CyberArk Secrets Manager - Self-Hosted

nShield® HSM Integration Guide

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Chapter 1. Introduction

CyberArk Secrets Manager - Self-Hosted, formerly CyberArk Conjur Secrets Manager Enterprise, offers secrets management for applications and services. There are four different deployment models. The model tested in this Integration Guide is the Dynamic Access Provider (DAP). For more information, see Secrets Manager - Self-Hosted in the CyberArk online documentation.

The base product is provided as a containerized appliance and can be executed in Docker or Kubernetes. The testing in this Integration Guide uses a basic deployment of nCOP in Docker.

1.1. Container images

Two container images were created for the purpose of this integration: a hardserver container and a CyberArk Conjur application container. These images are stored in an external registry:

- `nshield-hwsp`

  A hardserver container image that controls communication between the HSM(s) and the application containers.

- `conjur-appliance`

  An Application Access Manager (AAM) container image from CyberArk that will host the Master DAP Server.

1.2. Product configurations

Entrust has successfully tested nShield HSM integration with CyberArk Secrets Manager in the following configurations:

Software	Version
Security World	13.6.15
nCOP	1.1.3
Operating system	Ubuntu 24.04.2 LTS
CyberArk Secrets Manager - Self-Hosted appliance image	13.8.0

1.3. Supported nShield hardware and software versions

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

1.3.1. Connect XC

Security World Software	Firmware	Image	OCS	Softcard	Module
13.6.15	12.72.4 (FIPS 140-2 certified)	13.6.15	✓	✓	✓

1.3.2. nShield 5c

Security World Software	Firmware	Image	OCS	Softcard	Module
13.6.15	13.4.5 (FIPS 140-3 certified)	13.6.15	✓	✓	✓

1.4. Supported nShield HSM functionality

Feature	Support
Module-only key	Yes
OCS cards	Yes
Softcards	Yes
nSaaS	Yes
FIPS 140 Level 3 mode support	Yes

1.5. Requirements

Before installing these products, read the associated documentation:

- For the nShield HSM: *Installation Guide* and *User Guide*.
- If nShield Remote Administration is to be used: *nShield Remote Administration User Guide*.

- *nShield Container Option Pack User Guide*.
- DAP deployment, refer to Secrets Manager - Self-Hosted in the CyberArk online documentation.
- HSM Master Key Encryption, refer to Encrypt the master key using an HSM in the CyberArk online documentation.

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

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

  If using FIPS 140 Level 3, it is advisable to create an OCS for FIPS authorization. For information about limitations on FIPS authorization, see the *Installation Guide* of the nShield HSM.

- Whether to instantiate the Security World as recoverable or not.

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

1.6. More information

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

Access to the Entrust nShield Support Portal is available to customers under maintenance. To request an account, contact nshield.support@entrust.com.

Chapter 2. Procedures

2.1. Prerequisites

Before you can use nCOP and run the container images, complete the following steps:

1. Install Docker. For information, see Get Docker in the Docker online documentation.
2. Gain access to the CyberArk Secrets Manager appliance image.
3. Request the nCOP and Security World software from Entrust.
4. Set up the HSM. See the *Installation Guide* for your HSM.
5. Configure the HSM(s) to use the IP address of your container host machine as a client.
6. Load an existing Security World or create a new one on the HSM.
7. Copy the Security World and module files to your container host machine at a directory of your choice.
8. Create or edit the `cknfastrc` file in `/opt/nfast` and add one of the following config settings:
   - For OCS or Softcard protection:

     ```
     CKNFAST_LOADSHARING=1
     CKNFAST_NO_ACCELERATOR_SLOTS=1
     ```

   - For Module protection:

     ```
     CKNFAST_FAKE_ACCELERATOR_LOGIN=1
     ```

   - Optionally, the following can be added to generate PKCS #11 debug logs at the example location:

     ```
     CKNFAST_DEBUG=10
     CKNFAST_DEBUGFILE=/opt/ncop/pkcs11.log
     ```

9. Create a `pkcs11.yml` file with the following content:

   ```
   library: /opt/nfast/toolkits/pkcs11/libcknfast.so
   wrapping_key: <wrapping_key name>
   pin: <passphrase of ocs/softcard if required>
   slot: <slot number for the intended key protection type>
   ```

By default, the slot number for module protection is 0. For softcard and OCS protection, use the `ckcheckinst` command to find the slot number. The pin passphrase is not required if you are using module

> protection.

For more information on configuring and managing nShield HSMs, Security Worlds, and Remote File Systems, see the *User Guide* for your HSM(s).

Here is an example for **module** protection:

```
library: /opt/nfast/toolkits/pkcs11/libcknfast.so
wrapping_key: wrappingkey
slot: 0
```

Here is an example for **softcard** protection:

```
library: /opt/nfast/toolkits/pkcs11/libcknfast.so
wrapping_key: wrappingkey
pin: ncipher
slot: 4
```

Here is an example for **OCS** protection:

```
library: /opt/nfast/toolkits/pkcs11/libcknfast.so
wrapping_key: wrappingkey
pin: ncipher
slot: 3
```

2.2. Create and configure the nshield-hwsp container

Configure the nShield hardserver container so it can communicate with the CyberArk Secrets Manager Master DAP Server in a later step. See Create and configure the CyberArk Secrets Manager application container and the Master DAP Server.

To deploy an nCOP container image for use with CyberArk Secrets Manager:

1. Log in to the container host machine server with `root` privileges and launch a terminal window.
2. Set up the nCOP working directory:

   ```
   % mkdir -p /opt/ncop
   ```

3. Transfer the nCOP tar file to the host machine and extract it into the `/opt/ncop` directory:

   ```
   % tar xf ncop-1.1.3.tar -C /opt/ncop
   ```

4. Chand directory to `/opt/ncop`:

```
% cd /opt/ncop
```

5. Mount the Security World ISO file:

   Transfer the Security World ISO file to the host machine, then mount it so it can be used by the nCOP script that will create the hardserver image.

```
% mkdir SecWorld-13.6.15

% mount -o loop SecWorld_Lin64-13.6.15.iso SecWorld-13.6.15
```

6. Set up the hardserver image:

```
% ./make-nshield-hwsp SecWorld-13.6.15

Detecting nShield software version
Version is 13.6.15
Unpacking hwsp...
Removing redundant files...
Creating files...
.
.
.
 => exporting to image
2.4s
 => => exporting layers
2.4s
 => => exporting manifest sha256:ae87790fc1a8b01a2f0fc5f2b9e8feed2b535e5f3c98978726b330e0e2a81a06
0.0s
 => => exporting config sha256:ea4ec1ba7399f18de5789fee02b05087cbbd3bb1ab30691504319e60bb9d8e78
0.0s
 => => exporting attestation manifest
sha256:787ff411b7194fe027e5a5f35e3b497f7c312fb39ca89fe84f5eb58a047bcaa6  0.0s
 => => exporting manifest list sha256:7064478c1dfc6b3beca67ebc2399d405900bc01fc3dc1b110543d42ba346ca49
0.0s
 => => naming to docker.io/library/nshield-hwsp:13.6.15
0.0s
 => => unpacking to docker.io/library/nshield-hwsp:13.6.15
```

7. List the docker images to view the newly created hardserver image:

```
% docker images

IMAGE                  ID             DISK USAGE   CONTENT SIZE   EXTRA
nshield-hwsp:13.6.15   7064478c1dfc        921MB          207MB
```

8. Configure `nshield-hwsp`:

   a. Set up the hardserver configuration file and directory:

```
% mkdir -p /opt/ncop/config1
```

```
% ./make-nshield-hwsp-config --output /opt/ncop/config1 config <hsm ip address>
```

b. Check that the configuration file information matches your HSM deployment:

```
% cat /opt/ncop/config1/config

syntax-version=1

[nethsm_imports]
local_module=1
remote_esn=810B-03E0-D947
remote_ip=1X.1XX.1XX.XX
remote_port=9004
keyhash=62fc598786930f5d6f81251bb5870b952323b0d3
privileged=0
```

c. Create a new socket so that application containers can use the hardserver:

```
% docker volume create socket1
```

d. Run the `nshield-hwsp` container:

```
% docker run -d -v /opt/ncop/config1:/opt/nfast/kmdata/config:ro -v socket1:/opt/nfast/sockets
nshield-hwsp:13.6.15
```

e. Check the status of `nshield-hwsp` using the `enquiry` command:

```
% NFAST_SERVER=/var/lib/docker/volumes/socket1/_data/nserver /opt/nfast/bin/enquiry
```

2.3. Create and configure the CyberArk Secrets Manager application container and the Master DAP Server

The assumption is that you are inside the `/opt/ncop` directory and that the Security World ISO file still mounted. Transfer the conjur-appliance tar file to the host machine.

1. Load the `conjur-appliance into the local Docker registry:

   The following command can be used to load the `conjur-appliance` .tar file into the local Docker repository:

   ```
   % docker load -i <PATH-TO-TAR-FILE>/conjur-appliance-13.8.0.tar.gz
   ```

2. Extend the `conjur-appliance` image with the `nfast` utilities:

   ```
   % ./extend-nshield-application --from registry.tld/conjur-appliance:13.8.0 --pkcs11 SecWorld-13.6.15 --tag
   conjur-appliance-wnfast:13.6.15
   ```

```
Detecting nShield software version
Version is 13.6.15
NOTICE: --pkcs11 included by default with 12.60 ISO. Flag ignored
Unpacking /opt/nfast/SecWorld-13.6.15/linux/amd64/hwsp.tar.gz ...
Unpacking /opt/nfast/SecWorld-13.6.15/linux/amd64/ctls.tar.gz ...
Adding files...
Building image...
[+] Building 0.9s (8/8) FINISHED
docker:default
 => [internal] load build definition from Dockerfile
0.0s
 => => transferring dockerfile: 257B
0.0s
 => [internal] load metadata for registry.tld/conjur-appliance:13.8.0
0.0s
 => [internal] load .dockerignore
0.0s
 => => transferring context: 2B
0.0s
 => [internal] load build context
0.5s
 => => transferring context: 1.56MB
0.5s
 => [1/3] FROM registry.tld/conjur-
appliance:13.8.0@sha256:2d8ffc83934d05e00dab785ea34c31711479a15e3dc120a87b40ff324b651f26  0.0s
 => => resolve registry.tld/conjur-
appliance:13.8.0@sha256:2d8ffc83934d05e00dab785ea34c31711479a15e3dc120a87b40ff324b651f26  0.0s
 => CACHED [2/3] COPY opt /opt
0.0s
 => CACHED [3/3] RUN mkdir -p /opt/nfast/kmdata /opt/nfast/sockets && mkdir -m 1755 /opt/nfast/kmdata/tmp
0.0s
 => exporting to image
0.2s
 => => exporting layers
0.0s
 => => exporting manifest sha256:a44e962ab29ce9f8012b8d631bfa5c7e420a39de0875e61f612131fcf5281db7
0.0s
 => => exporting config sha256:74f732c46d1c2adb492b4b991d3aadd430e5b88d9a48f2d2b9bbf314def4d827
0.0s
 => => exporting attestation manifest
sha256:b89d5e19ef3768e72ea11bce85616aead1996aaa6d66a32f83ec8dc1c77c941d                0.0s
 => => exporting manifest list sha256:0d70ce10872daee8b530c172a879c537ff718bbda05fb7ea915459ca4e59fbec
0.0s
 => => naming to docker.io/library/conjur-appliance-wnfast:13.6.15
0.0s
 => => unpacking to docker.io/library/conjur-appliance-wnfast:13.6.15
```

3. List the docker images

```
% docker images

IMAGE                                ID             DISK USAGE   CONTENT SIZE   EXTRA
conjur-appliance-wnfast:13.6.15      0d70ce10872d       3.68GB          965MB
nshield-hwsp:13.6.15                 7064478c1dfc        921MB          207MB    U
registry.tld/conjur-appliance:13.8.0 2d8ffc83934d       2.75GB          759MB
```

4. Run the `conjur-appliance` container with the `nfast` container:

```
% docker run --name dap-wnfast -d \
  --restart=unless-stopped \
  --security-opt seccomp=/path/to/conjur-seccomp.json \
```

```
  -p "443:443" -p "5432:5432" -p "1999:1999" \
  -v /opt/nfast/kmdata:/opt/nfast/kmdata:rw \
  -v socket1:/opt/nfast/sockets \
  conjur-appliance-wnfast:13.6.15
```

5. Check the running containers

```
% docker ps -a

CONTAINER ID IMAGE                          COMMAND               CREATED        STATUS        PORTS
NAMES
3675b8a1cbd3 conjur-appliance-wnfast:13.6.15 "/usr/local/bin/entr…" 25 seconds ago Up 24 seconds
0.0.0.0:443->443/tcp, ... dap-wnfast
435c111f8ff8 nshield-hwsp:13.6.15            "/opt/nfast/sbin/nsh…" 26 hours ago   Up 26 hours
```

6. Perform the initial configuration of CyberArk Secrets Manager. The username is **admin**. For password requirements, see Configure the Secrets Manager cluster in the CyberArk online documentation.

```
% docker exec dap-wnfast evoke configure master \
  --accept-eula --hostname dap-wnfast.example.com \
  --leader-altnames master-cyberark-conjur.interops.local \
  --admin-password Mypassw0rD1! org1

I, [2026-04-01T14:54:34.641889 #79]  INFO -- : Performing Leader configuration...
I, [2026-04-01T14:54:34.641937 #79]  INFO -- : Validating Conjur configuration file...
I, [2026-04-01T14:54:35.337952 #79]  INFO -- : Configuration is valid. Server will not be restarted in test
mode.
.
.
.
You have accepted the CyberArk End User License Agreement.
Use `evoke eula show` in the future to display the EULA.
Configuration successful. Conjur Leader up and running.
```

You will need to add an entry in your DNS for the hostname used with `--leader-altnames`.

7. Copy the `cknfastrc` and `pkcs11.yml` configuration files into the running container:

```
% docker cp /opt/nfast/cknfastrc dap-wnfast:/opt/nfast/cknfastrc

% docker cp pkcs11.yml dap-wnfast:/opt/conjur/etc/pkcs11.yml
```

8. Generate a new Key Encryption Key (KEK) for CyberArk Secrets Manager to be stored on the HSM:

```
% docker exec dap-wnfast evoke pkcs11 generate

I, [2026-04-01T15:46:03.322892 #2258]  INFO -- : Using nCipher PKCS#11 13.6.15-437-54fe.
I, [2026-04-01T15:46:03.323446 #2258]  INFO -- : Using slot from config file
I, [2026-04-01T15:46:03.323583 #2258]  INFO -- : Using 810B-03E0-D947 Rt1.
I, [2026-04-01T15:46:03.324685 #2258]  INFO -- : Generating a new wrapping key with ID "wrappingkey"...
```

```
I, [2026-04-01T15:46:03.353412 #2258]  INFO -- : All done.
```

9. Start the `conjur-appliance` container, which will act as the Master DAP Server, in Interactive mode:

```
% docker exec -i -t dap-wnfast /bin/bash
```

10. Check for the generated key. Make sure it was created with the intended key protection type, defined by the `pkcs11.yml` file.

```
root@036009bab3fd:/# /opt/nfast/bin/nfkminfo -l

Keys with module protection:
 key_pkcs11_uaf8ef20fe82a2b7f5089b8ebe957218b2b199a167 `Conjur master key wrapping key'
```

The KEK is now ready for use.

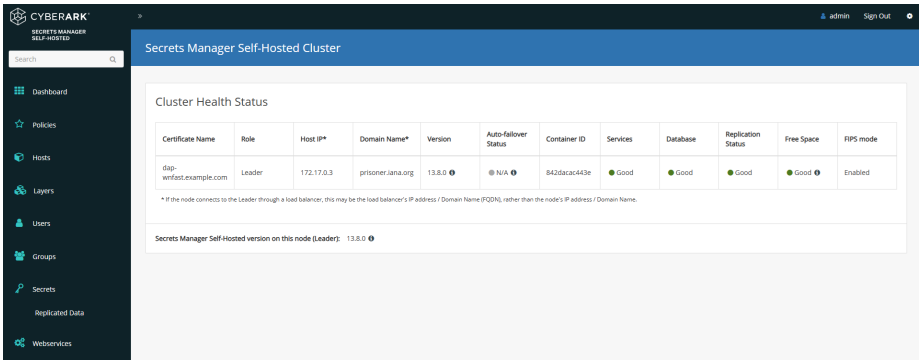
2.4. Web Interface

1. Log on to the web interface, for example https://master-cyberark-conjur.interops.local

You are going to use the server name used in the `--leader -altnames` option.

   - User: admin
   - Password: Mypassw0rD1!

2. Select the **Settings** symbol in the top right.
3. Select **Secrets Manager Self-Hosted Cluster**.
4. The master node should now be displayed.



2.5. Example commands used with the KEK

Here are some examples of commands that can be used inside the docker container. For more examples, see Server Key Encryption Methods in the CyberArk online documentation.

1. Start the `conjur-appliance` container, which will act as the Master DAP Server, in interactive mode:

```
% docker exec -i -t dap-wnfast /bin/bash
```

2. Generate a random master key. Keep this file secure.

```
root@036009bab3fd:/# mkdir -p /secrets
root@036009bab3fd:/# openssl rand 32 > /secrets/master.key
```

3. Encrypt the server keys with the 32-byte master key

```
root@036009bab3fd:/# evoke keys encrypt /secrets/master.key

Encrypted 4 key files and adjusted 0 symlinks
NOTE: To allow services access to keys, the keys must be unlocked. For more information, run 'evoke keys
unlock --help'.
```

4. Unlock the server keys and restart the CyberArk Secrets Manager services

```
root@036009bab3fd:/# evoke keys unlock /secrets/master.key

evoke keys unlock /secrets/master.key
Stopping service 'conjur'...
Stopping service 'nginx'...
Stopping service 'pg/main'...
Stopping service 'pg/audit'...
Stopping service 'seed'...
Stopping service 'syslog-ng'...
Starting service 'conjur'...
Starting service 'nginx'...
Starting service 'pg/main'...
Starting service 'pg/audit'...
Starting service 'seed'...
Starting service 'syslog-ng'...
Keys are unlocked. Services and scripts can now access encrypted data.
```

5. Wrap the master key

```
root@036009bab3fd:/#  evoke pkcs11 wrap /secrets/master.key

Using nCipher PKCS#11 13.6.15-437-54fe
Using slot from config file
Using 810B-03E0-D947 Rt1.
Using testSC.
Using wrapping key "wrappingkey".
Wrapping the master key...
Wrapped key stored in /opt/conjur/etc/pkcs11-keys.
```

6. Lock the keys

```
root@036009bab3fd:/# evoke keys lock

Stopping service 'conjur'...
Stopping service 'nginx'...
Stopping service 'pg/main'...
Stopping service 'pg/audit'...
Stopping service 'seed'...
Keys are Locked. Services and scripts can no longer access encrypted data.
```

7. Unlock the keys

```
root@036009bab3fd:/#  evoke keys unlock

No master key found in the session keyring
Using PKCS#11 master key configuration...
Using nCipher PKCS#11 13.6.15-437-54fe
Using slot from config file
Using 810B-03E0-D947 Rt1.
Using wrapping key "wrappingkey"...
Service 'conjur' is not running. Skipping stop.
Service 'nginx' is not running. Skipping stop.
Service 'pg/main' is not running. Skipping stop.
Service 'pg/audit' is not running. Skipping stop.
Service 'seed' is not running. Skipping stop.
Stopping service 'syslog-ng'...
Starting service 'conjur'...
Starting service 'nginx'...
Starting service 'pg/main'...
Starting service 'pg/audit'...
Starting service 'seed'...
Starting service 'syslog-ng'...
Keys are unlocked. Services and scripts can now access encrypted data.
```

Chapter 3. Additional resources and related products

3.1. nShield HSMs

3.2. nShield as a Service

3.3. nShield Container Option Pack

3.4. Entrust products

3.5. nShield product documentation