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HSMoD Service

MICROSOFT ACTIVE DIRECTORY CERTIFICATE SERVICES INTEGRATION GUIDE

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SafeNet Data Protection on Demand1.7

MICROSOFT ACTIVE DIRECTORY CERTIFICATE SERVICES INTEGRATION GUIDE

Contents

Overview

This document covers the necessary information to install, configure, and integrate Microsoft Active Directory Certificate Services (ADCS) on Windows with an HSM on Demand (HSMoD) service. It demonstrates how to secure your Microsoft Root Certificate Authority (CA) signing keys in an HSMoD service.

The Microsoft ADCS on Windows provides customizable services for creating and managing public key certificates used in software security systems employing public key infrastructure.

A server configured as a certification authority (CA) provides the management features needed to regulate certificate distribution and use. ADCS is the Windows Server service that provides the core functionality for Windows Server CAs. ADCS provides customizable services for managing certificates for a particular CA and for the enterprise.

The root of trust in a public key infrastructure is the CA. Fundamental to this trust is the CA's root cryptographic signing key, which is used to sign the public keys of certificate holders and more importantly, its own public key. The compromise of a CA's root key by malicious intent, inadvertent errors, or system failures can be of catastrophic proportions. Hence, this root-signing key must be diligently protected by the best technologies and practices within the cryptographic community such as using an HSM on Demand Service.

Using an HSMoD service to secure the Microsoft ADCS root key provides the following benefits:

> full life cycle management of the keys

> load-balancing and failover by clustering

This document contains the following sections:

> "Preparing for the Integration" on page 6

> "Integrating Microsoft Active Directory Certificate Services with an HSM on Demand Service on Windows Server 2012 R2 or Windows Server 2016" on page 10

This overview contains the following topics:

> "Third Party Application Details" below

> "Supported Platforms" below

Third Party Application Details

This integration guides uses the following third party applications:

> Microsoft Active Directory Certificate Services

Supported Platforms

The following platforms are tested with HSMoD Service:

> Windows Server 2016

> Windows Server 2012R2

Preparing for the Integration

Before you proceed with the integration, ensure you have completed the following:

> "Provision HSMoD Service" below
> "Preparing Environment in Windows Integrations" on page 9

Provision HSMoD Service

The HSM on Demand Service provides your client machine with access to an HSM application partition for storing cryptographic objects used by your applications. Application partitions can be assigned to a single client, or multiple clients can be assigned to, and share, a single application partition.

You must provision your HSM on Demand service by adding the service, downloading the service client package and initializing the HSM. Provisioning your HSM on Demand service entails:

> "Adding a Service" below
> "Adding a Service Client" below
> "Initializing the HSM" on page 8

Adding a Service

1. Under the **Services** tab, select the **Add New Service** page. Click **Deploy** on the service tile for the service you wish to add.

   NOTE Click **Deploy** on the HSM on Demand Service tile for your integration.

2. Review the "Terms of Services DPoD." Enable the **I have read and accept the Terms of Service above** check box and then click **Next**.
3. On the **Add <service_type> Service** page, enter a name for the Service in the **Service Name** field. You can optionally allow non-FIPS approved algorithms by selecting the **Allow non-FIPS approved algorithms** check box. Click **Next**.

   CAUTION! You cannot alter the FIPS setting after creating the service. You must decide if the service should allow or disallow non-FIPS approved algorithms before clicking **Finish** in the next step.

4. Review the configuration summary page. If acceptable, click **Finish**. If you would like to make changes to the configuration, click **Go Back**.

   When completed, the new service is listed under **My Services** and a **Create Service Client?** window displays.

5. Click **Create Service Client**.

Adding a Service Client

1. In the **Create Service Client** window enter a name for the service client in the **Service Client Name** field.

> **NOTE** If the **Create Service Client** window is not available, navigate to the **Services** tab and click the name of the Service you would like to generate a client for in the **My Services** table. On the Service Details page, click **New Service Client**.

2. Select **Create Service Client**.

   A new HSM service client package is created and provided for downloading on your client system.

> **NOTE** The HSM service client package is a zip file that contains system information needed to connect your client system to an existing HSM on Demand service. The HSM service client package should download immediately on creation. If it does not, or you lose access to your HSM service client package it can be accessed or reacquired through the **My Services** table.

3. Transfer the service client package to your client system. You can use SCP, PSCP, WinSCP, FTPS, or any other secure file transfer tool.
4. Unzip the service client package.

   For Linux, enter:

   ```
   unzip <service_client_package>.zip
   ```

   For Windows, using the Windows GUI or an unzip tool unzip the file:

   ```
   <service_client_package>.zip
   ```

> **NOTE** For more information about the service client package contents see .

5. Extract the cvclient-min file.

> **NOTE** Extract the cvclient-min file in the directory where you extracted the <service_client_package>.zip. **Do not** extract to a new cvclient-min directory.

   For Linux, untar the cvclient-min.tar

   ```
   tar xvf cvclient-min.tar
   ```

   For Windows, unzip the cvclient-min.zip.

6. Set the environment variable.

   For Linux, execute:

   ```
   source ./setenv
   ```

   For Windows, right click setenv.cmd and select **Run as Administrator**.

> **NOTE** If you encounter the error dll load failed with GetLastError() 126 move the contents of the cvclient_min folder up one directory and execute setenv.

7. Start LunaCM.

For Linux, execute the following from the directory where you extracted the cvclient-min.tar file.

```
./bin/64/lunacm
```

For Windows, execute the following from the directory where you unzipped the cvclient-min.zip file.

```
lunacm
```

Initializing the HSM

1. Set the active slot to the service partition.

   ```
   lunacm:>slot set -slot <slot_number>
   ```

   NOTE Execute slot list in LunaCM to identify the slot number associated with your service.

2. Initialize the application partition. During this process you will create the partition's Security Officer (SO), set the SO password, and specify the cloning domain.

   ```
   lunacm:> partition init -label <service_label>
   ```

3. Optional: If you wish to transfer key material to or from a PED-authenticated Luna partition, you initialize the SafeNet Data Protection On Demand partition using the red PED domain key.

   a. For DPoD deployments, contact customer support to obtain the necessary PED drivers so that your HSM client can communicate with the PED.

   b. Attach the PED locally to the client computer, insert the red cloning domain PED key, and initialize the partition, including the option to set the cloning domain from the red PED key. Execute:

   ```
   lunacm:> partition init -label <cryptovisor_partition_label> -importpeddomain
   ```

4. Log in as the partition's Security Officer:

   ```
   lunacm:>role login -name Partition SO
   ```

5. Initialize the Crypto Officer role:

   ```
   lunacm:>role init -name Crypto Officer
   ```

6. Log out of the partition Security Officer role and log in as the Crypto Officer.

   ```
   lunacm:>role logout
   lunacm:>role login -name Crypto Officer
   ```

7. You must change the Crypto Officer password immediately on the initial log in. Failure to due so will result in a password error on subsequent logins.

   ```
   lunacm:>role changepw -name Crypto Officer
   ```

8. Initialize the Crypto User role:

   ```
   lunacm:>role init -name Crypto User
   ```

9. Log out of the partition Crypto Officer role and log in as the Crypto User.

   ```
   lunacm:>role logout
   lunacm:>role login -name Crypto User
   ```

10. You must change the Crypto User password immediately on the initial log in. Failure to do so will result in a password error on subsequent logins.

    ```
    lunacm:>role changepw -name Crypto User
    ```

This completes initializing the HSM on Demand Service. The Crypto Officer and Crypto User roles can now be used to integrate applications with the HSMoD service to perform cryptographic operations

Constraints on HSMoD services

Please take the following limitations into consideration when integrating your application software with an HSM on Demand Service.

HSM on Demand Service in FIPS mode

HSMoD services operate in a FIPS and non-FIPS mode. If your organization requires non-FIPS algorithms for your operations, ensure you enable the **Allow non-FIPS approved algorithms** check box when configuring your HSM on Demand service. The FIPS mode is enabled by default.

Refer to the *Mechanism List* in the SDK Reference Guide for more information about available FIPS and non-FIPS algorithms.

Verify HSM on Demand <slot> value

LunaCM commands work on the current slot. If there is only one slot, then it is always the current slot. If you are completing an integration using HSMoD services, you need to verify which slot on the HSMoD service you send commands to. If there is more than one slot, then use the **slot set** command to direct a command to a specified slot. You can use **slot list** to determine which slot numbers are in use by which HSMoD service.

Preparing Environment in Windows Integrations

Your system requires access to the SafeNet Key Storage Provider (KSP). Copy the **SafeNetKSP.dll** file from your downloaded service client package to `C:\\Windows\System32`.

Failure to copy the **SafeNetKSP.dll** file will result in no access to the SafeNet Key Storage Provider's during the integration. For example, if configuring Microsoft Active Directory Certificate Services, the SafeNet Key Storage Providers will not be available options when setting up the Cryptography for CA.

Integrating Microsoft Active Directory Certificate Services with an HSM on Demand Service on Windows Server 2012 R2 or Windows Server 2016

This document provides detailed instructions and procedures to install and integrate Microsoft ADCS on Windows Server 2012 R2/2016 with an HSM on Demand Service. Microsoft ADCS uses the SafeNet Luna Key Storage Provider (KSP) for integration.

We recommend that you familiarize yourself with Microsoft ADCS before beginning the integration. Refer to the *Windows Server 2012 R2* or *Windows Server 2016* documentation for more information.

This integration contains the following topics:

Configuring the SafeNet Key Storage Provider (KSP)

You need to configure the SafeNet Key Storage Provider (KSP) so that the system can access the HSM on Demand Service as a user.

To configure the SafeNet Key Storage Provider

1. Navigate to the KSP installation directory. Run **KspConfig.exe**.

TIP The KSP client is available in the HSM on Demand service client package in the **/KSP** folder.

2. Double-click **Register or View Security Library**.
3. Click **Browse**. Select the **cryptoki.dll** file from the HSM on Demand service client package. Click **Register**.
4. On successful registration, a **Success!** message displays. Click **OK**.
5. Double-click **Register HSM Slots**.
6. Register the HSM for the Administrator user.

a. Open the **Register For User** drop-down menu and select **Administrator**.
b. Open the **Domain** drop-down menu and select your domain.
c. Open the **Available Slots** drop-down menu and select the service label.
d. Enter the **Slot Password**.
e. Click **Register Slot**.
f. On successful registration, a **Success!** message displays. Click **OK**.

7. Register the HSM for the System user.
   a. Open the **Register For User** drop-down menu and select **SYSTEM**.
   b. Open the **Domain** drop-down menu and select **NT AUTHORITY**.
   c. Open the **Available Slots** drop-down menu and select the service label. .
   d. Enter the **Slot Password**.
   e. Click **Register Slot**.
   f. On successful registration, a **Success!** message displays. Click **OK**.

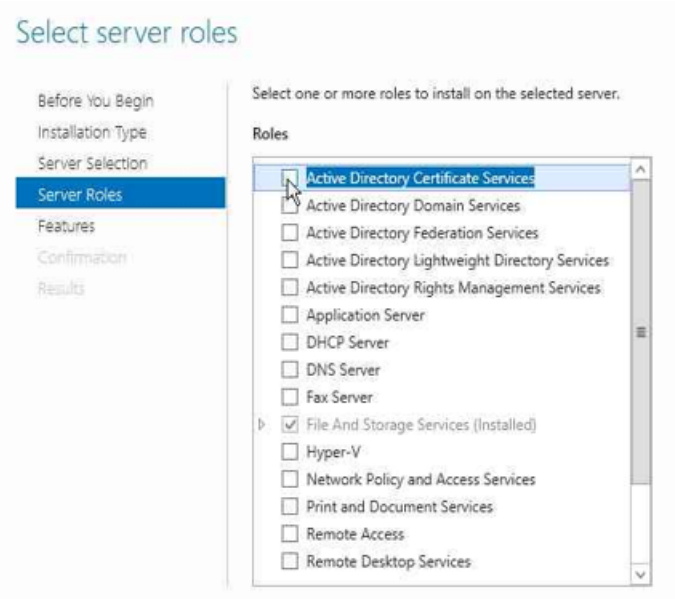
> **NOTE** The HSMoD service has been registered for both users, despite only one entry appearing for the <slot_label> in the Registered Slots section of the KSP interface.

Installing Microsoft ADCS

You need to install Microsoft ADCS to configure the Certificate Authority role for the system. You must configure the Microsoft ADCS to use the HSMoD service when you install and configure the Microsoft Certificate Authority (CA) user role.

To install Microsoft ADCS on Windows Server 2012/2016 Enterprise Full

1. Log in as an Enterprise Admin or Domain Admin with administrative privileges.
2. Click **Start**, **Administrative Tools**, and open the **Server Manager**.
3. Install the Certification Authority user role.
   a. Select **Add roles and features**.
   b. On the Before You Begin page click **Next**.
   c. On the Select installation type page enable the **Role-based or feature-based installation** radio button. Click **Next**.
   d. On the Select destination server page enable the **Select a server from the server pool** radio button. Select your server from the **Server Pool** menu. Click **Next**.
   e. On the Select Server Roles page select the **Active Directory Certificate Services** check box. Click **Next**.



f. A window will display asking you to **Add features that are required for Active Directory Certificate Services**. Click **Add Features**. Click **Next**.

> **NOTE** These are additional features that must be installed for the Active Directory Certificate Services to function.

g. On the Active Directory Certificate Services page click **Next**.

h. On the Select Role Services page select the **Certification Authority** check box. Click **Next**.

> **NOTE** The Certificate Authority is the only CA service supported by a cluster environment.

i. Click Install.

4. When the installation completes click **Configure Active Directory Certificate Services** on the destination server. The AD CS configuration wizard will display.

   a. On the Credentials page click **Next**.

   b. On the Role Services page enable the **Certification Authority** check box. Click **Next**.

   c. On the Setup Type page enable the **Enterprise CA** check box. Click **Next**.

   d. On the CA Type page enable the **Root CA** check box. Click **Next**.

   e. On the Private Key page select the option that is most appropriate for your organization. Follow the relative procedural set below:

Create a New Private Key	1. Enable the **Create a new private key** check box. 2. On the Cryptography for CA page open the **Select a cryptographic service provider (CSP)** drop-down menu and select a SafeNet Key Storage Provider algorithm from the list. 3. Open the **Key character length** drop-down menu and select an appropriate length. Select the **Hash algorithm** that the CA will use for signing certificates. 4. Enable the **Allow administrator interaction when the private key is accessed by the CA** check box. 5. Click **Next**.
Use Existing Private Key	1. Enable the **Use existing private key** and the **Select an existing private key on this computer** check box. The Change Cryptographic Provider dialog will display. 2. Click **Change** and select the SafeNet KSP algorithm that you used to generate the private key. 3. Clear the **CA common name** field. Click **Search**. 4. Select the existing key. Click **Next**. 5. Select the **Hash algorithm** that the CA will use for signing certificates. 6. Enable the **Allow administrator interaction when the private key is accessed by the CA** check box. 7. Click **Next**.

f. On the CA name page enter a **Common name** for this CA. Click **Next**

g. On the Validity Period page set the validity period for the CA certificate. Click **Next**.

h. On the Configure Certificate Database page set the location where the CA will store its logs. Click **Next**.

i. On the Confirm Installation Selections page verify that the CA you are about to configure is appropriate.

j. Click **Configure**.

8. Click **Close** to exit the AD CS Configuration after viewing the installation results.

9. Verify that the CA service is running.

```
sc query certsvc
```

10. Verify the CA key.

```
certutil -verifykeys
```

The MS ADCS integration with the HSM on Demand Service is complete. If you are configuring RAC you need to continue. If you are not configuring RAC, proceed to "Enrolling the CA certificate" on the next page.

11. Export the CA certificate

a. Open a command prompt and execute **certsrv.msc**. Click **OK**.

b. Select the CA node. Open the **Action** menu, click **All Tasks** and select **Backup CA**.

c. On the Welcome to the Certification Authority Backup Wizard page click **Next.**

d. Enable the **Private key and CA certificate** check box. Enter a directory location to store the certificate and key. Click **Next**.

e. Enter a password in the **Password** field, and confirm the password in the **Confirm Password** field. Click **Next**.

f. Click **Finish**.

> **NOTE** You will receive a warning message stating that the private key cannot be exported. This is expected behaviour. The private key will never leave the SafeNet HSM.

g. Click **OK**.

h. Use the **ksputil.exe** so that the keys will be visible to the second node in the cluster.

```
ksputil clusterKey /s <slot_number> /n <CA_name> /t <Target_host_name>
```

12. Halt the CA service to unlock the shared disk resources.

a. Click **Action**, select **All Tasks**, and then click **Stop Service**.

b. Close the CA management utility.

13. Detach the shared storage from the cluster node.

a. Access the Server Manager MMC utility. Click the **File and Storage Services**.

b. Open **Disks** and right-click the shared disk resource, select **Take Offline**.

14. Release the HSM from the cluster node.

a. Disable the network connection to the HSM.

b. Log off from the cluster node.

Enrolling the CA certificate

You need to set the certificate that will be used by the Certification Authority on the system.

To enroll a CA certificate using SafeNet Key Storage Provider

1. Verify that the CA service is running.

```
sc query certsvc
```

2. Create a CA template that uses SafeNet KSP.

a. Open a command prompt and execute **certtmpl.msc**.

b. Right-click the Administrator template and click **Duplicate Template**.

c. On the **Compatibility** tab open the **Certification Authority** drop-down menu and select Windows Server 2008. Open the **Certificate Recipient** drop-down menu and select Windows Server 2008. Click **OK**.

d. Select the **General** tab and enter a name for the template in the **Template display name** field.

e. Select the **Cryptography** tab and open the **Provider Category** drop-down menu. Select **Key Storage Provider**. Enable the **Requests must use one of the following providers** check box.

f. In the **Providers** field, select the **SafeNet Key Storage Provider** check box.

g. Open the **Algorithm name** drop-down menu and select an algorithm.

h. Open the **Request hash** drop-down menu and select a hash signature.

i. Select the **Subject Name** tab and uncheck the **Include e-mail name in subject name** check box and the **E-mail name** check box.

j. Click **Apply** to save the template and click **OK**.

3. Open a command prompt and execute **certsrv.msc**.
4. Double-click the CA name. Right-click **Certificate Templates**, select **New**, and click **Certificate Template to Issue**.
5. Select the template that was recently created. Click **OK**.
6. Request a certificate based on the template.

a. Open a command prompt and execute **certmgr.msc**.

b. Right-click **Personal**, select **All Tasks**, and click **Request New Certificate…**.

c. Click **Next**.

d. Click **Next**.

e. Enable the checkbox next to the recently created template.

f. Click **Enroll**.

g. Verify the certificate was enrolled successfully.

Archiving Keys

This section will demonstrate that the various configurations with the SafeNet Luna HSM do not interfere with the CA key archival functionality.

To add a Key Recovery Agent Template to the CA

1. Add Key Recovery Agent (KRA) template to the CA.
2. Open a command prompt and execute **certsrv.msc**.
3. Right-click **Certificate Templates**, select **New**, and click **Certificate Template to Issue**.
4. Select the **Key Recovery Agent** template. Click **OK**.

To request a KRA certificate

1. Open a command prompt and execute **certmgr.msc**.
2. Right-click **Personal**, select **All Tasks**, and click **Request New Certificate…**.
3. Click **Next**.
4. Click **Next**.
5. Enable the **Key Recovery Agent** check box.
6. Click **Enroll**.

7. Verify that enrollment is pending. Click **Finish**.

To issue the KRA certificate

1. Open a command prompt and execute **certsrv.msc**.
2. Open **Pending Requests**. Right-click on the latest request for the KRA template, select **All Tasks**, and click **Issue**.
3. Select **Issued Certificates…** and verify that a new certificate has been issued.

To retrieve the issued certificate from CA.

1. Open a command prompt and execute **certmgr.msc**.
2. Right-click **Certificates – Current User**, select **All Tasks**, and click **Automatically enroll and retrieve certificates**. Click **Next**.
3. Select the recently issued KRA certificate. Click **Finish**.

To configure the CA to support Key Archival.

1. Open a command prompt and execute **certsrv.msc**.
2. Right-click the CA name and select **Properties**.
3. Select the **Recovery Agents** tab and enable the **Archive the key** radio button. Click **Add**.
4. Select the recently created KRA certificate. Click **OK**.
5. A dialog window displays stating you must restart the Active Directory Certificate Services for the changes to take effect. Click **Yes**.

To create a template with key archival enabled

1. Open a command prompt and execute **certtmpl.msc**.
2. Right-click the User template and select **Duplicate Template**.
3. On the **Compatibility** tab open the **Certification Authority** drop-down menu and select Windows Server 2008. Open the **Certificate Recipient** drop-down menu and select Windows Server 2008. Click **OK**.
4. Select the **General** tab and enter a name for the template in the **Template display name** field. Enable the **Publish certificate in Active Directory** check box.
5. Select the **Request Handling** tab and enable the **Archive subject's encryption private key** check box .
6. Select the **Subject Name** tab and uncheck the **Include e-mail name in subject name check box** and the **E-mail name** check box.
7. Click **Apply** and then click **OK**.

To add a new template to CA for issuing

1. Open a command prompt and execute **certsrv.msc**.
2. Right-click **Certificate Templates**, click **New**, and select **Certificate Template to Issue**.
3. Select **UserKeyArchival** and click **OK**.

To issue the key archival template.

1. Open a command prompt and execute **certmgr.msc**.
2. Right-click **Personal**, select **All Tasks**, and click **Request New Certificate…**.
3. Click **Next**.
4. Click **Next**.
5. Enable the **UserKArchival** check box.
6. Click **Enroll**. Verify that the enrolment was successful.
7. Click **Finish**.

Performing a Key Recovery

You can recover archived keys.

To perform a key recovery

1. Log on to the system as Domain Administrator and ensure that the private key is still recoverable by viewing the Archived Key column in the Certification Authority console.
   a. Log on as Domain Administrator.
   b. From **Administrative Tools**, open **Certification Authority**.
   c. In the console tree, double-click **CA**, and then click **Issued Certificates**.
   d. From the **View** menu, click **Add/Remove Columns**.
   e. In **Add/Remove Columns**, in **Available Column**, select **Archived Key**, and then click **Add**. The Archived Key should now appear in Displayed Columns.
   f. Click **OK** and then, in the details pane, scroll to the right and confirm that the last issued certificate to **UserKeyArchival** has a **Yes** value in the **Archived Key** column.

   NOTE A certificate template must be modified so that the Archive bit and Mark Private Key as Exportable attributes are enabled. The private key is only recoverable if there is data in the Archived Key column.

   g. Double-click the **Archive User** certificate.
   h. Click **Details**. Write down the serial number of the certificate.

   NOTE The serial number is required for recovery. Do not include spaces between the values.

   i. Click **OK**, and close the Certification Authority.
2. Import the private key into an output file.
   a. Open a command prompt and execute **cd**. Ensure that you are in the **c:** directory.

b. Execute **certutil –getkey** <serial_number> <output_blob >

c. Execute **dir** <output_blob>

> **NOTE** If the file <output_blob> does not exist, verify the serial number that you used.

3. Recover the original private/public key.
   a. Open a command prompt and execute **certutil –recoverkey** <output_blob> **user.pfx**.
   b. When prompted, enter a new password.
   c. Execute **exit**. Close all windows and log off as the current user.
4. Find the recovered certificate.
   a. Open a command prompt and execute **certmgr.msc**.
   b. Right-click **Certificates (Current User)**, and select **Find Certificates**.
   c. Enter the CA name into the **Contains** field and click **Find Now**.
   d. Click **Select All** on the **Edit** menu.
   e. Click **Delete** on the **File** menu.
   f. Click **Yes**.
   g. Close Find Certificates.
5. Import the certificate.
   a. Right-click **Personal**, click **All Tasks**, and select **Import**.
   b. Click **Next**.
   c. On the Files to Import page enter **c:\user.pfx** in the **File Name** field. Click **Next**.
   d. Enter the password for the .pfx file. Click **Next**.
   e. On the Certificate Store page enable the **Automatically select the certificate store based on the type of certificate** check box. Click **Next**.
   f. Click **Finish**.
6. Verify the serial number of the imported certificate.
   a. Double-click **Personal** and select **Certificates**.
   b. Double-click the certificate.
   c. Click the **Details** tab. Verify that the serial number matches the original.

Preparing the Active Directory Certificate Services Cluster Environment

If you are configuring RAC you must prepare the ADCS cluster environment for configuration. Before you proceed with the following procedures, ensure you have completed the following:

> You must configure the SafeNet KSP before preparing the ADCS cluster environment. See "Configuring the SafeNet Key Storage Provider (KSP) " on page 10 for more information.

> You must complete "Installing Microsoft ADCS" on page 11 on the primary cluster node.

Setting up the CA server role on the secondary cluster node .

This section provides detailed procedures on setting up the secondary cluster node.

To configure the secondary cluster node

1. Log in to the cluster node with permissions to install the secondary cluster node. To install an enterprise CA log in to an account with enterprise permissions in the Active Directory domain.
2. Click **Start**, select **Run**, and enter **servermanager.msc** in the field. Click **OK**.
3. Click **File and Storage Services** and select **Disks**. Ensure that the shared disk used by the CA is online.
4. Click **Start**, select **Run**, and enter **MMC** in the field. Click **OK**.
5. Open the **File** menu and select **Add/Remove Snap-in…**.
6. Select **Certificates** from the **Available snap-ins** menu and click **Add**.
7. Enable the **Computer account** radio button and click **Next**.
8. Enable the **Local computer: (the computer this console is running on)** radio button. Click **Finish**.
9. Click **OK**.

To import an existing certificate

1. Right-click **Certificates (Local Computer)** and select **Personal**.
2. In the **Action** menu click **All Tasks** and select **Import…**.
3. The Certificate Import Wizard will open. Click **Next**.
4. Enter the filename of the CA certificate for import. Click **Next**.

> **NOTE** If you use the **Browse…** utility to find the certificate you must change the file type extension to Personal Information Exchange - ***.pfx**

5. Enter the password that was previously used to secure the private key. Click **Next**.

> **NOTE** The private key password is required even if there is no private key in the ***.pfx** file.

6. Enable the **Place all certificates in the following store** radio button. Enter **Personal** in the **Certificate Store** field. Click **Next**.
7. Click **Finish** to import the certificate. Click **OK** to confirm the import.
8. Repair the association between the certificate and private key.
   a. In the Certificate Manager expand **Personal** and select **Certificates**.
   b. Select the imported certificate. Open the **Action** menu and select **Open**.

c. On the **Details** tab select the **Serial number** field. Copy the serial number value to the clipboard. Click **OK**.

d. Open a command prompt and execute **certutil –repairstore MY "**<serial_number>**"**.

To add the AD CS role

1. Open the Server Manager and select **Add Roles and Features**.
2. The Add Roles and Features wizard displays. On the Before You Begin page click **Next**.
3. On the Select installation type page enable the **Role-based or feature-based installation** radio button. Click **Next**.
4. On the Select Destination server page enable the **Select a server from the server pool** radio button. Select your server in the **Server Pool** menu. Click **Next**.
5. On the Select Server Roles page select the **Active Directory Certificate Services** check box. Click **Next**.
6. A window displays asking you to **Add features that are required for Active Directory Certificate Services**. Click **Add Features**. Click **Next**.

> **NOTE** These are additional features that must be installed for the Active Directory Certificate Services to function.

7. On the Features page click **Next**.
8. On the Active Directory Certificate Services page click **Next**.
9. On the Select Role Services page select the **Certification Authority** check box. Click **Next**.

> **NOTE** The Certificate Authority is the only CA service supported by a cluster environment.

e. Click **Install**.

10. When the installation completes click **Configure Active Directory Certificate Services on the destination server**. The AD CS configuration wizard displays.

To configure the AD CS role

1. On the Credentials page click **Next**.
2. On the Role Services page enable the **Certification Authority** check box. Click **Next**.
3. On the Setup Type page enable the **Enterprise CA** check box. Click **Next**.
4. On the CA Type page enable the **Root CA** check box. Click **Next**.
5. On the Private Key page enable the **Use existing private key** and the **Select a certificate and use its associated private key** radio buttons. Click Next.
6. On the Existing Certificate page select the CA certificate that was generated on the primary node. Click **Next**.
7. On the Configure Certificate Database page set the location where the CA will store its logs. Click **Next**.

8. A dialog box will display stating an existing database was found. Click **Yes** to proceed.
9. Click **Configure**.
10. Click **Close** to finish the role installation.
11. Log off from the secondary cluster node.

Installing the Failover Cluster feature

The following procedure must be repeated for each node in the cluster.

To install the failover cluster feature

1. Log in to the cluster node with local Administrator permissions.
2. Open **Server Manager**. Click **Add roles and features**.
3. On the Before you begin page click **Next**.
4. Select the **Role-based or feature-based installation** radio button. Click **Next**.
5. On the Select destination server page enable the **Select a server from the server pool** radio button. Select your server in the **Server Pool** menu. Click **Next**.
6. Click **Next**.
7. On the Select Features page enable the **Failover Clustering** check box. Click **Next**.
8. A window will display asking you to **Add features that are required for Failover Clustering**. Click **Add Features**. Click **Next**.

> **NOTE** These are additional features that must be installed for the Active Directory Certificate Services to function.

9. Click **Install**. When the installation is complete click **Close**.

Configuring the Failover Cluster feature

You need to install and enable the failover cluster feature.

To configure the failover cluster feature

1. Log on to the cluster node.
2. Open **Server Manager**. Open the **Tools** menu and select **Failover Cluster Manager**.
3. Open the **Action** menu and select **Create a cluster**.
4. On the Before You Begin page click **Next**.
5. On the Select Servers page enter the cluster node name of the first cluster node in the **Enter Server Name** field. Click **Add**.
6. On the Select Servers page enter the cluster node name of any remaining nodes. Click **Add**.
7. Click **Next** to continue.

8. On the Access Point for Administering the Cluster page enter a name to identify the cluster configuration. Click **Next**.
9. On the Confirmation page verify that you have properly configured the cluster name with the failover cluster. Click **Next**.
10. On the Summary page verify the Create Cluster report. Click **Finish**.

Configuring the Active Directory Certificate Services Failover Cluster

You need to configure the failover cluster feature to recognize the primary and activate the standby databases on failure.

To configure the Active Directory Certificate Services Failover Cluster

1. Open the Failover Cluster Management snap-in. Right-click **Role** and select **Configure Role**.
2. On the Before You Begin page click **Next**.
3. On the Select role page select **Generic Service**. Click **Next**.
4. On the Select Service page select **Active Directory Certificate Services**. Click **Next**.
5. On the Client Access Point page enter a name for the service in the **Name** field. Click **Next**.
6. On the Select Storage page enable the check box next to the disk storage that is mounted to the node. Click **Next**.
7. On the Replicate Registry Settings page click **Add**. Enter **SYSTEM\CurrentControlSet\Services\CertSvc** and click **OK**. Click **Next**.
8. On the Confirmation page verify the service you are configuring. Click **Next**.
9. On the Summary page verify the Generic Service report. Click **Finish**.
10. Use the **ksputil.exe** to migrate the keys to the cluster.

```
ksputil c /s <slot_number> /t <CA_cluster_service_name> /n <CA_name>
```

Creating CRL objects in the Active Directory

You can create a Certificate Revocation List object for your active directory.

To create CRL objects in the active directory

1. Log on to the cluster node.
2. Open a command prompt and execute **cd %WINDIR%\System32\Certsrv\CertEnroll**
3. Publish the CRL into the active directory.

```
certutil -f dspublish "<CRL_file>"
```

Modifying the CA configuration in Active Directory

You can perform the following procedural set from any computer in your Active Directory configuration. The AIA object in the Active Directory stores the CA certificate. To enable both cluster nodes to update the CA certificate, complete the following.

To modify the CA configuration in active directory

1. Log on to the system with enterprise permissions.
2. Click **Start**, select **Run**, and enter **dssite.msc** in the field. Click **OK**.
3. Select the top node in the left pane. Open the **View** menu and select **Show Services**.
4. Expand **Services** and **Public Key Services**.
5. Select **AIA**. Select the CA name. Open the **Action** menu and select **Properties**.
   a. Select the **Security** tab and click **Add…**.
   b. Click **Object Types** and enable the **Computers** check box. Click **OK**.
   c. Enter the name of the secondary cluster node in the **Enter the object names to select** field. Click **OK**.
   d. Select the **Full Control** check box for each cluster in the configuration. Click **OK**.
6. Select Enrollment Services. Select the CA name. Open the **Action** menu and select **Properties**.
   a. Select the **Security** tab and click **Add…**.
   b. Click **Object Types** and enable the **Computers** check box. Click **OK**.
   c. Enter the name of the secondary cluster node in the **Enter the object names to select** field. Click **OK**.
   d. Select the **Full Control** check box for each cluster in the configuration. Click **OK**.
7. Select KRA. Select the CA name. Open the **Action** menu and select **Properties**.
   a. Select the **Security** tab and click **Add…**.
   b. Click **Object Types** and enable the **Computers** check box. Click **OK**.
   c. Enter the name of the secondary cluster node in the **Enter the object names to select** field. Click **OK**.
   d. Select the **Full Control** check box for each cluster in the configuration. Click **OK**.
8. Close the Sites and Services snap-in.

Backing up the Certification Authority

You can enable and configure the location where the CA backup files will be stored using the Active Directory certificate services management console.

To backup the CA

1. Click **Start**, select **Run**, and enter **certsrv.msc** in the field. Click **OK**.
2. Select the CA node. Open the **Action** menu, click **All Tasks** and select **Backup CA**.
3. On the Welcome to the Certification Authority Backup Wizard page click **Next**.
4. Enable the **Private key and CA certificate** check box. Enter a directory location to store the certificate and key. Click **Next**.
5. Enter a password in the **Password** field, and confirm the password in the **Confirm Password** field. Click **Next**.
6. Click **Finish**.

Restoring the Certification Authority

You can restore CA certificates from the Active Directory certificate services management console.

To restore the CA

1. Click **Start**, select **Run**, and enter **certsrv.msc** in the field. Click **OK**.
2. Select the CA node. Open the **Action** menu, click **All Tasks** and select **Restore CA**.
3. On the Welcome to the Certification Authority Backup Wizard page click **Next**.
4. Enable the **Private key and CA certificate** check box. Enter a directory location to temporarily store the certificate and key. Click **Next**.
5. Enter a password in the **Password** field, and confirm the password in the **Confirm Password** field. Click **Next**.
6. Click **Finish**.
7. A dialog will display. It asks “Do you want to start Active Directory Certificate Services?” Click **Yes**.
8. Verify the Active Directory Certificate Services have successfully restarted in **certsrv**.

Migrating a MS CA onto a HSM on Demand service using ms2Luna

Storing keys on the software is not a secure practice. We recommend migrating the security key onto the HSM on Demand service. Refer to the *SDK Reference Guide* for more information about using the ms2luna.exe command.

To migrate a MS CA onto a SafeNet HSM using ms2Luna

1. Copy the CA certificate thumbprint.
2. Open a command prompt and run ms2Luna.exe from the HSMoD service client package

> **NOTE** NOTE: You need to register the service using KSP before migrating MSCA to SafeNet HSM. See "Configuring the SafeNet Key Storage Provider (KSP) " on page 10 for more information about registering the service with the SafeNet KSP.

3. Enter the Thumbprint of CA certificate and press Enter.
4. Verify that CA provider changes to SafeNet Key Storage Provider.
5. Uninstall the existing CA that the key was removed from.