HID Global Validation Authority

nShield® HSM Integration Guide

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1. Introduction

The nShield Hardware Security Module (HSM) can generate and store a Root of Trust that protects security objects used by HID Global Validation Authority to safeguard user keys and credentials. You can use the HSM in FIPS 140-2 Level 2 or Level 3 mode to meet compliance requirements.

1.1. Product configurations

Entrust has tested nShield HSM integration with HID Validation Authority in the following configurations:

<table>
<thead>
<tr>
<th>Product</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating System</td>
<td>Windows Server 2019</td>
</tr>
<tr>
<td>HID ActivID VA</td>
<td>7.2 and 7.3</td>
</tr>
<tr>
<td>Database</td>
<td>Microsoft SQL Server 2019</td>
</tr>
<tr>
<td>Java</td>
<td>jdk-8u361-windows-x64</td>
</tr>
</tbody>
</table>

1.2. Supported nShield hardware and software versions

Entrust has tested the integrations with the following nShield hardware and software versions:

<table>
<thead>
<tr>
<th>Product</th>
<th>Security World Software</th>
<th>Firmware</th>
<th>Image</th>
<th>OCS</th>
<th>Softcard</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect XC</td>
<td>12.80.4</td>
<td>12.50.11 (FIPS Approved)</td>
<td>12.80.4</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connect XC</td>
<td>12.80.4</td>
<td>12.72.1 (FIPS Approved)</td>
<td>12.80.5</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connect XC</td>
<td>13.3.2</td>
<td>12.72.1 (FIPS Approved)</td>
<td>12.80.5</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nShield 5c</td>
<td>13.3.2</td>
<td>13.2.2 (FIPS Pending)</td>
<td>13.3.2</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.3. Supported nShield HSM functionality

<table>
<thead>
<tr>
<th>Feature</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module-only key</td>
<td>No</td>
</tr>
<tr>
<td>OCS cards</td>
<td>Yes</td>
</tr>
<tr>
<td>Softcards</td>
<td>No</td>
</tr>
<tr>
<td>nSaaS</td>
<td>Yes</td>
</tr>
<tr>
<td>FIPS 140-2 Level 3</td>
<td>Yes</td>
</tr>
</tbody>
</table>

1.4. Requirements

Before installing these products, read the associated documentation:

- For the HSM: Installation Guide and User Guide.
- For Remote Administration (if used): nShield Remote Administration User Guide.
- HID Global documentation: ActivID® Validation Authority Installation and Configuration Guide.

The integration between nShield HSMs and HID VA requires:

- nCipherKM JCA/JCE CSP support in the HSM.
- A correct quorum for the Administrator Card Set (ACS).
- An Operator Card Set (OCS).
  - A 1-of-N quorum must be used.
- Firewall configuration with usable ports:
  - 9004 for the HSM (hardserver).
  - 3501 for HID VA HTTP Port (default port number).
  - 3601 for HID VA HTTPS Port (default port number).

In addition, the following design decisions have an impact on how the HSM is installed and configured:

- Whether your Security World must comply with FIPS 140-2 Level 3 standards.

  If you are using FIPS Restricted mode, it is mandatory to create an OCS for FIPS authorization. It will be needed during the Validation Authority Configuration. For information about limitations on FIPS authorization, see the Installation Guide for the HSM.
• Whether to instantiate the Security World as recoverable or not.

1.5. More information

For more information about OS support, contact your HID Global sales representative or Entrust nShield Support, https://nshieldsupport.entrust.com.
2. Procedures

Follow these steps to install and configure the HID Global Validation Authority with the nShield HSM.

1. Install Java
2. Install the HSM
3. Install the Security World software and create a Security World
4. Create the OCS
5. Configure Java
6. Install and configure the database
7. Install the HID Global Validation Authority
8. Configure the HID Global Validation Authority
9. Start the HID Global Validation Authority

2.1. Install Java

1. Install the Java Development Kit (JDK).

HID specifically requires the JDK and not the Java Runtime Environment (JRE). Refer to the HID documentation for validated versions of the JDK.

2. Set the JAVA_HOME environment variables To do this, open a command prompt as Administrator and run:

   >setx JAVA_HOME "C:\Program Files\Java\jdk1.8.0_361"
   SUCCESS: Specified value was saved.

3. Add the Java utilities path %JAVA_HOME%\bin to the Windows system path.
2.2. Install the HSM

Install the nShield Connect HSM locally, remotely, or remotely via the serial console. See the following nShield Support articles and the Installation Guide for the HSM:

- https://nshieldsupport.entrust.com/hc/en-us/articles/360021378272-How-To-Locally-Set-up-a-new-or-replacement-nShield-Connect

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

1. Install the Security World software:
   a. Mount the DVD or .iso/disc image and locate setup.exe.
   b. Right-click the setup.exe icon and select Run as Administrator.
   c. For detailed instructions, see the Installation Guide and the User Guide for the HSM.

2. Add the Security World utilities path C:\Program Files\nCipher\nfast\bin to the Windows system path.

3. Open the firewall port 9004 for the HSM connections.

4. Enrol the HSM:
5. Open a command window and run the following command to confirm that the HSM is operational:

```
>enquiry
Server:
enquiry reply flags none
enquiry reply level Six
serial number 6308-03E0-D947
mode operational
...
Module #1:
enquiry reply flags none
enquiry reply level Six
serial number 6308-03E0-D947
mode operational
```

6. Create your Security World if one does not already exist, or copy an existing one. Follow your organization’s security policy for this.

7. Confirm that the Security World is usable:

```
>nfkminfo
World
generation 2
state 0x3fb7000c Initialised Usable ...
... 
mode fips1402level3

Module #1
generation 2
state 0x2 Usable
```

8. Edit the `C:\ProgramData\nCipher\Key Management Data\config\config` file. Add the following lines in the `[server_startup]` section:

```
[server_startup]
...
priv_port=9001
nonpriv_port=9000
```

2.4. Create the OCS

To create the OCS

1. Create the OCS, following your organization’s security policy for the value N of K/N. As required, create extra OCS cards, one for each person with access privilege, plus
Administrator Card Set (ACS) authorization is required to create an OCS in FIPS 140-2 level 3.

After an OCS card set has been created, the cards cannot be duplicated.

```
# createocs -m1 -s2 -N HIDValAuth -Q 1/1

FIPS 140-2 level 3 auth obtained.
Creating Cardset:
  Module 1: 0 cards of 1 written
  Module 1 slot 3: Admin Card #1
  Module 1 slot 2: blank card
  Module 1 slot 0: empty
  Module 1 slot 2:- passphrase specified - writing card
Card writing complete.
cardset created; hktlu = 6165632fe811c6475f4d61ae555698d437230cf3
```

2. List the OCS created:

```
> nfkminfo -c
Cardset list - 1 cardsets: (P)ersistent/(N)ot, (R)emoteable/(L)ocal-only
Operator logical token hash               k/n timeout  name
6165632fe811c6475f4d61ae555698d437230cf3  1/1  none-NL HIDValAuth
```

### 2.5. Configure Java

To configure Java:

1. Copy the `nCipherKM.jar` file from `%NFAST_HOME%\java\classes\` to the extensions folder of the local Java `%JAVA_HOME%\jre\lib\ext\`:

```
> copy "C:\Program Files\nCipher\nfast\java\classes\nCipherKM.jar" "C:\Program Files\Java\jdk1.8.0_361\jre\lib\ext\"
1 file(s) copied.
```

2. Download `jce_policy-8` from Oracle. For example:

![Java Cryptography Extension (JCE) Unlimited Strength JRE Policy Files 8 Download](https://www.oracle.com/technetwork/java/javase/downloads/java-cryptography-extension-jce-unlimited-strength-policy-8-1587461.html)
3. Extract and copy the extracted files `local_policy.jar` and `US_export_policy.jar` into the security directory `%JAVA_HOME%\jre\lib\security`:

```plaintext
>copy "C:\Users\Administrator\Downloads\jce_policy-8\UnlimitedJCEPolicyJDK8\local_policy.jar" "C:\Program Files\Java\jdk1.8.0_361\jre\lib\security\" 1 file(s) copied.

>copy "C:\Users\Administrator\Downloads\jce_policy-8\UnlimitedJCEPolicyJDK8\US_export_policy.jar" "C:\Program Files\Java\jdk1.8.0_361\jre\lib\security\" 1 file(s) copied.
```

4. Delete the following files from C:\Program Files (x86)\Common Files\Oracle\Java\javapath:\n   a. `java`
   b. `javaw`
   c. `javaws`

2.6. Install and configure the database

To install and configure the database:

1. Install the database where information about issuers, credentials, and revocation lists will be stored. See the HID documentation for compatible database versions.
2. Create a new database called `rtc`.
3. Create a new login as follows:
   a. For **Login name**, enter `rtc`.
   b. Select **SQL server authentication**.
   c. Enter a **Password** and confirm the password.
   d. For **Default database**, select `rtc`. For example:
e. For **Users mapped to this login**, select **rtc**.

f. For **Access privilege**, select **db_datareader, db_datawriter, db_ddladmin, db_owner**, and **public**. For example:

![Diagram showing mapped credentials]

```
<table>
<thead>
<tr>
<th>Map</th>
<th>Database</th>
<th>User</th>
<th>Default Schema</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>master</td>
<td>rtc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>model</td>
<td>rtc</td>
<td></td>
</tr>
<tr>
<td>yes</td>
<td>nshield</td>
<td>rtc</td>
<td></td>
</tr>
</tbody>
</table>
```

g. For **Server authentication**, select **SQL Server and Windows Authentication mode**.
4. Enable the TCP/IP network protocol.

5. Open the firewall port 1433 for the TCP/IP connection to the MS SQL server.

2.7. Install the HID Global Validation Authority

For detailed instructions, see the ActivID® Validation Authority Installation and Configuration Guide.

1. Run through the HID VA installer.

2. On the Choose Java Virtual Machine page of the installer, choose the Java executable within the JDK folder.
3. On the **HSM Support** page of the installer:
   
   a. Select **Install Support for an HSM**.
   
   b. Select **Choose** and find `%NFAS\HOME\java\classes`.

4. Complete the installation.
5. Launch the Windows Services and locate ActivID Validation Authority.
6. Right-click ActivID Validation Authority to select its properties.
8. On the Log On tab, select Local System account.
9. Select Apply and then select OK.

2.8. Configure the HID Global Validation Authority

1. Insert the OCS in the HSM.
2. On the Windows Start menu, run Configure Validation Authority.
3. Select Begin.
4. Select whether you are upgrading or new installation.
5. On the next page, provide your organization name.
6. On the Keystore page:
   a. Select Thales nShield (client software v11 or later) from the drop-down menu.
   b. Clear the Oracle SunJCE keystore for SSL Key check box.
   c. Select Regenerate Keys to create a new set of security keys that are protected by the nShield HSM.
   d. Select all four key options if this is a fresh install.
   
   This version of the VA has a known issue. It does not support an ECC key for the Asymmetric SSL Key option. If you want to install the VA using ECC keys, contact HID for more information.
   
e. Under Message Digest Algorithms:
i. For the **For Signatures** property, select **SHA-256**.

ii. For the **For OCSP Response Data** property, select **SHA-256**.

---

**Keystore**

The wizard asks you to set the type of key for each property.

- **For Signatures**
  - Select **SHA-256**.

- **For OCSP Response Data**
  - Select **SHA-256**.

---

**Message Digest Algorithms**

- **For Signatures**
  - Select **SHA-256**.

- **For OCSP Response Data**
  - Select **SHA-256**.

---

**Keystore Password (Required)**

i. Select **Prompt for Password at Server Start**.

ii. Enter and confirm the enter the OCS passphrase.

---

**Configure Database**

7. In the **Configure Database** page:

   a. For **Vendor**, select **Microsoft SQL Server**.

   b. For **Host**, enter **localhost**.

   c. For **Port**, enter **1433**.

   d. For **Database**, enter **rtc**.

   e. For **User**, enter **rtc**.

   f. For **Password**, enter the database password defined in **Install and configure the database**.

   g. Select **Next**.
8. In the **Initialize Database** page:
   a. Clear the **Remove all ActivID Validation Authority data and drop tables** check box.
   b. Select **Create required tables**.
   c. Select **Next**.

9. In the **Multi-Person Control** page, select **Next**.

10. In the **Administrator Account** page:
    a. Enter the credentials for the HID Global Validation Authority.
    b. Select **Next**.
11. In the **Proxy** page, do not update any properties. Then, select **Next**.

12. In the **Ports** page, do not update any properties. Then, select **Next**.

13. Select **Start/Restart** to finish.

A password dialog appears. Be aware that the dialog may be behind the Browser window.

14. Enter the OCS passphrase and select **OK**.

The installation completes.

15. Verify the installation:
a. Close your browser.
b. Open your browser and enter the following URL http://localhost:3501/monitor.jsp.
c. Confirm that STATUS OK appears.

2.9. Start the HID Global Validation Authority

To start the HID Global Validation Authority:

1. Insert the OCS card into the HSM.
2. Open a command prompt and start HID VA.

C:\Program Files\HID Global\Validation Authority 7.3\authority\bin>server.bat start
Using CATALINA_BASE: "C:\Program Files\HID Global\Validation Authority 7.3\authority"
Using CATALINA_HOME: "C:\Program Files\HID Global\Validation Authority 7.3\authority\..\tomcat"
Using CATALINA_TMPDIR: "C:\Program Files\HID Global\Validation Authority 7.3\authority\temp"
Using JRE_HOME: "C:\Program Files\Java\jdk1.8.0_361"
Using CLASSPATH: "C:\Program Files\HID Global\Validation Authority 7.3\authority\..\tomcat\bin\bootstrap.jar;C:\Program Files\HID Global\Validation Authority 7.3\authority\..\tomcat\bin\tomcat-juli.jar"
Using Security Manager

Entrust was unable to start the HID VA service from services as detailed in the HID Global documentation. The server.bat file was used instead.

A password dialog appears. Be aware that the dialog may be behind the Browser window.

3. Enter the OCS passphrase.
4. Access the HID Validation Authority Management Console from a web browser. To do this, select Start > HID Global > Validation Authority Management.
Login: admin
Password: **********