Entrust PKI Hub

nShield® HSM Integration Guide

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Chapter 1. Introduction

The Entrust PKI Hub is a versatile and robust virtual appliance that streamlines and simplifies deployment across various environments of the following Entrust solutions: Certificate Authority, CA Gateway, Certificate Enrollment Gateway, Certificate Hub, Timestamping Authority, and Validation Authority. The Entrust nShield Hardware Security Module (HSM) securely store and manage encryption keys. This document describes how to integrate both for added security of your PKI.

The HSM is available as an appliance or nShield as a Service (nSaaS). Throughout this guide, the term HSM refers to nShield Solo, nShield Connect, and nShield Edge products.

1.1. Product configuration

Entrust tested the integration with the following versions:

Product	Version
Entrust PKI Hub	v1.0

1.2. Supported nShield hardware and software versions

Entrust successfully tested with the following nShield hardware and software versions. All integration used OCS protection. Module-protected keys are not supported in Entrust Certificate Authority v10.0 and later versions.

Product	Firmware	Netimage
nSaaS	12.72.1 (FIPS 140-2 certified)	12.80.5
Connect XC	12.72.3 (FIPS 140-2 certified)	13.6.5
nShield 5c	13.4.5 (FIPS 140-3 certified)	13.6.5

1.3. Requirements

To integrate the HSM and PKI Hub, you require:

- A dedicated virtual appliance for the installation.
- A dedicated server for hosting a PostgreSQL database and the Entrust nShield key management data.
- Access to the Entrust TrustedCare Portal.

Familiarize yourself with:

- The Entrust PKI Hub Entrust PKI Hub 1.0 - Installation and Administration Guide.
- The Entrust nShield Product Documentation.
- Your organizational Certificate Policy, 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, Softcard, or OCS.
  - The level of compliance for the Security World, FIPS 140 Level 3.
  - Key attributes such as key size, time-out, or needed for auditing key usage.

Chapter 2. Deploy Entrust PKI Hub

For the purpose of this integration, the Entrust PKI Hub was deployed from iso in a virtual environment. A single node was deployed. The required PostgreSQL database was deployed in a virtual Ubuntu environment.

The complete instruction set is available in the Entrust PKI Hub Entrust PKI Hub 1.0 - Installation and Administration Guide.

Chapter 3. Install and configure the Entrust nShield HSM

This section applies to on-premises applications. In nSaaS applications, the Entrust PKI Hub gets the key management data as defined by the nSaaS service.

There are two scenarios for on-premises applications:

- An Entrust nShield HSM infrastructure already exists.
- No existing Entrust nShield HSM infrastructure.

In the first scenario, the Entrust PKI Hub pulls the key management data from the remote file system (RFS). At this point in time only Linux based RFS are supported. The RFS doesn't have to be a client of an HSM. However, it must contain the key management data (world, module file, and an OCS) in its `local` directory. Copy these files from an existing client to the RFS.

When no Entrust nShield HSM infrastructure exists, deploy a Linux server and install in it the security world software. Make this server a client of the HSM and create a world and OCS. After completing the configuration of the Entrust PKI Hub, this server can be removed as a client of the HSM and decommissioned.

The Entrust PKI Hub utilizes a user account to pulls the key management data from either the RFS or server. The permissions required for this account are described below.

- Install the Entrust nShield HSM
- Install the Entrust nShield Security World Software and create the Security World
- Edit the configuration files
- Create the OCS
- Create a user account

3.1. Install the Entrust nShield HSM

Install the nShield Connect HSM locally, remotely, or remotely via the serial console. Condensed instructions are available in the following Entrust nShield Support articles.

- How To: Locally Set up a new or replacement nShield Connect.

- How To: Remotely Setup a new or replacement nShield Connect.
- How To: Remotely Setup a new or replacement nShield Connect XC Serial Console Model.

The complete instruction set is available at nShield v13.6.5 Hardware Install and Setup Guides.

3.2. Install the Entrust nShield Security World Software and create the Security World

This section applies to the sever deployed when no Entrust nShield HSM infrastructure exists.

1. Install the Security World software. The complete instruction set is available at nShield Security World Software v13.6.5 Installation Guide.
2. Add the Security World utilities path to the system path. This path is typically `/opt/nfast/bin`.
3. Open firewall port 9004 for the Entrust nShield HSM connections.
4. If using remote administration, open firewall port 9005 for the Entrust nShield Trusted Verification Device (TVD).
5. Configure the server as a client of the Entrust nShield HSM.
6. Open a command window and run the following to confirm the Entrust nShield HSM is **operational**.

```
root@dev-ubuntu:~# enquiry
Server:
 enquiry reply flags  none
 enquiry reply level  Six
 serial number
 mode                 operational
 version              13.6.3
...
Module #1:
 enquiry reply flags  none
 enquiry reply level  Six
 serial number        7852-268D-3BF9
 mode                 operational
 version              13.2.4
 ...
```

7. Create your Security World or copy an existing one. Follow your organization's security policy for this.

ACS cards cannot be duplicated after the Security World is created. You may want to create extras per your

organization security policy.

8. Confirm the Security World is `usable`.

```
root@dev-ubuntu:~# nfkminfo
World
 generation  2
 state       0x3737000c Initialised Usable ...
 ...
Module #1
 generation 2
 state      0x2 Usable
```

3.3. Edit the configuration files

This section applies to the sever deployed when no Entrust nShield HSM infrastructure exists.

1. Edit the configuration file `/opt/nfast/cknfastrc`, adding the lines shown below. Set the file permissions to **read & execute** by all.

```
CKNFAST_OVERRIDE_SECURITY_ASSURANCES=none
CKNFAST_LOADSHARING=1
```

2. Edit the configuration file `/opt/nfast/kmdata/config/cardlist`. Add the serial numbers of the remote administration ready OCS smart cards, or a wild card.
3. Restart the Security World software.

```
root@dev-ubuntu:~# /opt/nfast/sbin/init.d-ncipher restart
```

3.4. Create the OCS

OCS are smart cards that are presented to the physical smart card reader of the HSM. For more information on OCS use, properties, and k-of-N values, see Operator Card Sets (OCS).

In case of an existing Entrust nShield HSM infrastructure, you have the choice of using an existing OCS (k=1) corresponding to your world, or create a new one. The quorum k of k-of-N must be 1 for this application.

Otherwise, create an OCS card set following your organization's security policy, with k=1.

OCS cards cannot be duplicated after they are created. You may

> want to create extras per your organization security policy.

3.5. Create a user account

1. Create a user account in the RFS or server. For the purpose of this integration we named it **pkihubuser**.
2. Add this user to the group **nfast**.

```
root@dev-ubuntu:~# usermod -aG nfast pkihubuser

root@dev-ubuntu:~# su - pkihubuser

pkihubuser@dev-ubuntu:~$ groups
pkihubuser nfast
```

Chapter 4. Integrate the Entrust PKI Hub and the Entrust nShield HSM

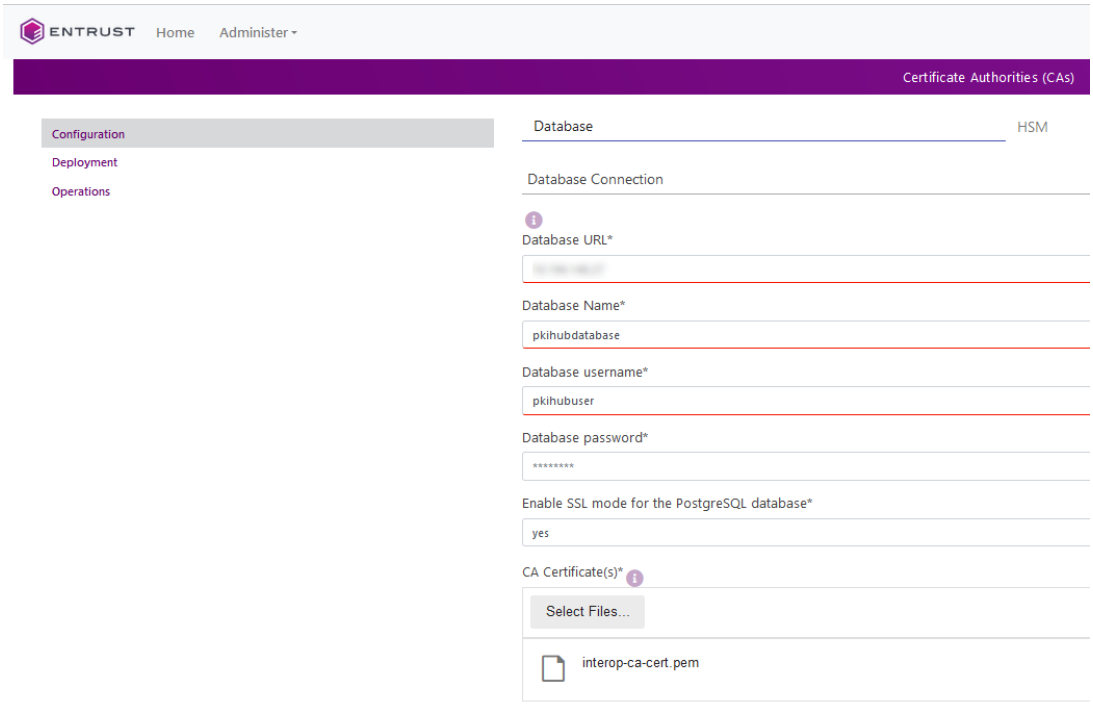
4.1. Make the Entrust PKI Hub server a client of the HSM

1. Using the HSM front panel, add the IP of the Entrust PKI Hub server as a client of the HSM.
2. Present the OCS card from section Create the OCS to the HSM through the front panel card reader.

4.2. Configure the Entrust PKI Hub

1. Login into the Entrust PKI Hub Management Console web GUI as explained in Starting up the Management Console .
2. In the content pane, under **Certificate Authorities**, select **Manage Solution**.
3. Leave the **Import configuration** and **Enable Advanced Configuration** toggle switches in the default off position. Then select **Next**.
4. In the **Database** tab, enter the database information create in section Deploy Entrust PKI Hub. Then select **Next**.

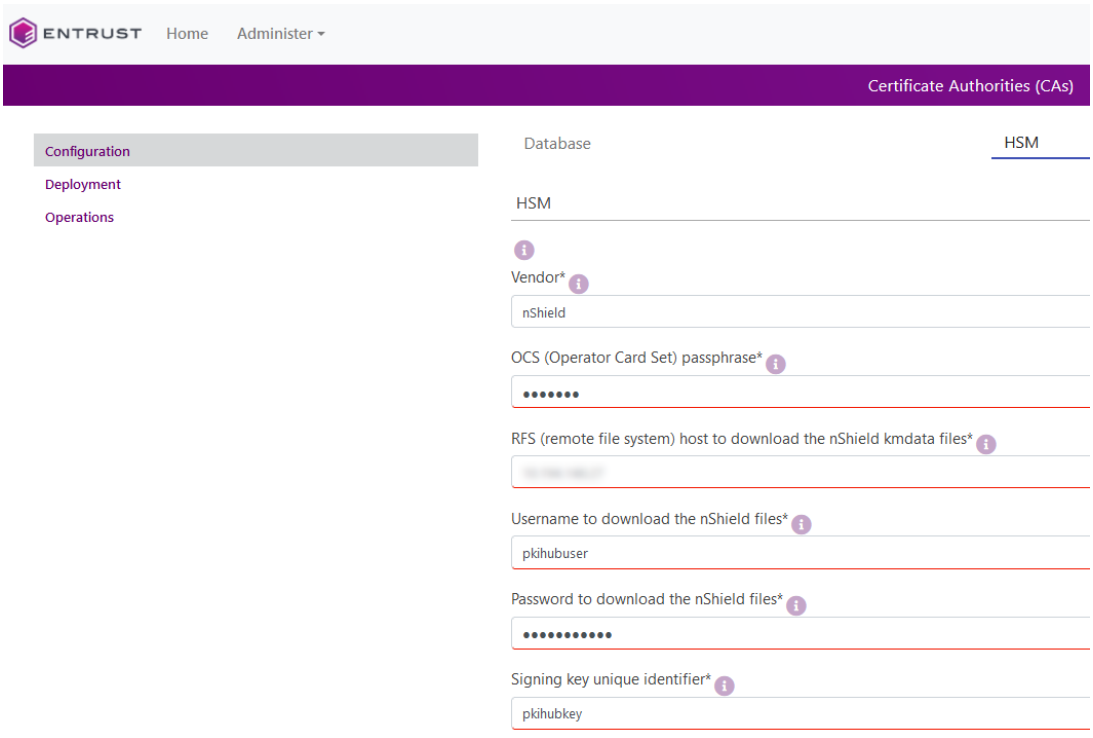
   For example:



5. In the **HSM** tab, enter the HSM information. In the **RFS** text box, enter the IP of the RFS, or server (no pre-existing Entrust nShield HSM infrastructure). Then select **Next**.

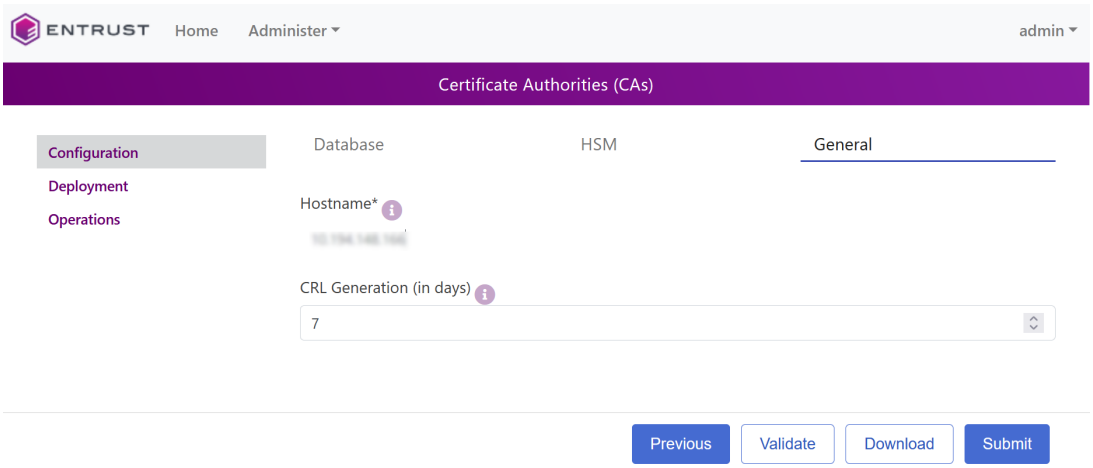
For the **Key unique identifier**, a name of your choice, only lowercase alphanumeric characters are allowed.

For example:

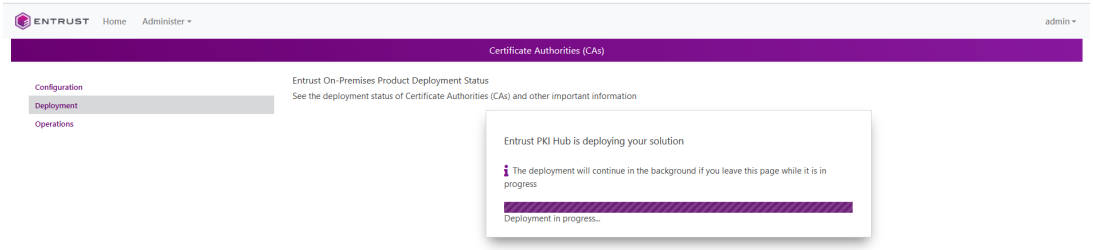


6. In the **General** tab, enter the PKI Hub hostname or IP. Then select **Validate**. Correct any detected configuration error until the Validate option displays no warnings.

   For example:

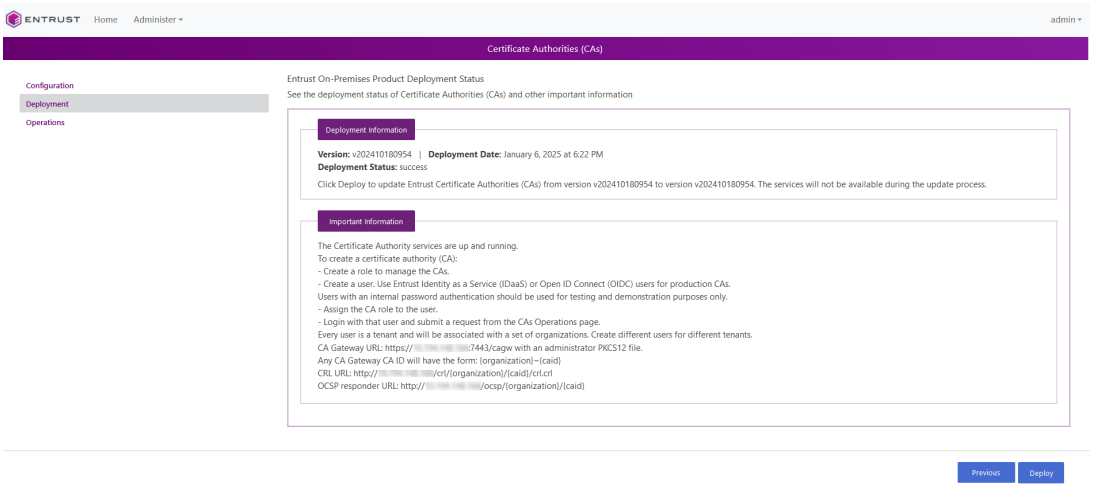


7. Select **Submit**.



8. Select **Deploy**. In the **Confirmation** pop-up window select **Yes**. After a few minutes, the configuration with the Entrust nShield HSM completes.

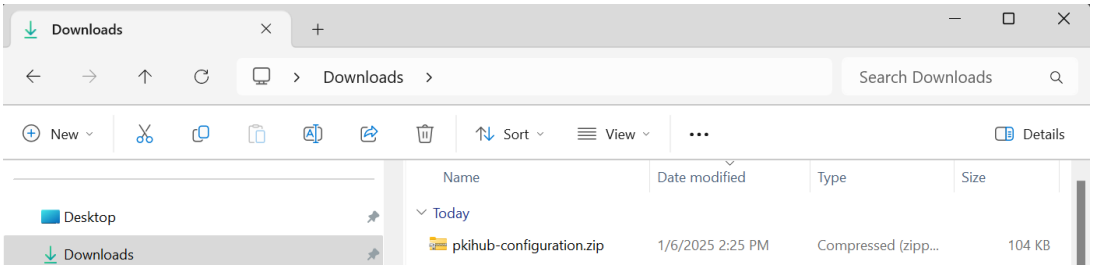
   For example:



Chapter 5. Test the integration

This test consist of validating the key created in the HSM in section Configure the Entrust PKI Hub.

1. Login into the Entrust PKI Hub Management Console web GUI.
2. In the content pane, under **Certificate Authorities**, select **Manage Solution**.
3. Select the download arrow icon to the right of **Export Configuration**. Notice the compressed folder downloaded to your computer.



4. Expand the compressed folder and navigate to `Downloads\pkihub-configuration\kmdata.tar\kmdata\local`. Notice the file named `key_encore_<Key unique identifier>`, where **<Key unique identifier>** is the value entered in Configure the Entrust PKI Hub. This file is the key blob corresponding to the key created in the Entrust nShield HSM.
5. For the purpose of validating the key, copy the key blob to an on-premises HSM client of the same world or server `local` folder `/opt/nfast/kmdata/local/`.
6. Execute the following commands. Notice the key name.

```
root@dev-ubuntu:/opt/nfast/kmdata/local# nfkminfo -k

Key list - 1 keys
 AppName ncore               Ident pkihubkey

root@dev-ubuntu:/opt/nfast/kmdata/local# rocs
'rocs' key recovery tool
Useful commands: 'help', 'help intro', 'quit'.
rocs> list keys
  No. Name                    App        Protected by
    1 Id: pkihubkey           ncore      testOCS
rocs> exit
```

7. Delete this key blob from the HSM client or server. It remains in the Entrust PKI Hub.

Chapter 6. Additional resources and related products

6.1. nShield as a Service

6.2. KeyControl

6.3. KeyControl as a Service

6.4. Entrust products

6.5. nShield product documentation