Microsoft AD CS and NDES

nShield® HSM Integration Guide for Microsoft Windows Server

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Microsoft Security

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Table of Contents

1. Introduction . . . 1
    1.1. Product configurations . . . 1
    1.2. Supported nShield hardware and software versions . . . 1
    1.3. Supported nShield HSM functionality . . . 2
    1.4. Requirements . . . 2
2. Procedures . . . 4
    2.1. Select the protection method . . . 4
    2.2. Install the Security World software and create a Security World . . . 4
    2.3. Generate the OCS in the CA server . . . 5
    2.4. Configure the CNG provider in the CA server . . . 7
    2.5. Configure the CNG provider on the NDES server . . . 7
    2.6. Install and configure AD CS on the CA server . . . 7
    2.7. Add certificates templates to the CA server . . . 11
    2.8. Install Web Server (IIS) on the CA server . . . 12
    2.9. Create a virtual directory to serve as the public key infrastructure (PKI) repository . . . 13
    2.10. Create domain user accounts to act as the NDES service account . . . 15
    2.11. Add the SCEPAdmin account and SCEPSvc service account to the local IIS_IUSRS group . . . 16
    2.12. Configure the SCEPAdmin account and SCEPSvc service account with request permission on the CA . . . 16
    2.13. Configure the SCEPDeviceAdmin account with enroll permission to the IPSEC (offline request) certificate template . . . 17
    2.14. Install and configure NDES . . . 18
    2.15. Configure the NDES admin page to use an SSL certificate . . . 20
3. Use a HSM for RA certificate private keys . . . 28
    3.1. Procedures changes. . . . 28
4. Troubleshooting . . . 30
    4.1. Using the `certreq -new <.req file here>` command returns an Invalid Provider Specified error. . . . 30
    4.2. If using remote admin, the **AD CS Configuration Wizard** does not detect the OCS. . . . 30
    4.3. Failed to add Certificate Templates at the End of the NDES installation . . . 30
5. Additional resources and related products . . . 33
    5.1. nShield HSMs . . . 33
    5.2. nShield as a Service . . . 33
    5.3. Entrust products . . . 33

5.4. nShield product documentation 33

Chapter 1. Introduction

This guide describes how MS NDES can utilize a Microsoft Certificate Authority enrolled with an Entrust nShield Hardware Security Module (HSM) as a Root of Trust for storage encryption, to protect the private keys and meet FIPS 140 Level 2 or Level 3.

The Entrust nShield is also used to protect the NDES Admin web page using TLS, where the private key for the certificate is nShield managed. NDES implements the Simple Certificate Enrollment Protocol (SCEP), which defines the communication between network devices and a Registration Authority (RA) for certificate enrollment.

SCEP supports the secure issuance of certificates to network devices which do not run with domain credentials to enroll for x509 version 3 certificates from a Certification Authority (CA).

Ultimately, the network device will have a private key and associated certificate issued by a CA protected by the Entrust nShield HSM. Applications on the device may use the key and its associated certificate to interact with other entities on the network. The most common usage of this certificate on a network device is to authenticate the device in an IPSec session.

1.1. Product configurations

Entrust tested the integration with the following versions:

Product	Version
Base OS	Windows Server 2025 Server
Entrust Security World	13.6.16 (LTS7), 13.9.5 (STS5)

1.2. Supported nShield hardware and software versions

Entrust tested the integration with the following nShield HSM hardware and software versions:

Product	Security World	Firmware	Netimage
Connect XC	13.6.16 (LTS7)	12.72.4 (FIPS 140-2 certified)	13.6.16 (LTS7)
	13.9.5 (STS5)	13.8.3 (STS5)	13.9.5 (STS5)

Product	Security World	Firmware	Netimage
nShield 5c	13.6.16 (LTS7)	13.4.5 (FIPS 140-3 certified)	13.6.16 (LTS7)
	13.9.5 (STS5)	13.8.4 (STS5)	13.9.5 (STS5)

1.3. Supported nShield HSM functionality

Feature	Support
Module-only key	Yes
OCS cards	Yes (No Passphrases)
Softcards	No
nSaaS	Yes
FIPS 140 Level 3	Yes

On windows 2025, the ability to access NDES via an unsecure connection has been disabled. It is basically a designed security feature. You should always use HTTPS to access NDES to ensure secure communication and proper functionality. It is a result of security best practices and configurations in modern server environments.

1.4. Requirements

Familiarize yourself with:

- Active Directory Certificate Services (AD CS): Network Device Enrollment Service (NDES) documentation (https://docs.microsoft.com).
- The *Installation Guide* and *User Guide* for the HSM.
- Your organizational Certificate Policy and Certificate Practice Statement and a Security Policy or Procedure in place covering administration of the PKI and HSM:
  - The number and quorum of Administrator cards in the Administrator Card Set (ACS) and the policy for managing these cards.
  - The number and quorum of operator cards in the Operator Card Set (OCS) and the policy for managing these cards.

- The keys protection method: Module or OCS (No passphrase).
- The level of compliance for the Security World, FIPS 140 Level 3.

  Entrust recommends that you allow only unprivileged connections unless you are performing administrative tasks.

- Key attributes such as key size, time-out, or need for auditing key usage.

Chapter 2. Procedures

Prerequisites:

- A Windows domain controller.
- Domain administrator privileges to add accounts and join clients.
- A Windows server in the domain with Internet Information Services (IIS) installed. Active Directory Certificate Service (AD CS) will be installed in this server per the instructions below.
- A second Windows server in the domain with IIS installed. NDES will be installed in this server per the instructions below.
- A Windows client in the domain to request CA hash and challenge password pairs.

2.1. Select the protection method

OCS or Module protection can be used to authorize access to the keys protected by the HSM. Follow your organization's security policy to select which one. The following protection methods were used in this integration:

- HSM OCS with no passphrase protection was used to protect the CA. This is the highest level of protection.
- HSM Module protection was used to generate the certificate request for IIS binding for secure access to the NDES server. IIS binding is only possible with:
  - OCS without a passphrase
  - Module protection
- Microsoft cryptography provider was used to protect the RA keys. For RA keys, only Cryptographic Application Programming Interface (CryptoAPI) Service Providers are supported.

For secure HTTPS connections, you can only use OCS with no passphrase or module protection. This is required when setting up the binding on the IIS server for the https protocol. At that stage the IIS server does not provide any mechanism to enter passphrases for OCS or softcard protection, therefore any protection method that uses a passphrase will fail.

2.2. Install the Security World software and create a Security World

1. Sign in to the CA server using the domain name, `<domain_name>\Administrator`.
2. Install the Security World software by double-clicking on the `SecWorld_Windows-xx.xx.xx.iso` file. For detailed instructions, see the *Installation Guide* for the HSM on https://nshielddocs.entrust.com/.
3. Add the Security World utilities path `C:\Program Files\nCipher\nfast\bin` to the Windows system path.
4. Open the firewall port `9004` outbound for the HSM connections.
5. Install the nShield Connect HSM locally, remotely, or remotely via the serial console.
6. Open a command window and run the following to confirm that the HSM is `operational`:

```
C:\Users\dbuser>enquiry
Server:
 enquiry reply flags  none
 enquiry reply level  Six
 serial number        ...
 mode                 operational
...
Module #1:
 enquiry reply flags  none
 enquiry reply level  Six
 serial number        ...
 mode                 operational.
 ...
```

7. Create your Security World if one does not already exist, or copy an existing one. Follow your organization's security policy for this. ACS cards cannot be duplicated after the Security World is created. Create a quorum K/N appropriate for your implementation and to protect against card failure or loss.
8. Confirm the Security World is `usable`:

```
C:\Users\dbuser>nfkminfo
World
 generation  2
 state       0x37270008 Initialised Usable ...
 ...
Module #1
 generation 2
 state      0x2 Usable
 ...
```

9. Sign in to the NDES server using the domain name, `<domain_name>\Administrator` and repeat the above steps, but copying the Security World from the CA server.

2.3. Generate the OCS in the CA server

To create the OCS:

1. If you are using remote administration, ensure that the `C:\ProgramData\nCipher\Key Management Data\config\cardlist` file contains the serial number of the card(s) to be presented.
2. Open a command window as a user with administrator privileges.
3. Execute the following command.

   Follow your organization's security policy for the values K/N. In this example, `K=1` and `N=1`.

   The OCS cards cannot be duplicated after it was created. Make sure no passphrase is provided at the prompt. Notice `slot 2`, remote via a Trusted Verification Device, is used to present the card.

   The authentication provided by the OCS as shown in the command is non-persistent and is only available for `K=1` and while the OCS card is present in the HSM front panel slot, or TVD. If you are using OCS card protection and non-persistent card configuration, OCS cards need to be inserted in the front panel or always present in the TVD. Add the `-p` (persistent) option in the command to retain authentication after the OCS card has been removed from the HSM front panel slot or from the TVD.

```
>createocs -m1 -s2 -N testOCS -Q 1/1

FIPS 140-2 level 3 auth obtained.

Creating Cardset:
 Module 1: 0 cards of 1 written
 Module 1 slot 0: Admin Card #1
 Module 1 slot 2: empty
 Module 1 slot 3: empty
 Module 1 slot 2: blank card
 Module 1 slot 2:- passphrase specified - writing card
Card writing complete.

cardset created; hkltu = ...
```

4. Verify that the OCS has been created:

```
nfkminfo -c
Cardset list - 1 cardsets:  (P)ersistent/(N)ot, (R)emoteable/(L)ocal-only
 Operator logical token hash              k/n timeout  name
 8b652e480d6307c32a1b1395a7a12c8ef07fbd24  1/1  none-NL testOCS
```

   The `rocs` utility also shows the OCS that was created:

```
>rocs
`rocs' key recovery tool
Useful commands: `help', `help intro', `quit'.
rocs> list cardset
No. Name                    Keys (recov) Sharing
  1 testOCS                 0 (0)        1 of 1
```

```
rocs> quit
```

2.4. Configure the CNG provider in the CA server

1. Sign in to the CA server using the domain name, <domain_name>\Administrator.
2. Select **Start** > **nCipher** > **CNG configuration wizard**.
3. Select **Next** on the **Welcome** window.
4. Select **Next** on the **Enable HSM Pool Mode** window, leaving **Enable HSM Mode for CNG Providers** un-checked.
5. Select **Use existing security world** on the **Initial setup** window. Then select **Next**.
6. Select the HSM (Module) if more than one is available on the **Set Module States** window. Then select **Next**.
7. In **Key Protection Setup**, select **Operator Card Set protection > Next**, then select the relevant option: **Module protection** or **Operator Card Set protection**.

   For **Module Protection**, the **Software Installation** window will come up. For **OCS Protection**, choose from **Current Operator Card Sets**. Notice this was created above.

8. Select **Next > Finish**.
9. Verify the provider:

```
>certutil -csplist | findstr nCipher
Provider Name: nCipher Security World Key Storage Provider
```

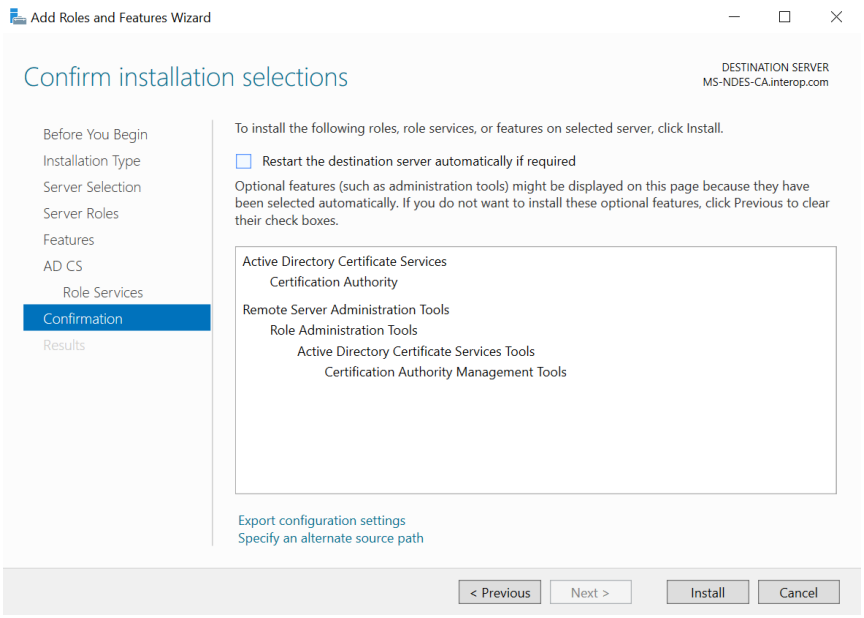
2.5. Configure the CNG provider on the NDES server

1. Sign in to the NDES server using the domain name, <domain_name>\Administrator.
2. Select **Start > nCipher > CNG configuration wizard**, then follow the steps to configure the CNG as described in Configure the CNG provider in the CA server.

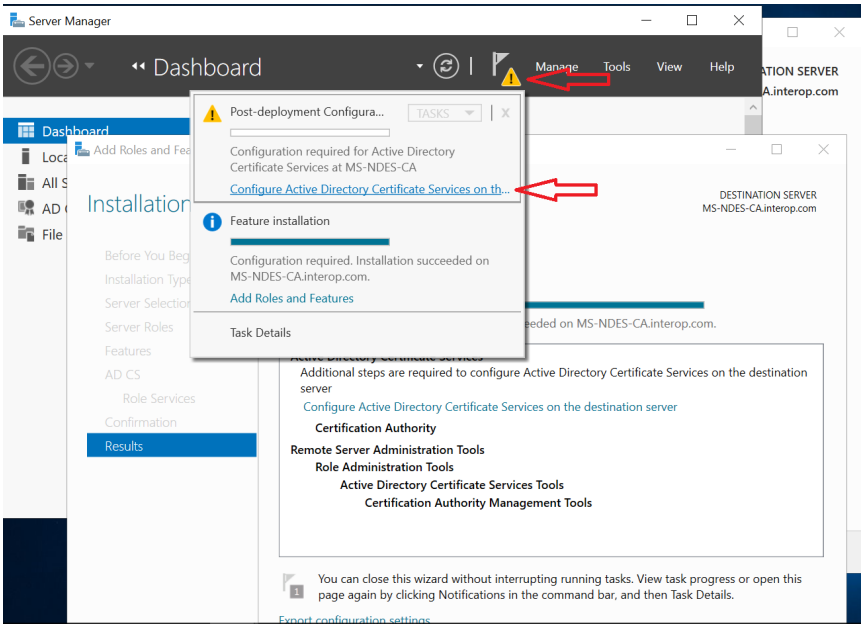
2.6. Install and configure AD CS on the CA server

1. Sign in to the CA server using the domain name, <domain_name>\Administrator.
2. Select **Start > Server Manager** to open the Server Manager.
3. Select **Manage**, then select **Add Roles & Features**. The **Before you begin** window appears. Select **Next**.
4. Select **Role-based or feature-based installation** on the **Select installation type** window. Select **Next**.

5. Select the local server from the pool on the **Select destination server** window. Select **Next**.
6. Select **Active Directory Certificate Services** role on the **Select server roles** window. The **Add Roles and Features** Wizard will appear. Select **Add Features** and then select **Next**.
7. In **Select features**, select **Next**.
8. Select **Next** on the **Active Directory Certificate Services** window.
9. Select **Certification Authority** on the **Select role services** windows.
10. Select **Next**.
11. Verify the information, then select **Install** on the **Confirm installation selections** window.



12. Do not select **Close** the **Installation progress** windows once the installation is complete. Instead, select the **Configure Active Directory Certificate Services on the destination server** link.

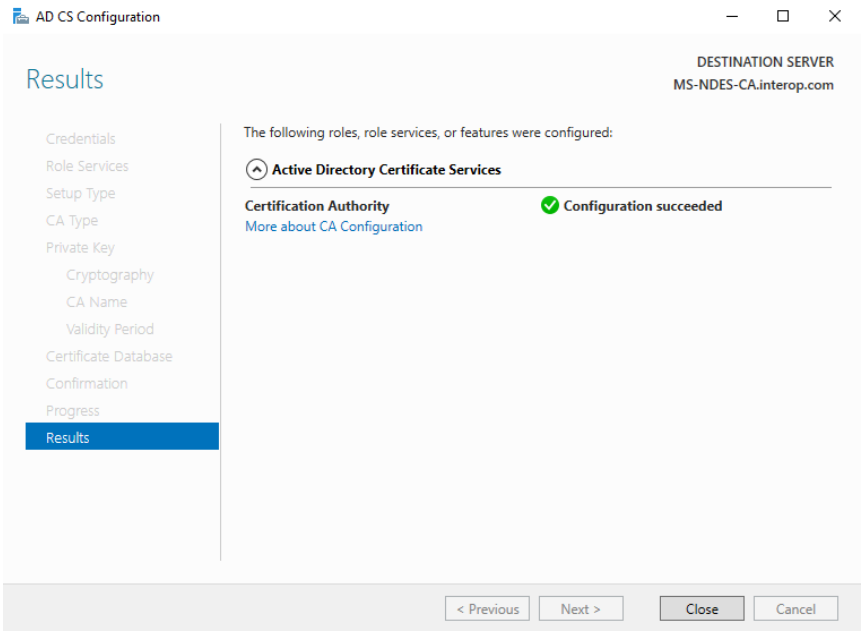


13. Verify the **Administrator** credentials, `<domain_name>\Administrator` on the **Credentials** text box on the **Credentials** windows. If needed select **Change** and specify the appropriate credentials. Select **Next**.
14. Select **Certification Authority** on the **Role Services** window. This is the only available selection when the certification authority role is installed on the server. If using OCS key protection, present the OCS card in the HSM or TVD. When the communication with the HSM has been established the button becomes active. Select **Next**.
15. Select **Enterprise CA** on the **Setup Type** window. Select **Next**.
16. Select **Root CA** on the **CA Type** window. Select **Next**.
17. Select **Create a new private key** on the **Private Key** window. Select **Next**.
18. In **Cryptography for CA > nCipher Security World Key Storage Provider**, select a provider with key length 2048 or longer. Also check **Allow administrator interaction when the private key is accessed by the CA**. Then select **Next**.
19. Take the default CA name given, or modify if required on the **CA Name** window. Select **Next**.
20. Enter the number of years for the certificate to be valid on the **Validity Period** window. Select **Next**.
21. Take the default locations for the database and database log files, or modify if required on the **CA Database** window. Select **Next**.
22. Select **Configure** on the **Confirmation** window.
23. A **Create new key** wizard window appears on the task bar. It may be hidden behind the other windows. Open it and select **Next**.
24. Select the protection method for the new key. Select **Next**.

You will be prompted to present the OCS cards if OCS protection method was chosen when the CNG provider was installed. There will be no prompt if Module protection was chosen.

If you are using a FIPS 140 Level 3 Security World, you will need to present an OCS card for FIPS authorization before the AD CS key can be generated, irrespective of your chosen protection method.

25. Present the OCS and select the module if more than one nShield Connect is available. Select **Finish** to close the wizard.
26. Select **Next** on the **Load key** window.
27. Select the module on the **Choose modules you wish to load the key onto** window. Select **Next**.
28. Select **Finish**. Successful configuration is shown as follows. Select **Close**.



29. The key generated can be verified using a CLI command:

```
>nfkminfo -l

Keys protected by cardsets:
 key_caping_machine--75393afa6878b98e3d91b5ff360284f706a97572 `interop-MS-NDES-CA-CA`
```

The `rocs` utility shows the names and protection methods of the keys.

```
>rocs
`rocs' key recovery tool
Useful commands: `help', `help intro', `quit'.
rocs> list keys
  No. Name                    App        Protected by
    1 interop-MS-NDES-CA-CA   caping     MSaDCSnDESocs
```

```
rocs> quit
```

30. Register `nFast Server` as a dependency of AD CS with the `ncsvcdep` tool in the `nfast/bin` directory. This is needed as the nShield service must have started before CA, otherwise the nShield CNG providers will fail.

    Run the command:

    ```
    >ncsvcdep -a certsvc
    ```

    Example output:

    ```
    Dependency change succeeded.
    ```

31. Verify that the CA service has started successfully.

    Run the command:

    ```
    >sc query certsvc
    ```

    Example output:

    ```
    SERVICE_NAME: certsvc
            TYPE               : 110  WIN32_OWN_PROCESS  (interactive)
            STATE              : 4  RUNNING
                                    (STOPPABLE, PAUSABLE, ACCEPTS_SHUTDOWN)
            WIN32_EXIT_CODE    : 0  (0x0)
            SERVICE_EXIT_CODE  : 0  (0x0)
            CHECKPOINT         : 0x0
            WAIT_HINT          : 0x0
    ```

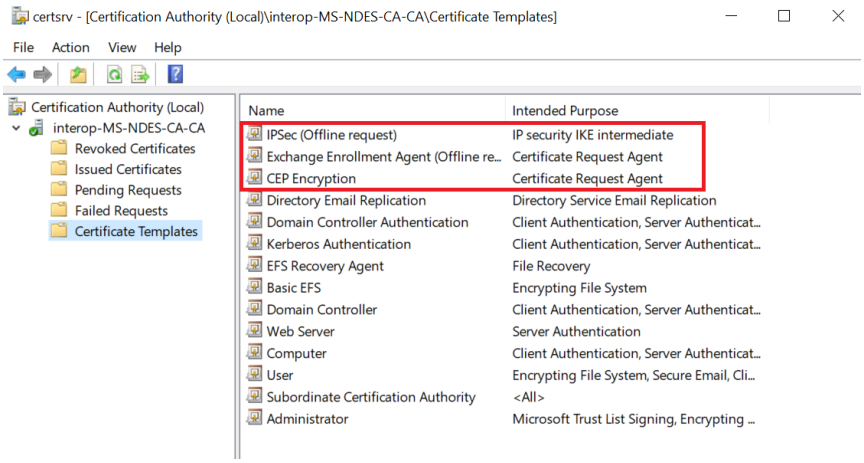
32. In **Installation progress**, select **Close**.

2.7. Add certificates templates to the CA server

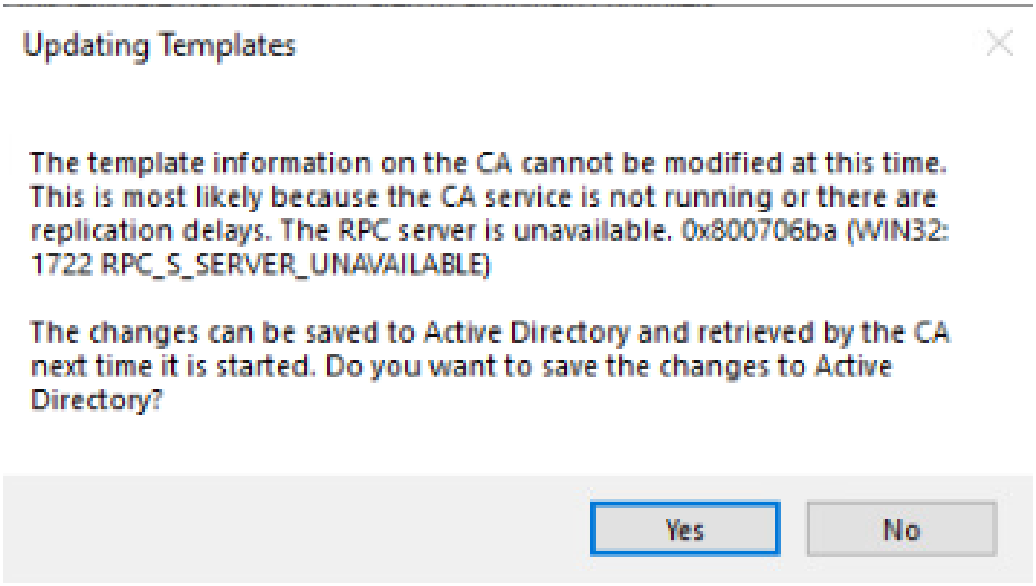
1. Sign in to the CA server using `<domain_name>\Administrator`.
2. Select **Server Manager > Tools > Certification Authority**.
3. Expand the issuing CA node in the left-hand pane.
4. Right-click **Certificate Templates**, then select **New > Certificate Template to Issue**.
5. Select the following templates, then select **OK**:
    - **Exchange Enrollment Agent (Offline Request)**
    - **CEP Encryption**

- **IPSEC (Offline request)**

6. Check that the templates have been added.



If you get a message indicating the CA service is not running, stop and then restart the Certificate Authority Service or reboot the CA server and try to add the certificate template again. A message like this gets displayed when this occurs:



2.8. Install Web Server (IIS) on the CA server

1. Sign in to the CA server using `<domain_name>\Administrator`.
2. Select **Start > Server Manager** to open the Server Manager.
3. Select **Manage**, then select **Add Roles & Features**. The **Before you begin** window appears. Select **Next**.
4. Select **Role-based or feature-based** installation on the **Select installation type** window. Select **Next**.

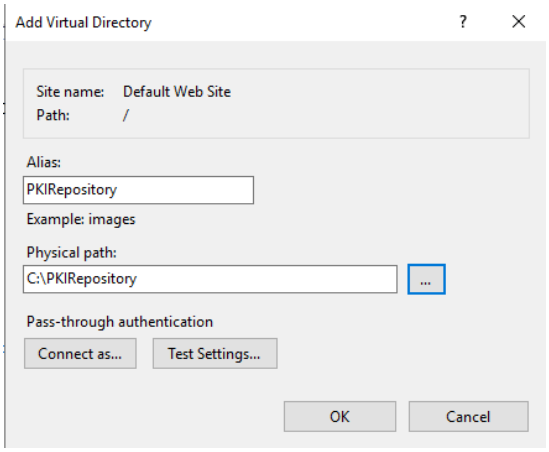
5. Select the local server from the pool on the **Select destination server** window. Select **Next**.
6. Select **Web Server (IIS)** on the **Select server roles** window. The **Add Roles and Features** Wizard will appear. Select **Add Features** and then select **Next**.
7. In **Select features**, select **Next**.
8. Select **Next** on the **Web Server Role (IIS)** window.
9. Select **Next** on the **Select role services** window.
10. Verify the information, then select **Install** on the **Confirm installation selections** window.
11. Select **Close**, once installation completes.

2.9. Create a virtual directory to serve as the public key infrastructure (PKI) repository

1. Sign in to the CA server using the domain name, `<domain_name>\Administrator`.
2. Create a local directory for PKI repository, for example `C:\PKIRepository`. See the following Microsoft link for instructions, https://docs.microsoft.com/en-us/troubleshoot/windows-server/networking/create-virtual-directory-folder-remote-computer.
3. Create a virtual directory. Notice the alias, physical path, and path credentials.
    a. Create a local directory for PKI repository, for example `C:\PKIRepository`.

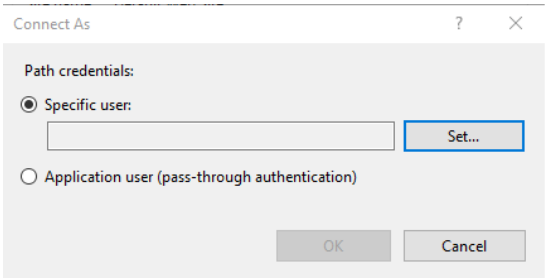
    ```
    % mkdir c:\PKIRepository
    ```

    b. Select **Start**, point to **Programs > Administrative Tools**, and then select **Internet Information Services (IIS) Manager**.
    c. In the **Internet Information Services** window, expand **server name** (where server name is the name of the server).
    d. Right-click the Web site that you want (for example, **Default Web Site**), and select **Add Virtual Directory**.
    e. On the **Add Virtual Directory** window, type the **Alias** that you want (for example, **PKIRepository**), select the **Physical Path**, and then select **OK**.



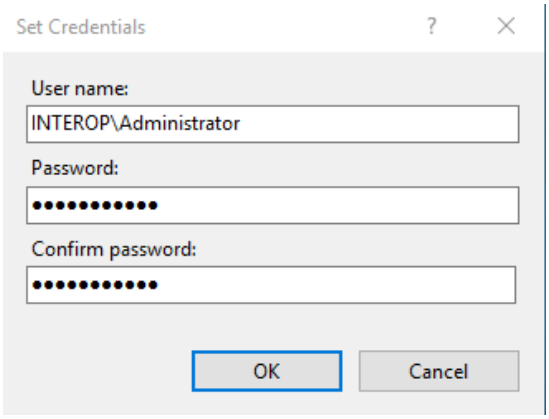
f. Right-click the new created Virtual Directory and select **Manage Virtual Directory > Advanced Settings**.

g. In the **Advanced Settings** window, select **Physical Path Credentials**.



h. In the **Connect As** window, select **Specific User > Set**.

i. In the **Set Credentials** windows, enter the domain name user id for **User Name**, and the password information for the user. Select **OK**.



4. Test the virtual directory per the same link above.

a. Start Microsoft Edge.

b. In the Address box, type the URL to your Web server (for example, http://CA-SERVER-IP-ADDRESS), and then select **Go**.

c. Verify that you can view the default Web site.

d. Append the alias of the virtual directory to the address that you typed (for example, http://CA-SERVER-IP-ADDRESS/PKIRepository), and then select **Go**.

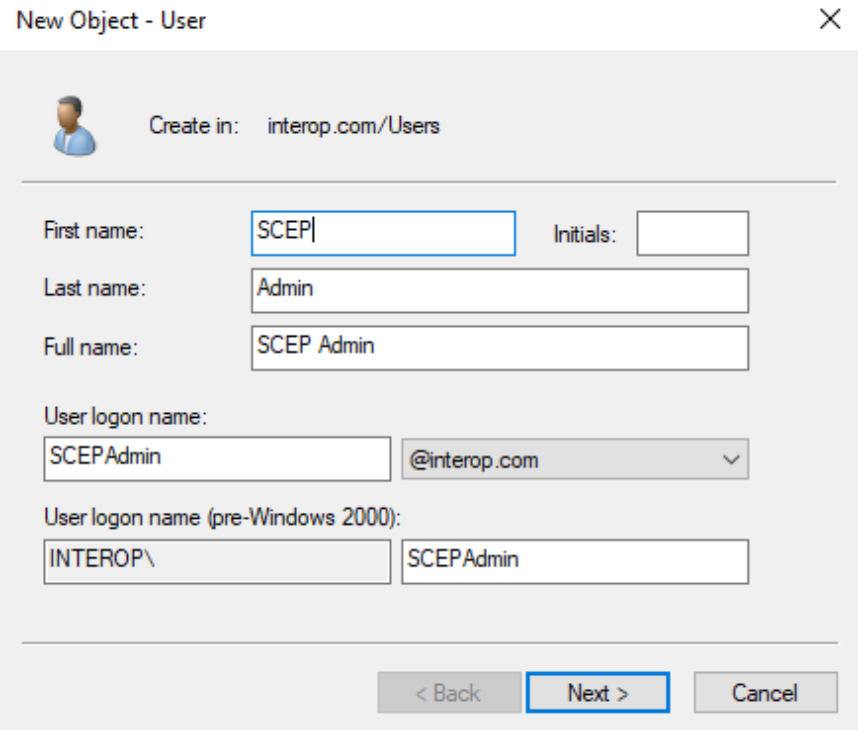
e. The virtual directory Web content is displayed in the browser window. You may get a forbidden error. If that's the case, create a index.htm file in `C:\PKIRepository` with some HTML content on it and reload the page, which should display properly.

2.10. Create domain user accounts to act as the NDES service account

1. Sign in to the Domain Controller as Domain Administrator.
2. Select **Active Directory Users and Computers** from the **Start** menu.

Add users **SCEPAdmin**, **SCEPSvc**, and **SCEPDeviceAdmin**.

1. Expand <domain_name>.com, right-click **Users** and select **New** > **User**.
2. Enter the name **SCEPAdmin** and select **Next**. Follow your organization's security policies to set the password. Never expires was selected for the purpose of this integration.



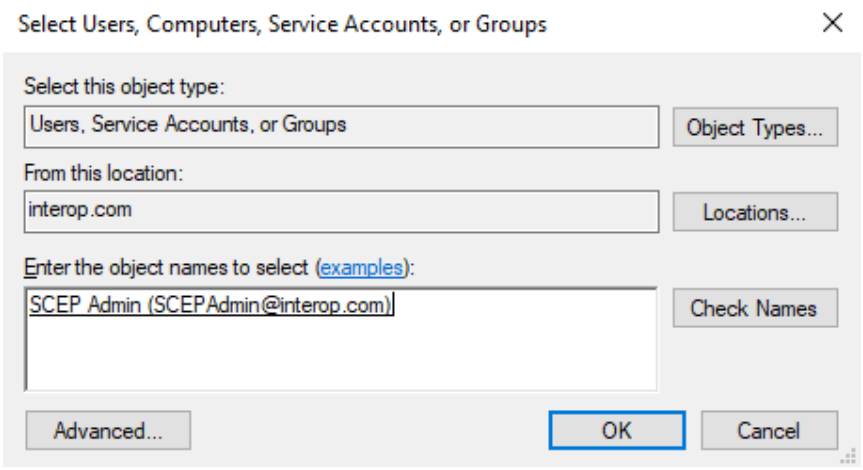
3. Create new users for **SCEPSvc** and **SCEPDeviceAdmin** by repeating the previous steps.

Add user **SCEPAdmin** to the **Enterprise Admins** and **Domain Admins** groups.

1. Right-click **Enterprise Admins** on the right pane and select **Properties**.
2. Select the **Members** tab and then select **Add**.
3. Enter the **SCEPAdmin** account, select **Check Names**, and if found then select **OK**.
4. Select **Apply** and **OK**.
5. Repeat the above steps for the **Domain Admins** group.

2.11. Add the SCEPAdmin account and SCEPSvc service account to the local IIS_IUSRS group

1. Sign in to the NDES server using the domain name, `<domain_name>\Administrator`.
2. Open **Computer Management** (`compmgmt.msc`).
3. Expand **Local User and Groups** on the **Computer Management** console tree, under **System Tools**. Select **Groups**.
4. Double-click **IIS_IUSRS** on the details pane.
5. Select **Add** on the **IIS_IUSRS Properties** window.
6. Enter the **SCEPAdmin** account, select **Check Names**, and if found then select **OK**.
7. Select **Apply** and **OK**.



8. Repeat the above steps for the SCEPSvc service account.

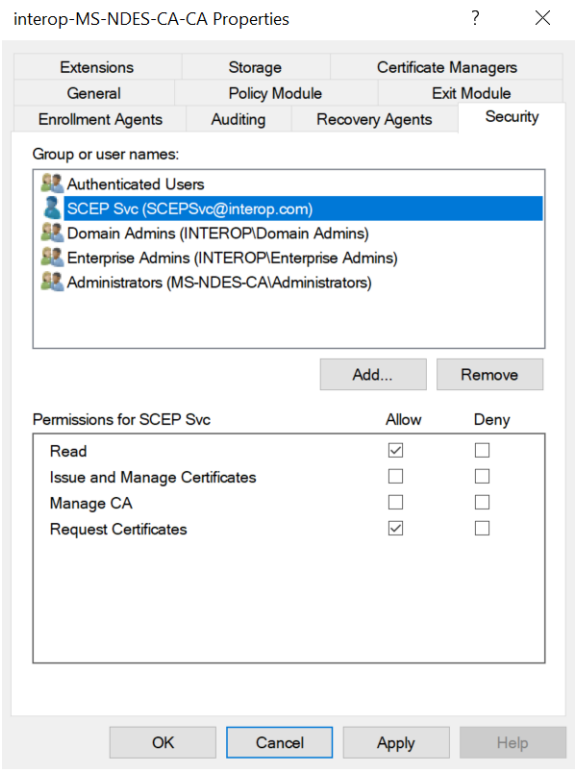
2.12. Configure the SCEPAdmin account and SCEPSvc service account with request permission on the CA

1. Sign in to the CA server using the domain name, `<domain_name>\Administrator`.
2. Select **Certification Authority** from the **Tools** menu on the **Server Manager** window.
3. Right-click the certification authority (this CA server) and then select **Properties**.

4. Select the **Security** tab.

   Notice the accounts that have **Request Certificates** permissions. By default the group **Authenticated Users** has this permission. The **SCEPAdmin** account will be a member of **Authenticated Users** when it is in use, which has **Request Certificates** permission. However, if that is not the case, do as follows:

5. Select **Add**.
6. On the **Select Users, Computers, Service Accounts, or Groups** text box, type the name of the **SCEPSvc** account, select **Check Names**, and if found select **OK**.
7. Select the **SCEPSvc** account and select the **Allow** check box that corresponds to **Request Certificates**.
8. Select **Apply** and then select **OK**.



9. Repeat the steps for the **SCEPAdmin** account.

2.13. Configure the SCEPDeviceAdmin account with enroll permission to the IPSEC (offline request) certificate template

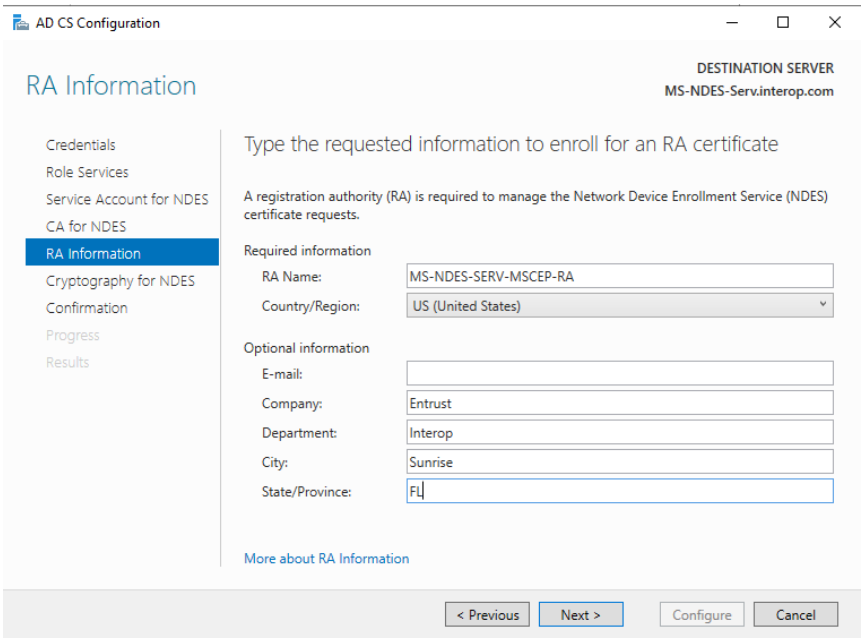
1. Sign in to the CA server using the domain name, `<domain_name>\Administrator`.
2. Select **Certification Authority** from the **Tools** menu on the **Server Manager** window.

3. Expand the server on the left pane, then right-click **Certificate Templates** and select **Manage**.
4. Right-click **IPSEC** on the **Template Display Name** pane and select **Properties**.
5. Select the **Security** tab. Then select **Add**.
6. On the **Select Users, Computers, Service Accounts, or Groups** text box, type the name of the **SCEPDeviceAdmin** account, select **Check Names**, and if found then select **OK**.
7. Select the **SCEPDeviceAdmin** account and verify the **Allow** check box that corresponds to **Enroll** is selected. Select **Apply** and then select **OK**.

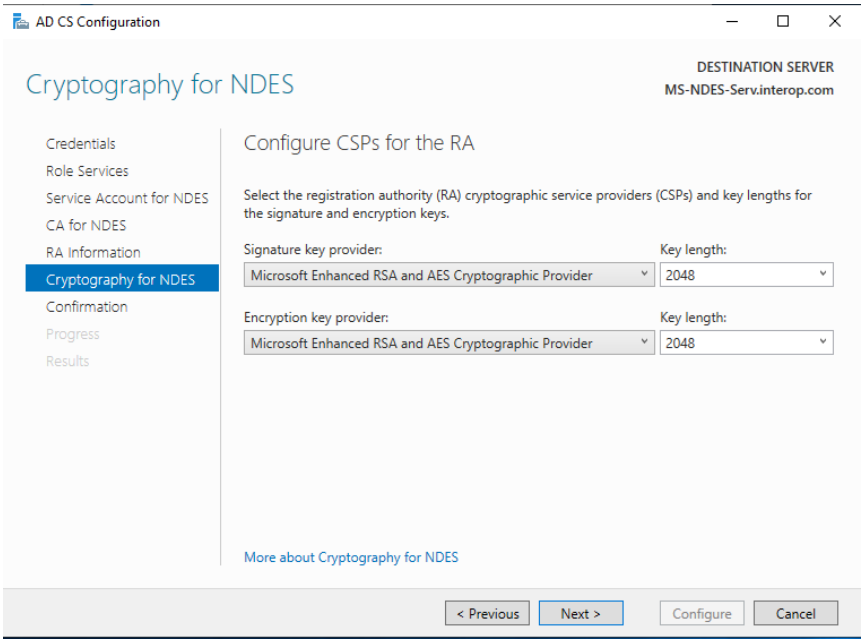
2.14. Install and configure NDES

1. Sign in to the NDES server using the domain name, `<domain_name>\Administrator`.
2. Select **Start > Server Manager** to open the Server Manager.
3. Select **Manage**, then select **Add Roles & Features**. The **Before you begin** window appears. Select **Next**.
4. Select **Role-based or feature-based installation** on the **Select installation type** window. Select **Next**.
5. Select the local server from the pool on the **Select destination server** window. Select **Next**.
6. Select **Active Directory Certificate Services** role on the **Select server roles** window. The **Add Roles and Features** Wizard appears. Select **Add Features** and then select **Next**.
7. Select **Next** on the **Select features** window.
8. Select **Next** on the **Active Directory Certificate Services** window.
9. Uncheck **Certification Authority** and check **Network Device Enrollment Service** on the **Select role services** window. The **Add Roles and Features** Wizard will appear.
10. Select **Add Features** and then select **Next** on the **Select role services** window.
11. Verify the information, then select **Install** on the **Confirm installation selections** window.
12. Do not select **Close** on the **Installation progress** windows once the installation is complete. Select the **Configure Active Directory Certificate Services on the destination server** link instead.
13. Change the **Credentials** to <domain_name>\SCEPAdmin on the **Credentials** windows. Select **Change**, enter new credential, then select **Next**.
14. From **Select Role Services to configure**, select **Network Device Enrollment Service**, then select **Next**.

15. Select the **Specify service account** on the **Service Account** window, then select **Select**.
16. Enter the credential for the **SCEPSvc** service account and then select **OK** and **Next**.
17. Select **CA name** on the **CA for NDES** windows, then select **Select**.
18. Choose the CA server on the **Select Certificate Authority** window, then select **OK** and **Next**.
19. Note the specified Registration Authority (**RA Name**) on the **RA Information** window. Complete any of the optional information as required. Then select **Next**.



20. Choose the **Signature key provider** and **Encryption key provider** on the **Cryptography for NDES** window. A key size of 2048 or larger is recommended.



21. Select **Next** and review the chosen options at the **Confirmation** window. Then select **Configure**.
22. Sign in to the CA server and present the OCS if OCS protection was selected. Look for an icon on the **Taskbar** if the **Load key** window is not present. You may be prompted to present the OCS.
23. Go back to the NDES server. Check for the **Configuration succeeded** message on the **Results** window, then select **Close**.

    If you get a message that it failed to add certificate templates at the end of the NDES installation see Failed to add Certificate Templates at the End of the NDES installation.

2.15. Configure the NDES admin page to use an SSL certificate

2.15.1. Create a template for the NDES Admin web service certificate request.

This will ensure that the nCipher KSP is used to generate the key pair.

1. Sign in to the NDES server using the domain name, `<domain_name>\Administrator`.
2. Create a `request.inf` file using a text editor as follows. Change **Subject** to the Fully Qualified Domain Name (FQDN) of the NDES Server, for example: `ms-ndes-serv.interop.com`.

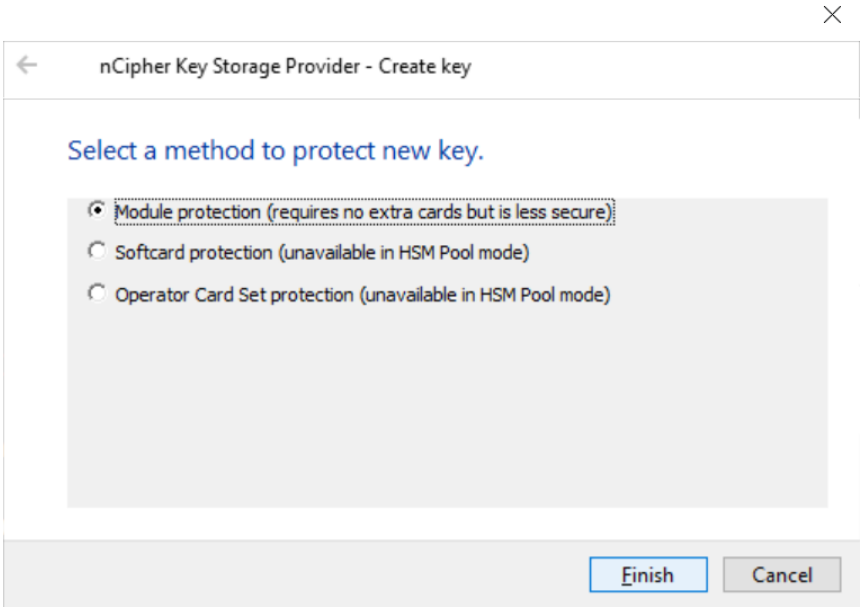
```
[Version]
Signature= "$Windows NT$"
[NewRequest]
Subject = "CN=<FQDN-of-NDES-Server>"
HashAlgorithm = SHA256
KeyAlgorithm = RSA
KeyLength = 2048
ProviderName = "nCipher Security World Key Storage Provider"
KeyUsage = 0xf0
MachineKeySet = True

[EnhancedKeyUsageExtension]
OID=1.3.6.1.5.5.7.3.1
```

    For example:

```
[Version]
Signature= "$Windows NT$"
[NewRequest]
Subject = "CN=ms-ndes-serv.interop.com"
HashAlgorithm = SHA256
KeyAlgorithm = RSA
KeyLength = 2048
```

```
ProviderName = "nCipher Security World Key Storage Provider"
KeyUsage = 0xf0
MachineKeySet = True

[EnhancedKeyUsageExtension]
OID=1.3.6.1.5.5.7.3.1
```

3. Create a Certificate request file by running the following command. Select **Module protection** when prompted.




```
certreq.exe -new <Path-to-Request.inf> <Name-of-Request>.req
```

Example output:

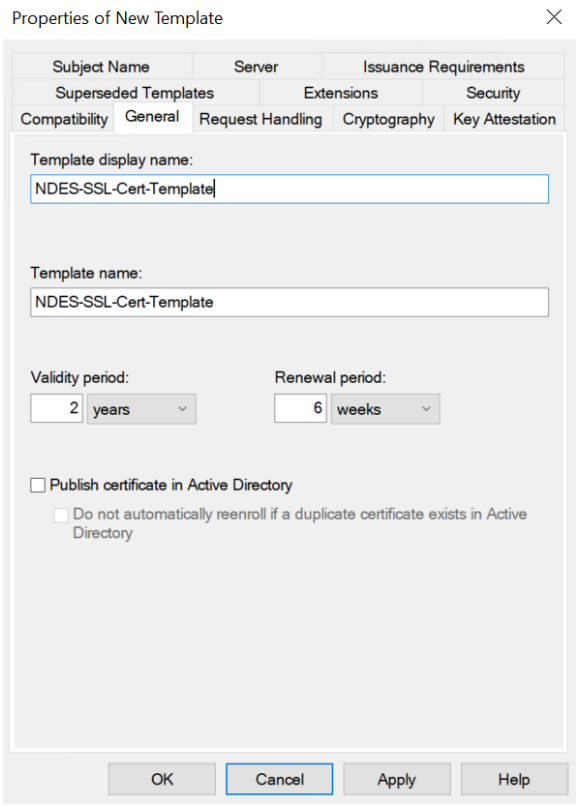
```
>certreq -new NDES-SSL-Cert.inf NDES-SSL-Cert.req

CertReq: Request Created
```

4. For OCS protection the system will ask to present the OCS card.
5. Copy the above certificate request file to the CA server.

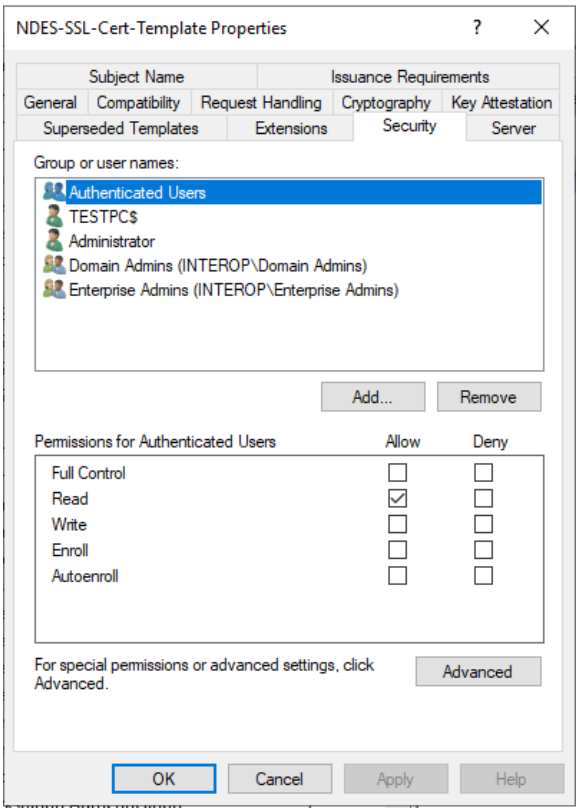
2.15.2. Have the CA issue a certificate based on the Web service certificate template and the certificate request above.

In this example, **Authenticated Users** is used for provisioning certificates. Consult your security team and reference Microsoft best practices for deploying in a production environment.

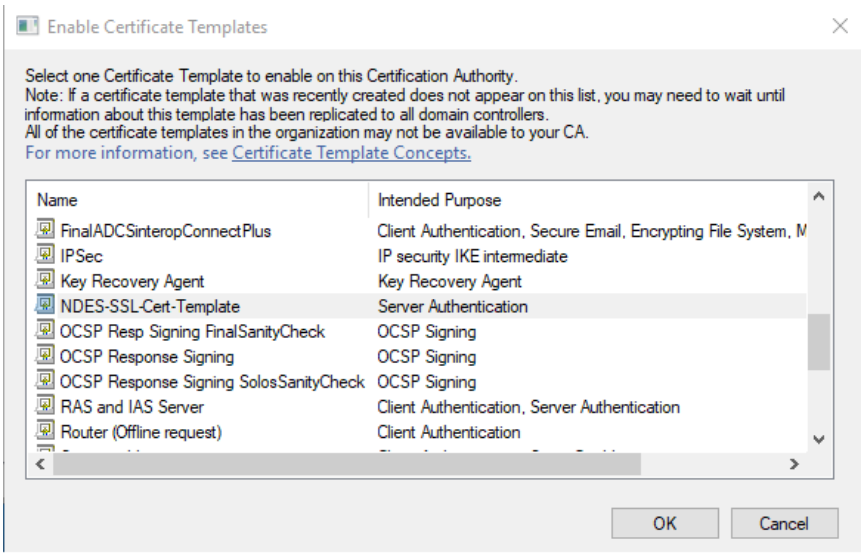
1. Sign in to the CA server using the domain name, `<domain_name>\Administrator`.
2. Enable the **Web Server** certificate template option. Open the **Certification Authority** tool and expand the issuing CA node on the left hand pane.
3. Right-click **Certificate Templates** and select **Manage**.
4. Right-click **Web Server** and select **Duplicate Template** on the **Certificate Template Console** window.
5. Select the **General** tab in the **Properties of New Template** dialog. Type the name you want to use on the **Template Display Name**. Then select **Apply** and **OK**.



6. Select the **Security** tab.
7. Select **Authenticated Users** in **Groups and user names**. Then check **Enroll** in **Permissions for Authenticated Users**. Then select **Apply** and **OK**.



8. Return to the **Certification Authority** window, right-click **Certificate Templates**, and select **New > Certificate Template to Issue**.
9. Select the certificate template that you created earlier, then select **OK**.



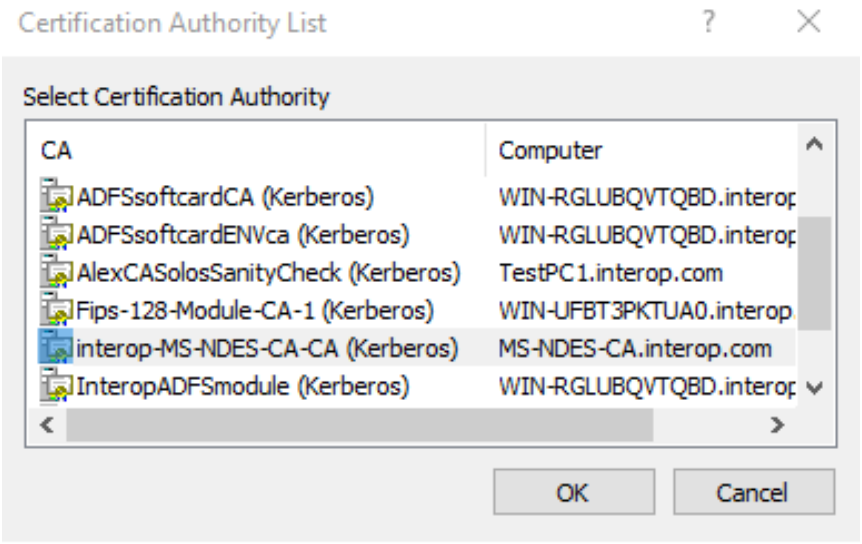
10. Run the following command to generated the certificate:

```
certreq -submit -attrib "CertificateTemplate:<New-Template-Name>" <Path-to-request.req>
```

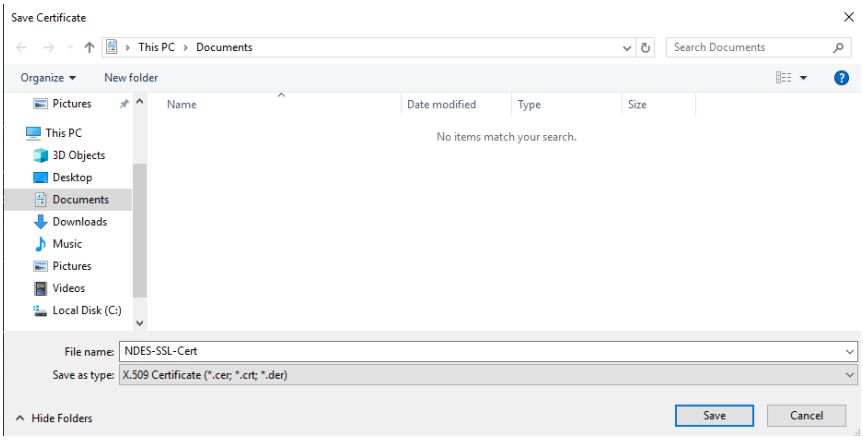
Partial output before executing the following steps:

```
>certreq -submit -attrib "CertificateTemplate:NDES-SSL-Cert-Template" NDES-SSL-Cert.req NDES-SSL-Cert.cer
Active Directory Enrollment Policy
  {96E14557-DDD4-48BD-BE1A-AA453F20D859}
  ldap:
```

11. Select the CA server from the **Certification Authority List** dialog, then select **OK**. Look for a cog icon which may be flashing on the Taskbar. Present the OCS cards.



12. Enter the name for the certificate generated on the **Save Certificate** dialog.



The final output is shown below:

```
>certreq -submit -attrib "CertificateTemplate:NDES-SSL-Cert-Template" NDES-SSL-Cert.req NDES-SSL-Cert.cer
Active Directory Enrollment Policy
  {96E14557-DDD4-48BD-BE1A-AA453F20D859}
  ldap:
RequestId: 11
RequestId: "11"
```

13. Copy the above certificate to the NDES server.

2.15.3. Install the certificate on the NDES server, matching it with the private key previously created using the nCipher CSP.

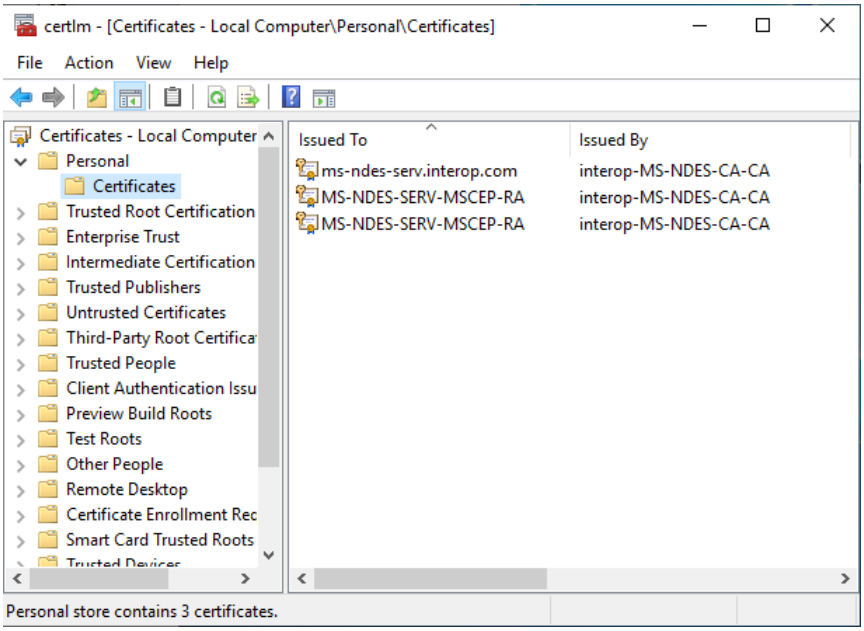
1. Sign in to the NDES server using the domain name, `<domain_name>\Administrator`.
2. Run the following command. If you are using OCS protection, present the card when prompted.

```
>certreq.exe -accept <Name-of-Certificate>.cer
```

Example output:

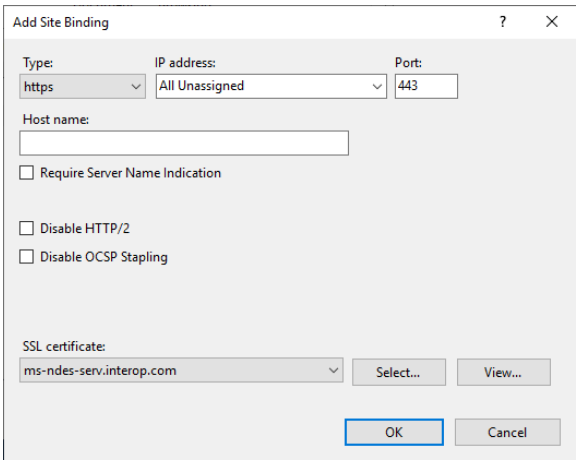
```
>certreq -accept NDES-SSL-Cert.cer
Installed Certificate:
  Serial Number: 7c0000000bf544d43dadb23a2f00000000000b
  Subject: CN=ms-ndes-serv.interop.com
  NotBefore: 10/7/2021 12:00 AM
  NotAfter: 10/7/2023 12:10 AM
  Thumbprint: a07344a115b23f7cd903851af3b66884e55aa3ea
```

3. Open `certlm.msc` by right-clicking on the Windows **Start** menu, then select **Run**, type `certlm.msc`, and select **OK**.
4. Expand the **Personal** store on the left pane and then select **Certificates**.
5. Check the certificate installed above is available.



6. Open the IIS manager, expand the server and **Sites** on the **Connections** pane and select **Default Web Site**.
7. Select **Bindings** on the **Actions** pane.
8. Select **Add** on the **Site Bindings** dialog.

9. Select **https** in **Type:** on the **Add Site Binding** dialog. Choose the certificate previously created in **SSL certificate**. Then select **OK** and **Close**.

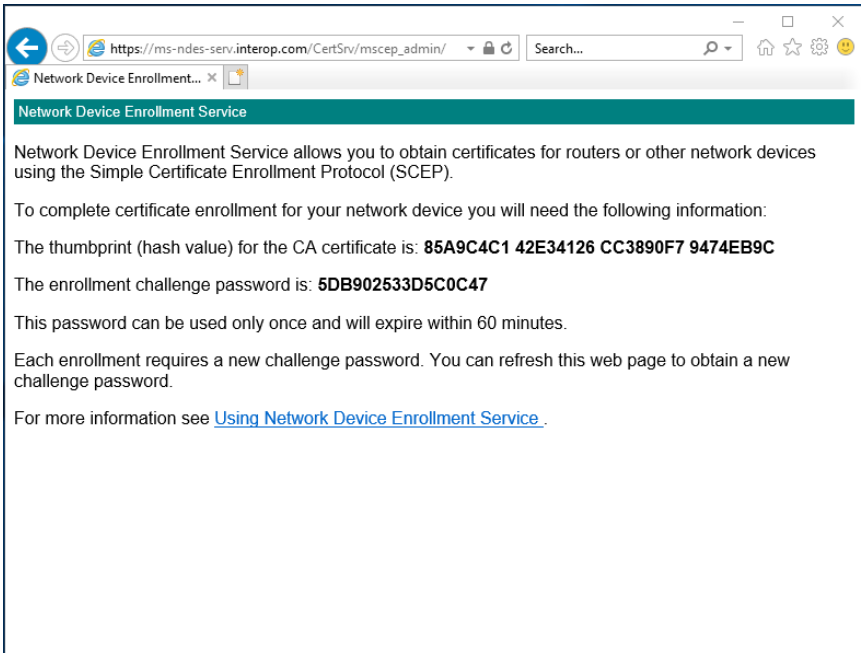


2.15.4. Increase the maximum number of allowed unique passwords generated by the NDES service to 30 before the service needs to be restarted.

1. Sign in to the NDES server using the domain name, `<domain_name>\Administrator`.
2. Open **regedit** by right-clicking on the Windows **Start** menu, then select **Run**, type `regedit`, and select **OK**.
3. Navigate to **Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Cryptography\MSCEP**.
4. In the right pane, right-click and select **New** > **DWORD (32-bit) Value**. Name the value **PasswordMax**.
5. Right-click the **PasswordMax** value and select **Modify**. Set the **Value data** to `30` in the **Edit DWORD (32-bit) Value** dialog, then select **OK**.
6. Restart the IIS server. Open the IIS manager, select the server on the **Connections** pane and select **Restart** on the **Actions** pane.

2.15.5. Test access to the NDES web site (secured).

1. Sign in to the Windows client.
2. Launch the browser and go to the following address: `https://<NDES-server-address>/CertSrv/mscep_admin`. Sign in as `<domain-name>\SCEPSvc`.
3. Notice the hash value of the CA certificate and the challenge password. Refreshing the browser generates a new challenge password.


https://ms-ndes-serv.interop.com/CertSrv/mscep_admin/
Search...
Network Device Enrollment...
Network Device Enrollment Service
Network Device Enrollment Service allows you to obtain certificates for routers or other network devices using the Simple Certificate Enrollment Protocol (SCEP).
To complete certificate enrollment for your network device you will need the following information:
The thumbprint (hash value) for the CA certificate is: 85A9C4C1 42E34126 CC3890F7 9474EB9C
The enrollment challenge password is: 5DB902533D5C0C47
This password can be used only once and will expire within 60 minutes.
Each enrollment requires a new challenge password. You can refresh this web page to obtain a new challenge password.
For more information see Using Network Device Enrollment Service .

Chapter 3. Use a HSM for RA certificate private keys

The instructions on this guide recommends that software based keys are used for the NDES Registration Authority (RA) certificates. Microsoft have recently posted a blog article about securing NDES. One of their recommendations is that a HSM should be used for the RA certificate private keys. See: https://techcommunity.microsoft.com/t5/core-infrastructure-and-security/ndes-security-best-practices/ba-p/2832619 for more information - pub: 11th October, 2021.)

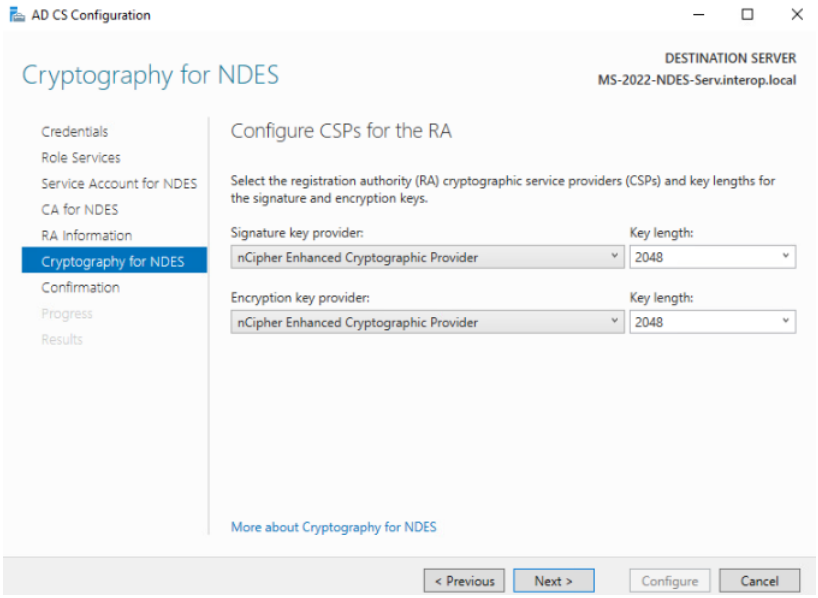
On this basis, this section describes what needs to be done to cover this off.

nCipher CAPI can be used with the NDES RA private keys though there are limitations:

1. You cannot use a FIPS 140 Level 3 Security World in the NDES server, as CAPI does not meet the requirements for its use.
2. The nCipher CAPI provider MUST be set up as the 'default' CAPI Provider on the NDES server via the CAPI Configuration wizards. If this is not done, using the CAPI provider is not provided as an option when installing/configuring NDES.
3. Only module key protection and a 1/N OCS with NO passphrase will work. Essentially, the nCipher CAPI provider has no way of prompting for PINs etc. due to not being supported by the nShield Service Agent and Interactive Services Detection being removed from later versions of Windows.

3.1. Procedures changes.

1. When asked to configure the CNG provider for the NDES server, you should use the **CSP Install Wizard** instead.
    a. Log into the NDES server using the domain name, INTEROP\Administrator.
    b. Select **Start > Entrust nShield Security World > CSP Install wizard**.
    c. Proceed with the configuration but make sure you select **Module Protection** or **OCS Protection**. Make sure the OCS has been created with no passphrase.
2. During the NDES Installation and configuration, in the **Configure CSPs for the RA**, choose the **Signature key provider** and **Encryption key provider** on the **Cryptography for NDES** window. A key size of 2048 or larger is recommended. Select one of the **nCipher** providers, like:
    a. **nCipher Enhanced Cryptographic Provider**
    b. **nCipher Enhanced RSA and AES Cryptographic Provider**



3. Once NDES is configured and installed successfully, before configuring the NDES admin page to use an SSL certificate, run the CNG provider configuration utility in the NDES server. It can coexist with the CSP setup done earlier. This is needed so the certificate request for the SSL certificate can be created.

Chapter 4. Troubleshooting

4.1. Using the `certreq -new <.req file here>` command returns an Invalid Provider Specified error.

This error occurs when the CSPs are not installed or not set up correctly.

4.1.1. Resolution

Ensure that the nCipher CNG CSP providers are correctly installed and set. Do this by running the **CSP Install Wizard** and **CNG Configuration Wizard** under **nCipher** in the **Start** menu.

4.2. If using remote admin, the **AD CS Configuration Wizard** does not detect the OCS.

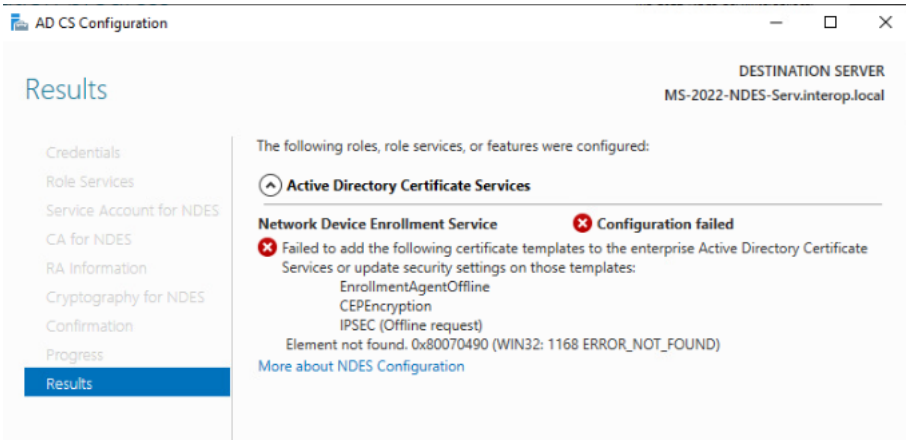
`cardpp --examine` shows **TokenSecureChannelError**. **TokenSecureChannelError** can occasionally be seen when presenting the OCS.

4.2.1. Resolution

Remove and re-insert the cards until it is picked up by `cardpp` and the **AD CS Configuration Wizard**.

4.3. Failed to add Certificate Templates at the End of the NDES installation

You see an error similar to this:



4.3.1. Resolution

To get around this issue you will need to add the CA certificate under trusted root certification authorities on the NDES server.

1. Sign in to the CA server using the domain name, `<domain_name>\Administrator`.
2. Bring up the `certmgr.msc` utility.
3. Expand the **Trusted Root Certification Authorities** under **Certificates - Current User** in the Left Pane and select **Certificates**.
4. Look for the CA Certificate that you are using and double-click it.
5. Select the **Certificates** tab, and select **Copy to File**. This will bring up the **Certificate Export Wizard**. Select **Next**.
6. Select **DER encoded binary X.509(.CER)** format for the format you want to use. Select **Next**.
7. In the **File to Export** windows, select **Browse** and pick a location and specify the file name. Select **Save**.
8. Select **Next** and then **Finish** to finish the export of the CA certificate.
9. Now you need to import the certificate in the NDES server. Copy the file to the NDES server.
10. Sign in to the NDES server using the domain name, `<domain_name>\Administrator`.
11. Double-click the CA certificated file you just exported.
12. Select **Install Certificate**.
13. In the **Certificate Import Wizard**, select **Local Machine** then select **Next**.
14. For the Certificate Store, select **Place all certificates in the following store**, then select **Browse**.
15. Select **Trust Root Certification Authorities** then select **OK**.
16. Select **Next**.

17. Select **Finish**, then **OK** in the **Import was successful** dialog.
18. Select **OK** to close the **Certificate** window.
19. Now Uninstall NDES and install it again.

Chapter 5. Additional resources and related products

5.1. nShield HSMs

5.2. nShield as a Service

5.3. Entrust products

5.4. nShield product documentation