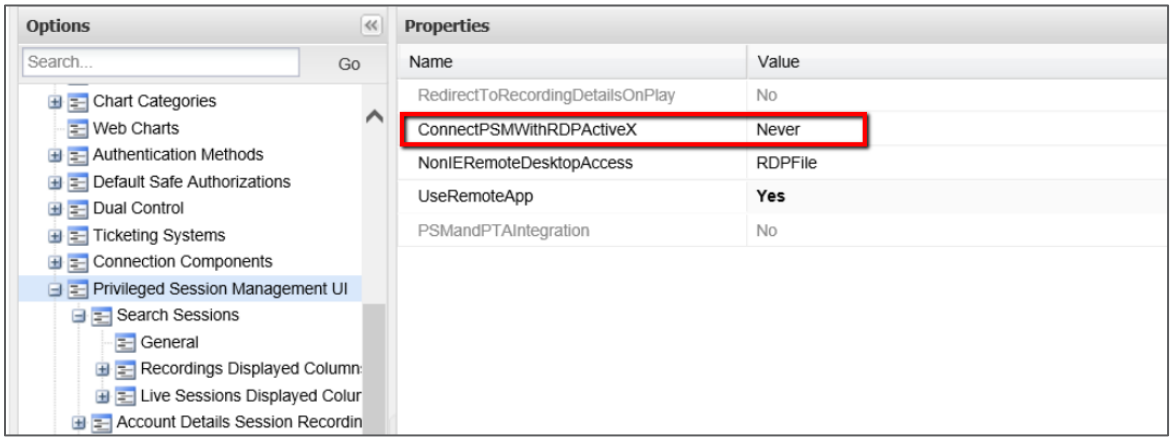
2. After successful PSM installation and configuration of the 2nd PSM server, remove the built-in administrator user from the **PSMMaster** CyberArk group.

3. Login to the PVWA as **vaultadmin01** and enable the **PSM** in the **Master Policy**.



4. Go to **ADMINISTRATION > Options > Privileged Session Management UI** and set *ConnectPSMWithRDPActivex* to **Never** so that RDPFile will be used to establish connections regardless of the browser**.** If ByBrowser is selected, IE will use ActiveX to establish connections but alternate browsers will use RDPFile. This is necessary to use the RemoteApp feature with alternate browsers like Firefox and Chrome.

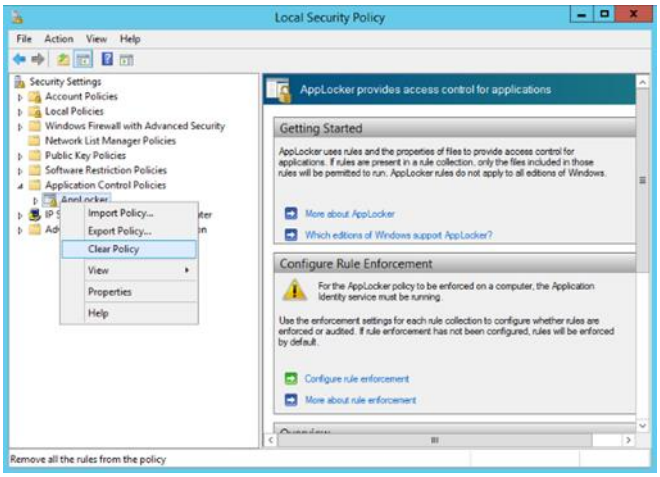
5. Click OK to save.



6. Attempt connecting to the customer's target devices using the relevant PSM Connection Components for all accounts (PSM-SSH, PSM-RDP, PSM-WinSCP and PSM-SQL*).

7. Troubleshoot issues as needed.

- Known Issue: PSMSR126E and / or PSMSC036E error is displayed during PSM-SSH connection testing, it may be necessary to clear Applocker policies, and then reapply them. Launch secpol.msc from the Run window to clear the Applocker policies and retry the connection component. Reapply the Applocker policies, then test again. If a first attempt times out, retry a second time.

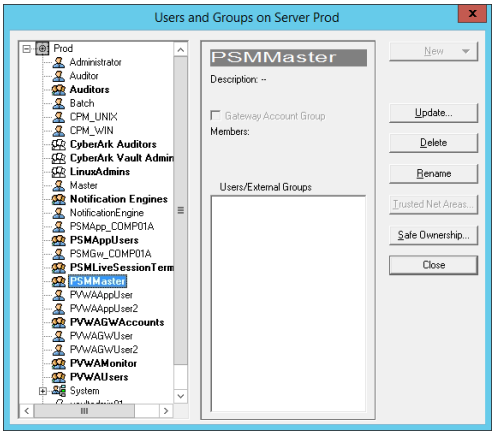


Load Balanced PSM Installation

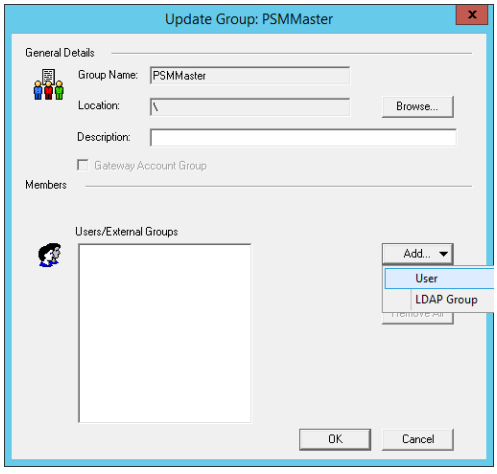
Note:	in this section we will install the 2nd PSM server and test connecting to the PSM servers via a load balancer.

Install 2nd PSM

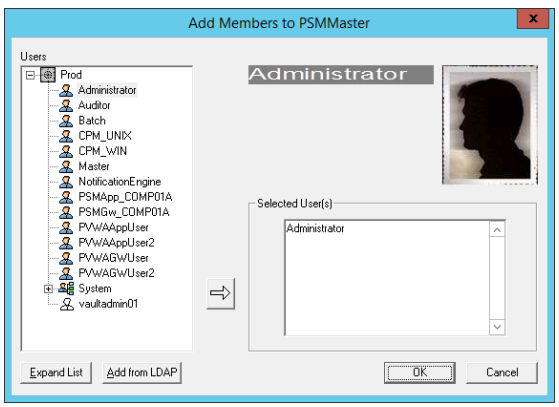
1. **Prior** to installing the 2nd PSM you must first add the **Administrator** user to the **PSMMaster** Group. Log in to **PrivateArk** as **Administrator** and go to **Tools > Administrative Tools > Users & Groups**. Select **PSMMaster** and Click **Update**.

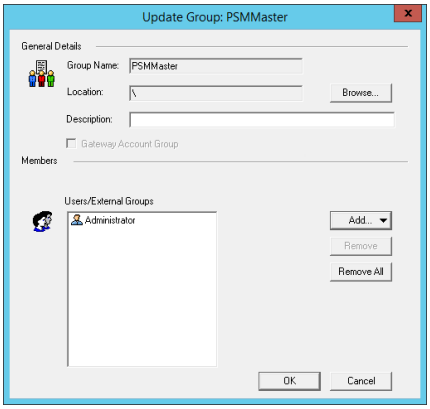


2. Click **Add** then **User**.

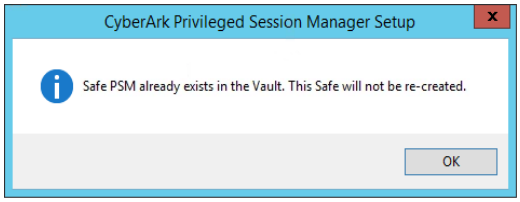


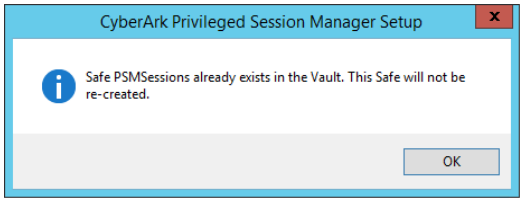
3. Double-click **Administrator**, then click **OK**, then click **OK** to update the group membership.

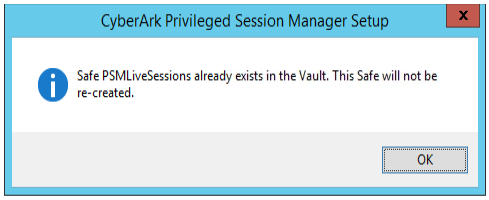


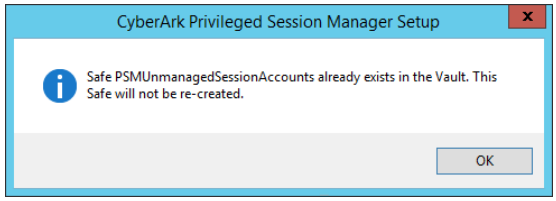


4. Log on to **Comp01b** as **cyber-ark-demo\admin01** and repeat the steps for installing the 1st PSM (including the installation and configuration of Remote Desktop Services, as well as the post installation and hardening steps). You will receive the following warnings during the installation of PSM software. This is normal.

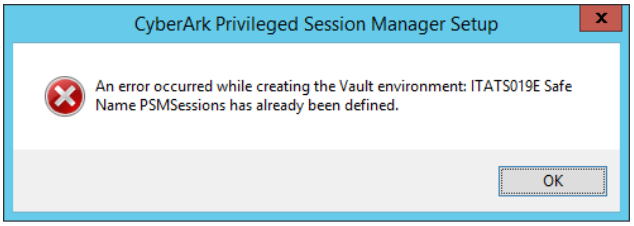




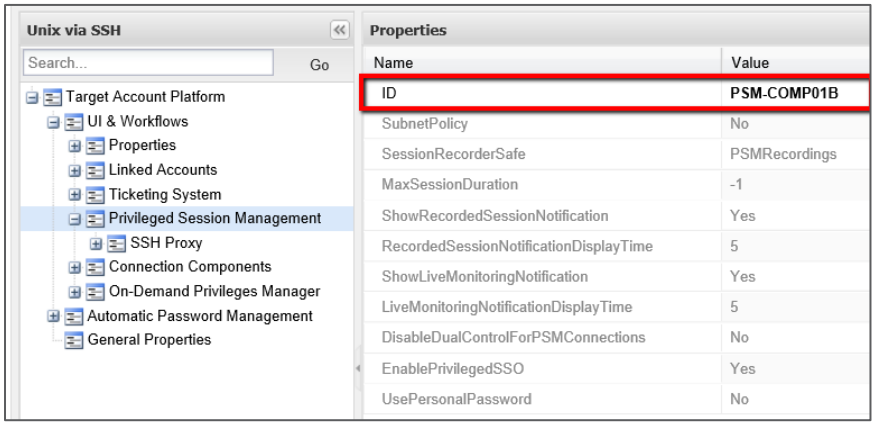




5. If you see the error message ITATS019E as shown in the graphic below, this indicates that the CyberArk built-in Administrator user is not a member of the PSMMaster group. Uninstall PSM and add the CyberArk built-in Administrator user to the PSMMaster group, then proceed with the PSM installation.



6. Before configuring the Load Balancer, test the connections via the 2nd PSM server by changing the PSM-ID from **PSMServer** to **PSM-COMP01B** in the platform settings for all relevant platforms.



Configure PSM Load Balancing

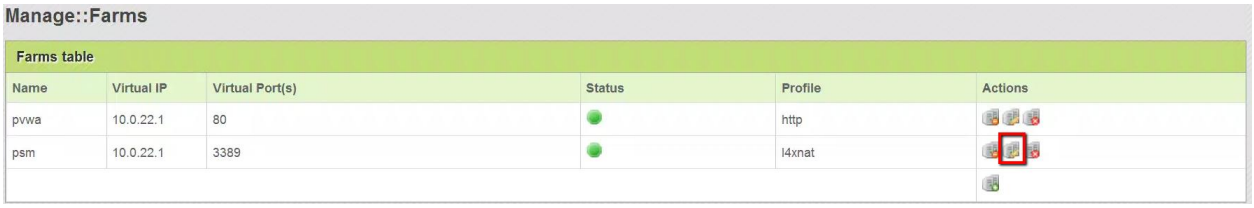
1. From **Comp01a** log on to the load balancer using a browser: https://10.0.0.5:444 (*username*: **admin**/*password*: **admin**).

2. Navigate to **Manage > Farms** and click on the **Add New Farm** icon in the Actions column, to configure a new farm.

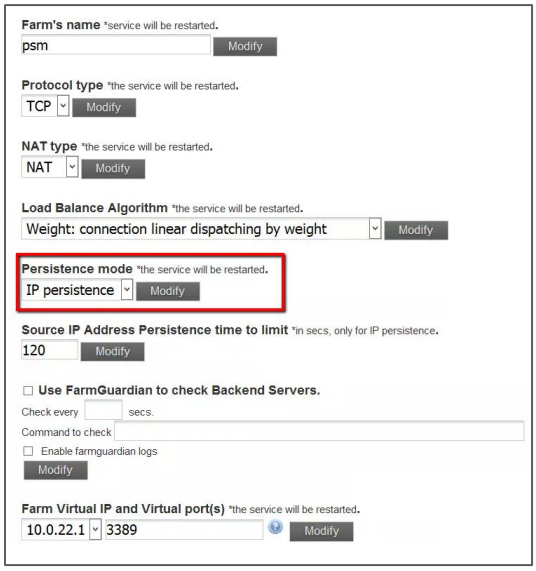
3. Set the *Farm Description Name* to **PSM** and select **L4xNAT** in *profile*, and choose Save & Continue.

4. Select Virtual IP: eth0:1>**10.0.22.1,** and Virtual Port: **3389** for RDP.

5. Click on **Save** then the **Edit the PSM Farm** icon.

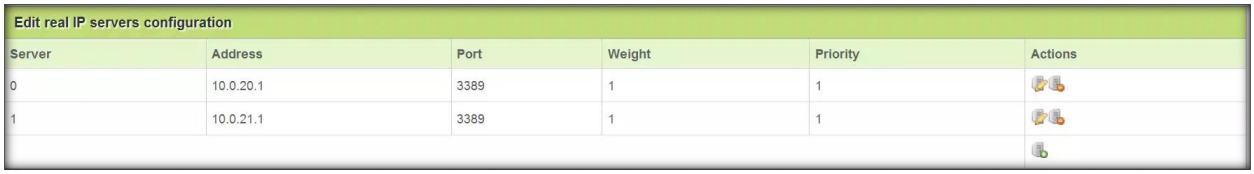


6. Next, change the *Persistence mode* to **IP Persistence and select Modify**.



7. Scroll down to section 'Edit real IP servers configuration' and select the 'Add Real Server' link in the Actions column.

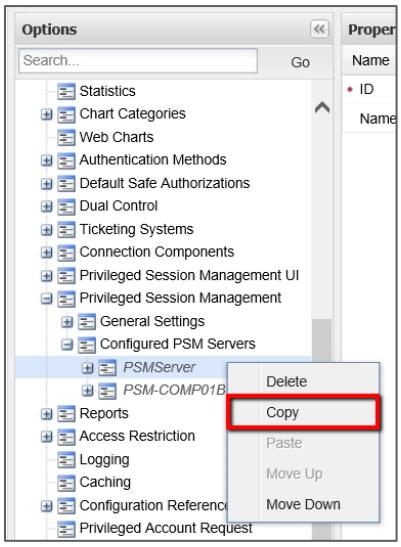
8. Add both PSM server IP addresses to the configuration and select the 'Save Real Server' link after each entry.



9. Review the Farms Table and ensure that the PSM Farm is started.

10. Exit the Zen Load Balancer GUI.

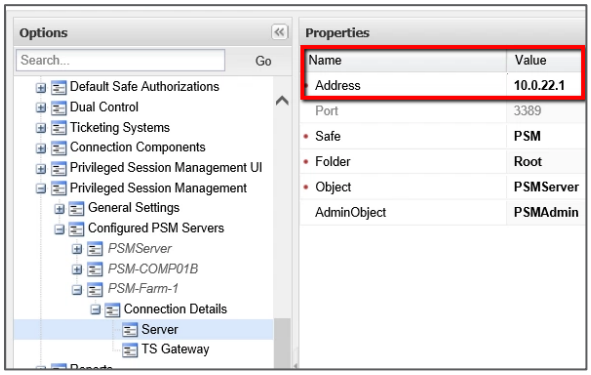
11. Login to the **PVWA** as **vaultadmin01** and go to **ADMINISTRATION > Options > Privileged Session Management > Configured PSM Servers** and copy **PSMServer.**



12. Right click on **Configured PSM Servers** and click on **Paste PSMServer**.

13. Go to the newly added *PSMServer* and change the ID to **PSM-Farm-1** and the name to **First PSM Farm**.

14. Expand PSM-Farm-1. Select **Connection Details** > **Server** and change the IP address to that of your PSM Farm virtual IP, 10.0.22.1. Click on **Apply** and **OK** to save the changes.



15. Next, change the *PSM ID* for the Unix platform you previously created to **PSM-Farm-1**.

16. At an Administrative Command Prompt, run IISRESET on both comp01x servers.

17. Try to connect to different target devices using the PSM farm (you can run multiple sessions at the same time), and look at the LB to see where the session lands using the monitoring option of the LB. try to do live monitoring as well using *Auditor01*.

PSMP Installation

Install PSMP

In this exercise you will configure a Linux server to run CyberArk's **PSM SSH Proxy** (PSMP) server. See the *Installing the Privileged Session Manager SSH Proxy* section of the *Privileged Account Security Installation Guide* for a full explanation of all the required steps.

Install Linux prerequisites

1. Confirm that all the prerequisites installed properly by running **./psmpcheck.sh** . The script contains the following command: *yum list installed |grep 'redhat-lsb.x86\|elfutils.i686\|glibc.i\|ncurses-libs.i\|libuuid.i\|libgcc.i\'* and should return the following:

```
[root@centos ~]# ./psmpcheck.sh
elfutils.i686           0.152-1.el6      @/elfutils-0.152-1.el6.i686
glibc.i686              2.12-1.132.el6_5.2
libgcc.i686             4.4.6-4.el6      installed
libuuid.i686            2.17.2-12.7.el6  installed
ncurses-libs.i686       5.7-3.20090208.el6
redhat-lsb.x86_64       4.0-7.el6.centos @base
[root@centos ~]#
```

Install the PSMP package

Before running the installer, we need to make a few advance preparations.

First, we will create an administrative user on the PSM SSH Proxy server and edit the vault.ini file, then create a credential file for the built-in administrator user so the installer can create the vault environment for the PSMP. Finally, we will edit the PSMP parameters file to specify the installation directory and accept the End User License Agreement.

1. Administrative users can connect to the PSMP machine to perform management tasks on the machine itself without being forwarded to a target machine. In addition to the built-in root users, the PSMP identifies proxymng as an administrative user when they connect to the PSMP server. Run **useradd proxymng** and **passwd proxymng as shown.** Set the password as Cyberark1

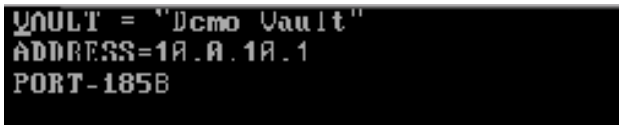
```
[root@psmp01 ~]# useradd proxymng
[root@psmp01 ~]# passwd proxymng
Changing password for user proxymng.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
```

2. Next we need to inform the PSMP installer where to find the vault server on the network. Change directories to **/root/PSM-SSHProxy-Installation/** directory and update the **vault.ini** file using the VI editor.

```
cd /root/PSM-SSHProxy-Installation/
vi vault.ini
```

3. Update the address vault to the VIP address of your vault server (e.g. **10.0.10.1**). Use the arrow keys to move the cursor to the text you want to amend, type ***R** (case-sensitive) to make the changes and hit **Esc** to stop editing.

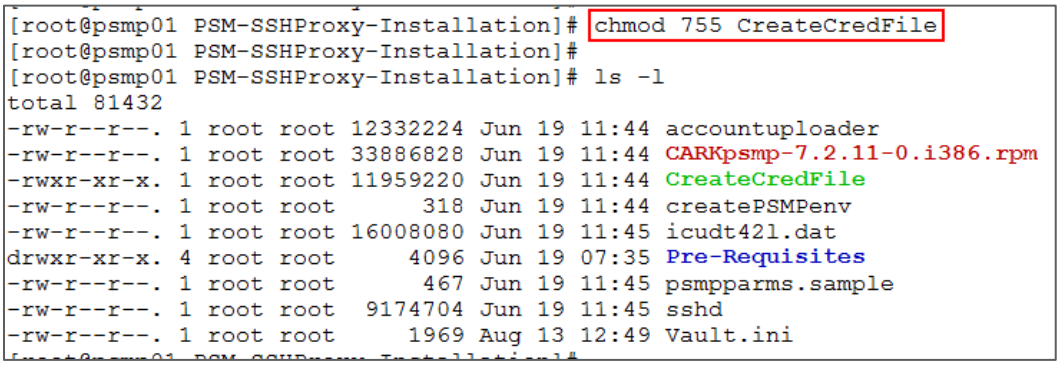
4. When finished, enter **:wq!** to save the file and quit vi.



5. Now we need to create a credential file for the administrator user, who will authenticate to the Vault and create the **Vault** environment during installation.

   a. Change directories to ***/root/PSM-SSHProxy-Installation.***

   b. Enter the following command to assign read, write and execute permissions to CreateCredFile, **"chmod 755 CreateCredFile"** as show in the graphic below.



   c. Run **./CreateCredFile user.cred**, enter **Administrator** as the *Vault Username* and **Cyberark1** as the *Vault Password*. Accept the default values for the remaining prompts.

```
[root@psmp01 PSM-SSHProxy-Installation]# ./CreateCredFile user.cred
Vault Username [mandatory] ==> administrator
Vault Password (will be encrypted in credential file) ==>
Disable wait for DR synchronization before allowing password change (yes/no) [No] ==>
External Authentication Facility (LDAP/Radius/No) [No] ==>
Restrict to Application Type [optional] ==>
Restrict to Executable Path [optional] ==>
Restrict to current machine IP (yes/no) [No] ==>
Restrict to current machine hostname (yes/no) [No] ==>
Restrict to OS User name [optional] ==>
Display Restrictions in output file (yes/no) [No] ==>
Command ended successfully
```

6. Next, we need to create and edit the psmpparms file to define the installation folder, and accept the End User License Agreement.

   a. Move *psmpparms.sample* to the **/var/tmp** directory and rename it to psmpparms using the command in the following example.

```
[root@psmp01 PSM-SSHProxy-Installation]#
[root@psmp01 PSM-SSHProxy-Installation]# mv psmpparms.sample /var/tmp/psmpparms
[root@psmp01 PSM-SSHProxy-Installation]#
```

   b. Edit the **psmpparms** file.

```
vi /var/tmp/psmpparms
```

   c. Edit the following lines and save the changes.

```
InstallationFolder=/root/PSM-SSHProxy-Installation
AcceptCyberArkEULA=Yes
```

```
[Main]
# -----------------------------------------------------------------------------
# The folder to which the installation CD was copied.
# -----------------------------------------------------------------------------
InstallationFolder=/root/PSM-SSHProxy-Installation

# -----------------------------------------------------------------------------
# Whether or not the CyberArk SSHD service should be installed.
# The CyberArk SSHD service is required for tunneling and for connecting with the SSH
# command in the following syntax:
# <ssh client> vaultuser@targetuser#domainaddress@targetmachine#targetport@targetpassword@proxyaddress
# -----------------------------------------------------------------------------
InstallCyberArkSSHD=Yes

# -----------------------------------------------------------------------------
# Whether or not you accept all the terms of the PSMP end user license agreement.
# This agreement is on the installation CD in the PSMProxy installation package.
# Open this agreement and read it carefully, then set this parameter to Yes.
# -----------------------------------------------------------------------------
AcceptCyberArkEULA=Yes

#PSMPAppUser=PSMPApp_<host_name>
#PSMPGWUser=PSMPGW_<hostname>
#PSMPConfigurationSafe=PVWAConfig
```

7. Run the PSMP installation by running **rpm -i CARKpsmp-10.1.0-44.x86_64.rpm** from the PSMP installation directory (the version number in the screenshot may not be identical, you can type the first characters of the filename and then press tab to auto-complete).

```
[root@centos PSM-SSHProxy-Installation]# rpm -i CARKpsmp-10.1.0-44.x86_64.rpm
warning: CARKpsmp-10.1.0-44.x86_64.rpm: Header V3 RSA/SHA256 Signature, key ID 0
8beaa44: NOKEY
Installation process is starting...
```

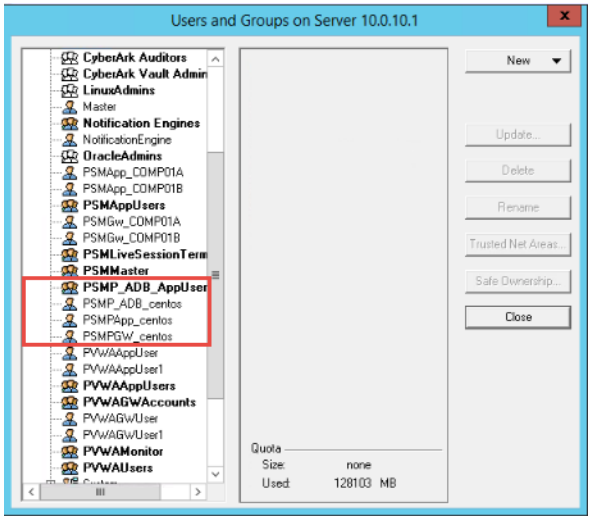
8. Run **service psmpsrv status** or **/etc/init.d/psmpsrv status** to ensure that the server is running as the installation has completed

```
[root@psmp01 PSM-SSHProxy-Installation]# /etc/init.d/psmpsrv status
PSM SSH Proxy is running.
PSMP ADBridge is running.
```

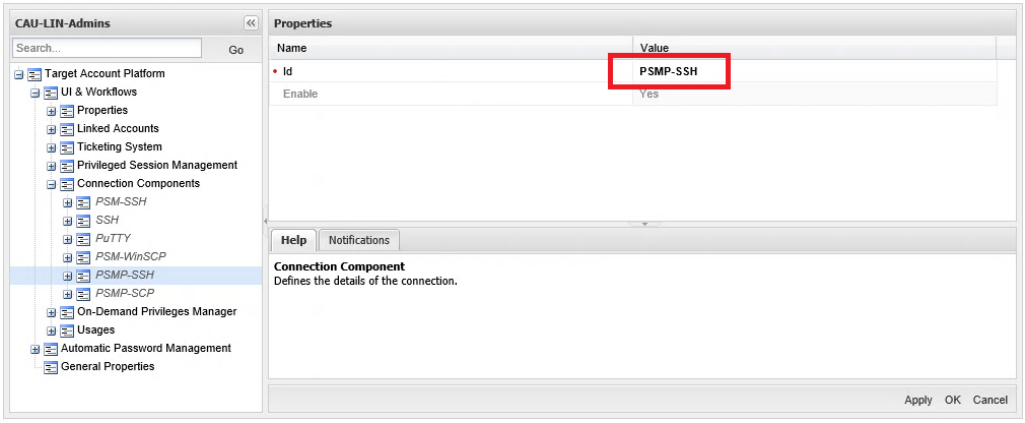
9. Review log using **cat /var/tmp/psmp_install.log**

```
Wed Mar 2 11:33:47 EST 2016 | Configuring the [sshd_config] file...
Wed Mar 2 11:33:47 EST 2016 | Configuring [sshd_config] file has finished.
Wed Mar 2 11:33:47 EST 2016 | Configuring the [sshd] service initialization script...
Wed Mar 2 11:33:47 EST 2016 | Configuring the [sshd] service initialization script has finished.
Wed Mar 2 11:33:47 EST 2016 | Replacing the [sshd] executable...
Wed Mar 2 11:33:47 EST 2016 | Starting the [sshd] executable...
Wed Mar 2 11:33:48 EST 2016 | The [sshd] executable was started successfully.
Wed Mar 2 11:33:48 EST 2016 | Replacing the [sshd] executable has finished.
Wed Mar 2 11:33:48 EST 2016 | Updating [sshd] has finished.
Wed Mar 2 11:33:48 EST 2016 | Script execution has finished.
Wed Mar 2 11:33:48 EST 2016 | Installation process was completed successfully.
```

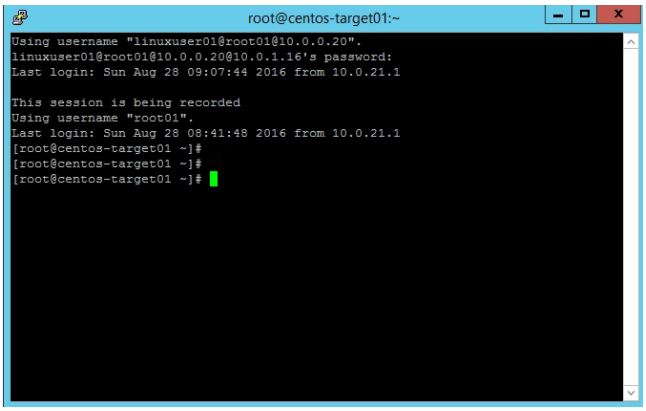
10. Check that the **PSMPApp_<*hostname*>** users and groups were added to the **Vault**.



11. Add the PSMP-SSH Connection Component to the platform managing account Root01@10.0.0.20. If the Platform managing the *root01* account was duplicated, you will need to manually create the reference to the *Connection Component*, as shown in the image below.



12. From the **Components** server, open **PuTTY**  and enter the following connection string in *Host Name* to verify that you can you log in with *linuxadmin01* to the Linux Server (*10.0.0.20*) using *root01* via the PSMP: **linuxadmin01@root01@10.0.0.20@10.0.1.16**.



13. Make sure you can see the recording of your session in the PVWA

Troubleshooting

1. If the installation fails you can view errors in the following logs:
   a. **/var/tmp/psmp_install.log** – This log file describes the activities that occurred during the installation process.

b. **/var/opt/CARKpsmp/temp/CreateEnv.log** – This log file describes the activities that occurred when the Vault environment for PSMP was created.

2. View the logs with the **less** command to view the logs and browse the pages using the **space** button.

```
[root@centos PSM-SSHProxy-Installation]#
[root@centos PSM-SSHProxy-Installation]# less /var/tmp/psmp_install.log _
```

3. Run **rpm –e CARKpsmp** in order to remove the existing PSMP package and try to install again.
4. If the installation completes successfully, but you cannot connect successfully via the PSMP, check the following logfile:

   a. **/var/opt/CARKpsmp/logs/PSMPConsole.log**

(Optional) Advanced PSMP Implementations

Requirements:

1. The Customer wants to implement ADB functionality with SSH Access Control.
2. The user linuxuser01 is a member of the LinuxUsers group in LDAP.
3. Members of LinuxUsers are only allowed to login to the UNIX device with their own named accounts using their AD credentials.
4. The Customer wants to use the PSMP to prevent end users from switching to the root01 account.

Objectives:

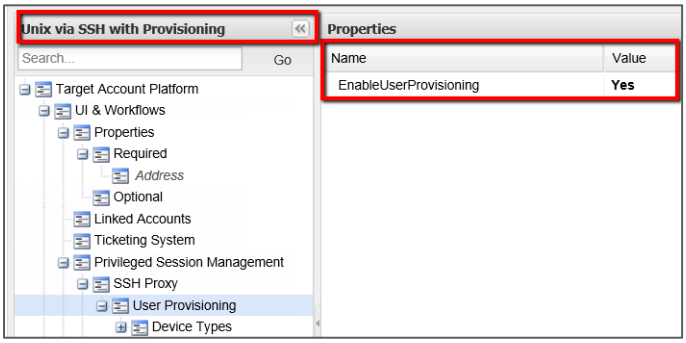
1. Implement ADB functionality and make sure you can log in to the UNIX device using linuxuser01 (the user should be created 'on the fly').
2. Implement SSH Access Control in order to prevent linuxuser01 from performing 'su – root01'

Advanced PSMP Implementations (Proposed Solution)

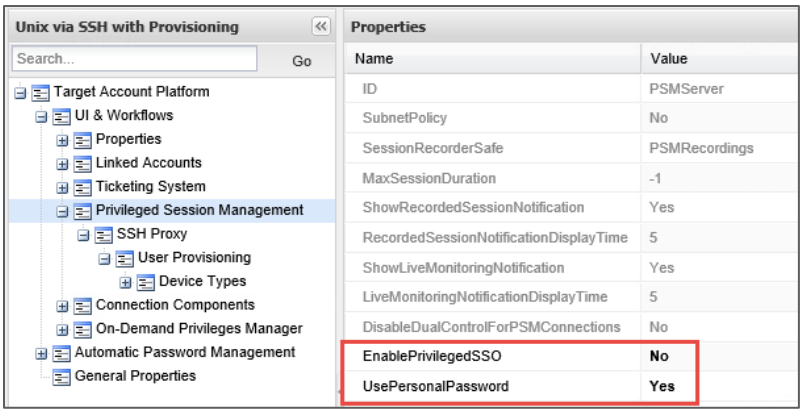
AD Bridge

Implementing AD Bridge to allow members of *LinuxUsers* to login with their AD credentials requires us to do the following:

1. Duplicate *Unix via SSH* to "**Unix via SSH with Provisioning"**.
2. Edit the new platform. Under UI & Workflows, Privileged Session Management, SSH Proxy, add **User Provisioning.**
3. Set parameter **EnableUserProvisioning** to **Yes**.

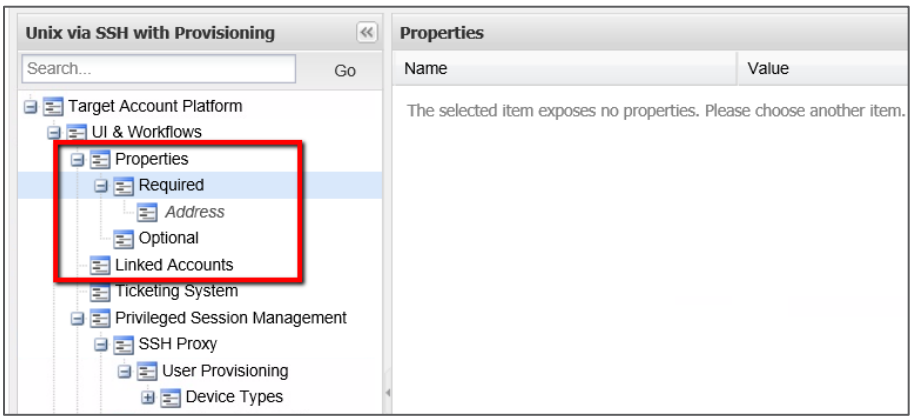


4. Set Privileged Session Management, EnablePrivilegedSSO = No and 'UsePersonalPassword' = Yes.

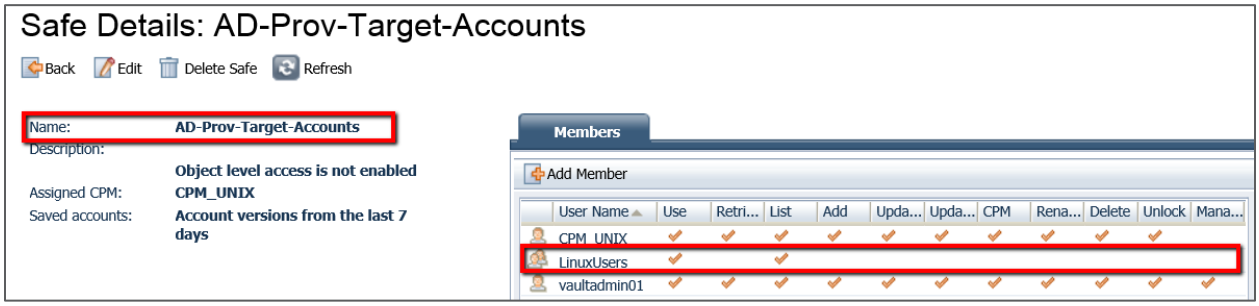


5. Delete the required property **Username**, leaving only **Address**.

6. Delete both Linked Accounts i.e., **LogonAccount** and **ReconcileAccount**.

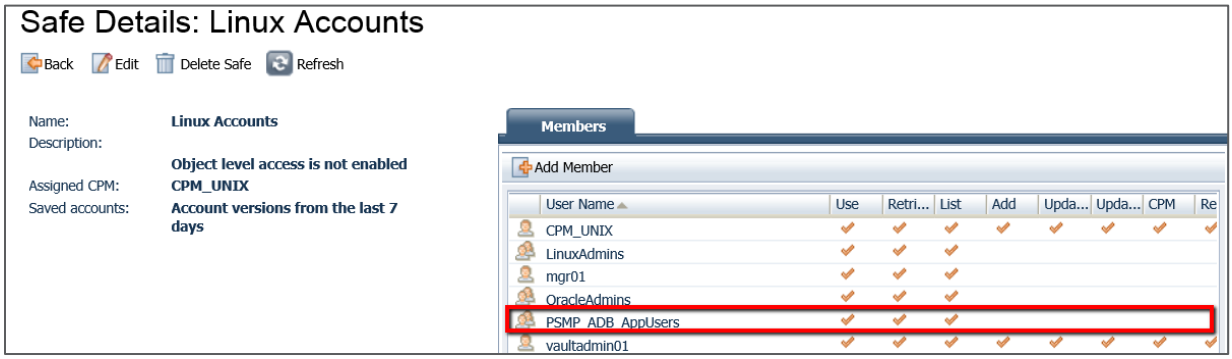


7. Create safe “AD-Prov-Target-Accounts” to store the *Target Machine Account*. Grant **LinuxUsers** *Use* and *List* permissions on the safe.

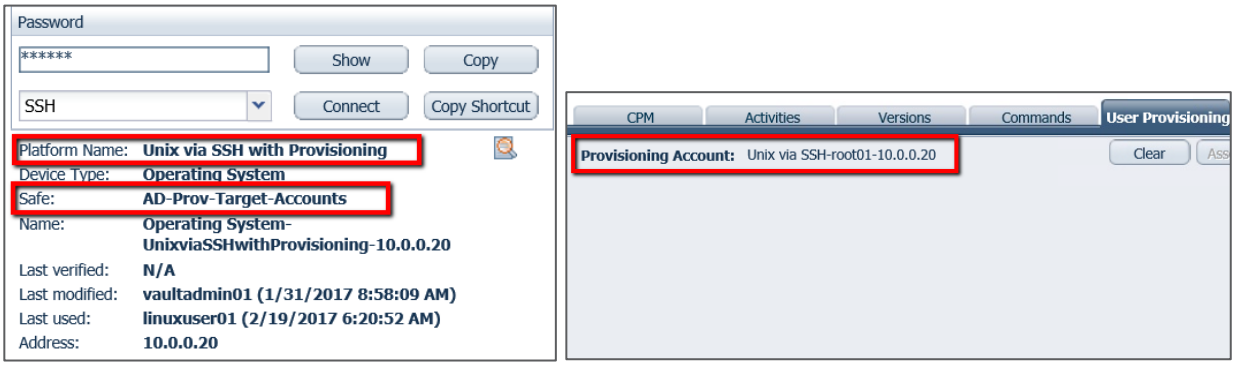


8. We will use the *root01@10.0.0.20* account as the “Provisioning Account”, thus we must also assign permissions on the **Linux Accounts** safe where root01 resides, providing access for the PSMP_ADB_AppUsers group.

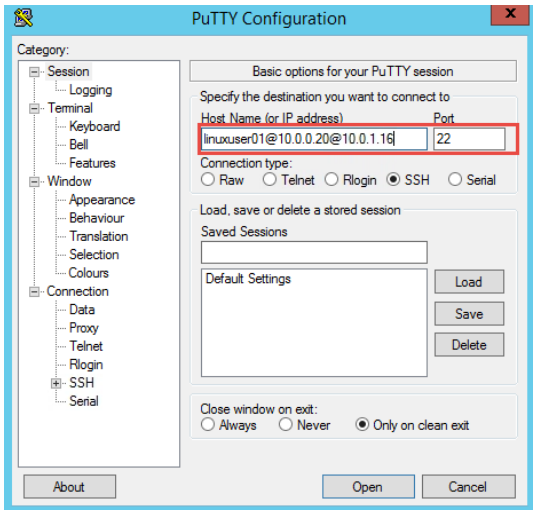
Note: If the environment has Dual Control enabled so that access to *root01* requires authorization from *mgr01*, grant the ADB app user group the **Access safe with confirmation** permission.



9. Next, create the target machine account for **10.0.0.20** and associate the new account with *root01* as the provisioning account. Notice this account has no username, no password and no linked accounts (this is normal).



10. Open Putty and enter linuxuser01@10.0.0.20@10.0.1.16 and press open. Please note that linuxuser01 exists in Active Directory but not on the Linux target server.



SSH Command Access Control

Implementing SSH Command Access control to block members of ***LinuxUsers*** from using the switch user (SU) command requires us to do the following:

Configure commands access control

1. Logged in as VaultAdmin01, Click ADMINISTRATION to display the System Configuration page, then click Options and navigate to:

2. Privileged Session Management > General Settings > Connection Client Settings.

3. Right-click and add Capabilities, then right click Capabilities and from the menu select Add Commands Access Control. A Commands Access Control capability with default settings appears.

4. Commands Access Control is disabled by default. Enabling of Commands Access Control is performed at the Platform level. This will be done later in the procedure.

5. Navigate to Options, Connection Components, and expand PSM-SSH or PSMP-SSH, or any other connection component that is used for SSH connections and requires the use of Commands Access Control.

6. Expand Target Settings, and right-click Supported Capabilities.

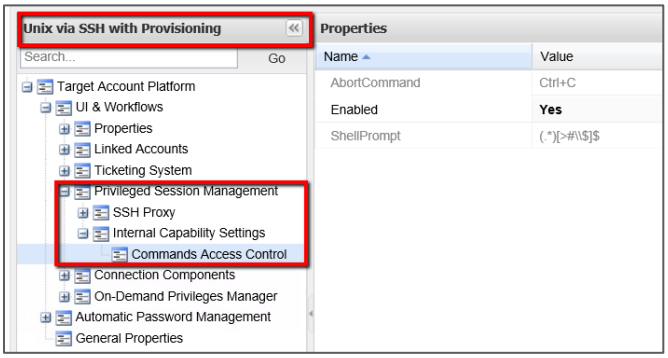
7. From the menu, select Add Capability. The Properties area of the new capability appears.

8. In the Id value field, specify CommandsAccessControl.

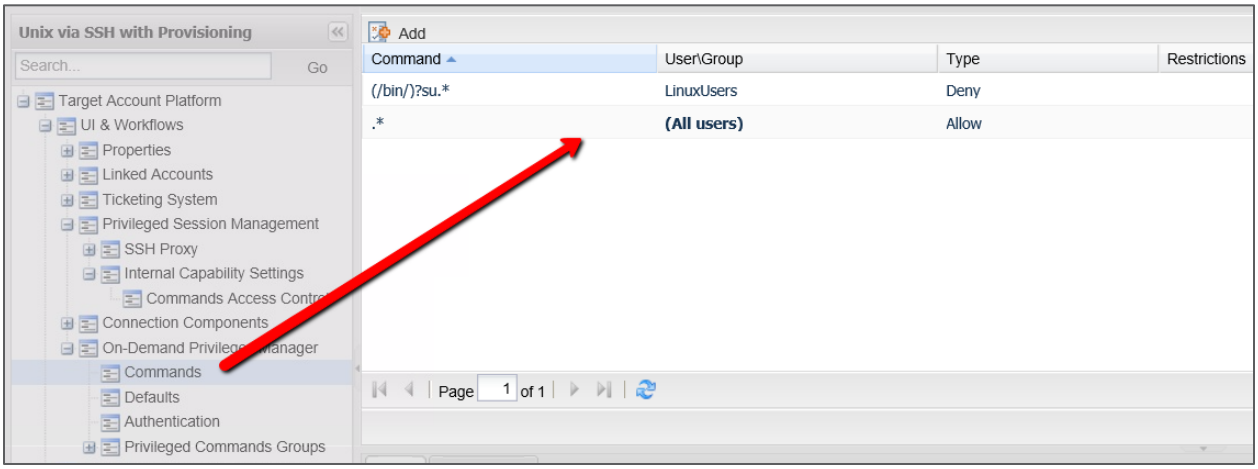
9. Click OK to save the new configuration.

10. Edit **Unix via SSH with Provisioning** platform.

11. Add **Internal Capability Settings** and enable **Commands Access Control** to the *Privileged Session Management* section.



12. All commands are denied by default once Command Access Control is enabled so we must first allow all commands and then begin blacklisting specific commands. Configure the allowed/blocked list of commands to allow all commands for all users, and deny the switch user (**SU**) command for members of the ***LinuxUsers*** group.



13. Restart the PSMP service on the PSMP server using the command:
`service psmpsrv restart`

14. Using putty, attempt to login as linuxuser01 and su to root.

Securing CyberArk

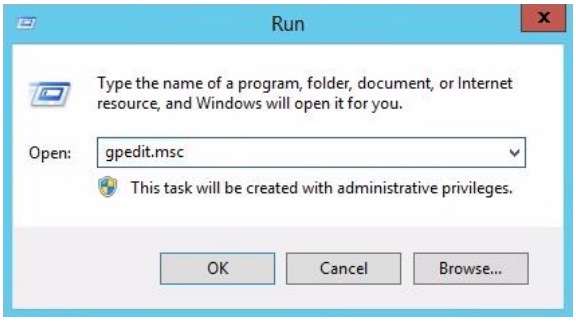
In this section you will be asked to perform several tasks to make your existing CyberArk platform more secure.

Use RDP over SSL

In this section you will configure the PSM server to accept RDP connections over SSL.

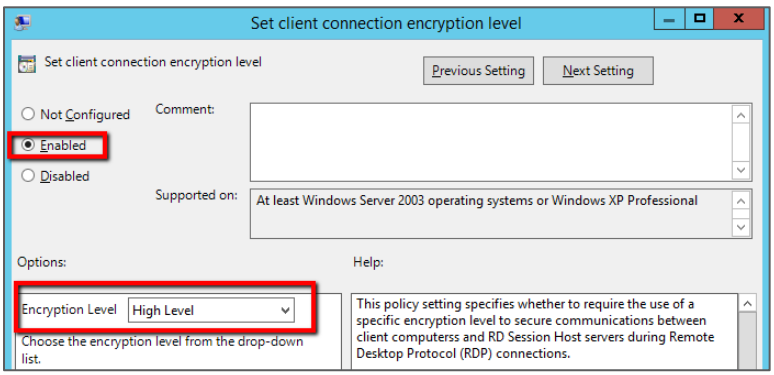
NOTE:	Connections to the **PSM** require a certificate on the **PSM** machine. By default, Windows generates a self-signed certificate, but you can and should use a certificate that is distributed by your Enterprise Certificate Authority.

1. Login to **comp01a** and run **gpedit.msc**.

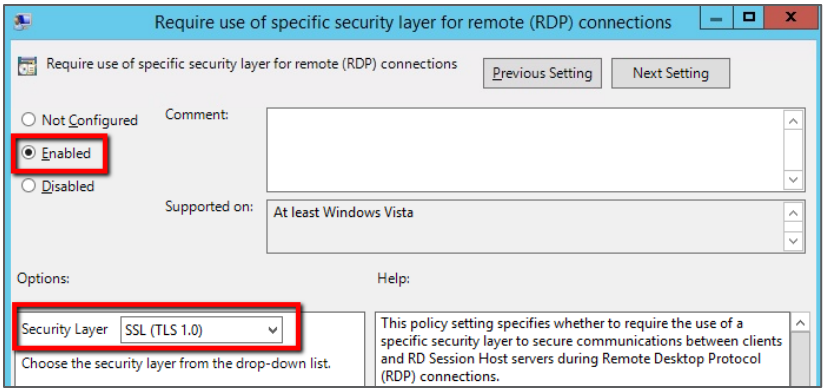


2. Navigate to **Computer Configuration** > **Administrative Templates** > **Windows Components** > **Remote Desktop Services** > **Remote Desktop Session Host** > **Security**.

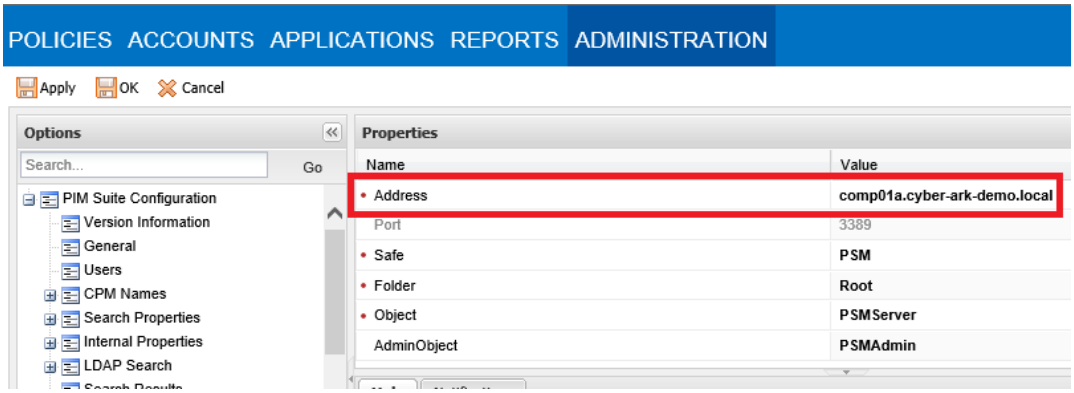
3. Open the Security settings for: **Set client connection encryption level**. Click on **Enabled** and set the encryption level to **High Level** then click **OK**.



4. Open the setting for: **Require use of specific security layer for remote (RDP) connections**. Click on **Enabled** and set the *Security Layer* to **SSL (TLS 1.0)** and click **OK**.



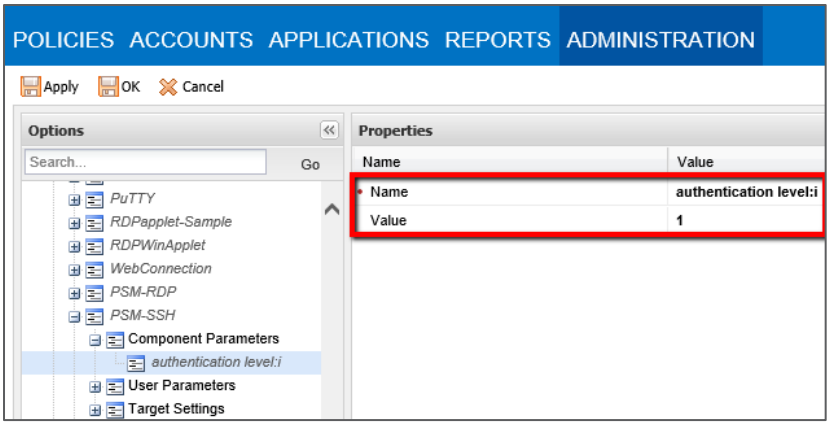
5. Login to the **PVWA** as **vaultadmin01** and go to **ADMINISTRATION > Options** > **Privileged Session Management** > **Configured PSM Servers** > **PSMServer** > **Connection Details** > **Server** and change the *Address* attribute to the FQDN of the **PSM** server (so that it matches the name of the **PSM** server certificate). Click **OK** to save the changes.



Note:	If you were using the **PSM** farm in your platforms, you must also change the PSM server ID back to **PSMServer** on those platforms. This is required due to limitations of the ZEN LB appliance.

6. In the **PVWA**, open **Administration** > **Component Settings** > **Options** > **Connection Components** > **PSM-SSH** > **Component Parameters**. Add a new parameter named **authentication level:i** and set the *Value* to **1**.

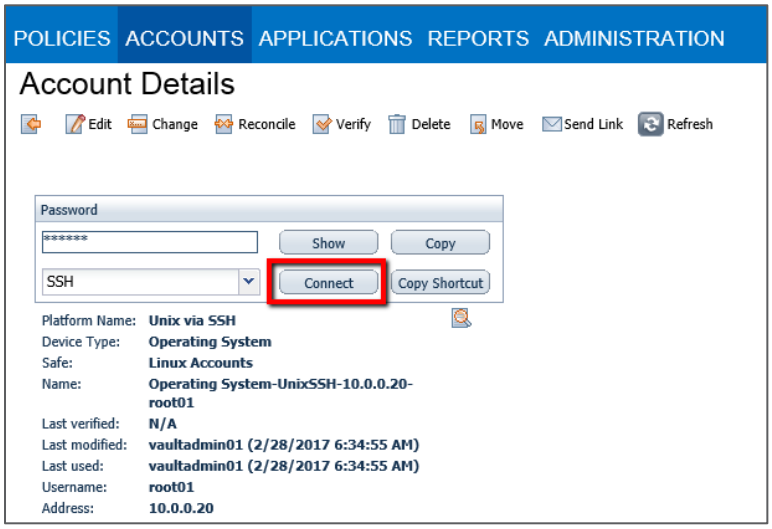
Note:	For connections with ActiveX or an external tool, the Name should be **AdvancedSettings4.AuthenticationLevel** with a Value of 1).



Note:	You will need to do the same for each active connection component in order to enable RDP over SSL connections to the **PSM** machine.

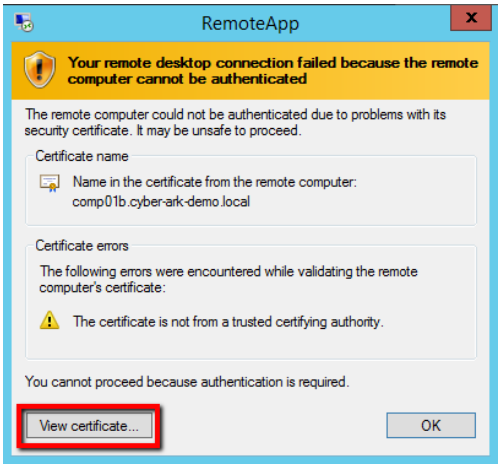
7. Restart the PSM service (as the PSM needs to refresh the configuration changes done to the connection component in the PVWA)

8. Next, try to connect to one of the accounts you previously configured via the **PSM** (this time using RDP over SSL).

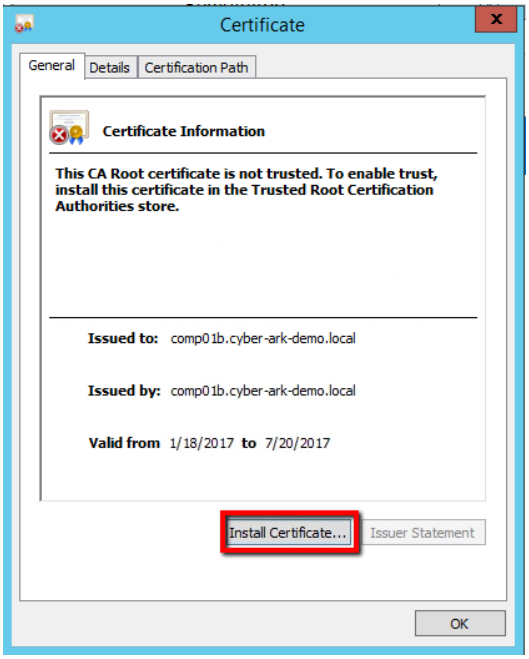


Note:	If this is the first time you try to use RDP over SSL you will also need to import the PSM server certificate to your Components server.

9. After clicking on the RDP file, click on **View certificate**.

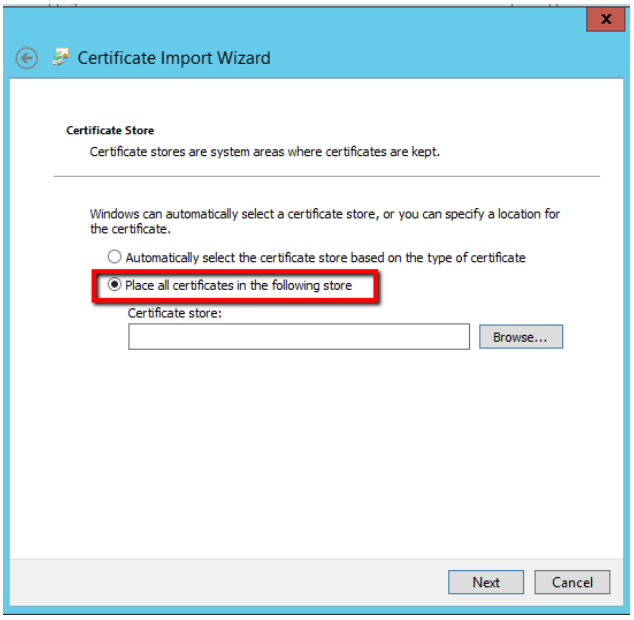


10. Click on **Install Certificate**.

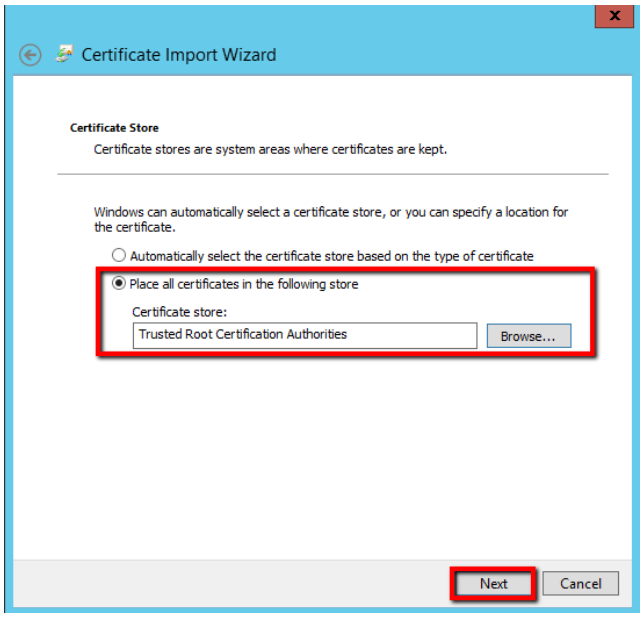


11. Click on **Local Machine** and click **Next**.

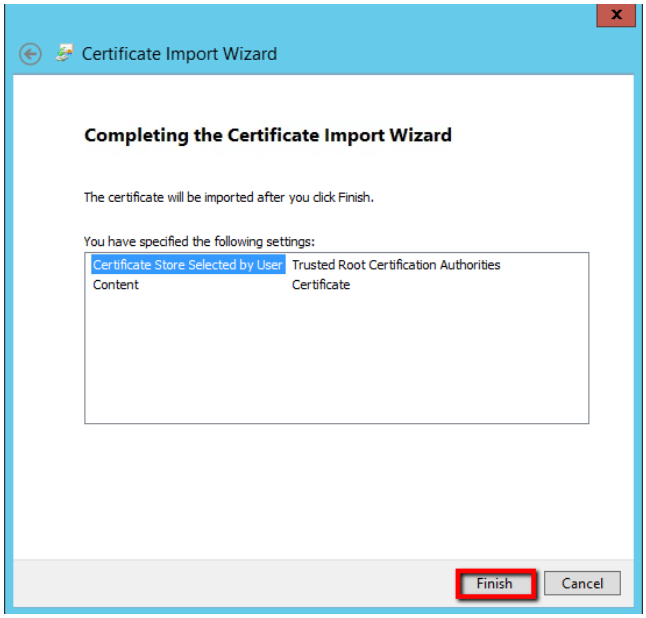
12. Click on **Place all certificates in the following store**.



13. Click on **Browse** and then choose **Trusted Root Certification Authorities**. Then click on **Next**.



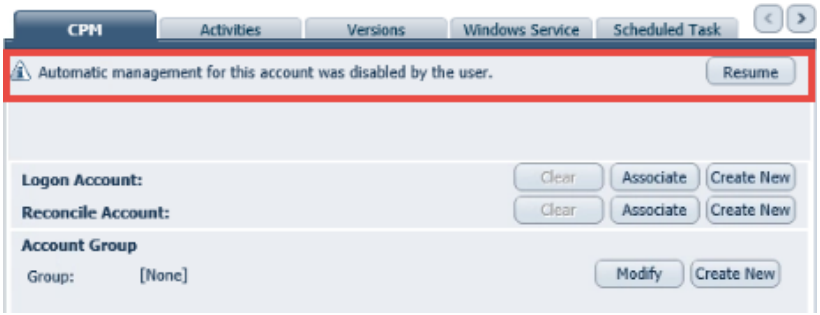
14. Click on **Finish** then re-establish the connection, which will now succeed.



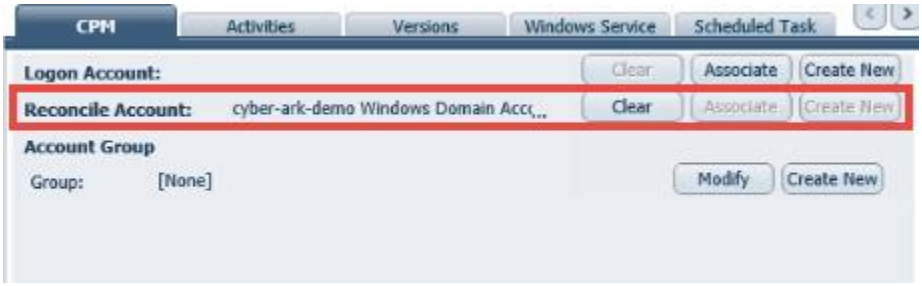
Manage LDAP BindAccount

NOTE: Ensure that a reconcile account is associated with the BIND account.

1. Logon to the PVWA as Vaultadmin01.
2. Edit the VaultInternal safe and assign CPM: CPM_WIN and Save.
3. Go to the Accounts tab and search for BindAccount.
4. Edit BindAccount. Select Resume to enable Automatic Management as seen in the following graphic.



5. In Account Details, associate a Reconcile Account by selecting Associate and choosing the Admin01 domain account.



6. Select the Change button to change the password of BindAccount.

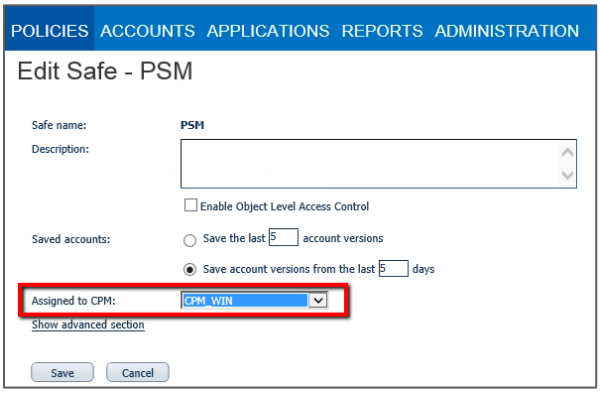
NOTE:	It is recommended to configure these password changes to take place "off hours" when user access to accounts in the vault is less likely. This can be accomplished by duplicating the Windows Domain Account platform, and configuring the platform settings accordingly.

Manage PSMConnect/PSMAdminConnect using the CPM

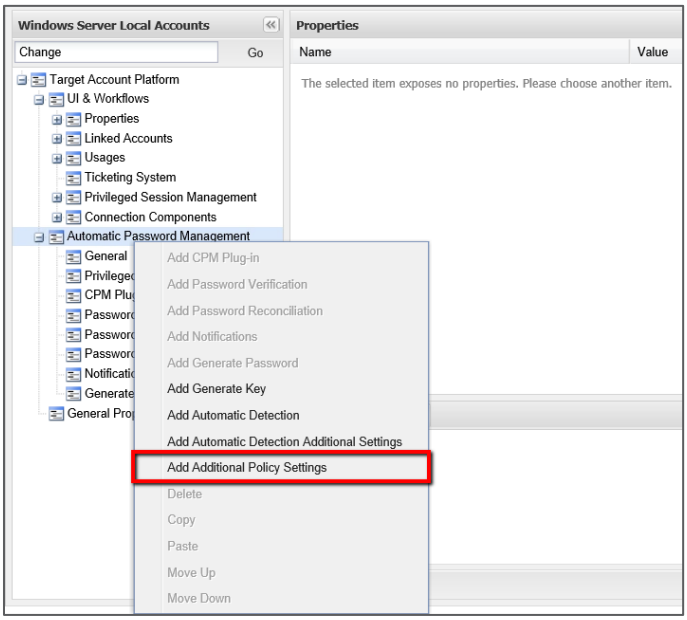
NOTE:	Customers who manage *PSMConnect* and *PSMAdminConnect* user credentials with the **CPM** must make sure that a reconcile account is associated with these accounts, and that changes to the password are done via Reconcile.

1. Login to the PVWA as CyberArk user **Administrator** and go to **POLICIES** > **Access Control (Safes)** and choose the **PSM** safe. Click on **Edit**.

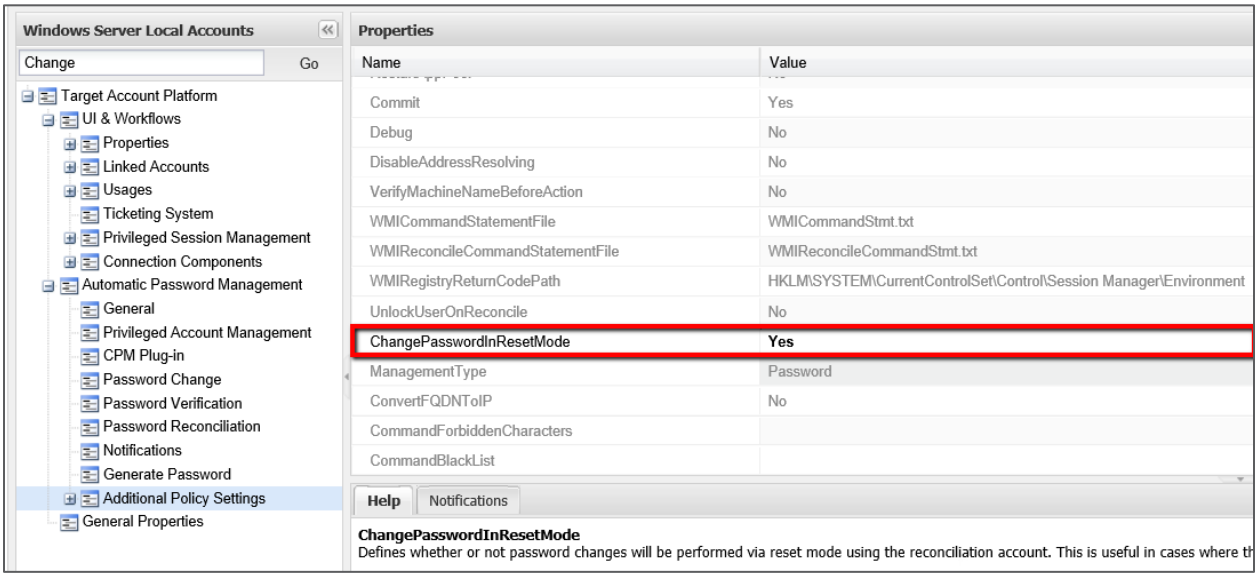
2. Assign to CPM: **CPM_WIN**.



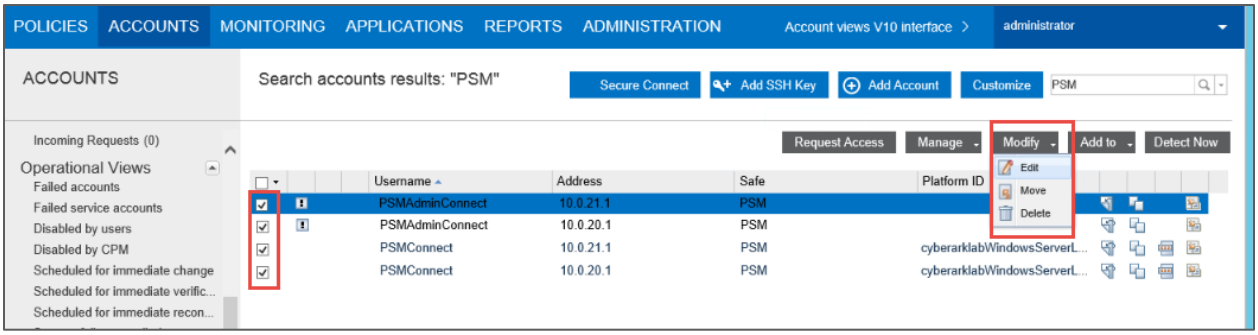
3. Next, we need to assign the PSM users to the **Windows Local Server Accounts** or preferably a duplicated platform based on Windows Local Server Accounts, and configure the platform to perform changes using the Reconcile mechanism. Go to platform management and edit right click on Automatic Password Management > Add Additional Policy Settings:



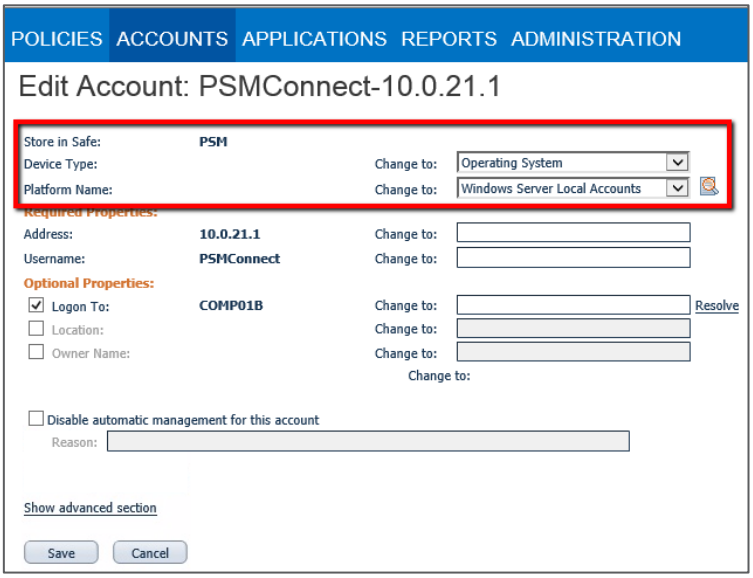
4. Set **ChangePasswordInResetMode** to Yes and click on OK to save.



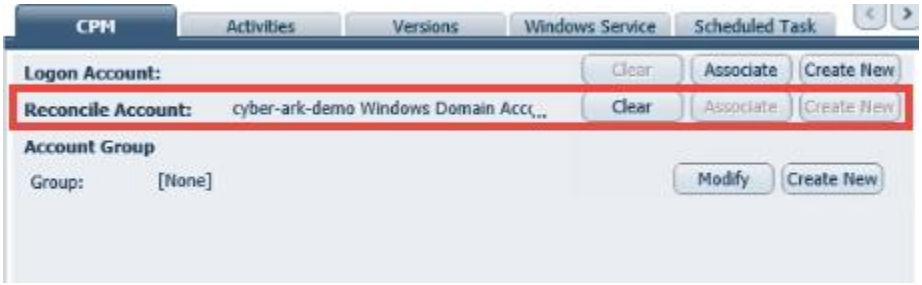
5. Go to **ACCOUNTS**, and select both **PSMConnect** and both **PSMAdminConnect** users. Select the Modify button and click on **Edit.**



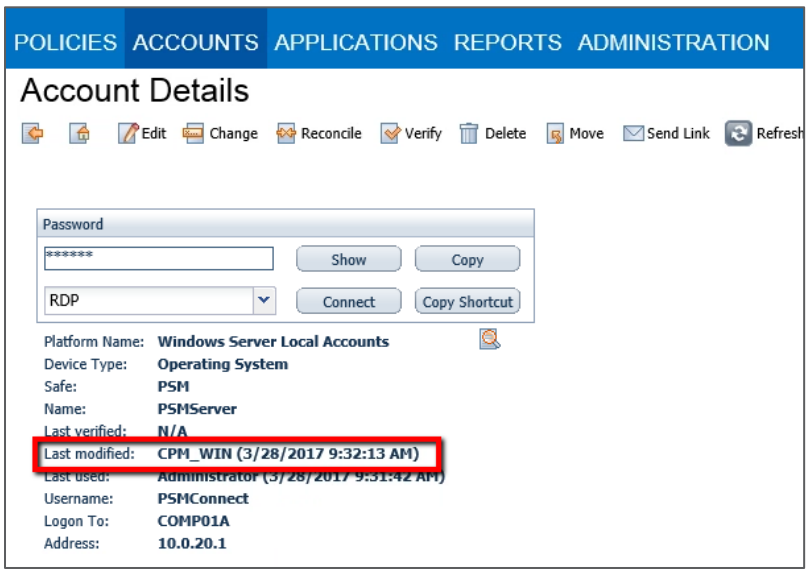
6. Change *Device Type* to **Operating System** and *Platform Name* to "**Windows Server Local Accounts"** (or the platform you created) and select **Save**.



7. In Account Details, associate a Reconcile Account for each **PSMConnect** and **PSMAdminConnect** user, by selecting Associate and choosing the Admin01 domain account. Alternatively, you can choose to define the Admin01 account as the Reconcile account at the platform level.



8. Select the Change button to change the password of all PSMConnect and PSMAdminConnect users. You should be able to see that the CPM successfully reconciled the passwords.



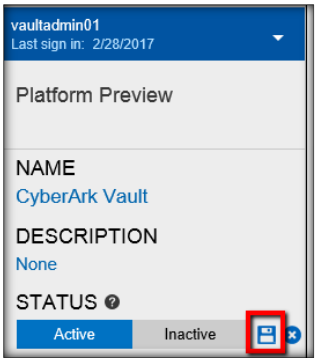
NOTE:	It is recommended to configure these password changes to take place during the night or at another time when user access to accounts in the vault is less likely.

Manage CyberArk Admin Accounts using the CPM

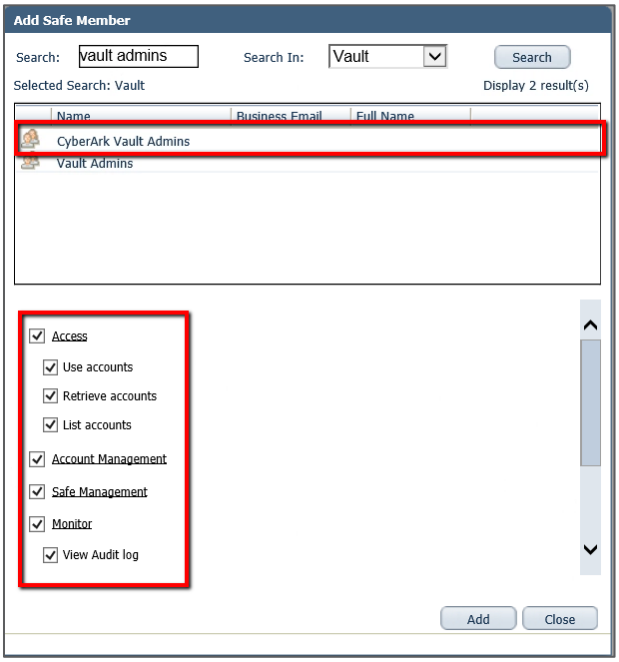
In this section you will configure the CPM to manage the password for the built-in CyberArk Administrator user.

NOTE:	After this step the CPM will change the password for the built-in administrator and you will need to retrieve the password of *Administrator* from the Vault.

1. Login to the PVWA as **vaultadmin01** and activate the **CyberArk Vault** platform.



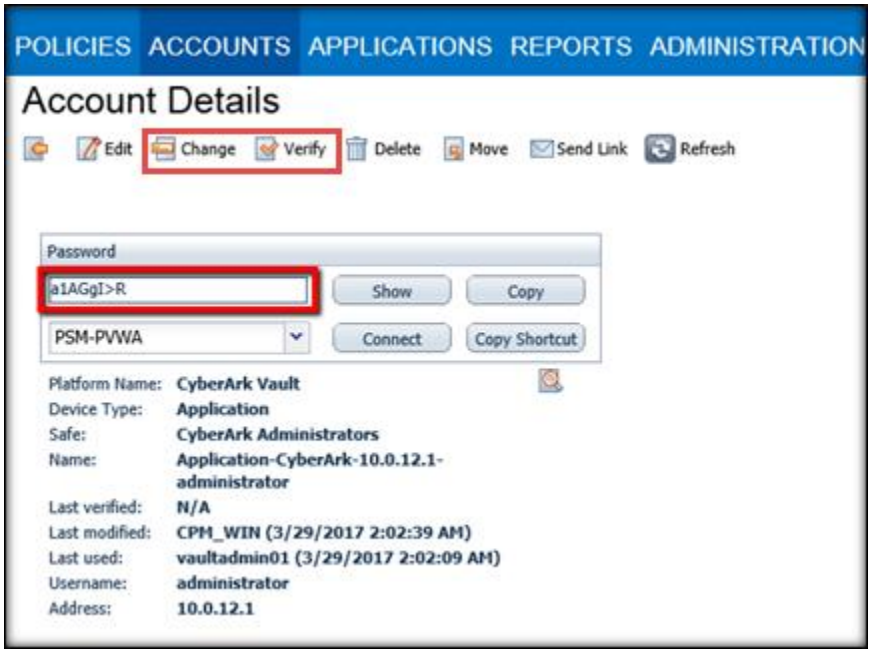
2. Next, create a new safe called **CyberArk Administrators** to store CyberArk administrative accounts. Assign the safe to **CPM_WIN a**nd grant the external CyberArk Vault Admins group full permissions to this safe.



3. Next, create a new account in the PVWA for **Administrator** with the following properties.

Store in Safe	**CyberArk Administrators**
Device Type	**Application**
Platform	**CyberArk Vault**
Username	**Administrator**
Address	**10.0.10.1**
Password	**Cyberark1**

4. Execute verify and password change operations for **Administrator**.

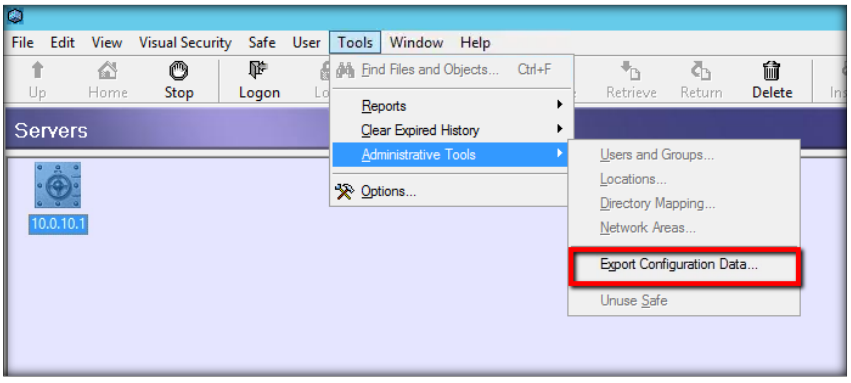


Connect with PSM-PrivateArk Client

In this section you will configure the PSM to support PrivateArk Client connections.

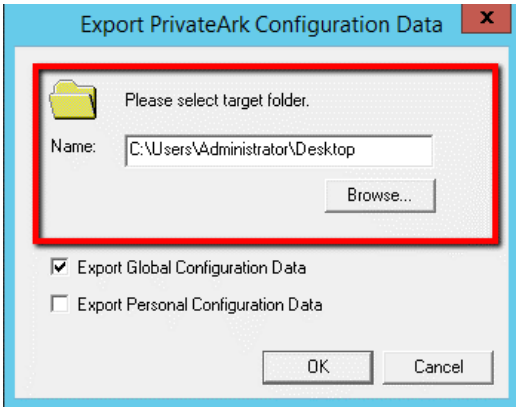
Note:	In order to use the PSM to connect to the Vault using the PSM-PrivateArk connection component, the PrivateArk Client must be installed on the PSM server and be configured in *Global Configuration* mode. Global Client Configuration enables you to define Vault parameters once and then make these parameters available to all users. This feature reduces system administration time and streamlines Vault management.

1. First, login to the PSM server and run the PrivateArk Client from the desktop (no need to login). Go to **Tools** > **Administrative Tools** > **Export Configuration Data**.

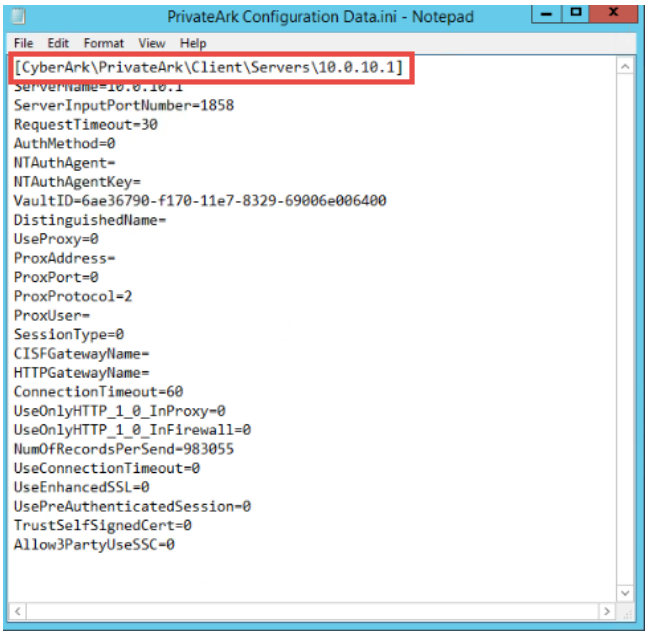


cd

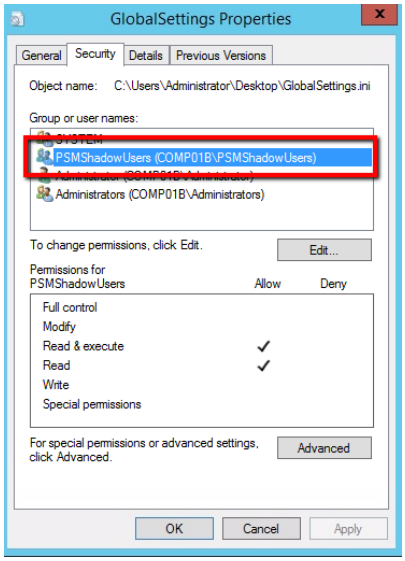
2. Export the Global Configuration Data to the **Desktop**.



3. Make sure that the **PrivateArk Configuration Data.ini** file was created successfully. Open the file and make sure that the IP address of the Vault server is in the path at the top of the file. Rename the file **GlobalSettings.ini**.

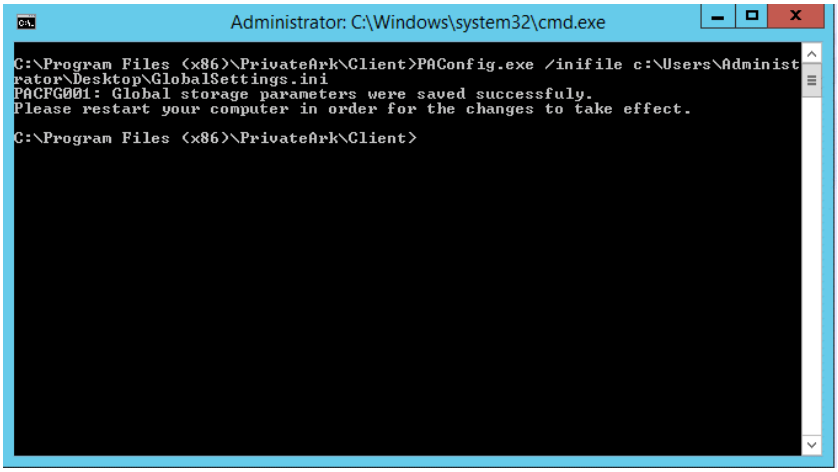


4. Next, open the **Properties** of the *GlobalSettings.ini* file. Go to the **Security** tab and give **Read & Execute** permissions on the file to the local **PSMShadowUsers** group on the PSM server.



5. Next, since the client is already installed in normal mode, you will use the *PAConfig* utility to change the configuration to Global Configuration. Simply open CMD in "C:\Program Files (x86)\PrivateArk\Client" and run the following command:

PAConfig.exe /inifile c:\Users\Administrator\Desktop\GlobalSettings.ini

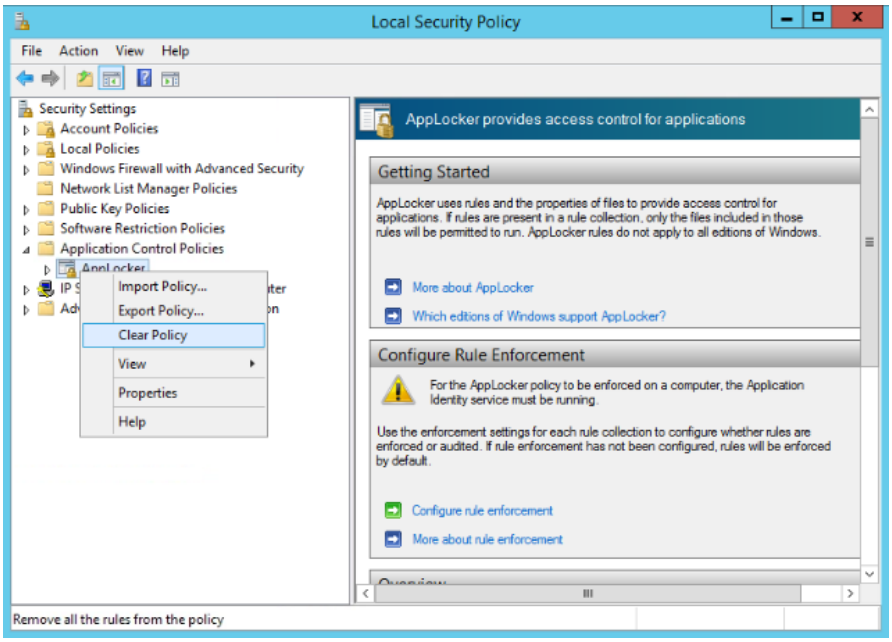


6. Restart the server.
7. Login to the PVWA as **Vaultadmin01** and add the Private Ark client executable as an authorized application in the Applocker configuration.

a. In the PSMConfigureApplocker.xml file, go to the “Generic Client support” section at the bottom. Copy the “Generic client sample” line. Paste this line with the “Microsoft IExplore processes” (because it is not commented) and edit the Name and Path as follows: Name=”PrivateArk Client”, Path="C:\Program Files (x86)\PrivateArk\Client\Arkui.exe"

```
<!-- Microsoft IExplore processes -->
<Application Name="IExplore32" Type="Exe" Path="c:\Program Files (x86)\Internet Explorer\iexplore.exe" Method="Publisher" />
<Application Name="IExplore64" Type="Exe" Path="c:\Program Files\Internet Explorer\iexplore.exe" Method="Publisher" />
<Application Name="SQLPlus" Type="Exe" Path="c:\oracle\instantclient\sqlplus.exe" Method="Hash" />
<Application Name="PrivateArk Client" Type="Exe" Path="C:\Program Files (x86)\PrivateArk\CLIENT\Arkui.exe" Method="Hash" />
```

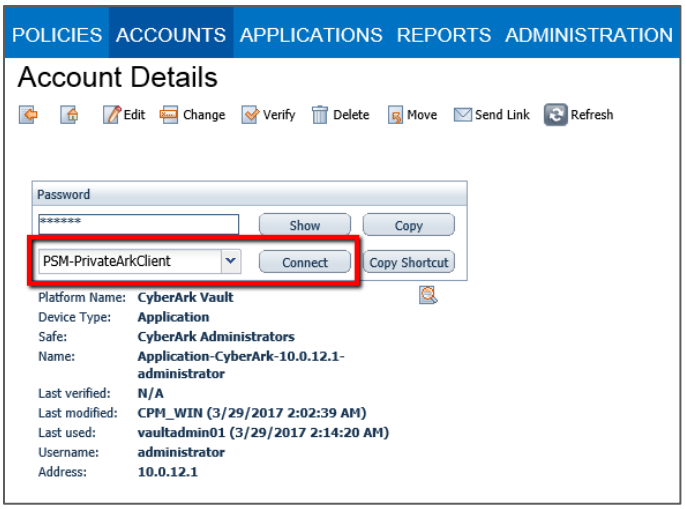
8. Save the file.
9. Delete all Applocker rules before running the Applocker script.
   a. Run SecPol.msc from the Start / Run menu.
   b. Expand Application Control Policies and right click on Applocker.
   c. Select Clear Policy.



10. Now reapply the Applocker rules by executing the PSMConfigureApplocker.ps1 script.

Note:	Refer to section “**Configure AppLocker Rules**”

11. Verify that you can connect to the Vault with **Administrator** using the **PSM-PrivateArkClient** connection component (don't forget to enable RDP over SSL for the connection component by adding a new connection parameter called **authentication level:i** with a value of **1** and restarting the PSM service).



Connect with PSM-PVWA

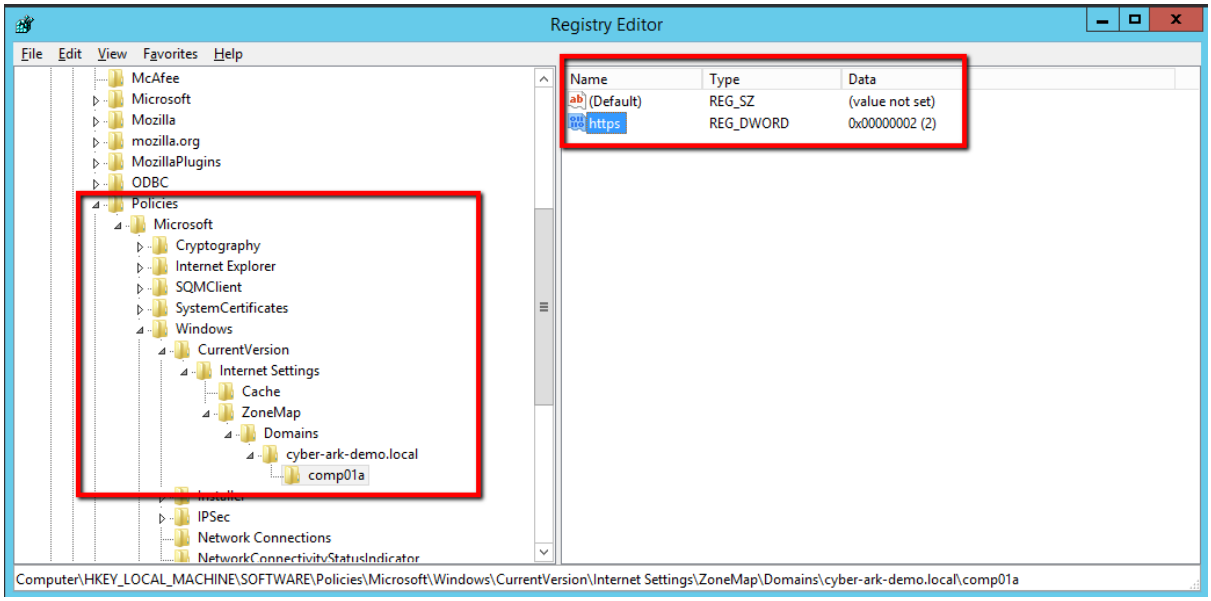
In this section you will configure the PSM to support connections with CyberArk administrative accounts to the Vault using the PVWA.

Note:	In order for the PSM to support connections to the Vault using the PSM-PVWA connection component, the PSM must be configured to run Web Applications. This should have been accomplished by updating the PSMHardening.ps1 script to support Web Applications and then running the hardening script. If you skipped the section "Post Installation and Hardening Tasks", go back and perform these steps.

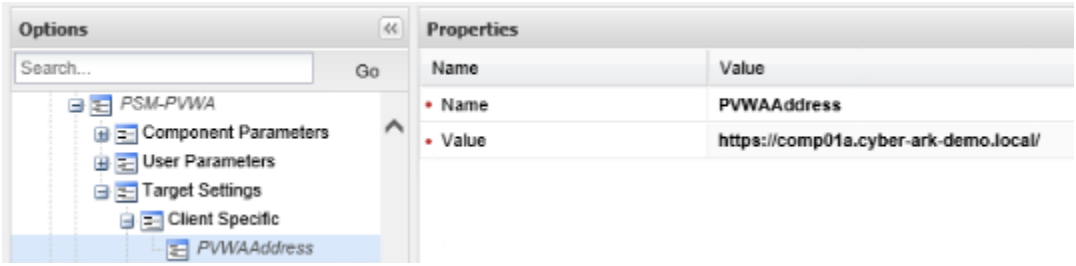
12. To support the *PSM-PVWA* connection component the URL of the PVWA must be added to the PSM server's IE *Trusted Sites* list. Since this needs to be done for all *PSMShadowUsers*, you will need to do this by creating the following key in the PSM machine Registry:

HKEY_LOCAL_MACHINE\SOFTWARE\Policies\Microsoft\Windows\CurrentVersion\Internet Settings\ZoneMap\Domains\cyber-ark-demo.local\comp01a

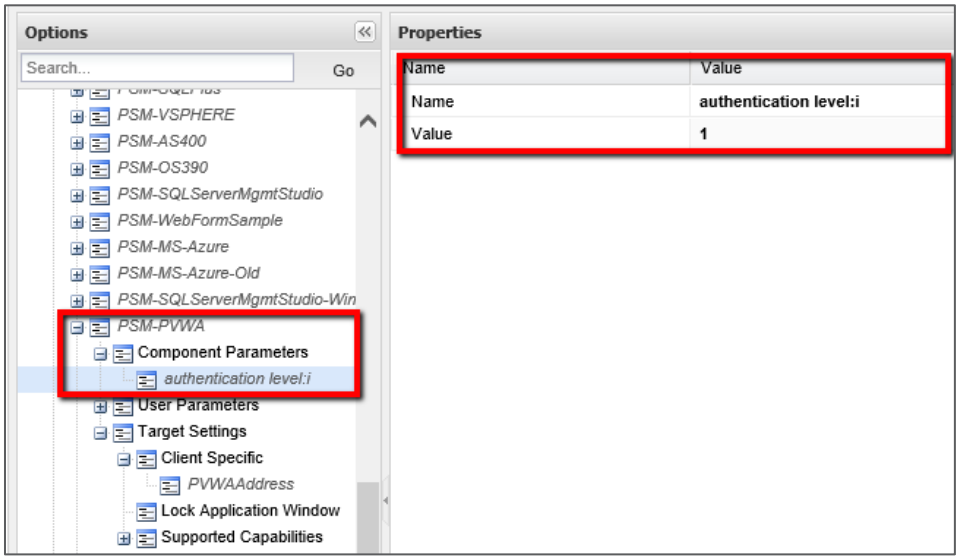
13. Add a new DWORD value called **https** with a decimal value of **2**.



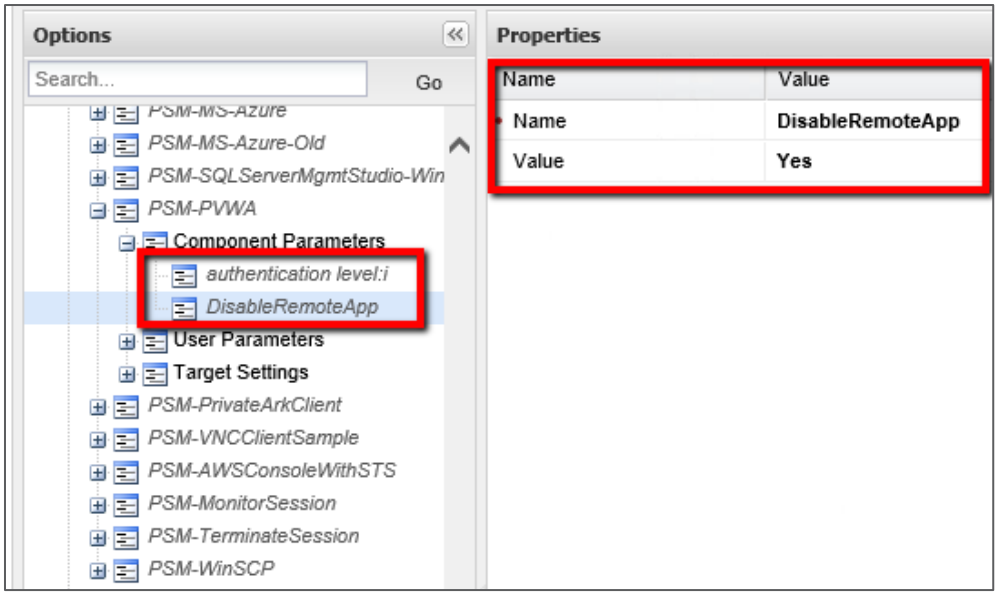
14. Login to the PVWA and navigate to **Options** > **Connection Components** > **PSM-PVWA** > **Target Settings** > **Client Specific > PVWAAddress** and change the *Value* parameter to the URL of the PVWA (e.g. **https://comp01a.cyber-ark-demo.local/**):



15. Enable RDP over SSL for the *PSM-PVWA* connection component by adding a new Component Parameter called **authentication level:i** with a value of **1**.



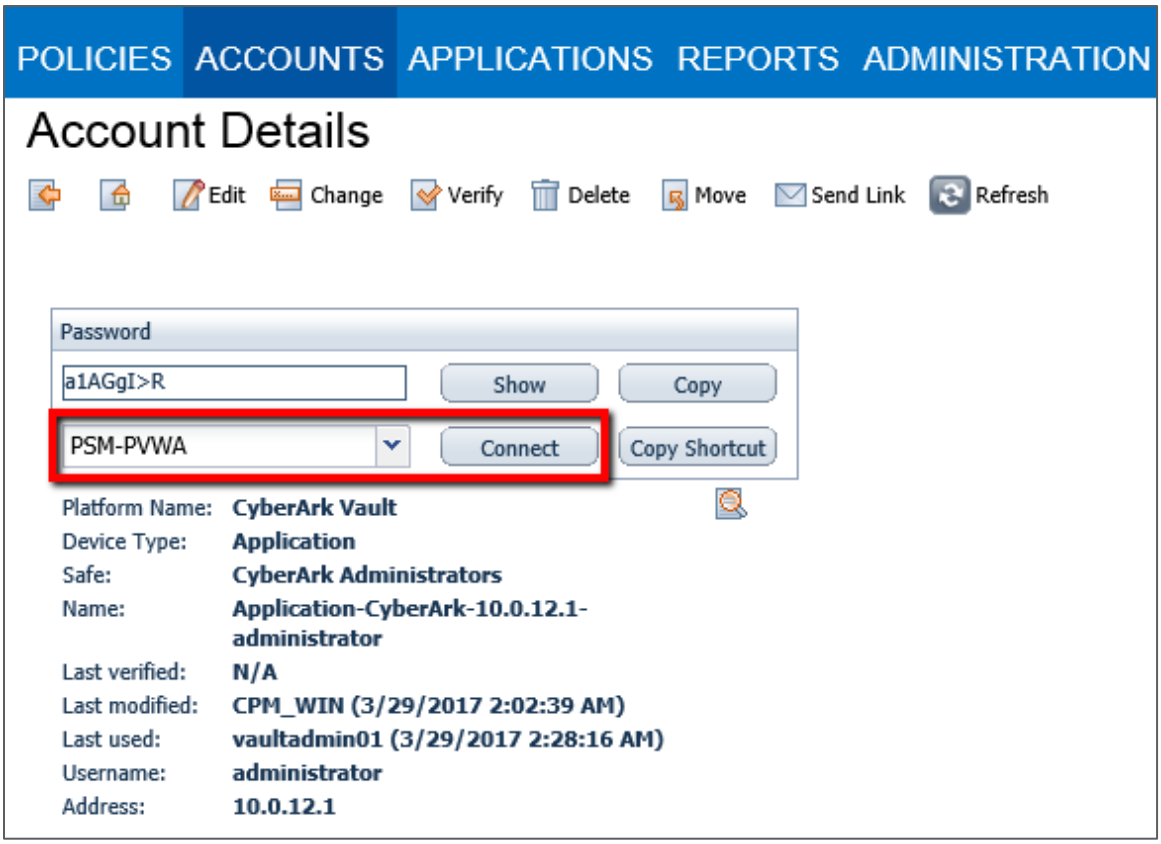
16. We will disable RemoteApp for this connection component as well by adding a Component Parameter call **DisableRemoteApp** with a value of **Yes** and restart the PSM service.



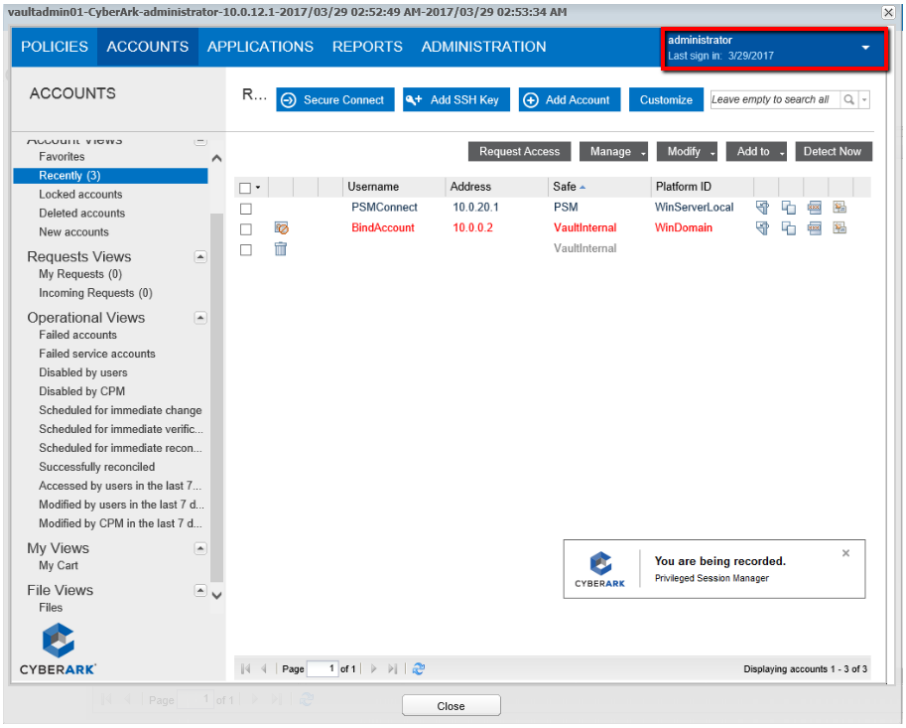
17. You must also configure Applocker to run the following executable: "***C:\Program Files (x86)\Java\jre1.8.0_101\bin\ssvagent.exe***". Add the following rule to Applocker and run the PSMConfigureApplocker.ps1 script (if the executable is still blocked by Applocker when you run the connection component, clear the policies using secpol.msc and then try running the script again)

```
<!-- Microsoft IExplore processes -->
<Application Name="IExplore32" Type="Exe" Path="c:\Program Files (x86)\Internet Explorer\iexplore.exe" Method="Publisher" />
<Application Name="IExplore64" Type="Exe" Path="c:\Program Files (x86)\Internet Explorer\iexplore.exe" Method="Publisher" />
<Application Name="PrivateArk Client" Type="Exe" Path="C:\Program Files (x86)\PrivateArk\Client\Awui.exe" Method="Hash" />
<Application Name="PVWA" Type="Exe" Path="C:\Program Files (x86)\Java\jre1.8.0_101\bin\ssvagent.exe" Method="Hash" />
```

18. Next, login to the PVWA as **Vaultadmin01** (don't forget to choose LDAP authentication) and try to connect with **Administrator** to the Vault using the **PSM-PVWA** connection component.



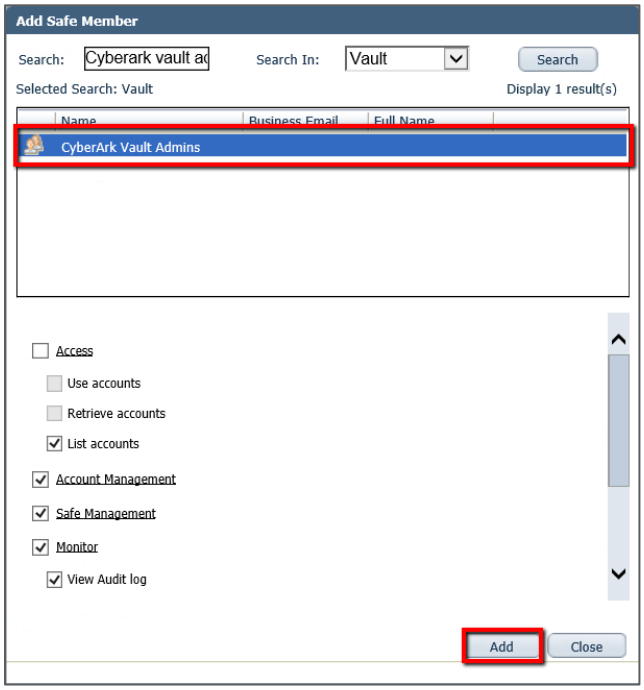
19. Verify that you can view the recordings of your PrivateArk Client and PVWA sessions (you can login with **Auditor01** who is an LDAP user to view the recordings).



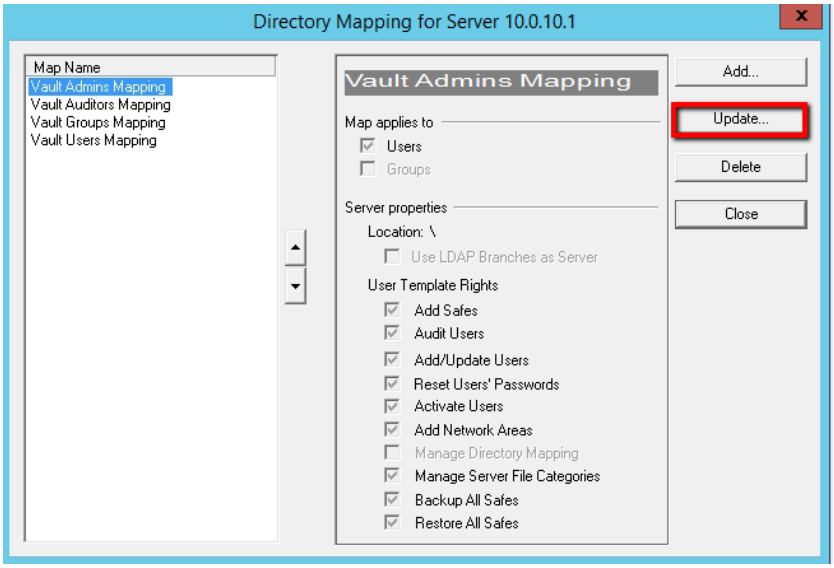
Remove Unnecessary CyberArk Administrative Privileges

Note:	Now that you have successfully connected to CyberArk administrative interfaces via the PSM, it is time to remove the admin authorizations of the CyberArk Vault Admins group. From this point on, all administrative activity on CyberArk will be done via the built-in administrator, fully monitored and audited by the PSM.

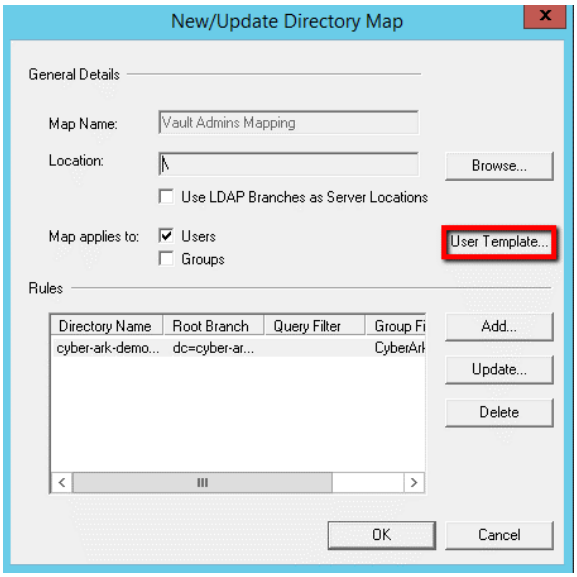
1. First, assign the external CyberArk Vault Admins group permissions on your privileged accounts safes (Linux, windows and Database). Assign the group all permissions except for “Use accounts” and “Retrieve accounts”. This is done to allow Vault Admins to manage the safes where accounts are stored but not have access to the passwords themselves. Note that CyberArk Vault Admins should still have **all** permissions (including “Use Accounts and “Retrieve Accounts”) on the CyberArk Administrators safe.

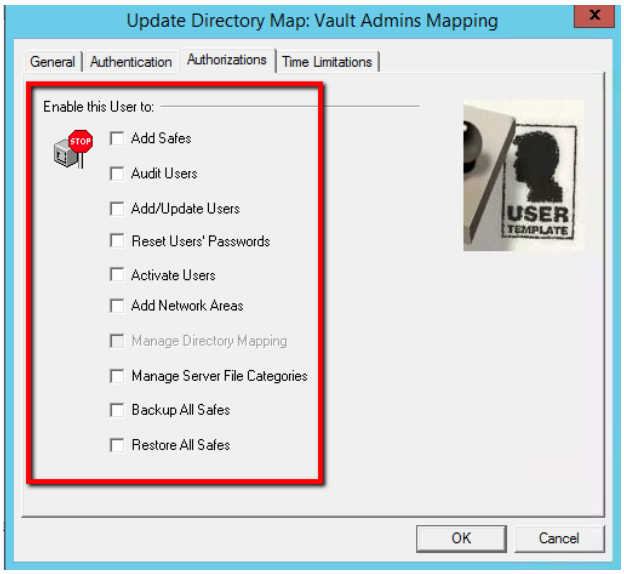


2. Next, login to the PrivateArk Client as administrator and go to **Tools** > **Administrative Tools** > **Directory Mapping**. Select the Vault Admins Directory mapping and click on update.



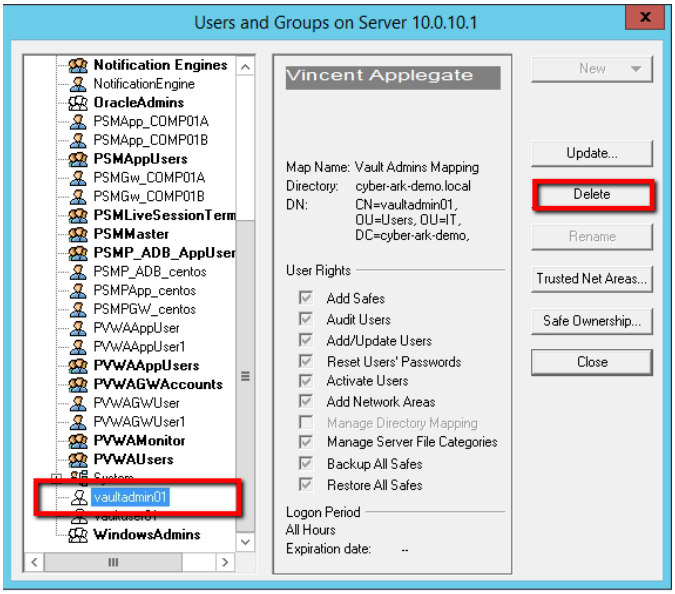
3. Select User Template and then remove all the Vault Authorizations.

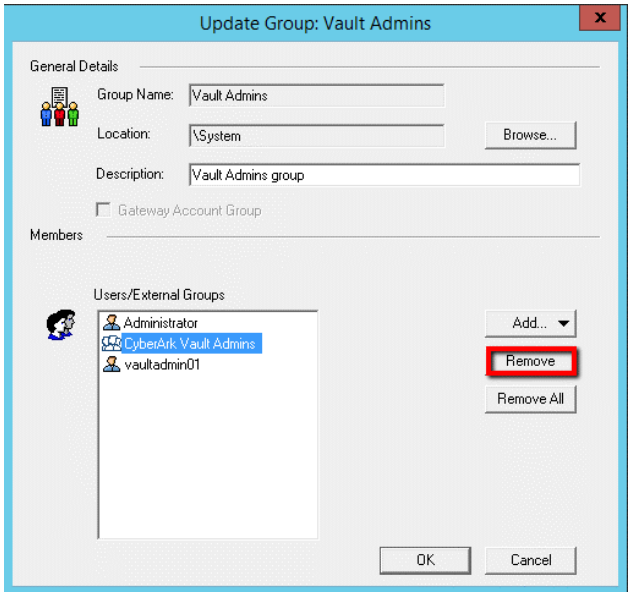




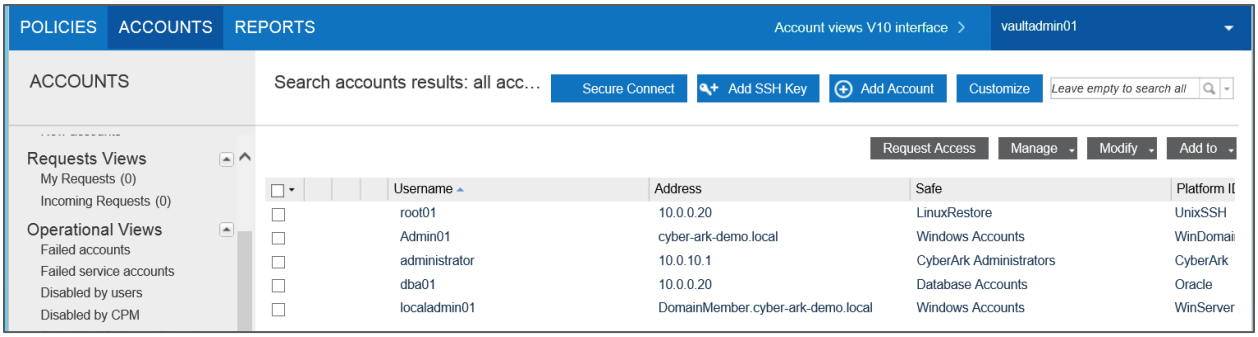
4.

5. Remove the external CyberArk Vault Admins group from the built-in Vault admins group and delete Vaultadmin01 from the Vault. Logoff from the PrivateArk Client.





6. At this stage Vaultadmin01 should be logged off from the PVWA automatically. Login to the PVWA again as **Vaultadmin01**. You should be able to see the accounts you previously created, but you should not see the Administrative tabs anymore. From now on, any administrative work should be done with the built-in administrator via the PSM.



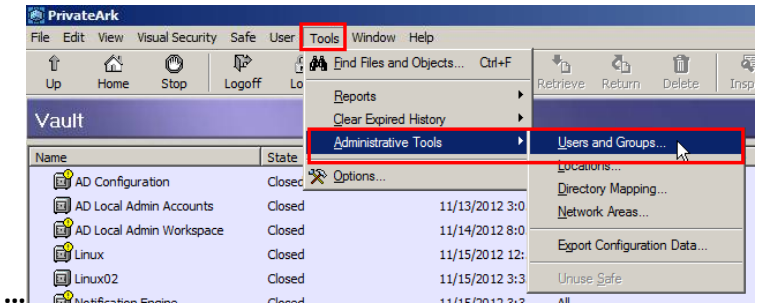
Backup

Enable the Backup and Users

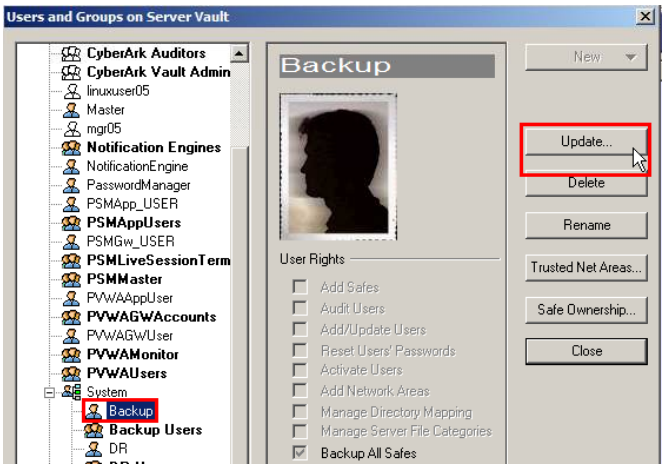
For this section of the exercise, you will first login to the **PrivateArk Client** on **Comp01A Server** in order to enable the users required to run a backup.

1. Use the **PrivateArk** client to log into the **Vault** as *administrator* (use the PSM-PrivateArk Client connection component).

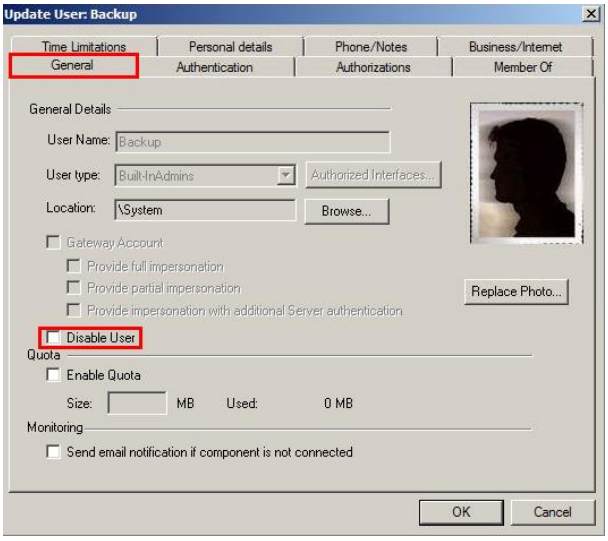
2. Go to **Tools > Administrative Tools > Users and Groups**.



3. Highlight the **Backup** user (located under System) and press **Update.**

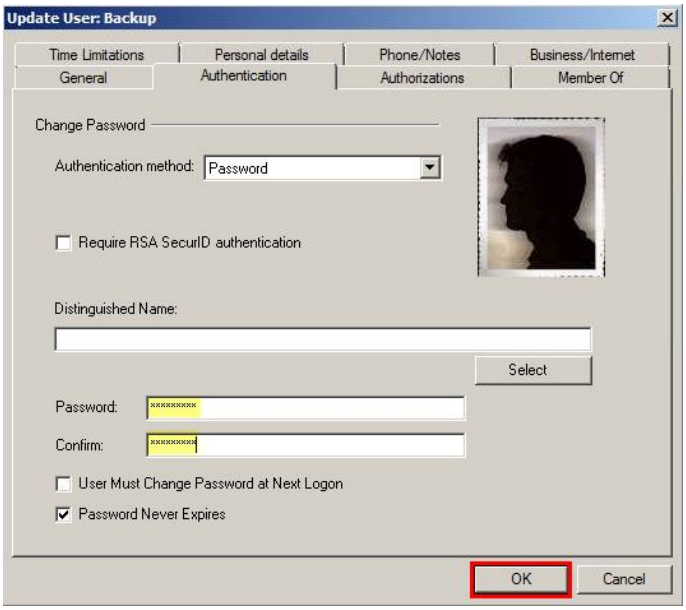


4. On the **General** tab uncheck the *Disable User* checkbox.



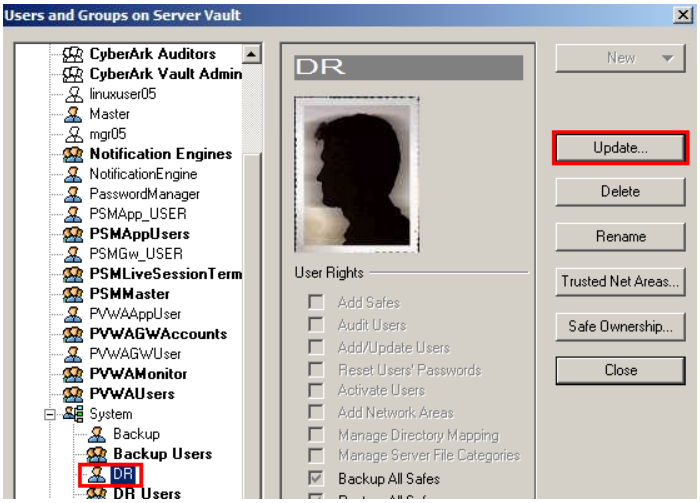
5. On the **Authentication** tab enter *Cyberark1* in the **Password** and **Confirm** fields.

6. Press **OK.**

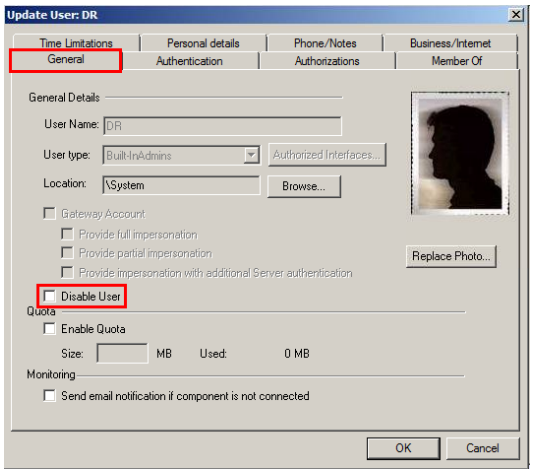


The DR user will be used in the Disaster Recovery exercise. We will enable it now.

7. Highlight the **DR** user (located under System) and press **Update.**

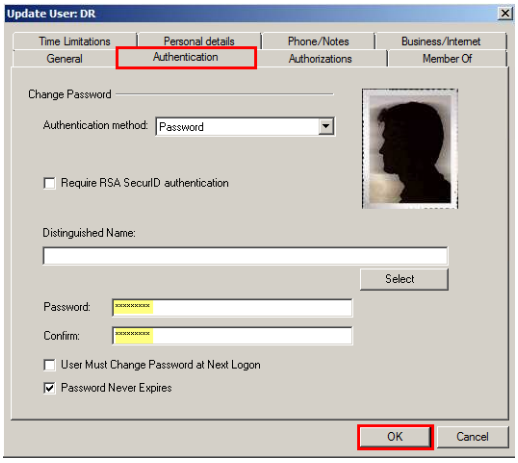


8. On the **General** tab uncheck the *Disable User* checkbox.



9. On the **Authentication** tab enter *Cyberark1* in the **Password** and **Confirm** fields

10. Press **OK**.

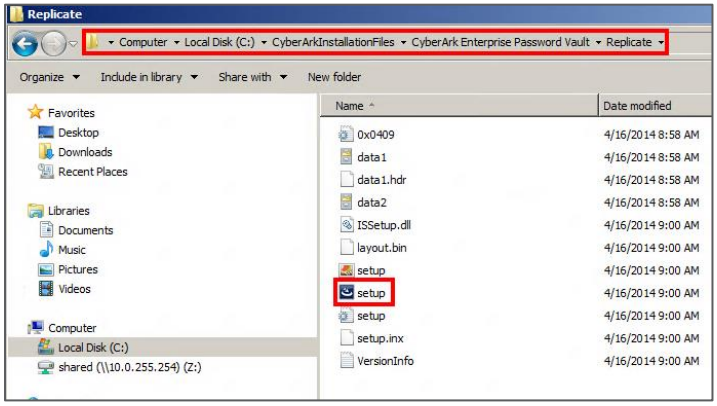


11. Log out of **PrivateArk Client**.

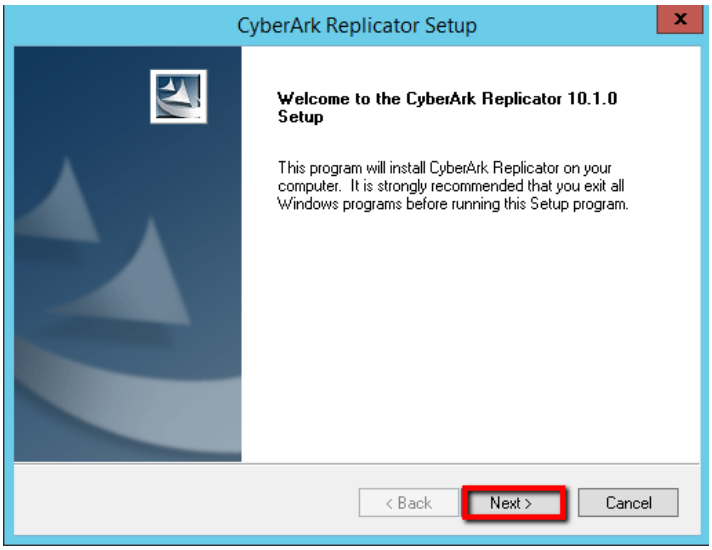
Install the PrivateArk Replicator

1. On the **Components Server**, open *Windows File Explorer* and go to *C:\CyberArkInstallationFiles\CyberArk Enterprise Password Vault\Replicate*.

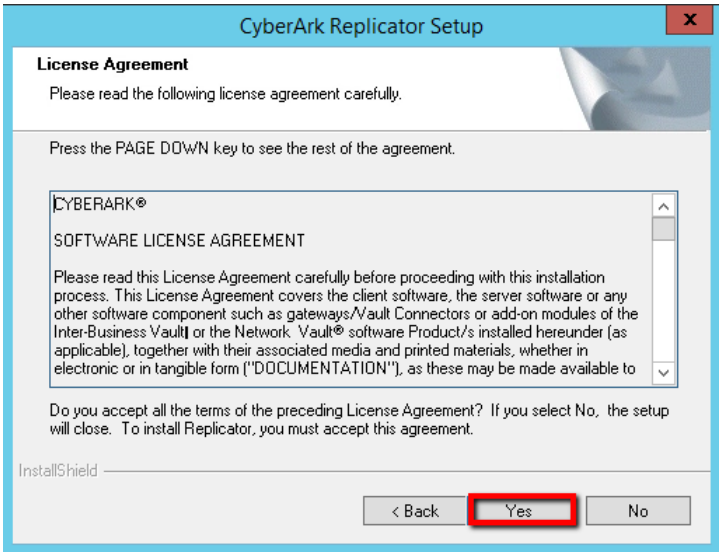
2. Double-click the **setup** icon.



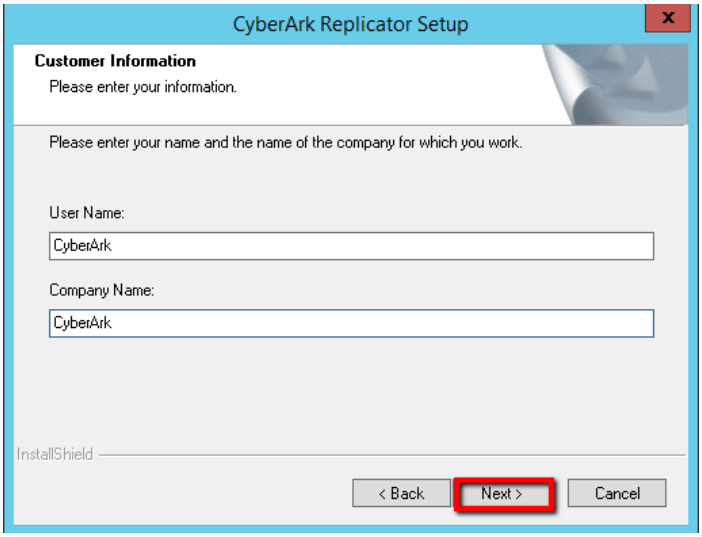
3. Accept all of the default parameters to complete the installation. On the first screen enter **Next.**



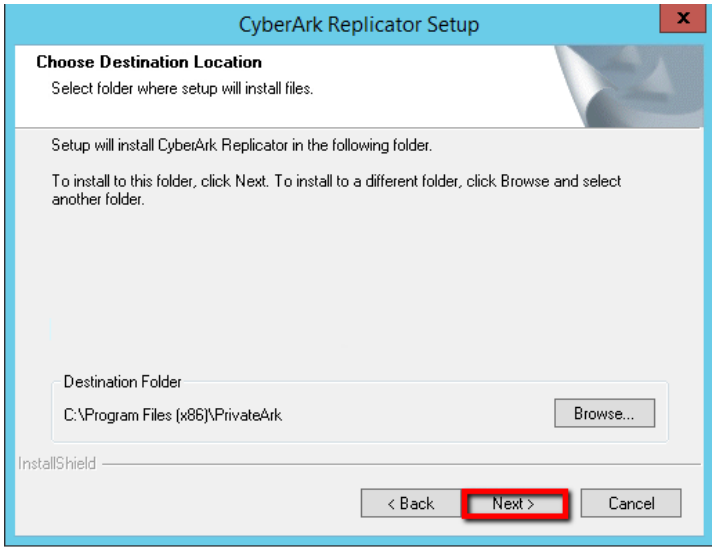
4. Click **Yes** to accept the license agreement.



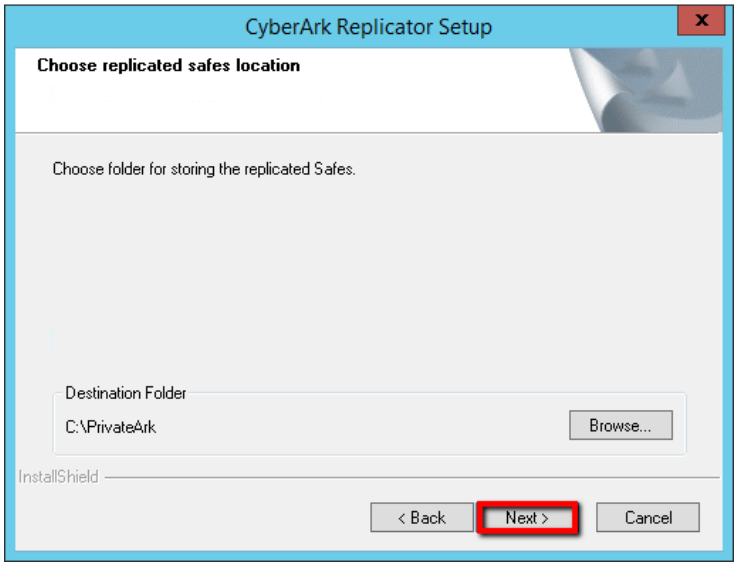
5. Enter *CyberArk* for the user and company names and press **Next.**



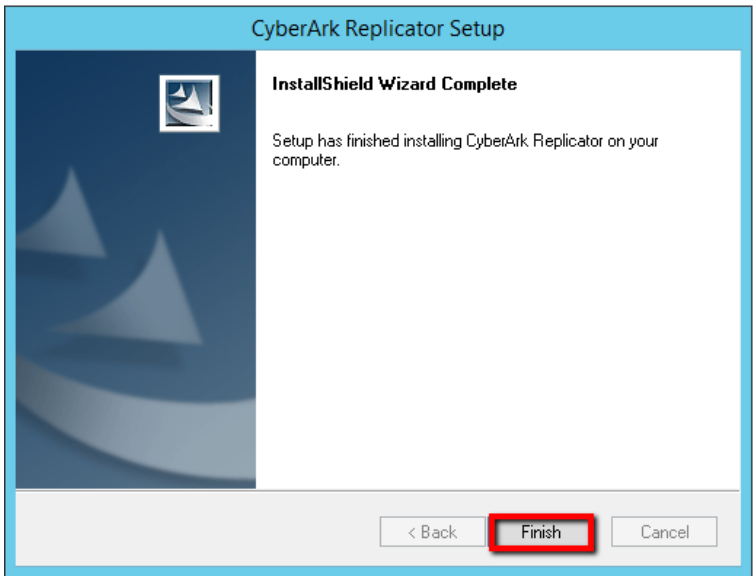
6. Press **Next** to accept the default destination location.



7. Press **Next** to accept the default **Safes** location.

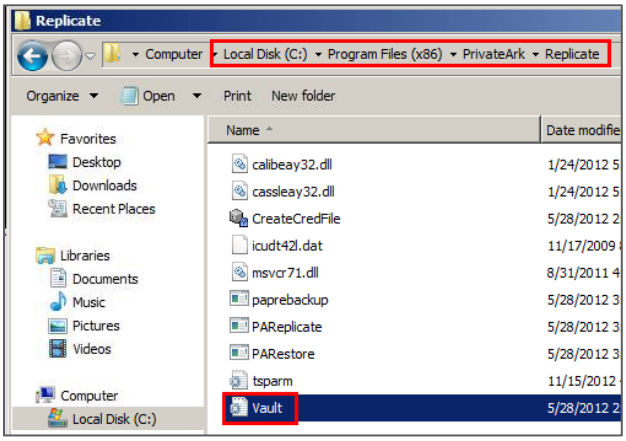


8. Click the **Finish** button.



9. In *Windows File Explorer*, go to *C:\Program Files (x86)\PrivateArk\Replicate*.

10. Double-click the **Vault.ini** file.



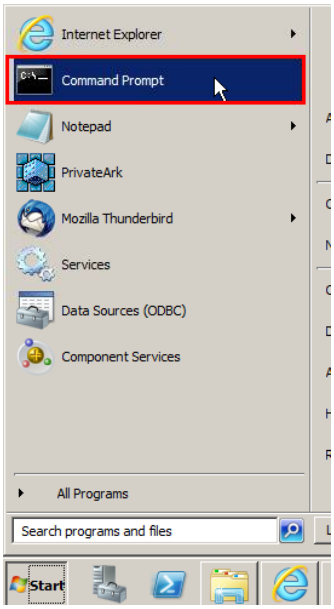
11. In the *vault.ini* file, enter "Vault" for the *VAULT* parameter.

12. Enter the IP address of your **Vault** server in the **address** parameter.

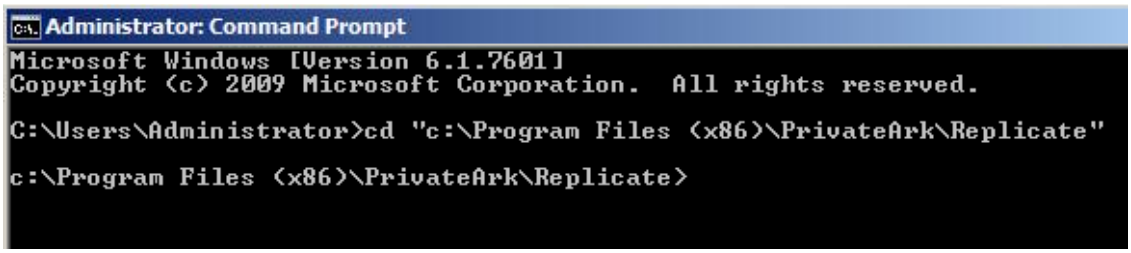
13. Save and close the file.

```
VAULT = "Vault"
ADDRESS=10.0.10.X
PORT=1858
```

14. Open a Command Prompt.



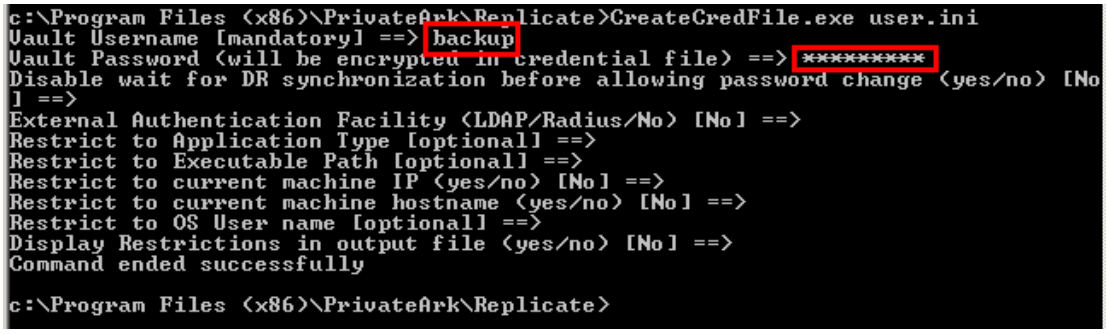
15. Enter the following: **`cd "C:\Program Files (x86)\PrivateArk\Replicate"`**



16. Run the following:

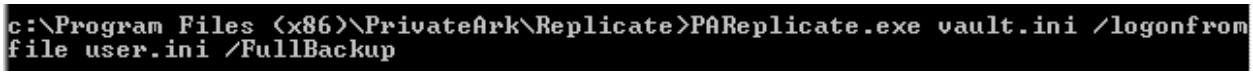
```
CreateCredFile.exe user.ini
Vault Username [mandatory] ==> Backup
Vault Password…==> Cyberark1
```

17. Press **Enter** to accept the defaults for the remaining questions.

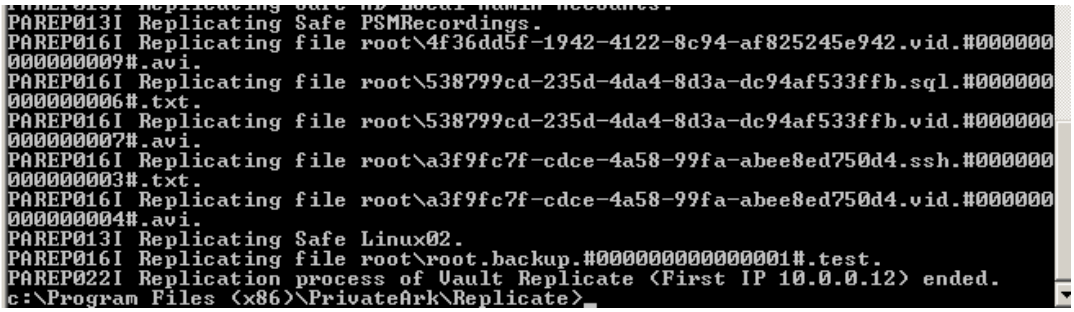


18. To run the backup, enter:

PAReplicate.exe vault.ini /logonfromfile user.ini /FullBackup



If the backup is successful, you should see a number of messages indicating that that files are being replicated with a final message stating that the replication process has ended.

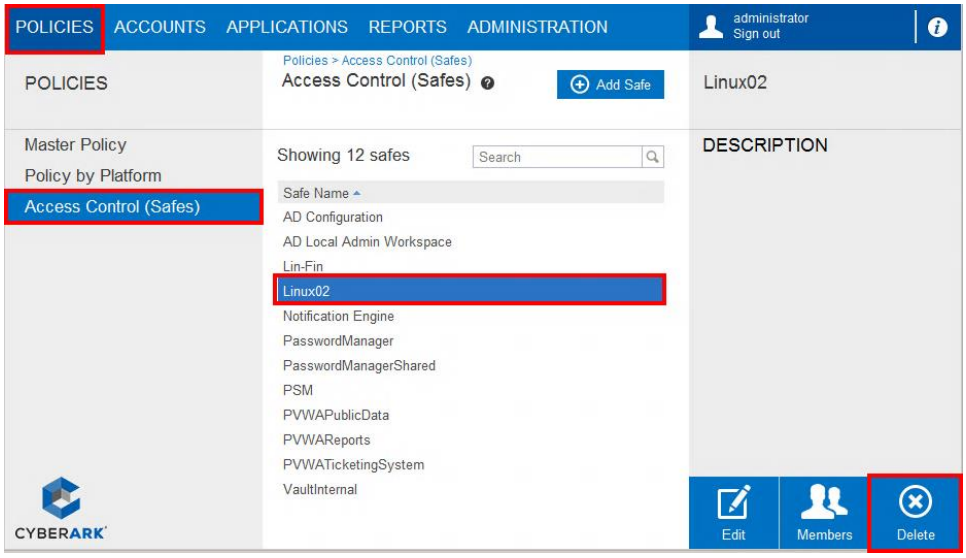


Testing the Backup/Restore Process

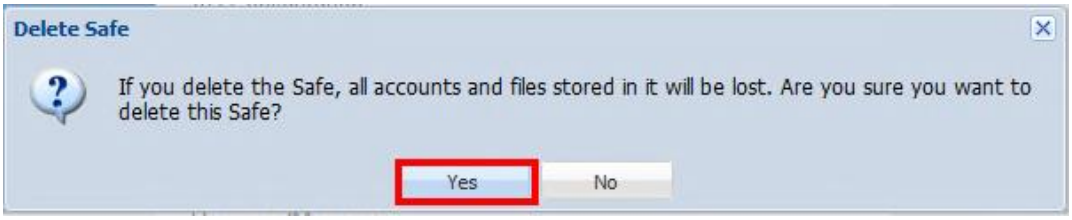
1. Login to the **PVWA** as **Vaultadmin01**.

2. Go to **POLICIES > Access Control (Safes)**.

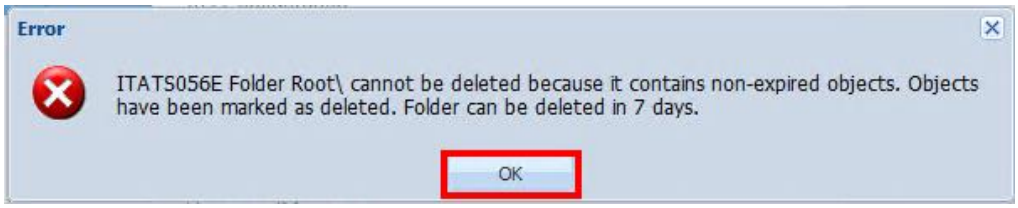
3. Highlight your Linux accounts safe (for example, Linux02) and press the **Delete** button.



4. Press **Yes** to confirm that you would like to delete the **Safe** and its contents.



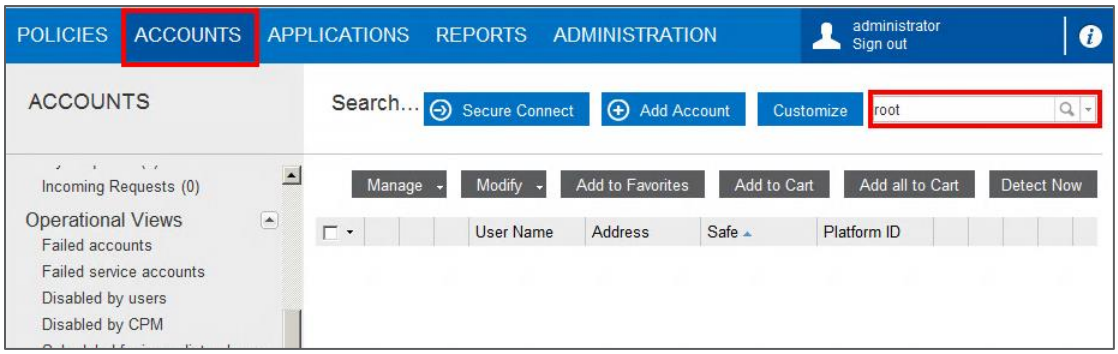
5. You will receive a message that the Root folder cannot be deleted for 7 days. However, the contents of the **Safe** should have been removed.



6. To confirm that the contents of the **Safe** have been deleted, go to the **Accounts** page.

7. Enter *root* in the search box and press the **Search** button.

8. The root account that you created earlier in this exercise using address *10.0.0.21,* should not appear.



9. Go back to the command prompt and run the following:

```
PARestore.exe vault.ini dr /RestoreSafe <Your Linux Safe Name> /TargetSafe
LinuxRestore
```

Note:	If the command doesn't run, check the syntax and make sure you have entered all of the spaces correctly. Use quotations for the safe name in case there is a space in the safe name (for example, if the name of the safe is Linux Account then use – "Linux Accounts").

10. Enter the DR user's password (*Cyberark1*).

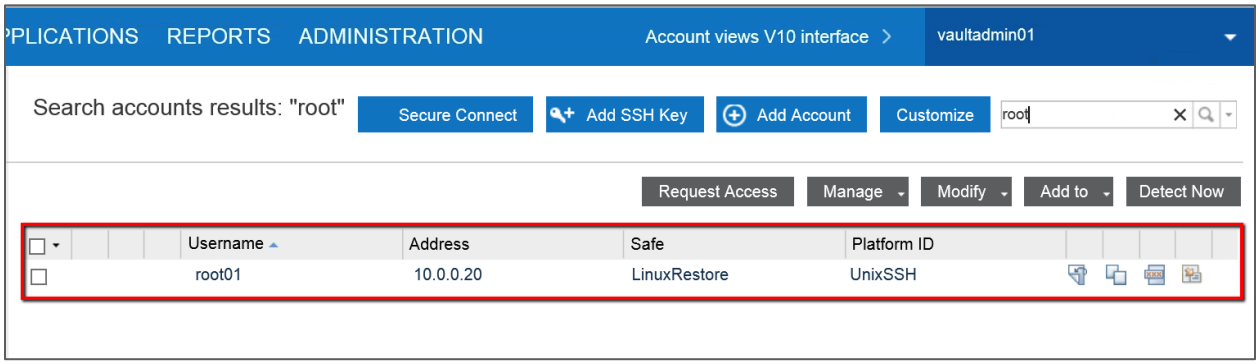
```
c:\Program Files (x86)\PrivateArk\Replicate>PARestore.exe vault.ini dr /RestoreS
afe Linux02 /TargetSafe LinuxRestore
Password: **********
```

11. You should receive a message stating that the restore process has ended.

```
PARST011I Restore process of Vault Restore (10.0.0.12) started at Thu Nov 15 16:
37:45 2012
PARST021I Restoring Metadata file backup-dump.sql.gz.
PARST009I Restoring file backup-dump.sql.gz.
PARST021I Restoring Metadata file cfg.backup-enecredfile.ini.gz.
PARST009I Restoring file cfg.backup-enecredfile.ini.gz.
PARST019I 1 out of 1 dump files restored successfully.
PARST020I 0 out of 0 Binary Logs restored successfully.
PARST027I 1 out of 1 Configuration files restored successfully.
PARST009I Restoring file root\root.backup.#0000000000000001#.test.
PARST008I 1 out of 1 files restored successfully.
ITATS414I Synchronizing owners of Safe LinuxRestore.

ITATS659I Setting user Administrator as owner of Safe LinuxRestore.

ITATS659I Setting user Master as owner of Safe LinuxRestore.

ITATS659I Setting user Batch as owner of Safe LinuxRestore.

ITATS659I Setting user Backup Users as owner of Safe LinuxRestore.

ITATS659I Setting user Auditors as owner of Safe LinuxRestore.

ITATS659I Setting user Operators as owner of Safe LinuxRestore.

ITATS659I Setting user DR Users as owner of Safe LinuxRestore.

ITATS659I Setting user Notification Engines as owner of Safe LinuxRestore.

ITATS659I Setting user PVWAGWAccounts as owner of Safe LinuxRestore.

ITATS659I Setting user PasswordManager as owner of Safe LinuxRestore.

ITATS408I Synchronizing objects of Safe LinuxRestore...

ITATS412I Moving restored object root\root.backup.#0000000000000001#.test to Root
\root.backup.#0000000000000001#.test.

PARST012I Restore process of Vault Restore (10.0.0.12) ended at Thu Nov 15 16:37
:49 2012

c:\Program Files (x86)\PrivateArk\Replicate>
```

12. Go back to the **PVWA** as **Vaultadmin01** and search for *root* again.

13. You should now see the root01 account residing in the **Safe** *LinuxRestore*.



Disaster Recovery

In this section we will install and test the Disaster Recovery module. Prior to installing the DR software, the DR server must have the **Private Ark Server** installed. The **PrivateArk Server** and **Client** software has already been installed on your DR machine.

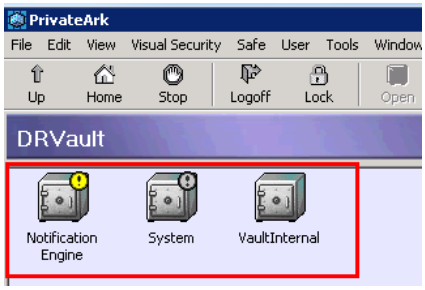
Note:	The first step in Disaster Recovery is to create or enable a user to run the DR process .If you have completed the backup exercise, the DR user has already been enabled. If you haven't enabled the user yet please refer to the "**Enable the Backup and DR users**" section.

Install the Disaster Recovery Module

1. Login to the Disaster Recovery server as *Administrator*.

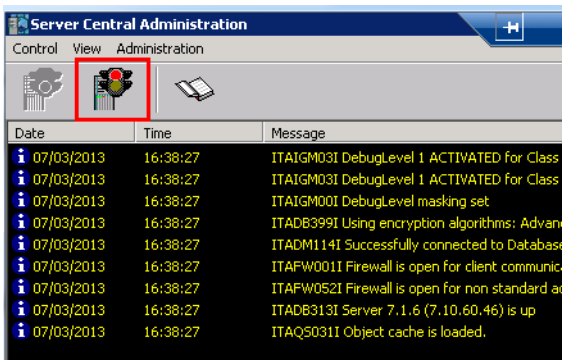
2. Open the **PrivateArk** client and login to the **DRVault** as administrator.

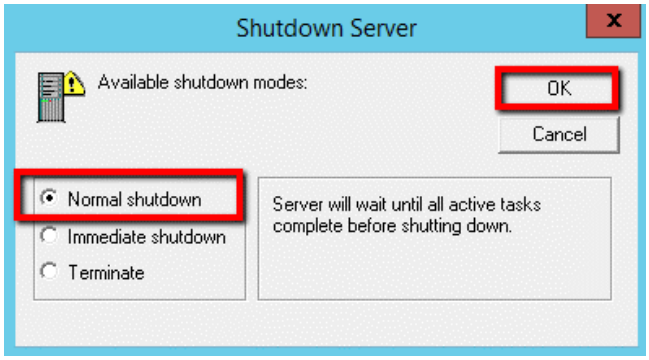
Note that the only **Safes** in the **Vault** are the three built-in Safes.



3. Logoff and close the **PrivateArk Client** application.

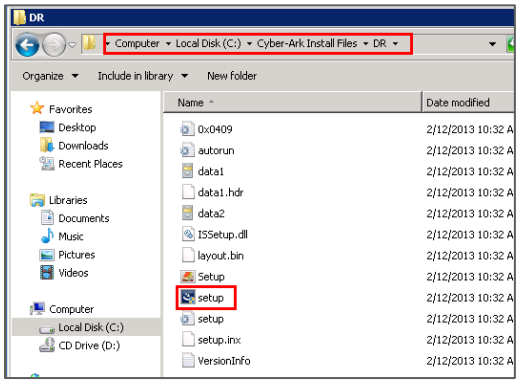
4. Double-click the **PrivateArk Server** icon on the desktop and press the **Stop** button. Disaster Recovery cannot be installed if the **PrivateArk** server service is running. Choose a *Normal shutdown*.





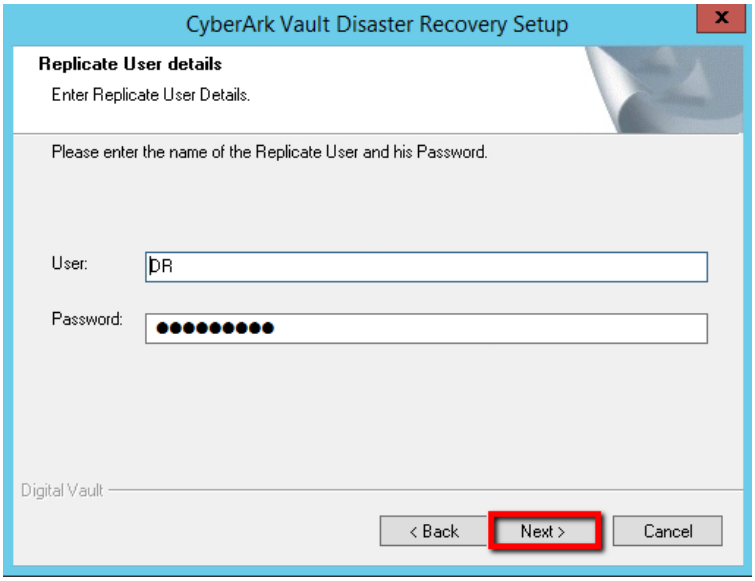
5. Close the **PrivateArk Server** GUI

6. Go to *C:\CyberArk Installation Files\Disaster Recovery* and double click **setup.exe.**

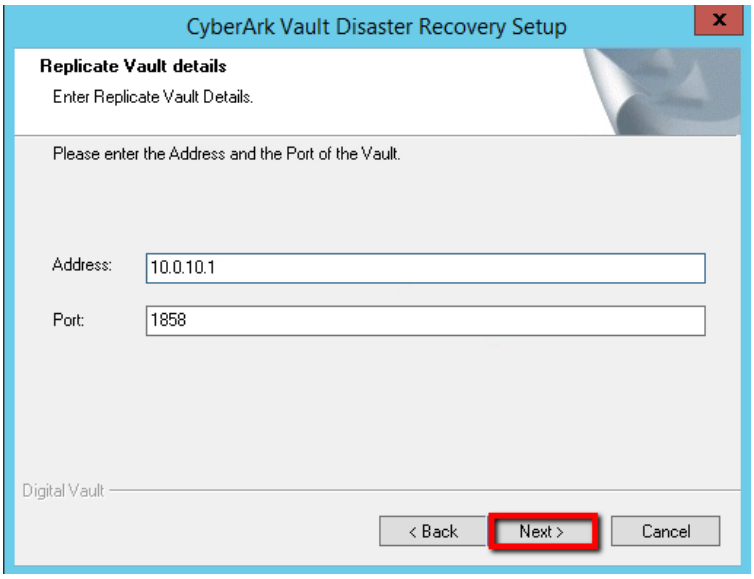


7. Press **Next** on the welcome screen and **Yes** to accept the license agreement. The enter *CyberArk* for **Name** and **Company** on the user information screen and click **Next** to accept the default destination folder.

8. Enter *dr* as the user and *Cyberark1* as the password and click **Next.**



9. Enter your **Primary Vault** IP and click **Next,**



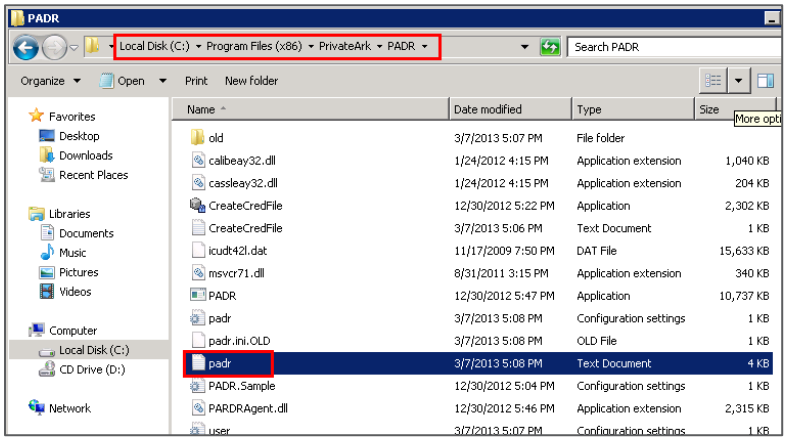
10. Finally allow the server to restart by pressing **Finish**.

Validate the Replication was successful

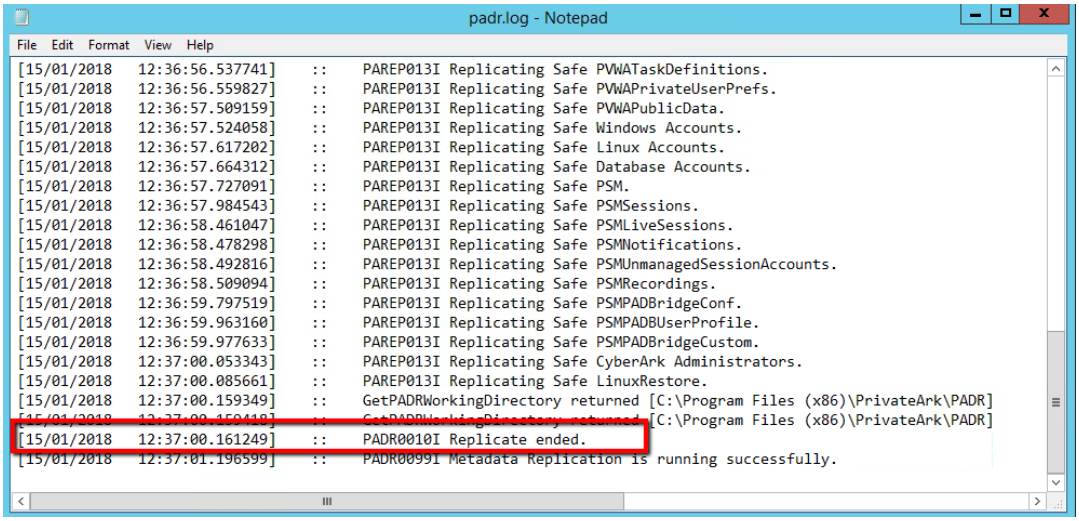
1. After the server restarts, Log back in to the **DR server** as **administrator**.

2. Go to '*C:\Program Files (x86)\PrivateArk\PADR*'. Accept all notifications from User Account Control to edit security.

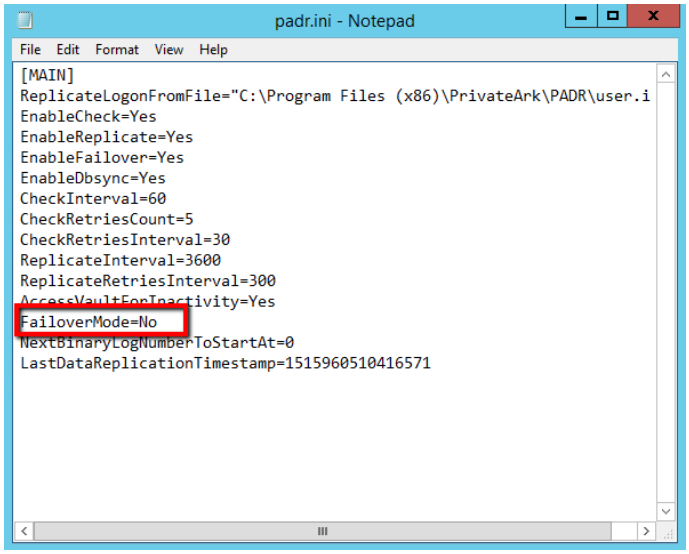
3. Using Notepad, open the *padr.log* file.



4. Confirm that the production **Vault** replicated correctly. You should see entries with informational codes PAREP013I Replicating Safe and at the end, PADR0010I Replicate ended.



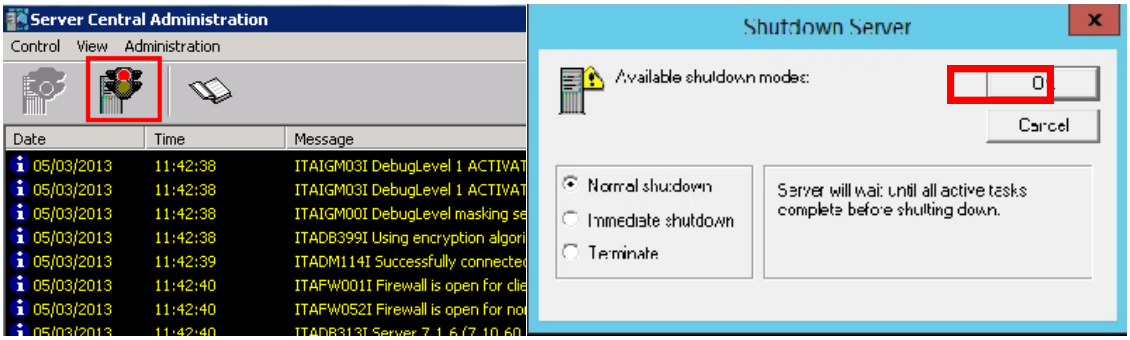
5. Open *PADR.ini* file and note that **FailoverMode** is equal to **No.**



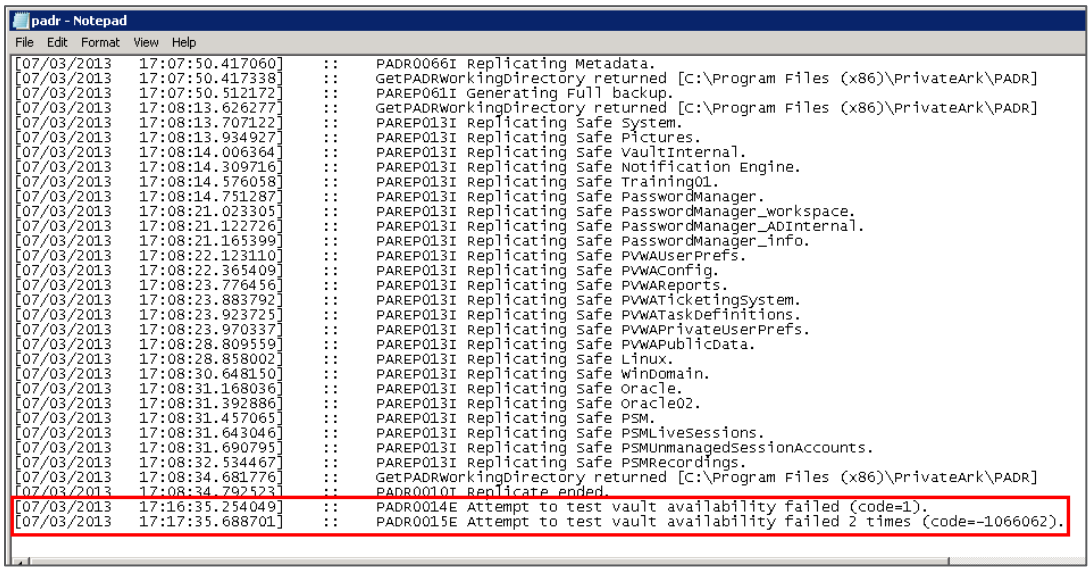
Execute Automatic Failover Test

1. Logon to the console of your **Primary Vault** server,.

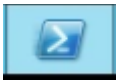
2. Stop the **PrivateArk Server** service, by clicking the **stoplight** as shown in the graphic. Select *Normal shutdown* and click **OK** and **Yes** at the confirmation popup.



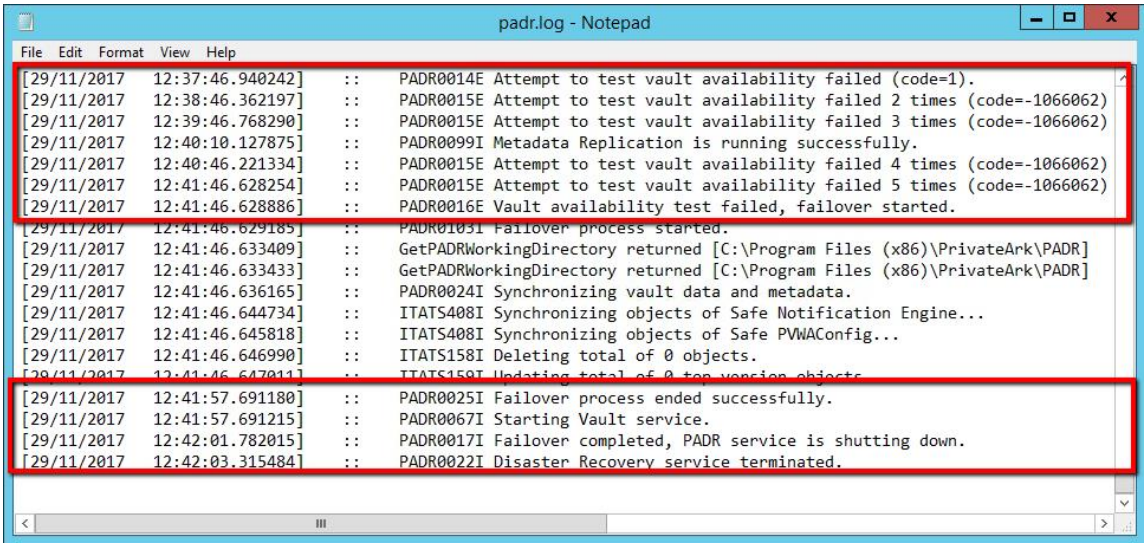
3. On the console of the ***DR Server***, open the PADR log file. You should see messages stating that the **DR Vault** cannot reach the production **Vault**.



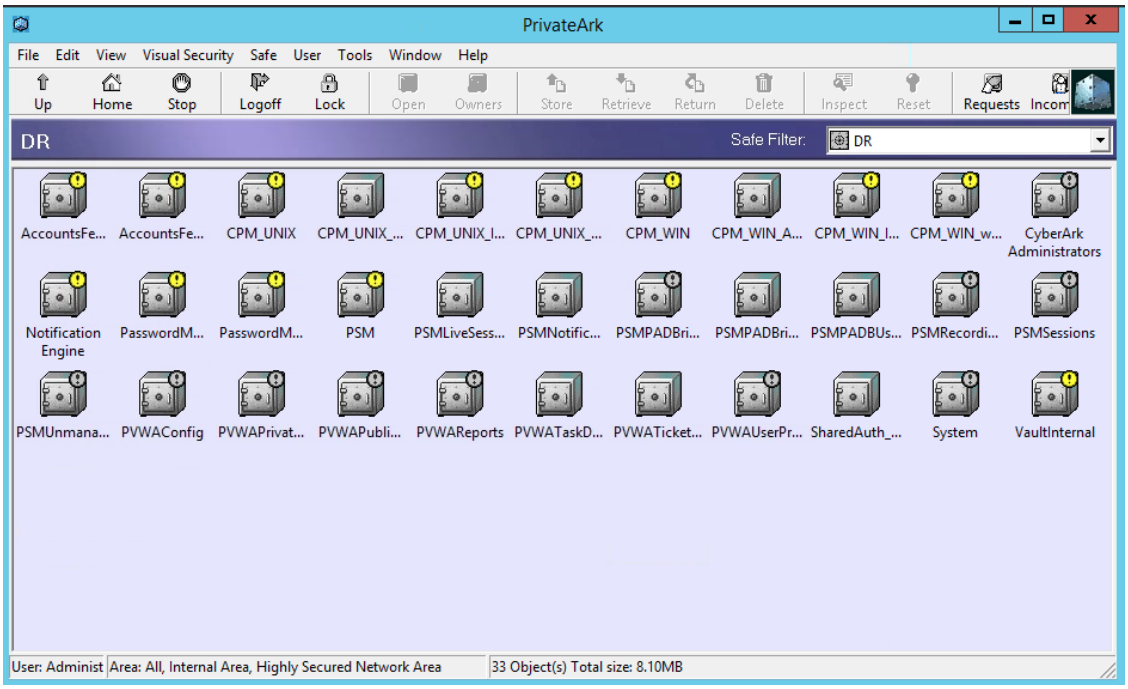
4. Alternatively, follow the tail of the *padr.log* using Windows Powershell.

- Open Windows Powershell from the taskbar. 
- Change directories to *C:\Program Files (x86)\PrivateArk\PADR*.
- Type the following command without the double quotes; “Get-Content .\padr.log –wait”

5. After a few minutes (5 failures by default), the DR **Vault** will go into failover mode.



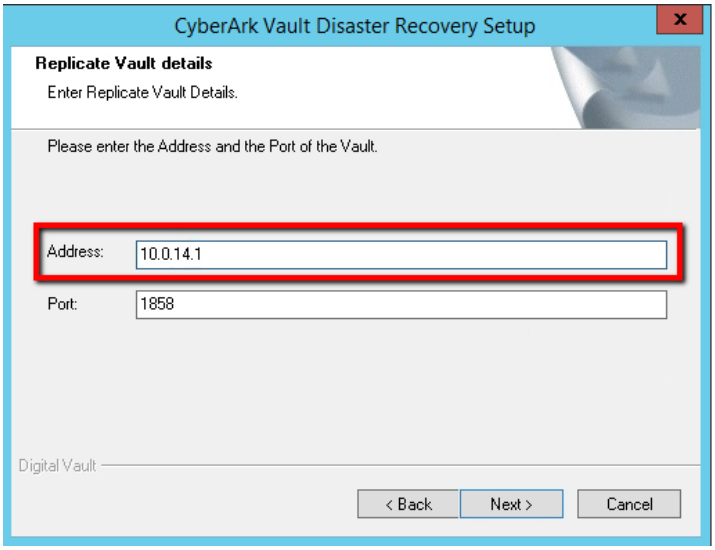
6. On the **DR Vault** server, open the PrivateArk client from the desktop. Login as *Administrator* (don't forget the password for administrator has changed and must be retrieved from the Vault). Note that the Safes and data match those in the **Primary Vault**.



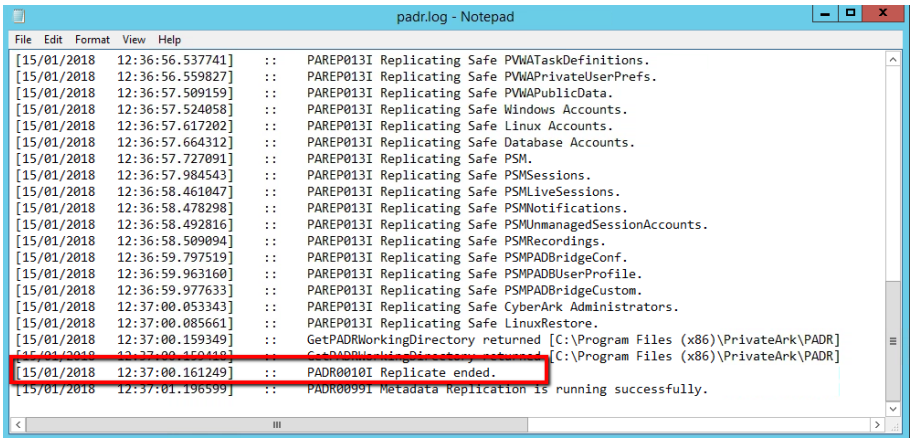
Execute Failback Procedure Using Manual Failover

In the next steps, you will replicate data back from the **DR Vault** to the **Primary Vault**, perform a **Manual Failover** to the **Primary Vault** up and set the DR server back to DR mode.

1. Login to the **Primary Vault Server** and Repeat the steps for Installing the DR module on the Primary Vault, this time configuring the DR module to replicate data from the DR Vault.



2. After restart, verify that the Primary Vault has replicated all the changes from the DR Vault.

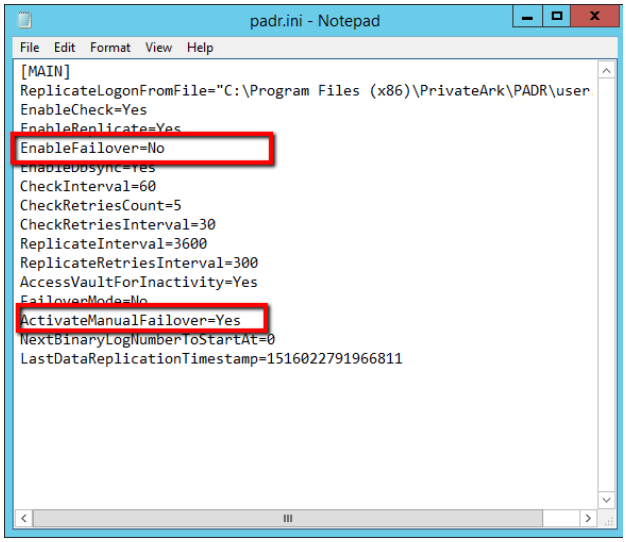


3. On the **Primary server** edit the PADR.ini file.

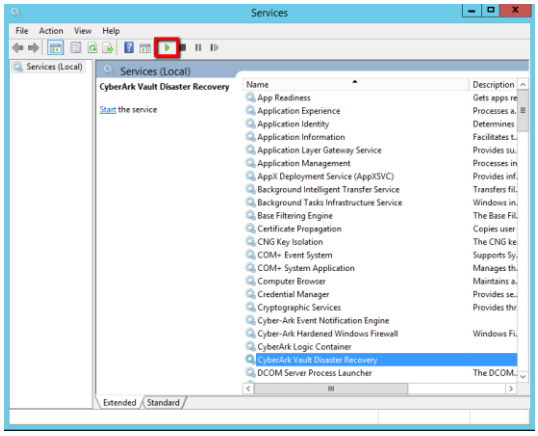
   a. Set EnableFailover=No

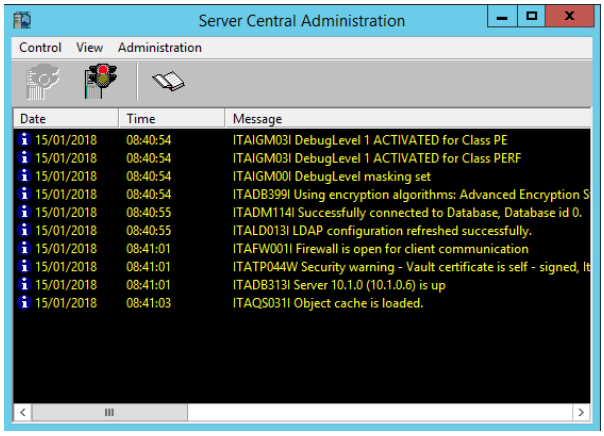
   b. Add the following line: ActivateManualFailover=Yes

   c. Save the file and exit.



4. Restart the Disaster Recovery Service on the Primary Server. The service will start and stop immediately (because of the “ActivateManualFailover” parameter), followed by the Vault being started. Verify that the Vault has started successfully on the Primary server.



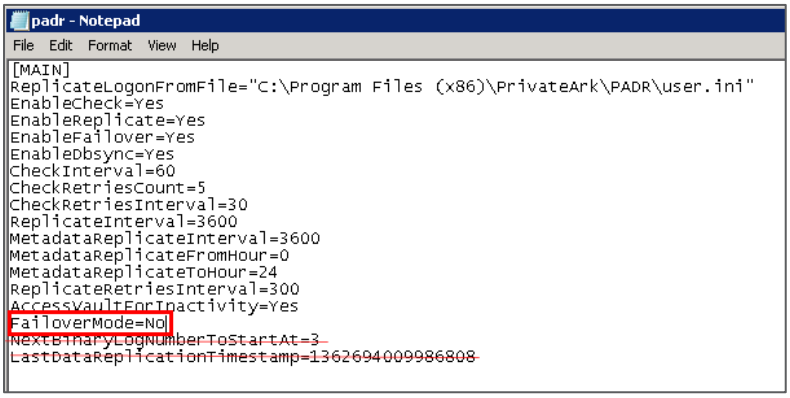


5. On the **DR server** edit the PADR.ini file.

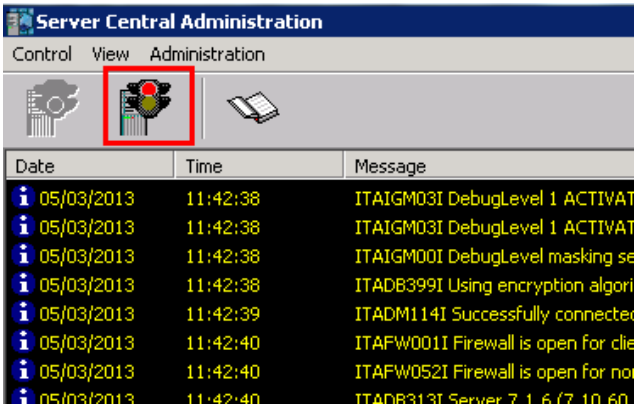
   a. Change *Failover mode* from *Yes* to **No.**

   b. Delete the last two lines (log number and timestamp of the last successful replication) in the file.

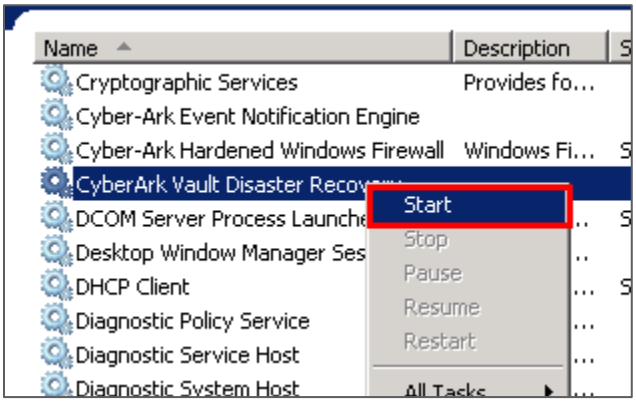
   c. Save and exit the file.



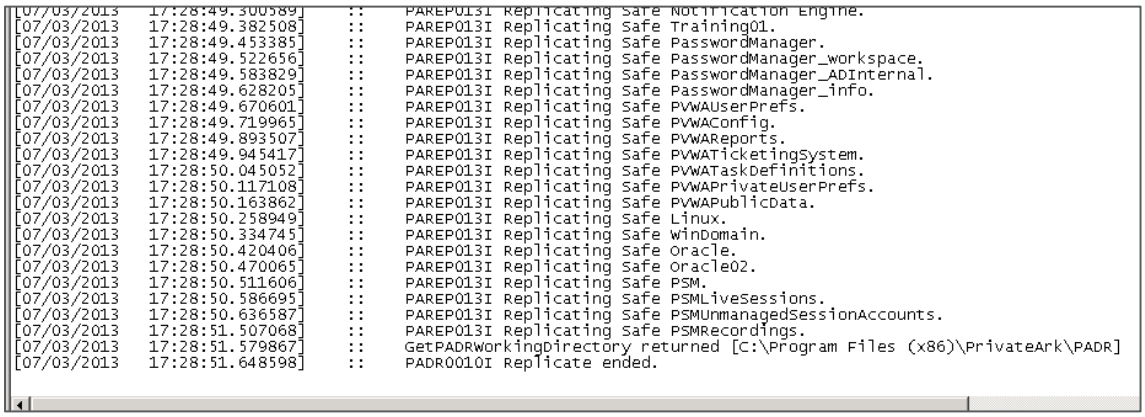
6. Open the **PrivateArk Server GUI** and stop the **PrivateArk Server** service, by clicking the **stoplight** as shown in the graphic. Exit the PrivateArk Server GUI.



7. Open Windows Services and **Start** the *CyberArk Vault Disaster Recovery* service.



8. Check the PADR log file and confirm that the replication process started and that the replication (from the Primary Server to the DR Server) has ended succesfuly.



```
[07/03/2013   17:28:49.300589]    ::    PAREP013I Replicating Safe Notification Engine.
[07/03/2013   17:28:49.382508]    ::    PAREP013I Replicating Safe Training01.
[07/03/2013   17:28:49.453385]    ::    PAREP013I Replicating Safe PasswordManager.
[07/03/2013   17:28:49.522656]    ::    PAREP013I Replicating Safe PasswordManager_workspace.
[07/03/2013   17:28:49.583829]    ::    PAREP013I Replicating Safe PasswordManager_ADInternal.
[07/03/2013   17:28:49.628205]    ::    PAREP013I Replicating Safe PasswordManager_info.
[07/03/2013   17:28:49.670601]    ::    PAREP013I Replicating Safe PVWAUserPrefs.
[07/03/2013   17:28:49.719965]    ::    PAREP013I Replicating Safe PVWAConfig.
[07/03/2013   17:28:49.893507]    ::    PAREP013I Replicating Safe PVWAReports.
[07/03/2013   17:28:49.945417]    ::    PAREP013I Replicating Safe PVWATicketingSystem.
[07/03/2013   17:28:50.045052]    ::    PAREP013I Replicating Safe PVWATaskDefinitions.
[07/03/2013   17:28:50.117108]    ::    PAREP013I Replicating Safe PVWAPrivateUserPrefs.
[07/03/2013   17:28:50.163862]    ::    PAREP013I Replicating Safe PVWAPublicData.
[07/03/2013   17:28:50.258949]    ::    PAREP013I Replicating Safe Linux.
[07/03/2013   17:28:50.334745]    ::    PAREP013I Replicating Safe WinDomain.
[07/03/2013   17:28:50.420406]    ::    PAREP013I Replicating Safe Oracle.
[07/03/2013   17:28:50.470065]    ::    PAREP013I Replicating Safe Oracle02.
[07/03/2013   17:28:50.511606]    ::    PAREP013I Replicating Safe PSM.
[07/03/2013   17:28:50.586695]    ::    PAREP013I Replicating Safe PSMLiveSessions.
[07/03/2013   17:28:50.636587]    ::    PAREP013I Replicating Safe PSMUnmanagedSessionAccounts.
[07/03/2013   17:28:51.507068]    ::    PAREP013I Replicating Safe PSMRecordings.
[07/03/2013   17:28:51.579867]    ::    GetPADRWorkingDirectory returned [C:\Program Files (x86)\PrivateArk\PADR]
[07/03/2013   17:28:51.648598]    ::    PADR0010I Replicate ended.
```

EPV Implementations (Proposed Solution)

Note:	The following instructions are meant to assist you in case you get stuck during the advanced EPV implementations. These instructions are only meant to be used as a reference for this lab.

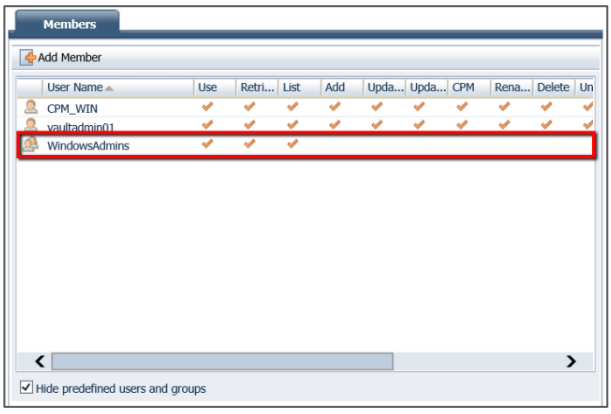
Windows

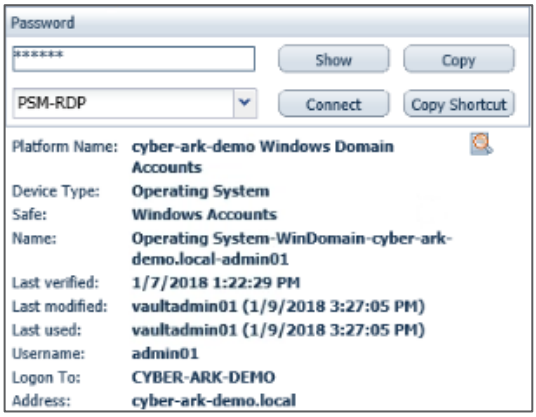
"***The Customer has one Domain Controller (10.0.0.2) and one windows server in the domain (10.0.10.50). The domain administrator account is admin01…winadmin01 is a member of the WindowsAdmins group in LDAP. Members of the WindowsAdmins group should be given permissions on all Windows accounts***"

These two sections require us to create a safe to store Windows Accounts and create one windows domain account. You should duplicate the "Windows Domain Accounts" platform. Since all members of *WindowsAdmins* should have access to all windows accounts, it's ok to use just one safe to store the domain accounts and the local accounts.

What requirement would force you to create separate safes for domain and local accounts?

1. Create safe 'Windows Accounts' and assign CPM: CPM_WIN
2. Add the ldap group WindowsAdmins with default permissions.
    a. Duplicate the Windows Domain Accounts platform and name it "cyberark lab Windows Domain Accounts" (may require an IISRESET or a 20 minute wait for the PVWA to refresh the active policy list)
3. Create Admin01 ldap account
    a. Add the domains FQDN to the address field.
    b. Select "Logon To:" parameter and select Resolve to populate the field.

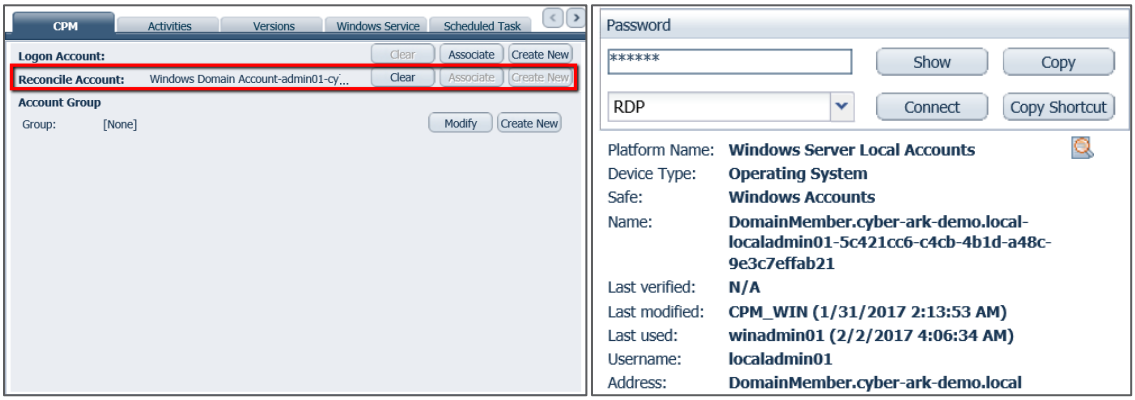




"***The local administrator account on the domain member (10.0.10.50) is localadmin01 (the password for the local admin account is unknown)***".

This section requires us to create a Windows Local Server Account and reconcile the local account using admin01. You have 2 options; use Accounts Discovery or add the account manually. Regardless of your choice ensure the following steps.

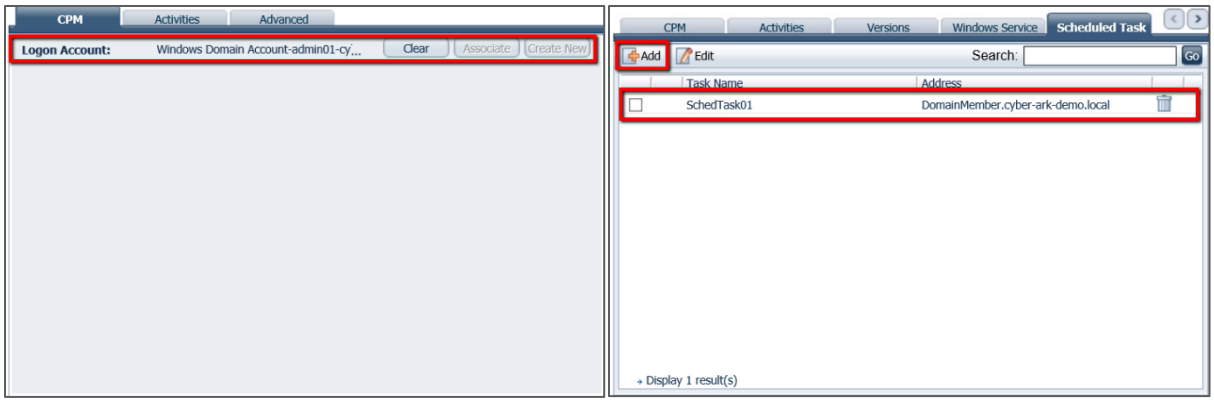
1. Duplicate the 'Windows Server Local Accounts' platform and name it, "cyberark lab Windows Server Local Accounts" (may require an IISRESET or a 20 minute wait for the PVWA to refresh the active policy list)
2. Create account 10.0.10.50\localadmin01 in safe 'Windows Accounts' and assign it to the platform created in step 1. Leave the password field blank.
3. Associate Reconcile Account cyber-ark-demo\admin01 and execute a Reconcile operation.



"***On the domain member there is a scheduled task (SchedTask01) that runs under the context of the localadmin01 user and is programed to send the vault administrator (vaultadmin01) an email every time it runs. Note that although the scheduled task runs under the credentials of localadmin01, only admin01 has permissions to change the password for SchedTask01"***.

This section requires us to add a **Windows Scheduled** task to the **localadmin01** account, and use **admin01** as the logon account for the usage. This usage can be added manually or discovered automatically using Accounts Discovery but the logon account must be assigned to the Scheduled Task usage manually.

1. Add a Windows Scheduled task usage to the localadmin01 account.
    - Task Name = SchedTask01
    - Address = 10.0.10.50 (or domainmember.cyber-ark-demo.local)
2. Assign logon account Admin01, to usage.
3. Ensure “SearchForUsages” parameter is set to Yes in the account platform.
4. Change the localadmin01 account password. Wait for the next CPM cycle to update the SchedTask01 usage.
5. Test by running command “schtasks /run /s 10.0.10.50 /tn schedtask01” and login to the WebMail client for confirmation.

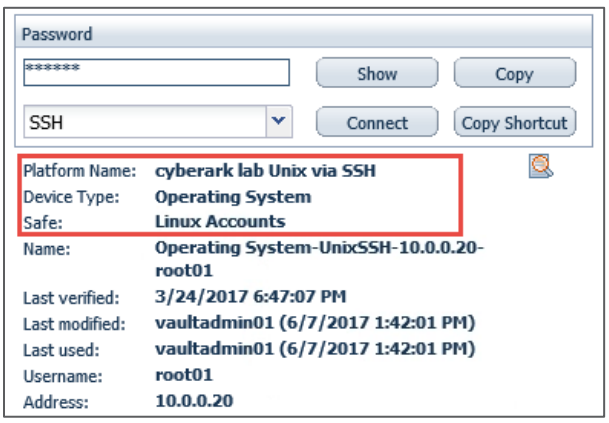


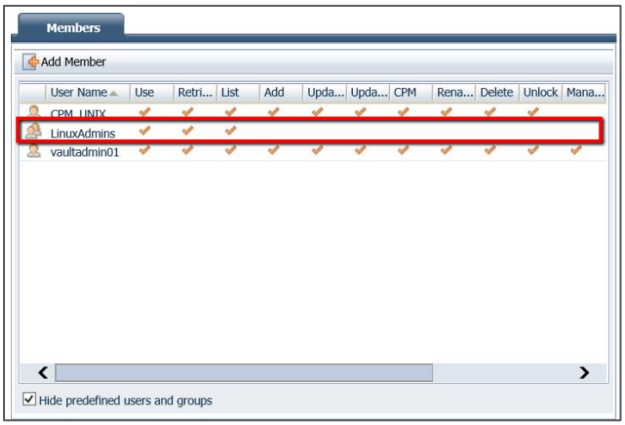
UNIX

“***The Customer has one Linux server (10.0.0.20). The root account on the server is called root01. linuxadmin01 is a member of the LinuxAdmins group in LDAP... Members of the LinuxAdmins group should be granted permissions on all the Linux accounts***.”

This section only requires us to create a safe to store Unix accounts (in my example it’s called **Linux Accounts**), assign permissions to **LinuxAdmins** and create a single Unix account. Duplicate the **Unix via SSH** platform.

1. Create a safe to store Unix accounts named “Linux Accounts”
2. Assign CPM: CPM_UNIX
3. Assign default permissions to ldap group LinuxAdmins
4. Duplicate the ‘Unix via SSH’ platform. Name it “cyberark lab Unix via SSH”
5. Create the Unix account root01 in safe Linux Accounts.
    - Assign to “cyber-ark-demo Unix via SSH” platform created in the previous step.
    - Address = 10.0.0.20
    - Password = Cyberark1



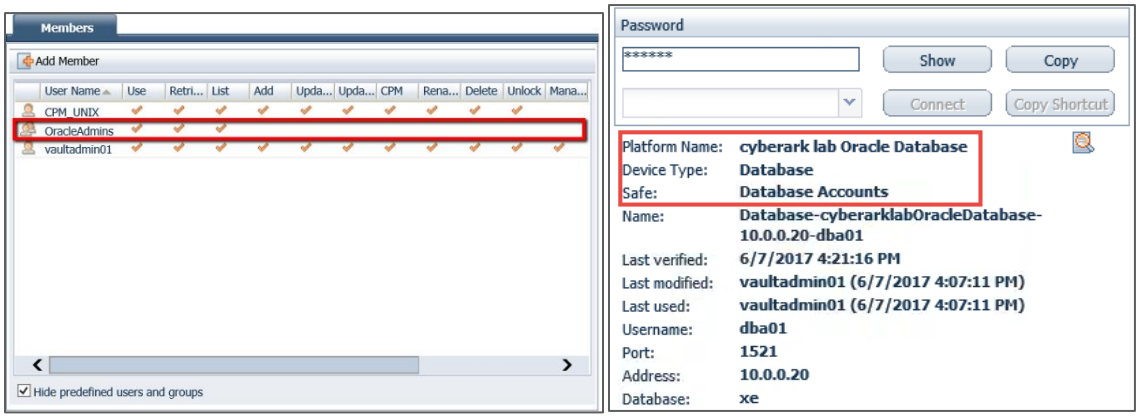


Database

“The Linux server mentioned above (10.0.0.20) also hosts an Oracle database .The name of the database is xe. The port is 1521. The database administrator account is named dba01…OracleAdmin01 is a member of the OracleAdmins group in LDAP. Members of the OracleAdmins group should be granted permissions on all Oracle Accounts”

These two sections require us to create a safe to store Database/Oracle accounts and create an oracle account called *dba01.* Duplicate the **Oracle Database** platform.

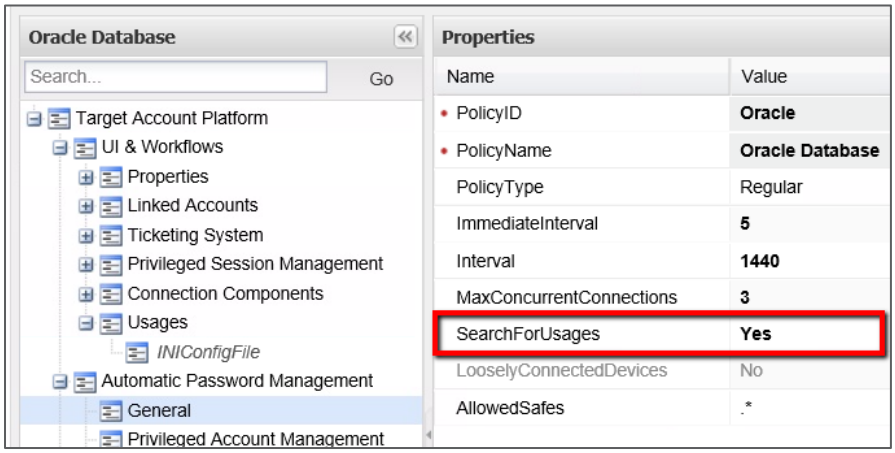
1. Create a safe named ‘Database Accounts’. Assign CPM_Unix.
2. Assign default permissions to ldap group, OracleAdmins.
3. Duplicate the ‘Oracle Database’ platform. Name it ‘cyberark lab Oracle Database’
4. Edit the ‘cyberark lab Oracle Database’ platform.
    - Navigate to Automatic Password Management > Generate Password. Update the MinSpecial parameter to a value of -1.
5. Create Oracle account dba01 in ‘Database Accounts’ safe, assigned to the ‘cyberark lab Oracle Database’ platform created in the previous step.
    - Address = 10.0.0.20
    - Database = xe
    - Port = 1521
    - Password = Cyberark1

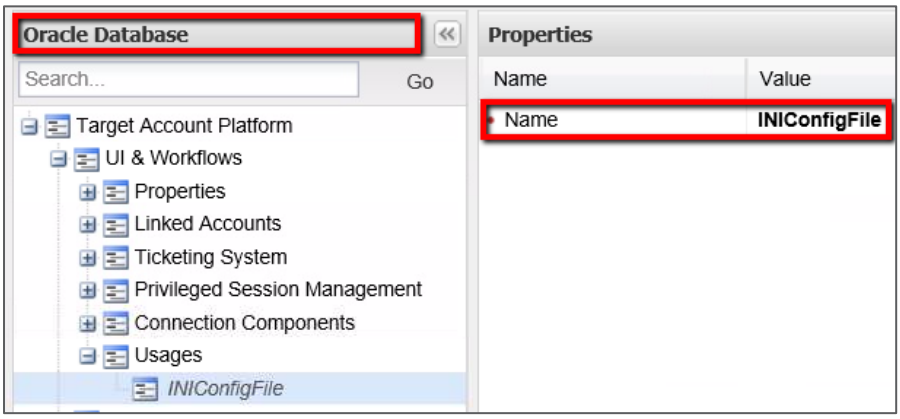


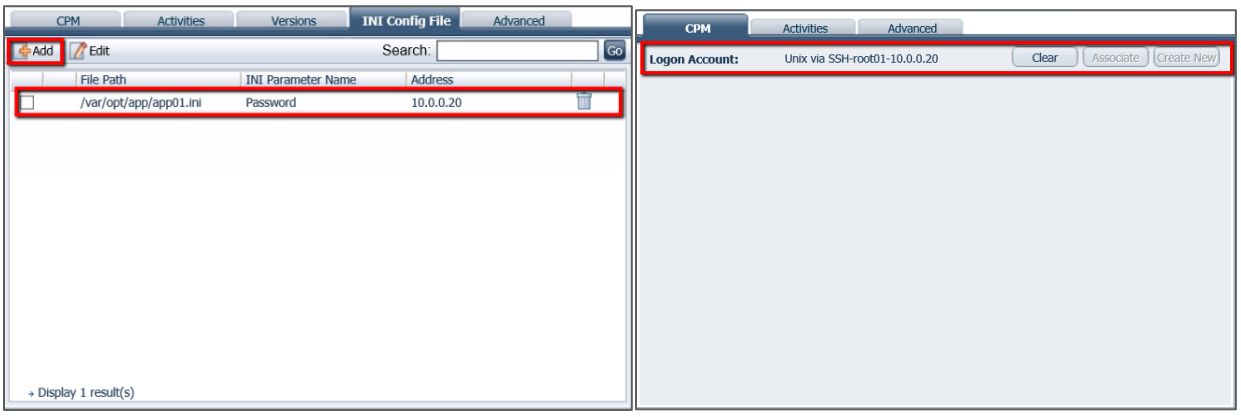
“In addition, there is an application on the Linux server that connects to the Oracle database using the dba01 credentials. The credentials are stored in a text file (/var/opt/app/app01.ini). When the CPM changes the password for dba01, it must also change the password stored in the app01.ini file. Note that only root01 has permissions to change the password in the file”.

This section requires us to create an *INI configuration file* usage for *dba01* and set **root01** as the logon account for the usage. Before we can do so, we must add a usage called **INIConfigFile** to the “cyberark lab Oracle Database” platform, and set **SearchForUsages** to **Yes**. Then we can add the INI configuration file to the *dba01* account and associate the account *root01* as the logon account for that usage.

1. INI Section = Server
2. INI Parameter Name = Password
3. Connection Type: SSH







Note: If you've done everything correctly, by the end of this entire part you should end up with four main accounts in total (as well as two usages).

Username	Address	Safe	Platform ID
localadmin01	DomainMember.cyber-ark-demo.local	Windows Accounts	WinServerLocal
admin01	cyber-ark-demo.local	Windows Accounts	WinDomain
root01	10.0.0.20	Linux Accounts	UnixSSH
dba01	10.0.0.20	Database Accounts	Oracle