HPE NFV Director

Installation and Configuration Guide

Release 4.1.1

First Edition

Hewlett Packard Enterprise

Notices

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Preface

About this Guide

This document describes the operations related to installation, configuration and administration of NFVD 4.1.1 for a typical standard production environment:

- Installing and configuring NFVD:
  - Chapter 1: Preparing and checking NFVD environment
  - Chapter 2: Installing/Upgrading NFVD
  - Chapter 3: Post-installation steps

This document does not cover the steps related to VIM/solution integration, such as:

- Configuring and administering discovery for NFVD 4.1.1
- Configuring NFVD 4.1.1 optional Software Components (OMi, CMDB).
- Installing NFVD 4.1.1 resource modelling tool.

This document also takes the following assumptions:

- Infrastructure administration tasks are not detailed and handled by a contact identified as “IT Admin”.
- Oracle DBA administration tasks are not detailed and handled by a contact identified as “Oracle DBA”.

Audience

This guide is intended for any stakeholder requiring to install and configure NFVD for production environment. It is recommended that the person is knowledgeable in basic Linux and Oracle administration to use this document.

Document History

Edition	Date	Description
1	14 October, 2016	First edition

Table 1: Document history

Chapter 1 Preparing and checking NFVD environment

1.1 Overview

This includes following steps:

- Checking packages availability
- Preparing NFVD 4.1.1 environment

1.2 Checking packages availability

1.2.1 Checking NFVD packages availability

Make sure you have the following packages available, required for installation:

Package Name	Reference
NFVD Installer	nfvd-installer-04.01.001-1.el6.noarch.rpm
NFVD Base Product	NFVD411_BaseProduct.tar
NFVD Software	NFVD411_Software.tar

Table 2 : Required media for installation

1.2.2 Checking SiteScope package availability

Note: This step can be ignored if NFVD monitoring feature is not required.

Make sure you have the following packages available, required for installation:

Package Name	Reference
HP SiteScope 11.30 for Linux	HP_SIteScope_11.30_for_Linux_64bit_T8354-15016.zip
HP SiteScope hotfix	sis1131concurrent_templ_deploy_deleteGroupEx.zip

Table 3 : Required media for installation

Note: HP SiteScope 11.30 for Linux package is typically included in HP SiteScope 11.30 SW E-Media.

1.2.3 Getting references to software download links

Find hereunder a few useful links regarding components which will not be documented for detailed installation.

Component	Version/Part Number
Oracle	http://docs.oracle.com
couchDB	http://docs.couchdb.org
Apache Directory Studio	https://directory.apache.org/studio/
Active Directory schema snap-in installation in Windows 2008R2	http://social.technet.microsoft.com/wiki/contents/articles/10827.install-the-active-directory-schema-snap-in-in-windows-2008-server.aspx

openLDAP	http://docs.adaptivecomputing.com/viewpoint/hpc/Content/topics/1-setup/installSetup/settingUpOpenLDAPOnCentos6.htm

Table 4 : Software download links

1.3 Preparing NFVD environment

1.3.1 Preparing configuration of hosts

NFVD deployment encompasses 3 NFVD components:

- NFVD component for Fulfillment (FF).
- NFVD component for Assurance (AA).
- NFVD component for GUI.

In a typical installation for NFVD:

- FF and GUI components are deployed in one Virtual Machine Host with RHEL 6.6 x86_64 deployed in VCenter 5.5U2 VMware infrastructure.
- AA component is deployed in one Virtual Machine Host with RHEL 6.6 x86_64 deployed in VCenter 5.5U2 VMware infrastructure.

Note: Other installation are possible but would require a validation from HPE Services.

In the remaining part of the document, the following naming convention is used:

Naming	Definition
<FF_HOST>	IP address of Host where NFVD component for Fulfillment (FF) is deployed.
<AA_HOST>	IP address of Host where NFVD component for Assurance (AA) is deployed.
<GUI_HOST>	IP address of Host where NFVD component for GUI is deployed.
<INSTALLER_HOST>	IP address of Host where NFVD Installer tool is installed.

Table 5 : Naming convention

In a typical installation for NFVD, <FF_HOST>, <GUI_HOST> and <INSTALLER_HOST> are the same.

NFVD Product also requires **connectivity** to hosts where the following components are deployed:

- DNS server.
- Oracle DB server component (Oracle 11gR2) in order to deploy its data model and store persistent data.
- Server with LDAPv3 implementation. Typical examples are:
  - OpenLDAP server without SSL connection.
  - ActiveDirectory with SSL connection.
- Mail server component.
- VIM Infrastructure (Helion Carrier-Grade 2.0 OpenStack, RedHatOpenStack 7, pure OpenStack Kilo or vCenter 5.5).
- Omi/BSC component (if HPSW is used for discovery).

Note: From NFVD standpoint, there is no constraint on how these components are actually deployed, either through physical or virtual hosts, either collocated or not collocated, as long as they meet connectivity requirements.

In the remaining part of the document, the following naming convention is used:

Naming	Definition
<ORACLE_HOST>	Host IP address of Oracle single-instance server where Oracle component is installed. or Scan IP addresses of Oracle RAC cluster where Oracle component is installed.
<LDAP_HOST>	Host IP address where LDAPv3 server component is reachable.
<OMI_HOST>	Host IP address where OMi/BSC component is reachable.
<MAIL_SERVER_HOST>	Host IP address where Mail Server is reachable.

Table 6 : Product naming convention

1.3.2 Preparing configuration of VIM

Note: Steps in this chapter can typically be delegated to IT Admin of the VIM.

Make sure to configure the CINDER volume types with the following predefined names:

- Vmware-Quality-A
- Kvm-Baremetal-Quality-A
- Vmware-Quality-B
- Kvm-Baremetal-Quality-B
- All-vsa-Quality-A

1.3.3 Instantiating NFVD VMs in VMware infrastructure

Note: Steps in this chapter can typically be delegated to IT Admin of the VMware infrastructure.

Make sure that that following Virtual Machines are allocated in VMware infrastructure (with VMware Tools installed), can ping each other, can be accessed through ssh, are time-synced and can access yum repo.

Component	Guest OS	IP Address	vCPUs	RAM (GB)	vDisks	Disk size (GB)	
						OS root	NFVD
FF+GUI	RedHat Linux 6.6 x86_64	<FF_HOST> (identical to <GUI_HOST>)	16	32	2	50	100
AA	RedHat Linux 6.6 x86_64	<AA_HOST>	6	24	2	50	150

Table 7 : Typical sizing required per component

Note: Other installations are possible but would require a validation from HPE Services.

Note: In context of custom project, installation can be customized to distribute sub-components (HPSA, HPSA EP, UCA) across several VMs but this requires support from NFVD Team to agree on project-specific customizations, which may require changes to installation scripts.

Find hereunder a typical example for VMware Tools installation on Virtual Machines (once you have selected VM on VCenter with right click→ Guest → Install/Upgrade VMWare Tools):

```
# mkdir /media/cdrom
# mount –t iso9660 /dev/cdrom /media/cdrom
# cd /var/tmp/
# tar –xvzf /media/cdrom/VMwareTools*.tar.gz
# cd vmware-tools-distrib/
# ./vmware-install.pl

[Accept all default values by clicking on Return]

#
```

Find hereunder a typical example of network connectivity:

- /etc/sysconfig/network

```
NETWORKING=yes
HOSTNAME=<[FF|AA|GUI|SITESCOPE]_HOSTNAME>.<NFVD_DOMAIN>
NOZEROCONF=yes
NETWORKING_IPV6=yes
IPV6_AUTOCONF=no
GATEWAY=<NFVD_GATEWAY>
```

Typical example:

```
NETWORKING=yes
HOSTNAME=ducati49.gre.hpecorp.net
NOZEROCONF=yes
NETWORKING_IPV6=yes
IPV6_AUTOCONF=no
GATEWAY=16.16.88.1
```

- /etc/sysconfig/network-scripts/ifcfg-eth0

```
DEVICE="eth0"
BOOTPROTO="static"
HWADDR="<MAC ADDRESS allocated by VMWare for eth0>"
IPV6INIT="yes"
MTU="1500"
NM_CONTROLLED="yes"
ONBOOT="yes"
TYPE="Ethernet"
IPADDR=<[FF|AA|GUI]_HOST>
NETMASK=<NFVD_NETMASK>
GATEWAY=<NFVD_GATEWAY>
USERCTL=no
```

Typical example:

```
DEVICE="eth0"
BOOTPROTO="static"
HWADDR="00:50:56:B1:3F:98"
IPV6INIT="yes"
MTU="1500"
NM_CONTROLLED="yes"
ONBOOT="yes"
TYPE="Ethernet"
IPADDR=16.16.88.200
NETMASK=255.255.248.0
GATEWAY=16.16.88.1
USERCTL=no
```

- /etc/udev/rules.d/70-persistent-net.rules

```
# This file was automatically generated by the /lib/udev/write_net_rules
# program, run by the persistent-net-generator.rules rules file.
```

```
#
# You can modify it, as long as you keep each rule on a single
# line, and change only the value of the NAME= key.

# PCI device 0x15ad:0x07b0 (vmxnet3)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="<MAC ADDRESS
allocated by VMWare for eth0>", ATTR{type}=="1", KERNEL=="eth*", NAME="eth0"
```

Typical example:

```
# This file was automatically generated by the /lib/udev/write_net_rules
# program, run by the persistent-net-generator.rules rules file.
#
# You can modify it, as long as you keep each rule on a single
# line, and change only the value of the NAME= key.

# PCI device 0x15ad:0x07b0 (vmxnet3)
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="00:50:56:b1:3f:98",
ATTR{type}=="1", KERNEL=="eth*", NAME="eth0"
```

Typical example to enable ssh connectivity: */etc/ssh/sshd_config* file and change the value of *PermitRootLogin* to yes, then restart sshd service:

```
# vi /etc/ssh/sshd_config
....
PermitRootLogin yes
...
# service sshd restart
```

Typical example regarding time-synchronization through NTP:

Invoke *system-config-date* utility, click on "Synchronize date and time over the network", then reference NTP Server(s).

Typical example:

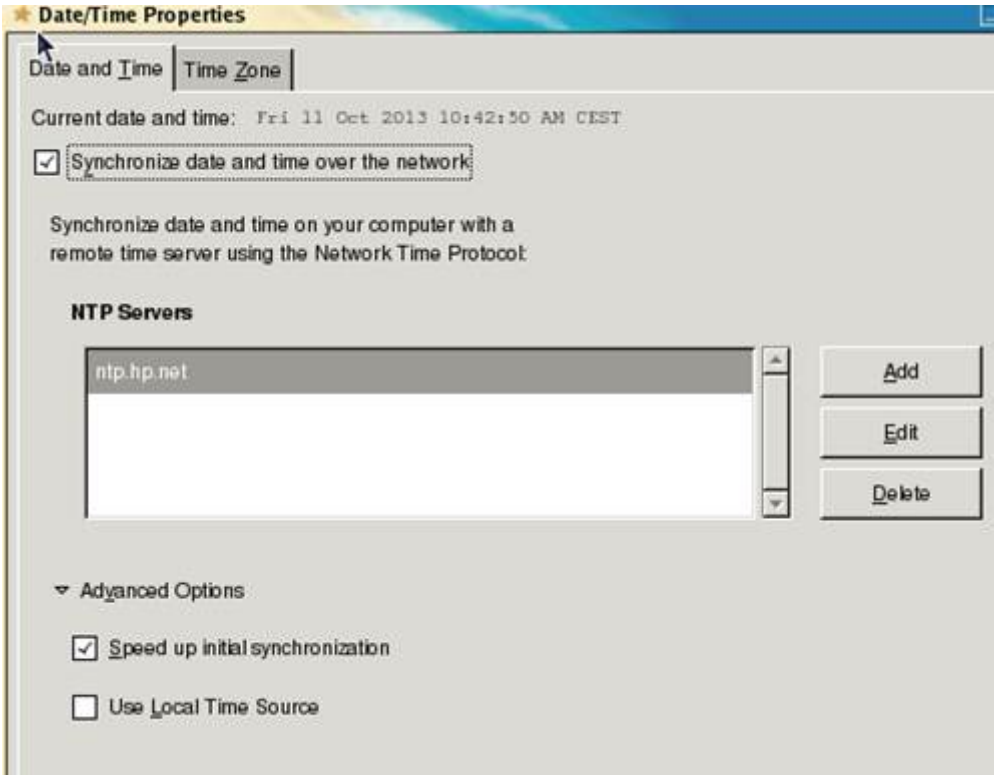


Figure 1 : Date/Time Properties

Typical example for yum repo:

In order to use yum tool to automatically manage dependencies, there is a need to make sure RedHat Enterprise Linux 6.6 x86_64 distribution is available through a repo.
In order to make it available, one typical example is to mount RHEL 6.6 iso image (or equivalent) and reference it through a repo.

Typical example:

```
# vi /etc/yum.repos.d/redhat.repo

[core]
name=RPM Repository for Red Hat Enterprise Linux $releasever - $basearch - Base OS
baseurl=http://repoman.gre.hpecorp.net/mrepo/rhel6.6-server-$basearch/disc1/Server
enabled=1
gpgcheck=0

[updates]
name= RPM Repository for Red Hat Enterprise Linux $releasever Updates - $basearch - Updates
baseurl=http://linuxcoe.corp.hp.com/LinuxCOE/RedHat-updates-
yum/6Server/en/os/$basearch
enabled=0
gpgcheck=0

#
```

1.3.4 Performing basic setup of NFVD VMs

Note: Steps in this chapter can typically be delegated to IT Admin of the VMware infrastructure.

1.3.4.1 Installing RPMs

On: <INSTALLER_HOST>
Login: root

Install following RPMs:

- ksh
- telnet
- libaio-0.3.107-10.el6.x86_64.rpm
- oracle-instantclient11.2-basic-11.2.0.4.0-1.x86_64.rpm
- oracle-instantclient11.2-sqlplus-11.2.0.4.0-1.x86_64.rpm

On: <AA_HOST>, <FF_HOST>, <GUI_HOST>
Login: root

Install following RPMs:

- ksh
- unzip
- dos2unix

On: <GUI_HOST>
Login: root

Install following RPMs:

- openssl
- createrepo
- perl

On: <FF_HOST>
Login: root

Install following RPMs (if you don't have any external SMTP server available):

- postfix

1.3.4.2 Setting up file system layout

Note: Setting up file system layout can be typically handled through *system-config-lvm* utility (installable with yum/rpm).

1.3.4.2.1 Fulfillment host

Typical File System Layout for NFVD FF is following:

vDisk		**Volume Group**		**Logical Volume**		
Id	Size (GB)	Name	Size (GB)	Name	Size (GB)	Mounting Point
2	50	vgFF	50	vgFF-lvolJBoss	10	/opt/HP/jboss
				vgFF-lvolOptSA	20	/opt/OV/ServiceActivator
				vgFF-lvolVarSA	10	/var/opt/OV/ServiceActivator
				vgFF-lvolEtcSA	5	/etc/opt/OV/ServiceActivator

Table 8 : File system layout for NFVD FF

Note: Other installations are possible but would require a validation from HPE Services.

1.3.4.2.2 Assurance host

Typical File System Layout for NFVD AA is following:

vDisk		**Volume Group**		**Logical Volume**		
Id	Size (GB)	Name	Size (GB)	Name	Size (GB)	Mounting Point
2	150	vgAA	150	vgAA-lvolOM	50	/var/opt/openmediation-70
				vgAA-lvolUCA	50	/var/opt/UCA-EBC
				vgAA-lvolAGW	50	/var/opt/HPE/nfvd

Table 9 : File system layout for NFVD AA

Note: Other installations are possible but would require a validation from HPE Services.

1.3.4.2.3 GUI host

Not applicable since there is no dedicated volume group on GUI host for GUI application.

1.3.4.3 Enabling ports

On: <FF_HOST>
Login: root

Make sure the following ports are enabled in */etc/sysconfig/iptables*:

```
# vi /etc/sysconfig/iptables
....
-A INPUT -p tcp -m tcp -m tcp --dport <HPSA_WEB_SERVER_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <HPSA_RESOURCE_MANAGER_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <HPSA_WORKFLOW_MANAGER_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 1220 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 1221 -j ACCEPT
...
```

Typical example:

```
# vi /etc/sysconfig/iptables
....
-A INPUT -p tcp -m tcp -m tcp --dport 8080 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 9223 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 2000 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 1220 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 1221 -j ACCEPT
...
```

Apply configuration change:

```
# service iptables restart
```

On: <AA_HOST>
Login: root

Make sure the following ports are enabled in */etc/sysconfig/iptables*:

```
# vi /etc/sysconfig/iptables
....
-A INPUT -p tcp -m tcp -m tcp --dport <UCA_AUTOMATION_CONSOLE_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <UCA_CONSOLE_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <UCA_EBC_JMS_BROKER_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <ACTION_SERVICE_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <HPSA_UCA_AUTOMATION_SYNC_SERVER_PORT> -j
ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <UCA_AUTOMATION_UI_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <AA_GW_JBOSS_ADMIN_CONSOLE_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <SITESCOPE_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <NEO4J_PORT> -j ACCEPT
...
```

Typical example:

```
# vi /etc/sysconfig/iptables
....
-A INPUT -p tcp -m tcp -m tcp --dport 12500 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 8090  -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 61666 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 26700 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 8191 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 18080 -j ACCEPT
```

```
-A INPUT -p tcp -m tcp -m tcp --dport 18888 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport 7474 -j ACCEPT
...
```

Apply configuration change:

```
# service iptables restart
```

On: <GUI_HOST>
Login: root

Make sure the following ports are enabled in */etc/sysconfig/iptables*:

```
# vi /etc/sysconfig/iptables
....
-A INPUT -p tcp -m tcp -m tcp --dport <UOC_WEB_SERVER_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <COUCHDB_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <IDP_PORT> -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport <IMAGE_UPLOADER_PORT> -j ACCEPT
...
```

Typical example:

```
# vi /etc/sysconfig/iptables
....
-A INPUT -p tcp -m tcp -m tcp --dport 3000 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport  5984 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport  38080 -j ACCEPT
-A INPUT -p tcp -m tcp -m tcp --dport  1337 -j ACCEPT
...
```

Apply configuration change:

```
# service iptables restart
```

On: <LDAP_HOST>
Login: root

Make sure the following ports are enabled in */etc/sysconfig/iptables*:

```
# vi /etc/sysconfig/iptables
....
-A INPUT -p tcp -m tcp -m tcp --dport <LDAP_PORT> -j ACCEPT
...
```

Typical example:

```
# vi /etc/sysconfig/iptables
....
-A INPUT -p tcp -m tcp -m tcp --dport 389 -j ACCEPT
...
```

Apply configuration change:

```
# service iptables restart
```

1.3.5 Configuring NFVD with LDAPv3 server

NFVD supports two typical implementations of LDAPv3 Server:

- OpenLDAP without SSL
- ActiveDirectory with SSL

If you have an:

- OpenLDAP : go to section 1.3.5.1
- Active Directory : go to section 1.3.5.2

1.3.5.1 Configuring NFVD with openLDAP

Skip this part if you use Active Directory.

1.3.5.1.1 Prerequisites

- An instantiation of openLDAP with RootDN=nfvd.domain is reachable and its schema can be extended:

On: <LDAP_HOST>
Login: root

- olcDatabase\={2\}bdb.ldif file

```
# cd /etc/openldap/slapd.d/cn\=config
# vi olcDatabase\={2\}bdb.ldif
[…]
olcSuffix: dc=nfvd,dc=domain
olcRootDN: dc=nfvd,dc=domain
[…]
olcAccess: {0}to attrs=userPassword by self write by dn.base="dc=nfvd,dc=domain" write by
anonymous auth by * none
olcAccess: {1}to * by dn.base="dc=nfvd,dc=domain" write by self write by * read […]
```

- olcDatabase\={1\}monitor.ldif file

```
# cd /etc/openldap/slapd.d/cn\=config
# vi olcDatabase\={1\}monitor.ldif
[…]
olcAccess: {0}to *  by dn.base="gidNumber=0+uidNumber=0,cn=peercred,cn=exter
 nal,cn=auth" read  by dn.base="dc=nfvd,dc=domain" read  by * n
 one
[…]
```

- In order to apply the changes, LDAP service has to be restarted:

```
# service slapd restart
```

1.3.5.1.2 Extending openLDAP schema

On: <LDAP_HOST>
Login: root

- Create file */tmp/ldapPublicKey.schema* with content as follows:

```
[root@nfvdvm25 ~]# cd /tmp
[root@nfvdvm25 ~]# vi ldapPublicKey.schema

# octetString SYNTAX
attributetype ( 1.3.6.1.4.1.24552.500.1.1.1.13 NAME 'sshPublicKey'
 DESC 'MANDATORY: OpenSSH Public key'
 EQUALITY octetStringMatch
 SYNTAX 1.3.6.1.4.1.1466.115.121.1.40 )

# printableString SYNTAX yes|no
objectclass ( 1.3.6.1.4.1.24552.500.1.1.2.0 NAME 'ldapPublicKey' SUP top AUXILIARY
 DESC 'MANDATORY: OpenSSH LPK objectclass'
```

```
        MAY ( sshPublicKey $ uid )
        )
```

- Create file */tmp/newSchema.conf* with content as follows:

```
        [root@nfvdvm25 ~]# vi newSchema.conf

       include /tmp/ldapPublicKey.schema
```

- Create a new directory */tmp/conf.d* where the tool *slaptest* is going to create the necessary files with the schema information to import in the OpenLDAP schema:

```
        [root@nfvdvm25 ~]# mkdir conf.d
```

- Execute the "slaptest" tool:

```
        [root@nfvdvm25 ~]# slaptest -f /tmp/newSchema.conf -F /tmp/conf.d
```

- Edit the generated file "/tmp/conf.d/cn\=config/cn\=schema/cn\=\{0\}ldappublickey.ldif" and delete the following lines:

```
        [...]
       structuralObjectClass: [...]
       entryUUID: [...]
       creatorsName: [...]
       createTimestamp: [...]
       entryCSN: [...]
       modifiersName: [...]
       modifyTimestamp: [...]
       [...]
```

In that file change the following lines to:

```
        [...]
       dn: cn=ldapPublicKey,cn=schema,cn=config
       objectClass: olcSchemaConfig
       cn: ldapPublicKey
        [...]
```

- Import this new object class and attribute to OpenLDAP with the "ldapadd" tool:

```
        [root@nfvdvm25 ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f
/tmp/conf.d/cn\=config/cn\=schema/cn\=\{0\}ldappublickey.ldif
```

- Restart *slapd* service:

```
        [root@nfvdvm25]# service slapd stop
       [...]
       [root@nfvdvm25]# service slapd start
```

1.3.5.1.3 Importing NFVD structure

As openLDAP schema is extended, next step is to import NFVD structure:

On: <LDAP_HOST>
Login: root

- Create */tmp/structure.ldif* file as follows:

```
        [root@nfvdvm25]# vi structure.ldif
       version: 1
```

```
dn: dc=nfvd,dc=domain
objectClass: dcObject
objectClass: organization
dc: nfvd
o : nfvd

dn: ou=users,dc=nfvd,dc=domain
objectClass: top
objectClass: organizationalUnit
ou: users

dn: ou=groups,dc=nfvd,dc=domain
objectClass: top
objectClass: organizationalUnit
ou: groups

dn: ou=profiles,dc=nfvd,dc=domain
objectClass: top
objectClass: organizationalUnit
ou: profiles

dn: cn=nfvd.domain,ou=groups,dc=nfvd,dc=domain
objectClass: top
objectClass: groupOfNames
cn: nfvd.domain
member: uid=default
businessCategory: domain
```

- Import the NFVD structure file using *ldapadd* tool:

```
#ldapadd -x -W -D "dc=nfvd,dc=domain" -f structure.ldif
```

1.3.5.2 Configuring NFVD with ActiveDirectory

Skip this part if you use OpenLDAP.

1.3.5.2.1 Prerequisites

- An ActiveDirectory snap-in is reachable and its schema can be extended.

1.3.5.2.2 Extending ActiveDirectory schema

On: <AD_HOST>
Login: root

1.3.5.2.2.1 Attribute ‘sshPublicKey’

1. Double click on AD Schema snap-in

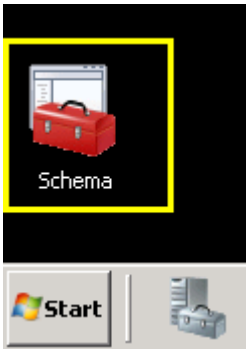
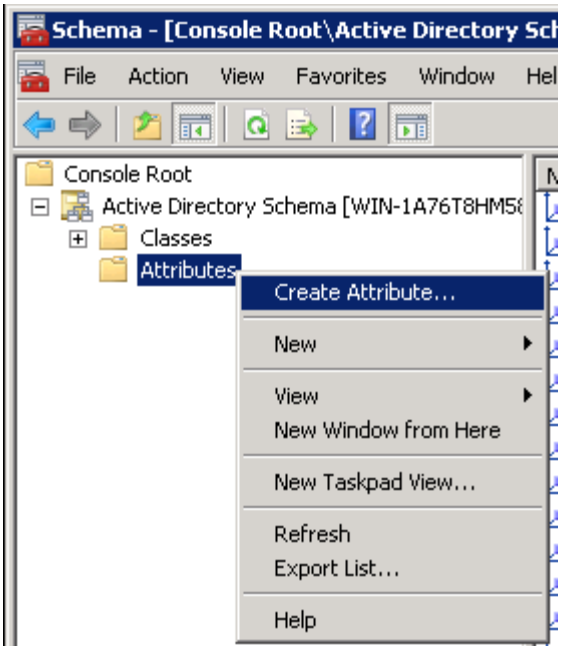


Figure 2 : Double click in Schema shortcut



2. Create a new attribute (right button on your mouse over 'Attributes')

Figure 3 : Create Attribute

3. Fill the values according to next image:

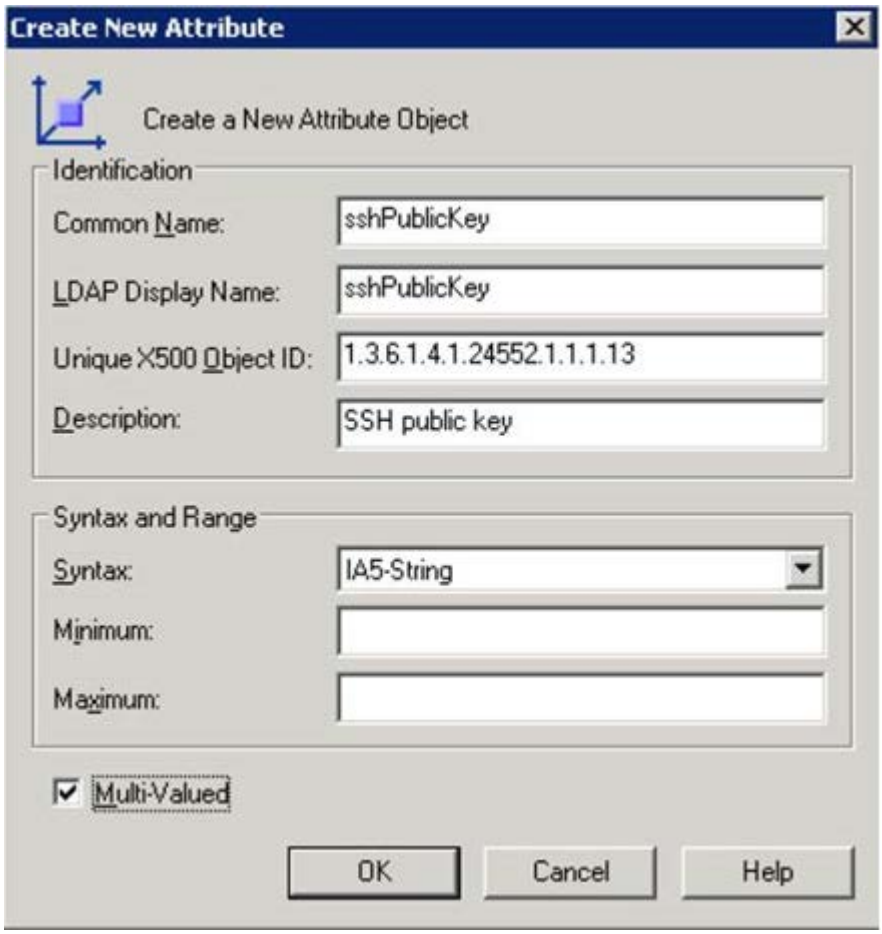


Figure 4 : Fill the values for new attribute

The values you have to type are:

- Common name: sshPublicKey
- LDAP Display name: sshPublicKey

- Unique X500 Object ID: 1.3.6.1.4.1.24552.500.1.1.1.13
- Description: SSH public key
- Syntax: IA5-String
- Multi-valued: yes

Click on <OK> button to add the new attribute: a new attribute will be added to your AD Schema.

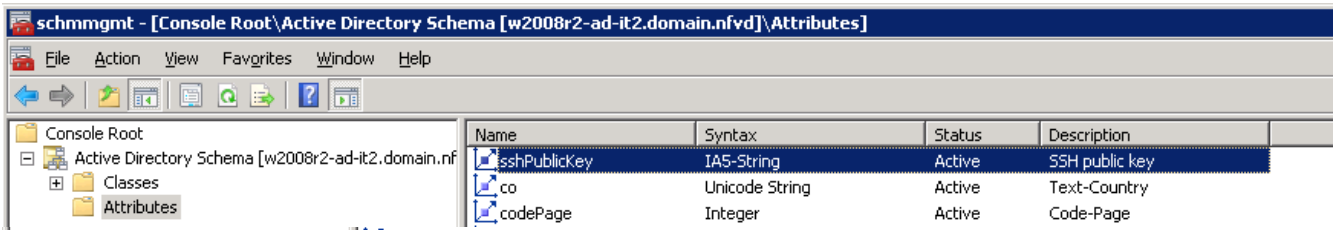


Figure 5 : New attribute 'sshPublicKey' has been created

1.3.5.2.2.2 Schema Class 'ldapPublicKey'

1. (if you have not done before) Double click on AD Schema snap-in

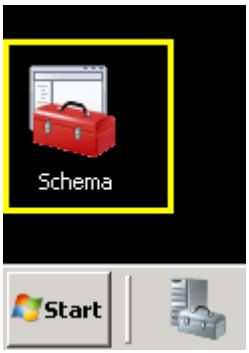


Figure 6 : Double click in Schema shortcut

2. Create a new class (right button on your mouse over 'Classes')

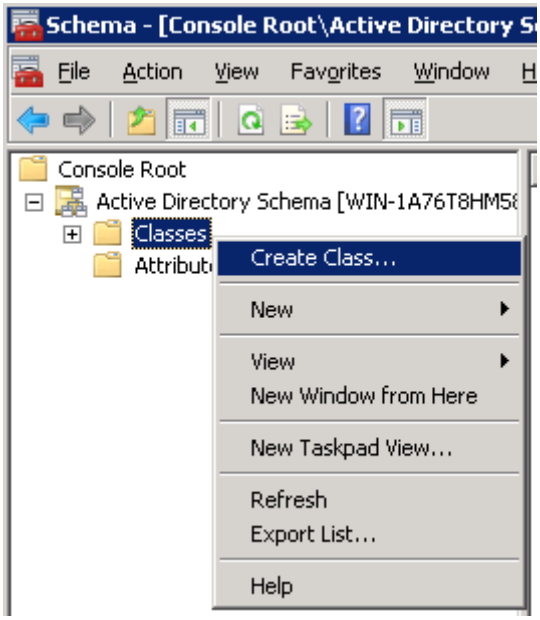


Figure 7 : Create Class

3. Fill the values according to next image

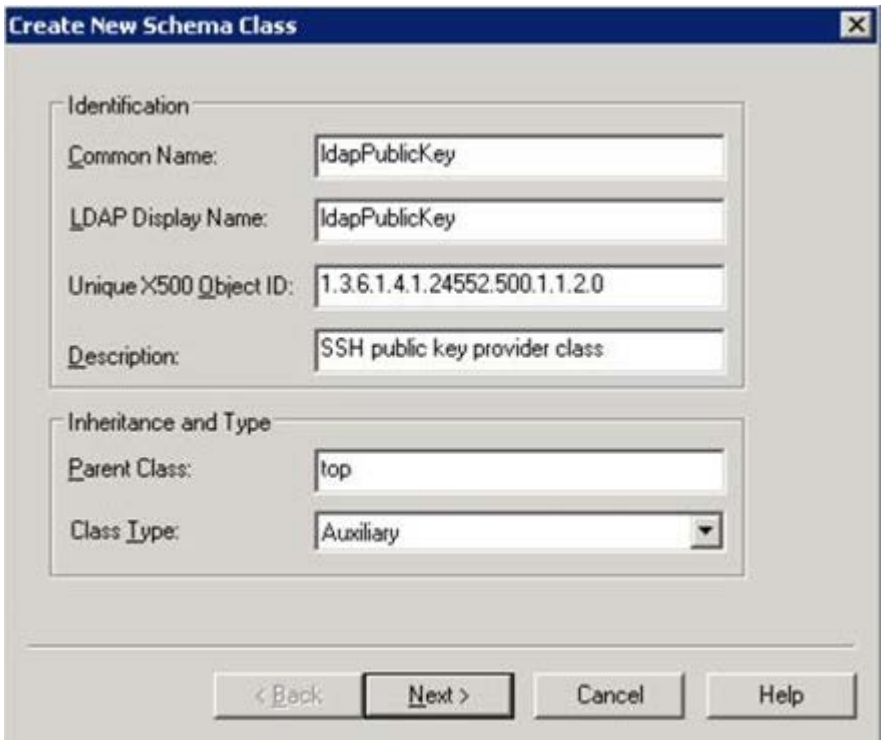


Figure 8 : Fill the values for new class

The values you have to type are:

- Common name: ldapPublicKey
- LDAP Display name: ldapPublicKey
- Unique X500 Object ID: 1.3.6.1.4.1.24552.500.1.1.2.0
- Description: SSH public key provider class
- Parent class: top
- Class type: Auxiliary

Click on `<Next>` button: you will see the following window:

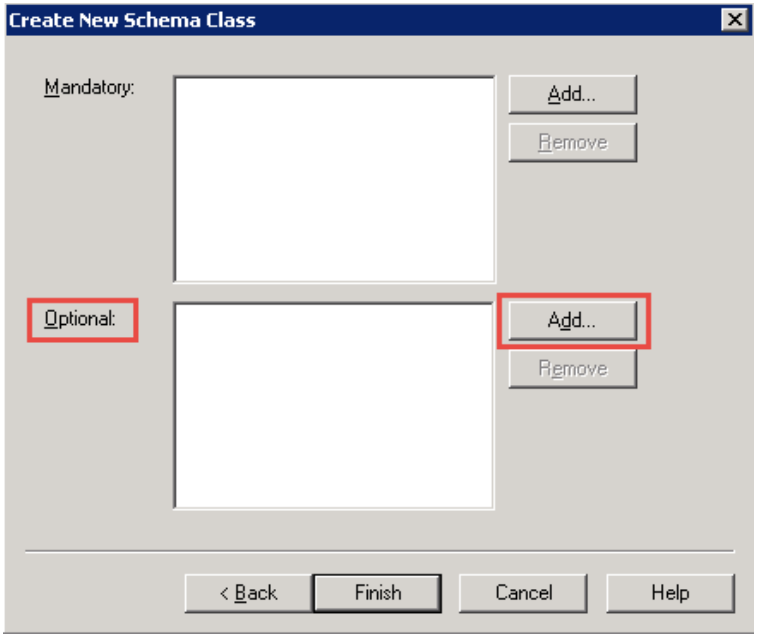


Figure 9 : Adding a new optional attribute to the new class

Select the `sshPublicKey` attribute you created in previous section and click `<OK>` button.

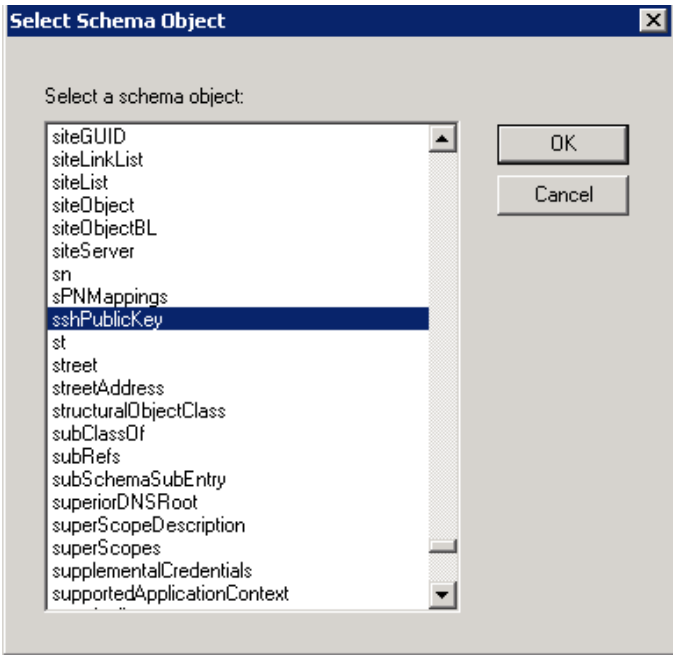


Figure 10 : Adding `sshPublicKey` attribute

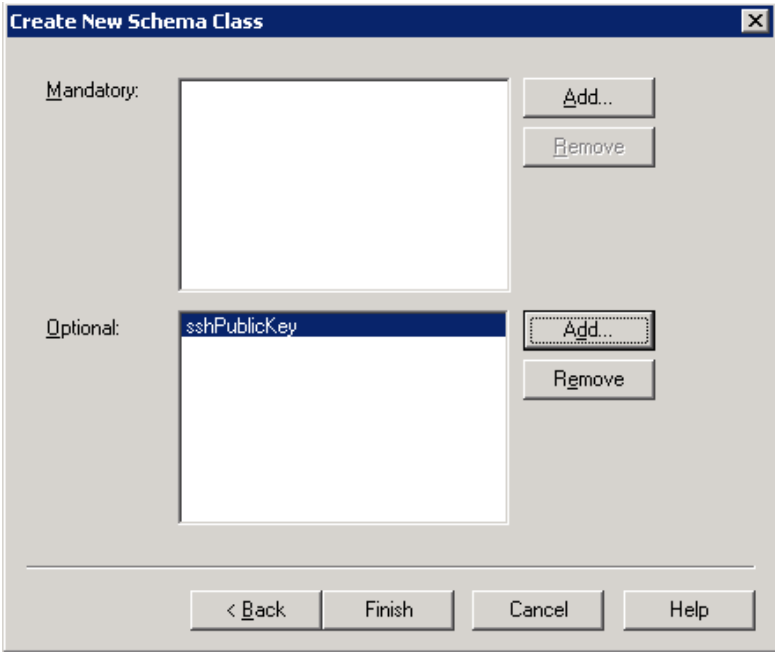


Figure 11 : `sshPublicKey` attribute added.

When you click on <Finish> button, a new schema class called ldapPublicKey will be added to your AD Schema.

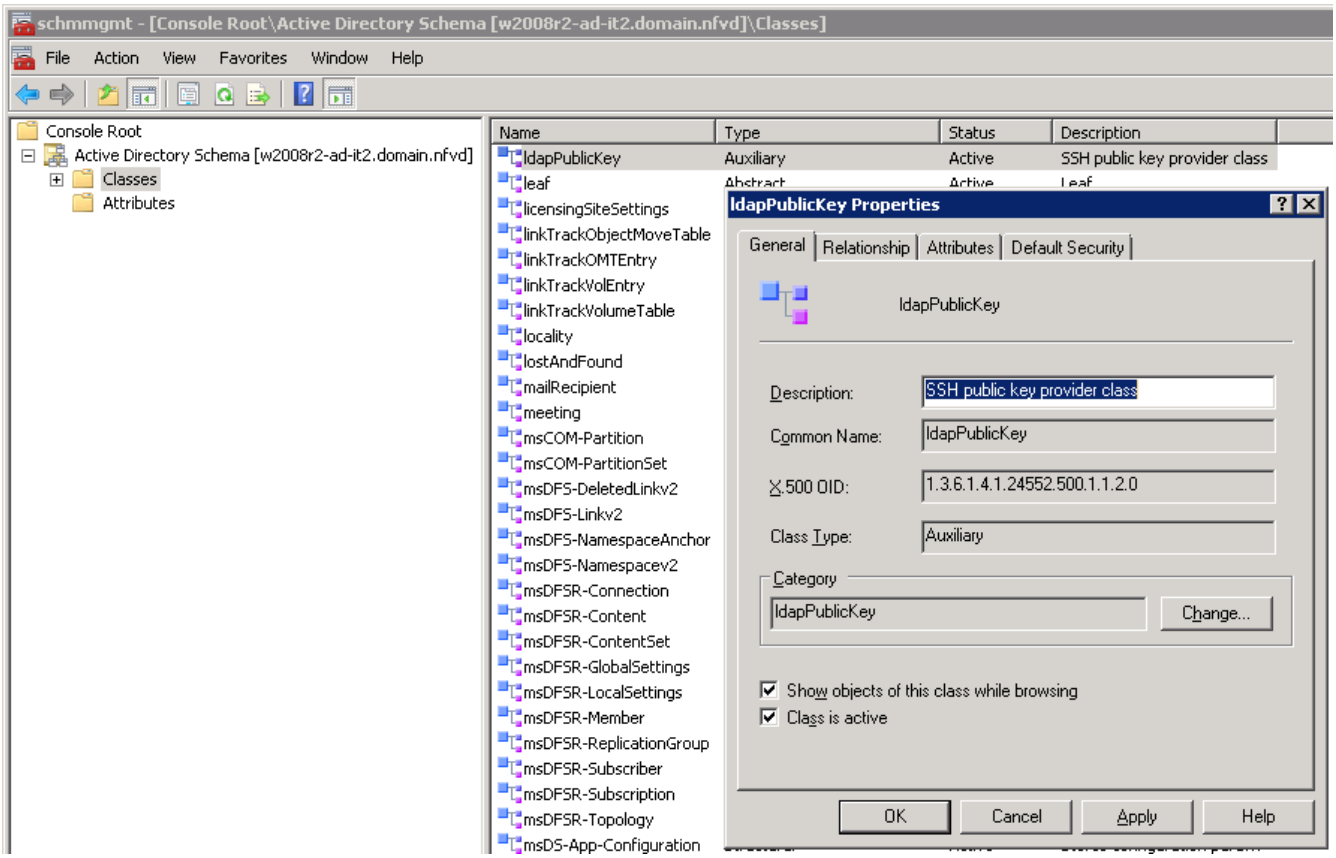


Figure 12 : Schema class `ldapPublicKey`.

1.3.5.2.3 Configuring Active Directory

You need to create the NfvdManagement group in your Active Directory importing a LDIF file.
From a command prompt use "ldifde" tool:

```
ldifde -i -k -f .\active_directory_structure.ldif –j .\
```

The file "active_directory_structure.ldif" contains this info:
(Here **DC=<DOMAIN_CONTROLLER_NAME>,DC=<DOMAIN_SUFFIX>** is the Domain Controller name of the Active Directory, for example "DC=domain,DC=nfvd")

```
version: 1

dn: OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
objectClass: organizationalUnit
objectClass: top
instanceType: 4
objectCategory: CN=Organizational-Unit,CN=Schema,CN=Configuration,
DC=<DOMAIN_CONTROLLER_NAME>,D
 C=<DOMAIN_SUFFIX>
ou: NfvdManagement
distinguishedName: OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
name: NfvdManagement

dn: OU=groups,OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
objectClass: organizationalUnit
objectClass: top
instanceType: 4
objectCategory: CN=Organizational-Unit,CN=Schema,CN=Configuration,
DC=<DOMAIN_CONTROLLER_NAME> ,D
 C=<DOMAIN_SUFFIX>
ou: groups
distinguishedName: OU=groups,OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
name: groups
```

```
dn:
CN=NfvdManagement,OU=groups,OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
objectClass: group
objectClass: top
instanceType: 4
objectCategory:
CN=Group,CN=Schema,CN=Configuration,DC=<DOMAIN_CONTROLLER_NAME>
cn: NfvdManagement
desktopProfile: domain
distinguishedName:
CN=NfvdManagement,OU=groups,OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
name: NfvdManagement


dn: OU=profiles,OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
objectClass: organizationalUnit
objectClass: top
instanceType: 4
objectCategory: CN=Organizational-Unit,CN=Schema,CN=Configuration,
DC=<DOMAIN_CONTROLLER_NAME>, DC=<DOMAIN_SUFFIX>
ou: profiles
distinguishedName: OU=profiles,OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
name: profiles

dn:
CN=administrator,OU=profiles,OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
objectClass: group
objectClass: top
groupType: -2147483646
instanceType: 4
objectCategory:
CN=Group,CN=Schema,CN=Configuration,DC=<DOMAIN_CONTROLLER_NAME>
cn: administrator
distinguishedName:
CN=administrator,OU=profiles,OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
name: administrator

dn: OU=users,OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
objectClass: organizationalUnit
objectClass: top
instanceType: 4
objectCategory: CN=Organizational-Unit,CN=Schema,CN=Configuration,
DC=<DOMAIN_CONTROLLER_NAME>,D
 C=<DOMAIN_SUFFIX>
ou: users
distinguishedName: OU=users,OU=NfvdManagement,DC=<DOMAIN_CONTROLLER_NAME>
name: users
```

For example:

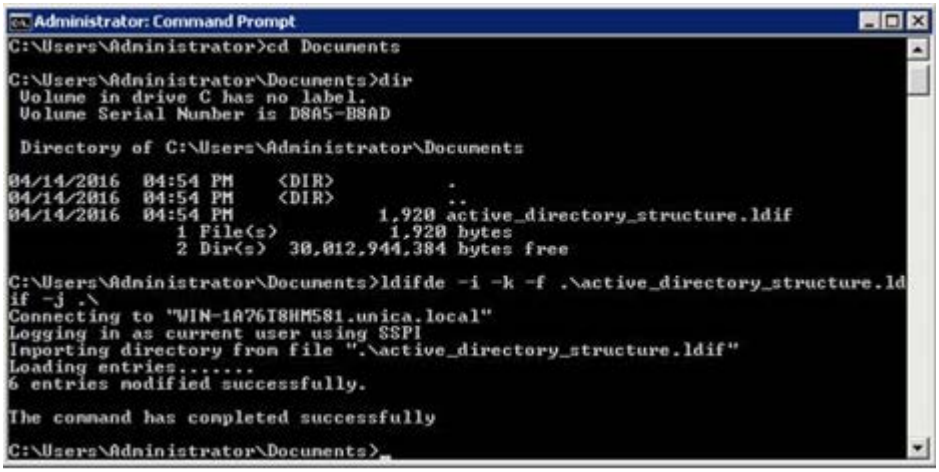


Figure 13 : Configure Active Directory

1.3.5.2.4 Generating a self-signed certificate for LDAP

In order to make a SSL connection an update to JBoss "standalone.xml" configuration file is needed, then Import a self-signed certificate file generated in AD machine to JBoss java VM.

1. Generate a self-signed certificate.

In Active Directory Windows Machine, select Start button then Administrative tools, and then Server manager…

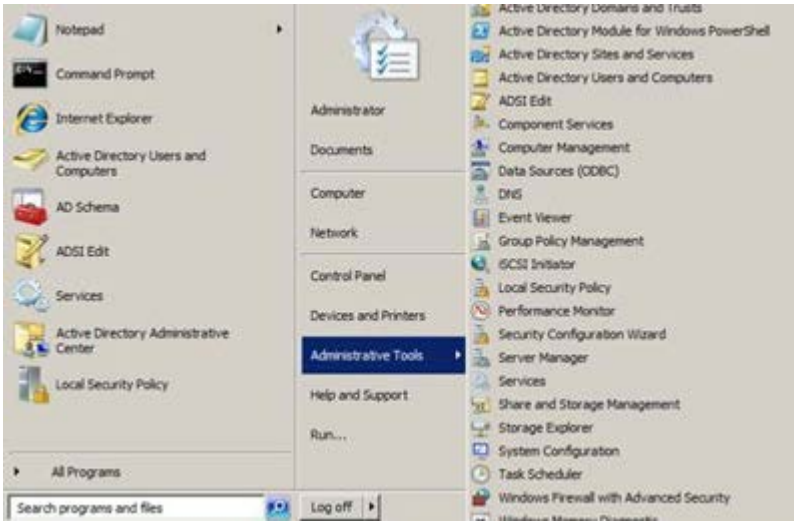


Figure 14 : Generating self-signed certificate for LDAP

In Server Manage, right-click on Roles node and select "Add roles…" click next…
In Add Roles Wizard check Web Server (IIS)… and click next, and then next again

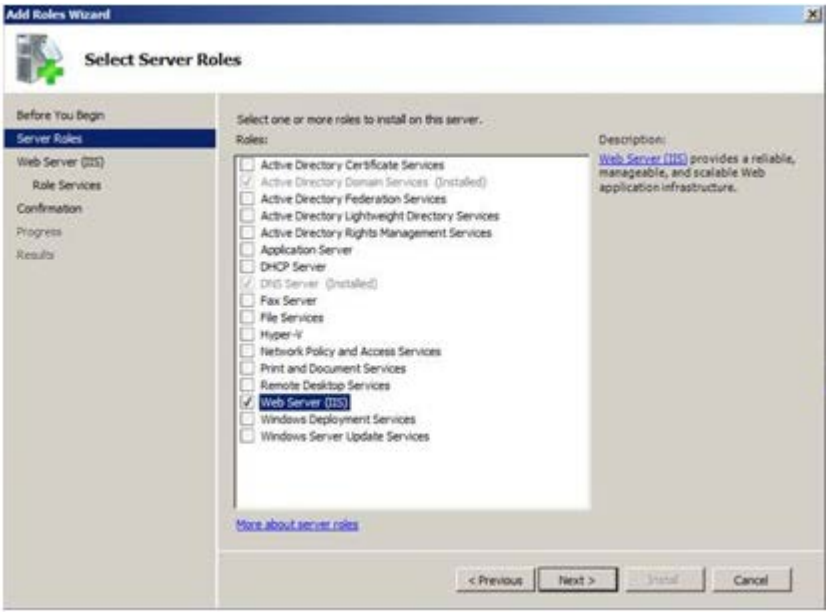


Figure 15 : Add Roles Wizard, server roles

In Role Services, deselect all checks and then check Management Tools -> IIS Management Console and then click next

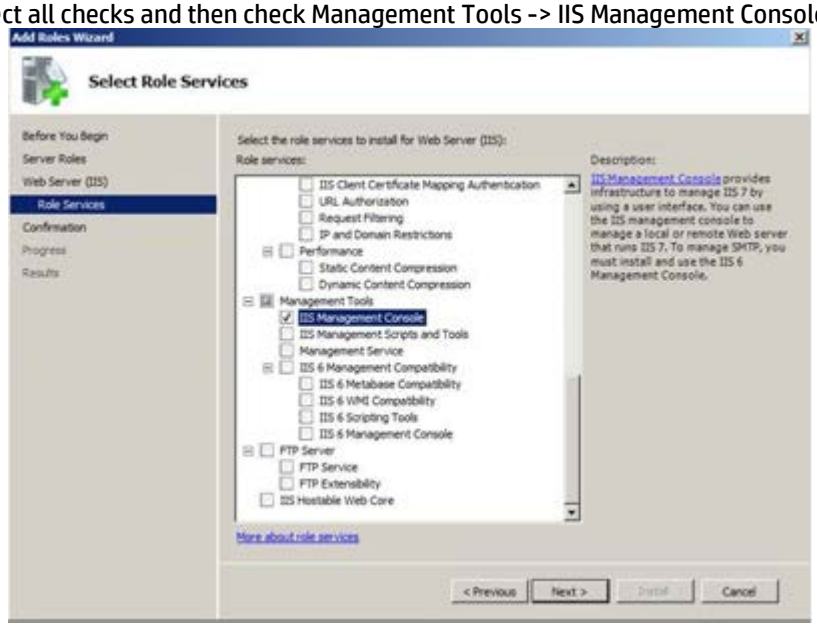


Figure 16 : Add Roles Wizard, role services

In Confirmation step click “Install” and then “Close”.

Now in Server Manager window expand “Web Server (IIS)” node and select “Internet Information Services (IIS) Manager” node.
In the window on the right select “<machine-name>(DOMAIN\Administrator)” node and then double-click on “Server Certificates” icon:

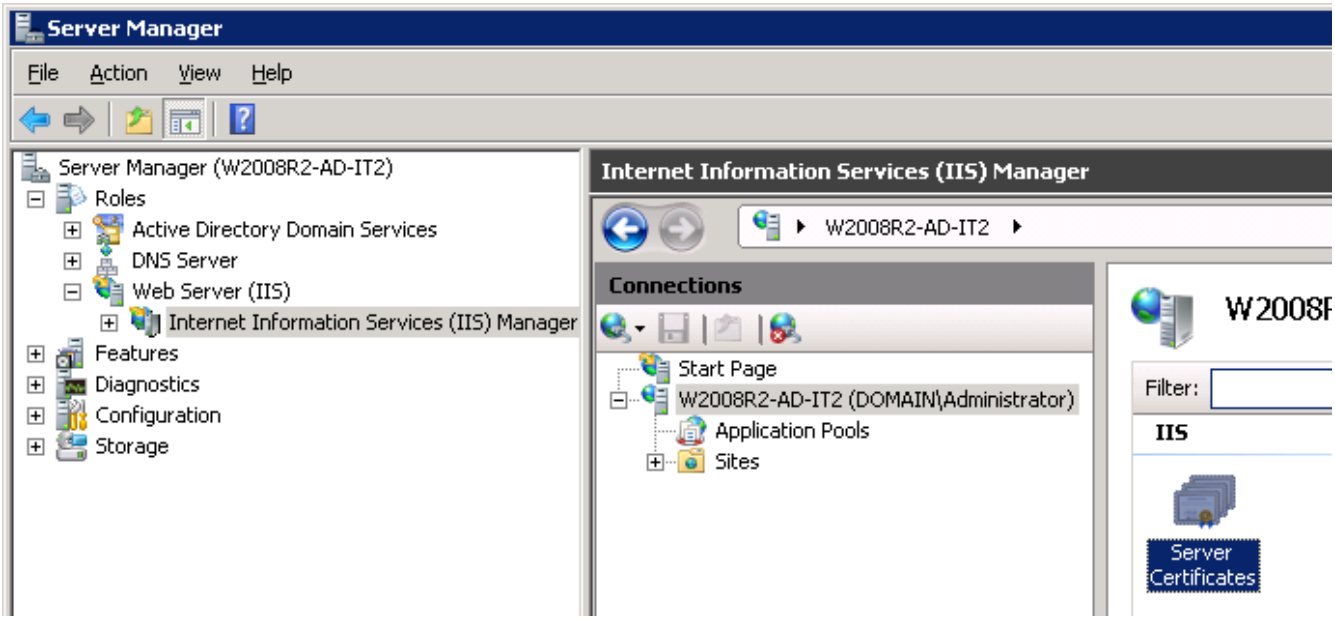


Figure 17 : Server Manager, IIS Manager

In “Server Certificates” frame click on “Create Self-Signed Certificate…” on the right (“Actions” frame)

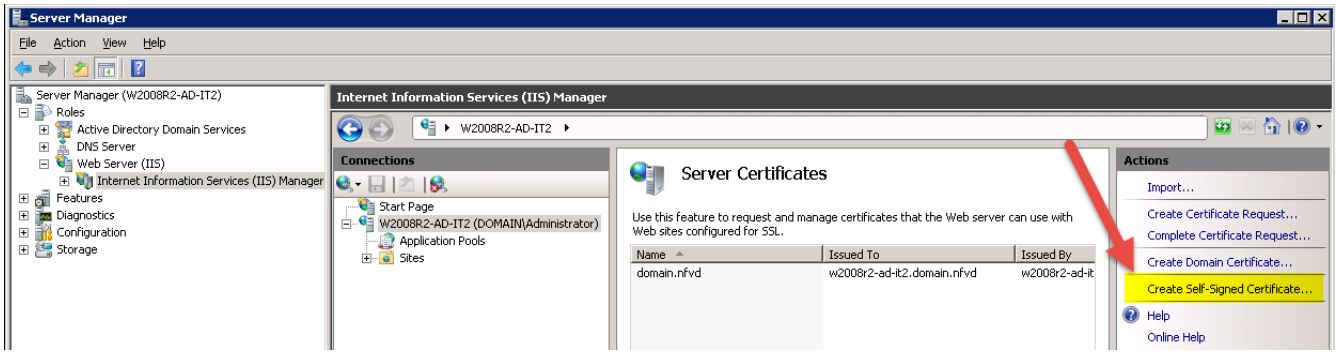


Figure 18 : Server Manager, create Self-Signed Certificate

In “Create Self-Signed Certifcate” window, type a friendly name for the file name and click “OK”…

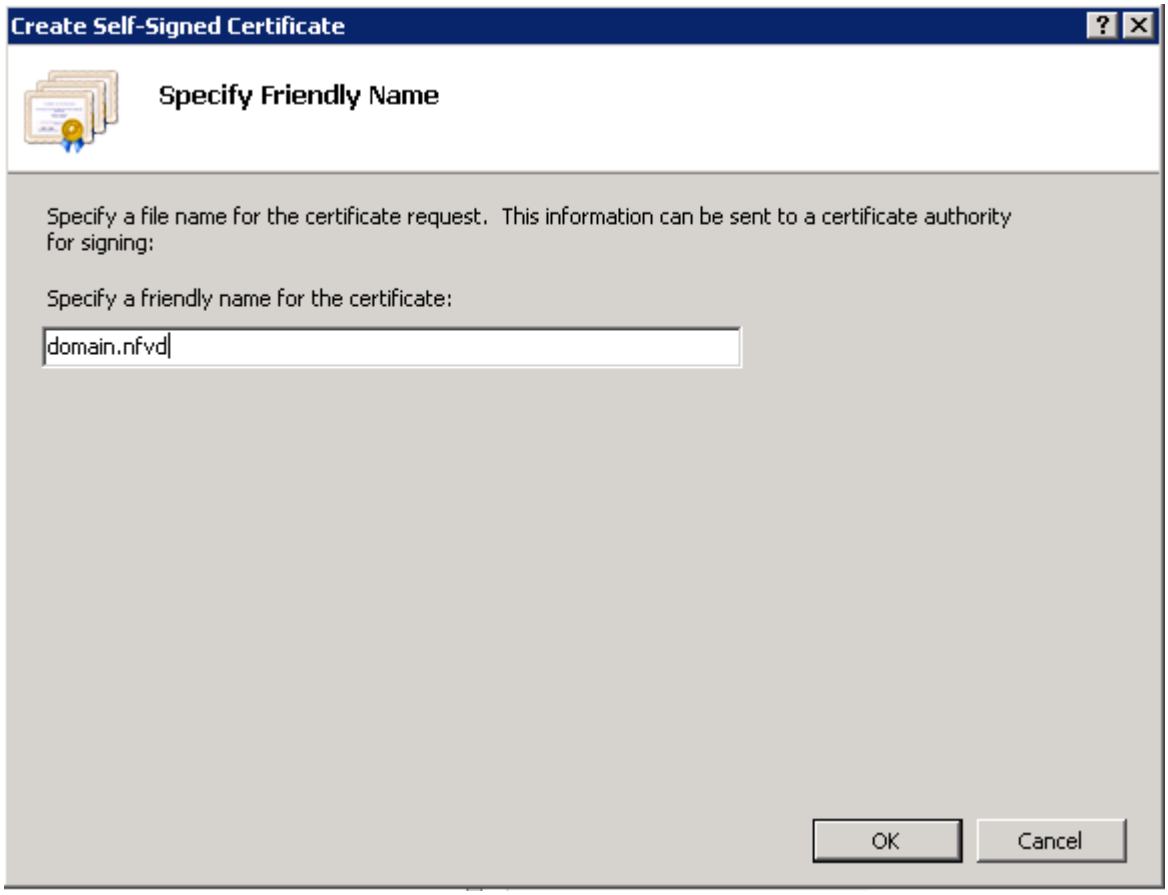


Figure 19 : Create Self-Signed Certificate, specify friendly name

Now, right click on the new certificate created and select “Export...”...
On “Export Certificate” dialog select a directory to export the certificate and then a password and click “OK”...

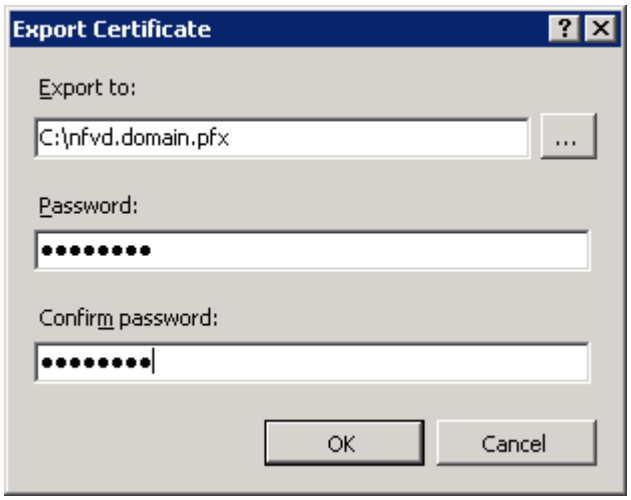


Figure 20 : Export Certificate

In Active Directory Windows machine, select Start menu and then type “run”, then type “mmc”

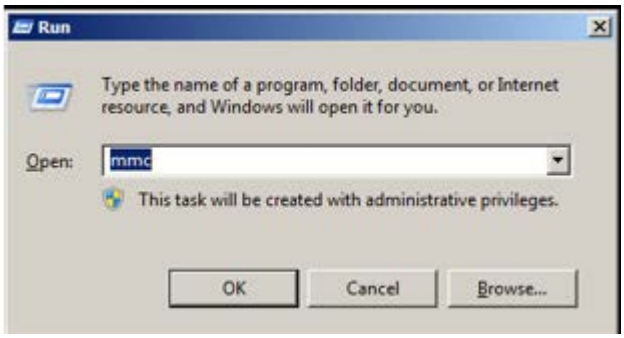


Figure 21 : Run mmc

In console root window select File-> Add/Remove Snap-in...

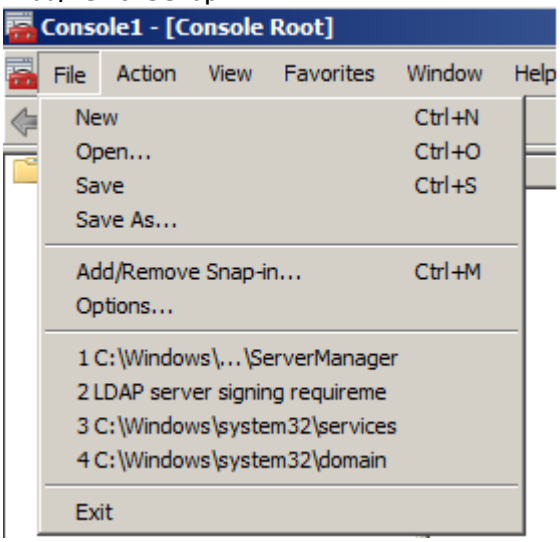


Figure 22 : Console1

In “Add or Remove Snap-ins” dialog select “Certificates”, then “Add->”, then check “Service Account”, then click “Next”...

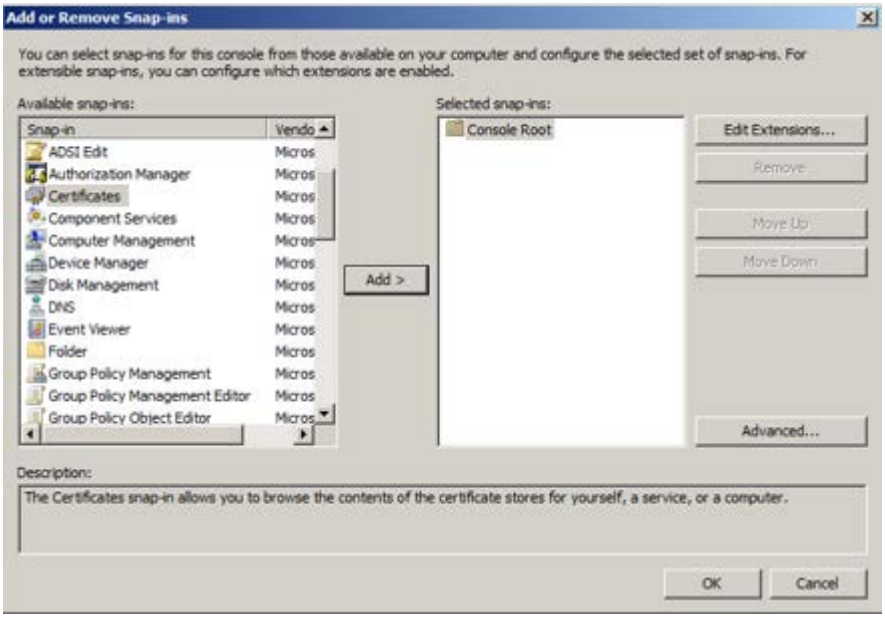


Figure 23 : Add Snap-ins

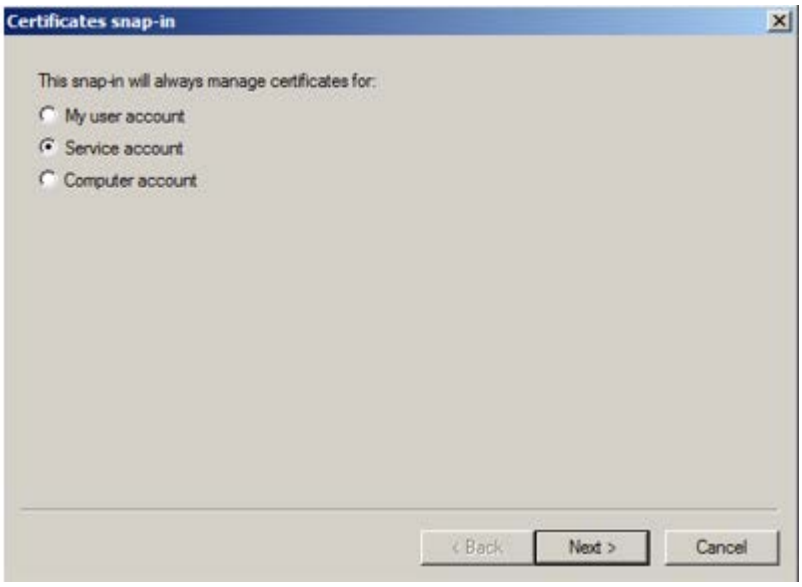


Figure 24 : Certificates snap-in

In “Select Computer” dialog select “Local computer”, then click “Next”

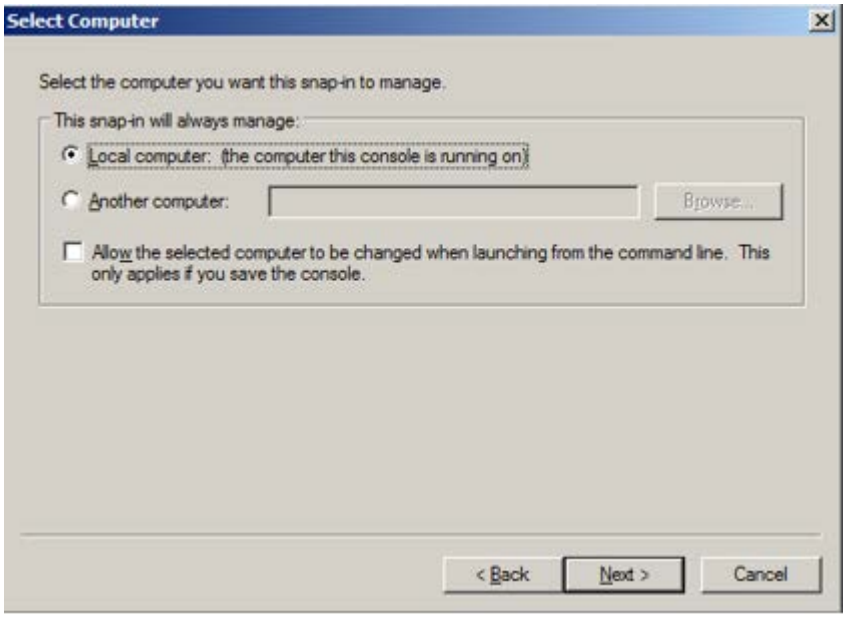


Figure 25 : Select Computer

In “Certificates snap-in” dialog select “Active Directory Domain Services” service account… and then click “Finish”

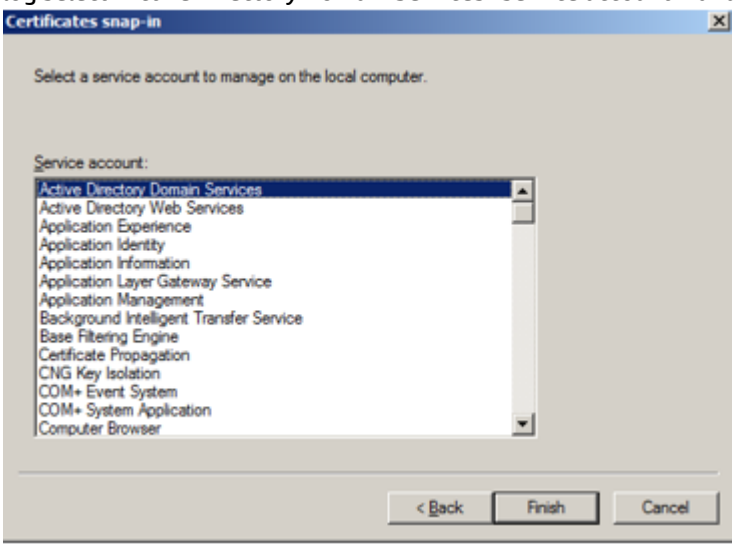


Figure 26 : Certificates snap-in

In “Add or Remove Snap-ins” dialog click “OK”…

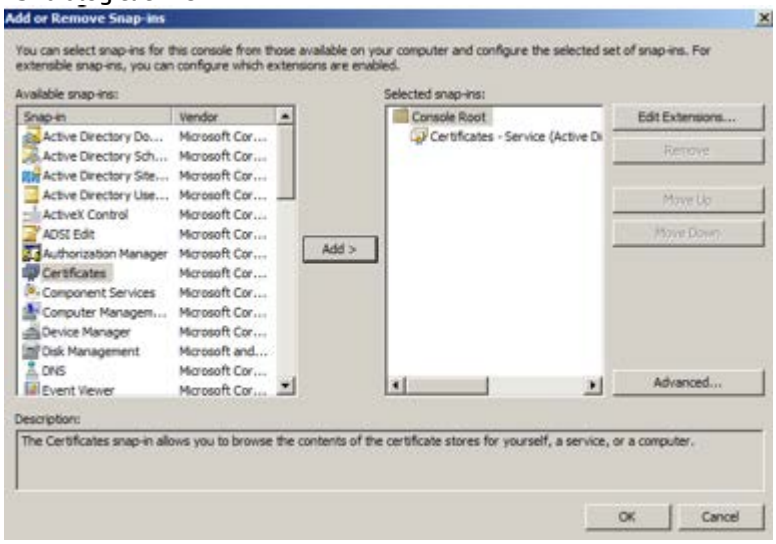


Figure 27 : AA or Remove Snap-ins

1.3.5.2.5 Importing certificate to JBoss VM.

If the file that contains the self-signed certificate is named, for example, “nfvd.pfx” and the password for that file is “1234”…

Use *keytool* utility to import the certificate and reply to interactive questions with answers in red:

```
# /opt/java1.6/bin/keytool -importkeystore –srckeystore nfvd.pfx -srcstoretype pkcs12 -destkeystore /opt/java1.6/jre/lib/security/cacerts -deststoretype JKS –noprompt
Enter destination keystore password: changeit
Enter source keystore password: 1234
Entry for alias 6ff943a2-aa90-4fbc-84eb-c51d1325ed5f successfully imported.
Import command completed:  1 entries successfully imported, 0 entries failed or cancelled
```

The self-signed certificate is imported in “cacerts” file:

```
**********
Alias name: 6ff943a2-aa90-4fbc-84eb-c51d1325ed5f
Creation date: Dec 22, 2015
Entry type: PrivateKeyEntry
Certificate chain length: 1
Certificate[1]:
-----BEGIN CERTIFICATE-----
MIIC+jCCAeKgAwIBAgIQJfbFmwaf44VPDNYayzzS8zANBgkqhkiG9w0BAQUFADAmMSQwIgYDVQQD
ExtXSU4tMUE3NlQ4SE01ODEudW5pY2EubG9jYWwwHhcNMTUxMjIyMTUyMjM5WhcNMTYxMjIyMDAw
MDAwWjAmMSQwIgYDVQQDExtXSU4tMUE3NlQ4SE01ODEudW5pY2EubG9jYWwwggEiMA0GCSqGSIb3
DQEBAQUAA4IBDwAwggEKAoIBAQDeEiQjZYTkVKKAE8UvTm0HaIgMKumm2HnoipfcuErIJ3VBlD3m
42k22QMXHgSW4w+2urZjYZtrbGs+d/wEcss7aFSo7/SU7DDl9h4ULgxQ3KSg8ozIg2q93X+oDkN0
AP4muhhw8hmstlVjgrpLy2HDBxVe8ruVwaWwCC04ebIOZFKFmdbjfYSJyMQX07tNLkS4jQ88+dTw
5reqZqfgFu2c45JWNOGBoYz9HTFg7UftWE3i5C5EoKA7qgpWwev/6ZKbbhh7EJfH6Xi300pEqdhB
8Q20x2VCZJ4GAP5/r483XE21sXfKPbgRgeK24XHQhHonJc9yMsa5m/e/Og/1muMXAgMBAAGjJDAi
MAsGA1UdDwQEAwIEMDATBgNVHSUEDDAKBggrBgEFBQcDATANBgkqhkiG9w0BAQUFAAOCAQEADmyb
MBQR7+sn0lpcOy4J/jJr4TBMfhxeIZ5rjUD3mtGfhCqzVP9xuYycBKPDTovPTi8xW9JZzOWOl8D3
tHBZWRDRciyfyD8uFOc6YotVaWM5Ql410hQ2uxNx6pS0z6+xdccSjjzAbTo3lUSADtm/VSv9YIb3
0HqTS4wgI4rzpBTmLyZiEb891COEO98LWQ28pByyyp2PzIN3te75BlRr2lN70otx57+TsLOuh0P9
bIBmfLBZwCIEHhhD9YzwlHW40HCMf68xav7iYVvelykIe+K8hTcbS7OBiQ7x2gXxfai2PsKX9hLf
```

```
tNoec5rJtwtFMd3l50WR55T5+scqUeU3nQ==
-----END CERTIFICATE-----
****************************************
```

1.3.5.3 Install LDAP from scratch.

In order to configure the “nfvd” user password we should download all the packages that we are going to need:

1. As “root” user, we will execute the following command:
   i. `yum -y install openldap openldap-clients openldap-servers`

2. After this we will create a new password , also as root:

```
slappasswd
New password : p@ssw0rd
Re-enter new password : p@ssw0rd
{SSHA}UzXs6I6b8JhK9X18jcO/q263jXnk44Vt
```

We should copy the SSHA field, and we will paste the value as the following step describes.

3. Once created the new password we will put our attention in the generated SSHA, we will copy that value and we will configure the new password in the “bdb.ldif” archive, also as root user:

```
cd /etc/openldap/slapd.d/cn\=config
vi olcDatabase\=\{2\}bdb.ldif

cd /etc/openldap/slapd.d/cn\=config
vi olcDatabase\=\{2\}bdb.ldif

olcSuffix: dc=nfvd
olcRootDN: dc=nfvd
olcRootPW: {SSHA}7dRDWUBgt+Xj9jYntIIXq+2HO6U1nAKR
```

4. After the configuration of the “bdb.ldif” we should configure the archive “monitor.ldif”, always as root user.

```
[root]# cd /etc/openldap/slapd.d/cn\=config
[root]# vi olcDatabase\=\{1\}monitor.ldif

cd /etc/openldap/slapd.d/cn\=config
vi olcDatabase\=\{1\}monitor.ldif

olcAccess: {0}to * by
dn.base="gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth" read by
dn.base="dc=nfvd" read by * none

olcAccess: {0}to *  by
dn.base="gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth" read  by
dn.base="dc=nfvd" read  by * none
```

5. After this, we will start the slapd service:

```
[root]# chkconfig slapd on
[root]# service slapd start

chkconfig slapd on
service slapd start
```

6. We will check the “ldapPublicKey.schema” archive, to check the SSH configuration.

```
cd /tmp
vi ldapPublicKey.schema
```

```
# octetString SYNTAX
attributetype ( 1.3.6.1.4.1.24552.500.1.1.1.13 NAME 'sshPublicKey'
DESC 'MANDATORY: OpenSSH Public key'
EQUALITY octetStringMatch
SYNTAX 1.3.6.1.4.1.1466.115.121.1.40 )

# printableString SYNTAX yes|no
objectclass ( 1.3.6.1.4.1.24552.500.1.1.2.0 NAME 'ldapPublicKey' SUP top
AUXILIARY
DESC 'MANDATORY: OpenSSH LPK objectclass'
MAY ( sshPublicKey $ uid )
)
```

7. We will edit the “newSchema.conf” file to include the previously checked “ldapPublicKey.schema”.

```
[root]# vi newSchema.conf

vi newSchema.conf

include /tmp/ldapPublicKey.schema
```

8. Once we have inlcude the file, we will create the folder “conf.d” in order to check the config file previously edited.

```
[root]# mkdir conf.d

mkdir conf.d

[root@nfvdvm25 ~]# slaptest -f /tmp/newSchema.conf -F /tmp/conf.d

slaptest -f /tmp/newSchema.conf -F /tmp/conf.d

config file testing succeeded
```

9. Once the testing of the file is succesfull we will check the file “ldapPublickey.ldif”:

```
[root@nfvdvm25 ~]# vi
/tmp/conf.d/cn\=config/cn\=schema/cn\=\{0\}ldapPublickey.ldif

vi /tmp/conf.d/cn\=config/cn\=schema/cn\=\{0\}ldapPublickey.ldif


# AUTO-GENERATED FILE - DO NOT EDIT!! Use ldapmodify.
# CRC32 39c6db2b
dn: cn=ldapPublicKey,cn=schema,cn=config
objectClass: olcSchemaConfig
cn: ldapPublicKey
olcAttributeTypes: {0}( 1.3.6.1.4.1.24552.500.1.1.1.13 NAME 'sshPublicKey' D
ESC 'MANDATORY: OpenSSH Public key' EQUALITY octetStringMatch SYNTAX 1.3.6.
1.4.1.1466.115.121.1.40 )
olcObjectClasses: {0}( 1.3.6.1.4.1.24552.500.1.1.2.0 NAME 'ldapPublicKey' DE
SC 'MANDATORY: OpenSSH LPK objectclass' SUP top AUXILIARY MAY ( sshPublicKe
y $ uid ) )
```

10. Now, that we have checked it, we will add the configurated credentials to the ldap.

```
[root@nfvdvm25 ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f
/tmp/conf.d/cn\=config/cn\=schema/cn\=\{0\}ldapPublicKey.ldif

ldapadd -Y EXTERNAL -H ldapi:/// -f
/tmp/conf.d/cn\=config/cn\=schema/cn\=\{0\}ldapPublicKey.ldif
```

11. After the adding we will edit the file “acme.ldif”, we will make sure that looks as follow.

```
[root@nfvdvm25]# vi acme.ldif

vi acme.ldif

dn: dc=nfvd
objectClass: dcObject
objectClass: organization
dc: nfvd
o : nfvd
```

12. Once the file is checked, and edited if is needed, we will add the file to the ldap

```
[root@nfvdvm25]# ldapadd -x -W -D "dc=nfvd" -f acme.ldif

ldapadd -x -W -D "dc=nfvd" -f acme.ldif
```

The directive “-W” means that a password will be modified, the directive “-D” implies that the file will be bound to the specified “dc”, in this case, “dc=nfvd”, “-f” it will refer to the specific file “acme.ldif”.

13. After we add the file “acme.ldif”, we should edit the file “structure.ldif”, we will check that the file looks like follow:

```
[root@nfvdvm25]# ldapadd -x -W -D "dc=nfvd" -f acme.ldif

ldapadd -x -W -D "dc=nfvd" -f acme.ldif

[root@nfvdvm25]# vi structure.ldif
version: 1

dn: ou=users,dc=nfvd
objectClass: top
objectClass: organizationalUnit
ou: users

dn: uid=nfvd,ou=users,dc=nfvd
objectClass: inetOrgPerson
objectClass: ldapPublicKey
objectClass: organizationalPerson
objectClass: person
objectClass: top
cn: name surname
sn: surname
businessCategory: domain
destinationIndicator: nfvd
givenName: name
mail: email@hpe.com
preferredLanguage: en-us
sshPublicKey:: MTIzNTQ2
telephoneNumber: 123546
uid: nfvd
userPassword:: nfvd

dn: ou=groups,dc=nfvd
objectClass: top
objectClass: organizationalUnit
ou: groups

dn: cn=nfvd,ou=groups,dc=nfvd
objectClass: top
objectClass: groupOfNames
cn: domain
cn: nfvd
member: uid=default
member: uid=nfvd,ou=users,dc=nfvd
businessCategory: domain

dn: ou=profiles,dc=nfvd
objectClass: top
objectClass: organizationalUnit
ou: profiles
```

```
dn: cn=administrator,ou=profiles,dc=nfvd
objectClass: groupOfNames
objectClass: top
cn: administrator
member: uid=default
member: uid=nfvd,ou=users,dc=nfvd
```

We will change the “mail: email@hpe.com” for a mail address that will serve us to get the info about our nfvd user when it will be created.

14. Once the file “structure.ldif” have been modified we will add it to the ldap.

```
[root@nfvdvm25]# ldapadd -x -W -D "dc=nfvd" -f structure.ldif

ldapadd -x -W -D "dc=nfvd" -f structure.ldif
```

15. Now we will insert some specific lines in the file “module.properties”.

```
cat /opt/uoc2/jboss-eap-
6.4/modules/com/hpe/nfvd/auth/main/conf/module.properties
sed -i 's|nfvd.domain|nfvd|g' /opt/uoc2/jboss-eap-
6.4/modules/com/hpe/nfvd/auth/main/conf/module.properties
cat /opt/uoc2/jboss-eap-
6.4/modules/com/hpe/nfvd/auth/main/conf/module.properties
```

16. After the insertion, we need to restart the “nfvd_addon_services”.

```
/opt/uoc2/scripts/nfvd_addon_services restart
/opt/uoc2/scripts/nfvd_addon_services status
```

17. Once restarted, we will make four specific insertions in the “beans.xml” file.

```
sed -i 's|<class>com.hp.spain.nfvd.idm.service.decorator.OMIU|<!--
<class>com.hp.spain.nfvd.idm.service.decorator.OMIU|g'
/opt/HP/jboss/standalone/deployments/nfvd.ear/nfvd-modules-ext-2.0.0-
SNAPSHOT.jar/META-INF/beans.xml
sed -i
's|OMIProfileManagementServiceDecorator</class>|OMIProfileManagementServiceDec
orator</class>-->|g' /opt/HP/jboss/standalone/deployments/nfvd.ear/nfvd-
modules-ext-2.0.0-SNAPSHOT.jar/META-INF/beans.xml
sed -i 's|<alternat|<!--<alternat|g'
/opt/HP/jboss/standalone/deployments/nfvd.ear/nfvd-modules-ext-2.0.0-
SNAPSHOT.jar/META-INF/beans.xml
sed -i 's|</alternatives>|</alternatives>-->|g'
/opt/HP/jboss/standalone/deployments/nfvd.ear/nfvd-modules-ext-2.0.0-
SNAPSHOT.jar/META-INF/beans.xml

cat /opt/HP/jboss/standalone/deployments/nfvd.ear/nfvd-modules-ext-2.0.0-
SNAPSHOT.jar/META-INF/beans.xml
```

18. After the insertion we will edit the “standalone.xml”, in the path “/opt/uoc2/jboss-eap-6.4/standalone/configuration/standalone.xml”

```
vi /opt/uoc2/jboss-eap-6.4/standalone/configuration/standalone.xml
```

```
<config-property name="validationDN">
    DC=nfvd,DC=domain
</config-property>
<config-property name="securityCredentials">
   secret
</config-property>
```

We will assure that the “securityCredentials” has the value “secret”.

19. Once the file has been editted we will restart the LDAP services

```
service slapd restart
```

Chapter 2 Installing/Upgrading NFVD

2.1 Installing a new platform

This section only applies to an installation from scratch.
If you want to upgrade from a previous version, please refer to section 2.2 “Upgrading an existing platform” below

On: <INSTALLER_HOST>
Login: root

Copy NFVD installer in a repository directory (typical example: /kits/archives). Go to the directory where you copied the nfvd-installer-04.01.001-1.el6.noarch.rpm file and install it:

```
# rpm -ivh nfvd-installer-04.01.001-1.el6.noarch.rpm
```

Make sure that all required archives (see sections 1.2.1 and 1.2.2) are copied in the same directory (typical example: /kits/archives).

Execute the following command:

```
# /opt/HPE/nfvd/install/nfvd-install.sh /kits/archives
```

The installer automatically unpacks the necessary archives and will start asking some questions about the hostnames of the systems composing your platform, the discovery mode (use of OMi/uCMDB or not) and some Oracle DB and LDAP parameters. You will also have to enter the root password of each of your systems in order to configure the SSH access (required by the installer).

Once all data are entered, the installer asks: “*Do you want to continue with installation*”.

At this point, if you choose ‘*y*’, then the installer will continue with all default values for the ports, credentials, user names…
If you want to specify different values, refer to section 2.1.1 below in order to change some specific values.
When this is done, you can answer ‘y’ to resume the installation.

As soon as the installation is complete (it usually takes around 2 hours), please execute steps described in Chapter 3 “Post-installation steps”.

2.1.1 Filling in advanced NFVD configuration parameters

Skip this part if you plan to use the default values for the ports, credentials, user names…

On: <INSTALLER_HOST>
Login: root

Edit */var/opt/HPE/nfvd/install/NFVD_var* topology information file and update values between brackets with the topology information:

```
#########################################################
# GENERIC CONFIG
#########################################################
#-------------------------------------------------------
# Enter INSTALLER_HOST of NFV-D platform
# Typical example:
# INSTALLER_HOST=16.16.88.181
#-------------------------------------------------------
INSTALLER_HOST=<your installer host>

#########################################################
# DB configuration
```

```
#########################################################

#-------------------------------------------------------
# Enter DB HOST and DB NAME where Oracle DB is located
# Typical example:
# DB_HOST=16.16.88.181
# DB_SERVICE_NAME=XE
# DB_DATAFILES_PATH=/uoradata/oradata/XE
# ORACLE_ROOT_PWD=hwroot
# SYS_DB_USER=SYS
# SYS_DB_PWD=SYS
#-------------------------------------------------------

DB_HOST=<your DB host>
DB_SERVICE_NAME=<your DB name>
DB_DATAFILES_PATH=<your DB datafiles path>
ORACLE_ROOT_PWD=<your root password for DB VM>

SYS_DB_USER=<your SYS DB user>
SYS_DB_PWD=<your SYS DB pwd>

#########################################################
# FF configuration
#########################################################
#-------------------------------------------------------
# Enter FF HOST where FF is located
# Typical example:
# FF_HOST=16.16.88.181
# FF_ROOT_PWD=hwroot
#-------------------------------------------------------

FF_HOST=<your FF host>
FF_ROOT_PWD=<your FF root password>

#########################################################
# AA configuration
#########################################################
#-------------------------------------------------------
# Enter AA HOST where AA is located
# Typical example:
# AA_HOST=16.16.88.182
# AA_HOSTNAME=nfvdemo20
# AA_ROOT_PWD=hwroot
#-------------------------------------------------------

AA_HOST=<your AA host>
AA_HOSTNAME=<your AA hostname>
AA_ROOT_PWD=<your AA root password>

#########################################################
# GUI configuration
#########################################################
#-------------------------------------------------------
# Enter GUI HOST where GUI is located
# Typical example:
# GUI_HOST=16.16.88.200
# GUI_ROOT_PWD=hwroot
#-------------------------------------------------------

GUI_HOST=<your GUI host>
GUI_ROOT_PWD=<your GUI root password>

#########################################################
# DISCOVERY MODE
#########################################################
#-------------------------------------------------------
```

```
# Enter the Discovery mode
# TWO VALUES:
# OPENSTACK -> if you use Openstack for discovery
# HPSW -> if you use HP Software (cmdb, OMI)

DISCOVERY_MODE=OPENSTACK
```

Note: If you wish to perform advanced configuration by updating */var/opt/HPE/nfvd/install/repo_ansible/group_vars/all* file, contact NFVD Team.

2.2 Upgrading an existing platform

This section describes the procedure to upgrade from a previous version of NFVD (4.0.0 or 4.1) to 4.1.1.

On: <INSTALLER_HOST>
Login: root

Copy NFVD installer in a repository directory (typical example: /kits/archives). Go to the directory where you copied the nfvd-installer-04.01.001-1.el6.noarch.rpm file and install it:

```
# rpm -Uvh –force nfvd-installer-04.01.001-1.el6.noarch.rpm
```

Make sure that all required archives (see sections 1.2.1 and 1.2.2) are copied in the same directory (typical example: /kits/archives).

If the currently installed version has no customized Definitions or Components, please execute the following command:

```
# /opt/HPE/nfvd/install/nfvd-install.sh /kits/archives
```

If the currently installed version was customized with some specific Definitions or Components, please execute the following command:

```
# /opt/HPE/nfvd/install/nfvd-install.sh -c <custom_files_dir> /kits/archives
```

Where

<custom_files_dir> is a directory containing customized files (Components, Definitions, Instances) replacing files from the kits. The directory content must match the same structure as in /opt/OV/ServiceActivator/solutions/NFVModel/etc/LoadXML

The installer automatically unpacks the necessary archives and will start asking some questions about the hostnames of the systems composing your platform, the discovery mode (use of OMi/uCMDB or not) and some Oracle DB and LDAP parameters. You will also have to enter the root password of each of your systems in order to configure the SSH access (required by the installer).
All questions already asked by a previous installation will be automatically filled.

Once all data are entered, the installer asks: "*Do you want to continue with upgrade*".

At this point, if you choose '*y*', then the installer will continue with the upgrade

As soon as the installation is complete (it usually takes around 25 minutes), you are done!
You don't have to consider any step related to license installation (previous licenses are still valid) or post installation.

2.3 Troubleshooting Installation

On: <INSTALLER_HOST>
Login: root

In case of failure, the installer exits, displaying the messages explaining what caused trouble.

When the blocking problem is fixed, the installation or upgrade can be resumed by calling:

```
# /opt/HPE/nfvd/install/nfvd-install.sh /kits/archives
```

You will have to answer "*We have detected existing installation files .. Do you want to resume it?*".

The installer from there will explicitely skip all steps previously done, and resume work from only the last failing step.

A complete, detailed installer log is always available in */tmp/nfvd_install.log*, and the particular trace of the step that caused failure in */tmp/nfvd_install_last.log*

Chapter 3 Post-installation steps

You don't have to consider this chapter if you are upgrading from a previous version.

3.1 Install Commercial licenses

Refer to NFV Director Administration Guide, "NFVD Base Product licenses".

3.2 Integrating SiteScope with Assurance Gateway to enable KPI metrics collection

On: <AA_HOST>
Login: root

Note: This step can be ignored if NFVD monitoring feature is not required.

In order to enable KPI data collection from SiteScope, perform the following steps.

```
# cd /opt/HPE/nfvd/templates/bin
# ./dataintegration_tool_sitescope.sh -lwssopath <lwssofmconf.xml path> -host <Sitescope-
hostnameOrIP> -port <Sitescope-port> -uname <SitescopeAdminUsername> -pass
<SitescopeAdminPassword> -dname <diname> -url <agw_url> -tagname <tagname>
```

Typical example:

```
# cd /opt/HPE/nfvd/templates/bin/

# If Assurance Gateway in HTTP mode
# ./dataintegration_tool_sitescope.sh -lwssopath /var/opt/HPE/nfvd/conf/lwssofmconf.xml -
host localhost -port 18888 -uname admin -pass admin -dname DefaultSis-AGW-INTG -url
http://<AA_HOST>:18080/nfvd/kpimetrics -tagname NFVD

# If Assurance Gateway in HTTPS mode
# ./dataintegration_tool_sitescope.sh -lwssopath /var/opt/HPE/nfvd/conf/lwssofmconf.xml -
host localhost -port 18888 -uname admin -pass admin -dname DefaultSis-AGW-INTG -url
https://<AA_HOST>:18443/nfvd/kpimetrics -tagname NFVD
```

Once the above tool is executed successfully, the same can be verified or updated in SiteScope portal.

- Click on Preferences > Integration Preferences.
- A record by name '<diname>' will be created. Open the same.

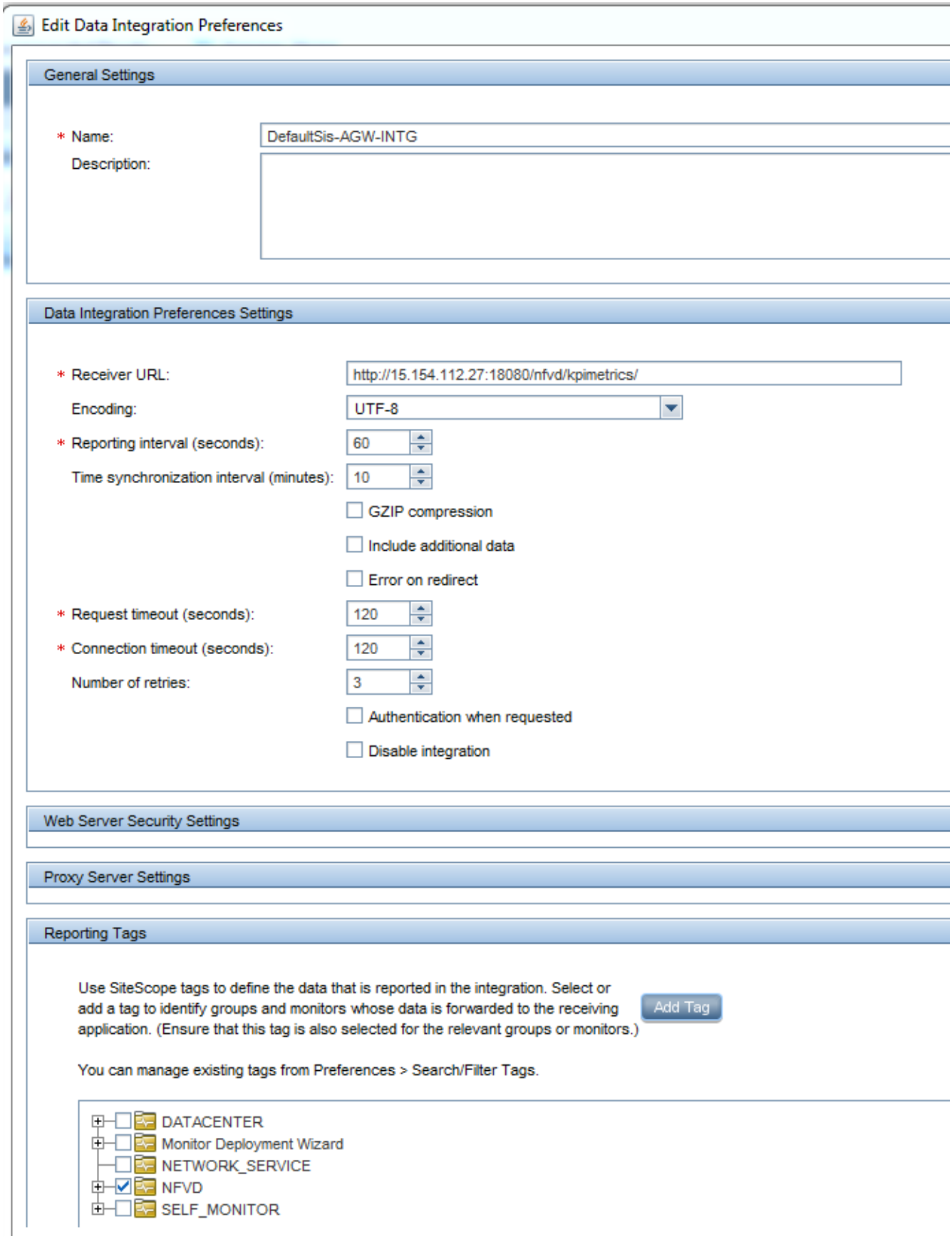


Figure 28 : SiteScope Data Integration Preferences

3.3 Configure the NFVD API to support https.

In this section we will expose how to configure the typical installation of NFV-Director solution to support https protocol, the configuration should take place in the machine were the solution is installed, in case the different functional parts of the solution were installed in more than one machine, this configuration should take place in the FullFillment machine.

We assume as starting point that:

- The user is using Red Hat 6.6.
- The user already have a certificate to use.
- The user already have a key to use.

The configuration steps are :

The user will locate the file "standalone.xml" in the following path:

```
/opt/HP/jboss/standalone/configuration/standalone.xml
```

Once we have the file located, we will edit the file adding the following lines:

<connector name="ajp" protocol="AJP/1.3" scheme="http" socket-binding="ajp"/>

Just under the line: <connector name="http" protocol="HTTP/1.1" scheme="http" socket-binding="http"/>

After we finish the edition of the file, we will save the file, and continue with the following steps:

- The user will restart the JBoss service using the following command:

```
service activator start
```

- Install apache server and mod_ssl using the command below:

```
Yum install httpd mod_ssl
```

- Place the certificate in the directory: ***/etc/pki/tls/certs***
  And the key in the folder: ***/etc/pki/tls/private*** **directories**
- Go to **/etc/httpd/conf.d/ssl.conf** and comment all the lines that are not commented between :
  "<VirtualHost _default_:443>"
  .....
  "</VirtualHost>"

Now we need to create a new file in the path : **/etc/httpd/conf.d** with following content, you should replace the text with <> with your own values, the key is assumed not to contain a passphrese.

```
<VirtualHost *:80>
    ServerName <Your server name>

    RewriteEngine On
    RewriteCond %{HTTPS} off
    RewriteRule ^ https://%{Your HTTP_HOST}%{Your REQUEST_URI}
</VirtualHost>

<VirtualHost *:443>
    SSLEngine on
    SSLProtocol all -SSLv2 -SSLv3

    ServerName <Your server name>
    SSLCertificateFile /etc/pki/tls/certs/<Your certificate>
    SSLCertificateKeyFile /etc/pki/tls/private/<Your Key>
    SSLCipherSuite DEFAULT:!EXP:!SSLv2:!DES:!IDEA:!SEED:+3DES

    ProxyRequests Off
    ProxyPreserveHost On
```

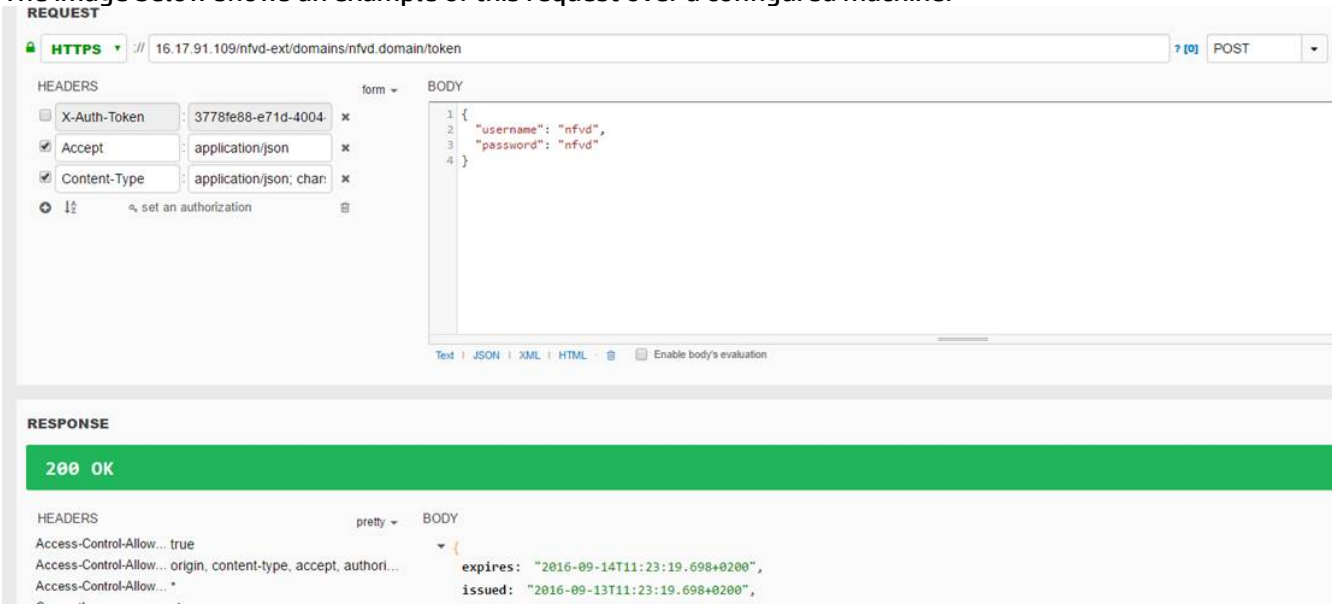
```
    ErrorLog /var/log/httpd/nfvd_error.log
    CustomLog /var/log/httpd/nfvd.log combined

    <Proxy *>
        Order deny,allow
        Allow from all
    </Proxy>

    ProxyPass / ajp://localhost:8009/
    ProxyPassReverse / ajp://localhost:8009/
</VirtualHost>
```

Once we have created and stored the file we will restart our Apache server:

```
service httpd restart
```

Once this configuration is finished, you should be able to do requests to:
https://<your_server_ip>/nfvd(-ext).

The image below shows an example of this request over a configured machine:



3.4 Installing certificate for Active Directory connection

On: <FF_HOST>
Login: root

When your LDAP Vendor is Active Directory, the default configuration uses a SSL connection (port 636) between NFVD and AD server.
In this case, you need to import into your NFVD VM the CA Certificate from your AD server.
Refer to section 1.3.5.2.5 “Importing certificate to JBoss VM.

Standard procedure to import the CA certificate is shown below:

```
/opt/java1.6/bin/keytool -importkeystore -srckeystore my_ca_cert.pfx -srcstoretype pkcs12 -destkeystore /opt/java1.6/jre/lib/security/cacerts -deststoretype JKS -noprompt
```

where:

/opt/java1.6	: path where your Java version is located
my_ca_cert.pfx	: file that contains the CA certificate from your AD server
/opt/java1.6/jre/lib/security/cacerts	: keystore where the CA cert will be sotred

Example output:

```
[root@my_vm ~]# /opt/java1.6/bin/keytool -importkeystore –srckeystore emea.local.pfx -srcstoretype pkcs12 -destkeystore /opt/java1.6/jre/lib/security/cacerts -deststoretype JKS –noprompt
Enter destination keystore password: changeit
Enter source keystore password: 1234
Entry for alias 6ff943a2-aa90-4fbc-84eb-c51d1325ed5f successfully imported.
Import command completed:  1 entries successfully imported, 0 entries failed or cancelled
```

Here,
+ "changeit" is the password for cacerts file in your VM
+ "1234" is the certificate file password

You can list all the imported CA Certs using the following command:

```
/opt/java1.6/jre/bin/keytool keytool -list -v -keystore /opt/java1.6/jre/lib/security/cacerts
```

It will show entries similar to this:

```
*******************************************
Alias name: 6ff943a2-aa90-4fbc-84eb-c51d1325ed5f
Creation date: Dec 22, 2015
Entry type: PrivateKeyEntry
Certificate chain length: 1
Certificate[1]:
-----BEGIN CERTIFICATE-----
MIIC+jCCAeKgAwIBAgIQJfbFmwaf44VPDNYayzzS8zANBgkqhkiG9w0BAQUFADAmMSQwIgYDVQQD
ExtXSU4tMUE3NlQ4SE01ODEudW5pY2EubG9jYWwwHhcNMTUxMjIyMTUyMjM5WhcNMTYxMjIyMDAw
MDAwWjAmMSQwIgYDVQQDExtXSU4tMUE3NlQ4SE01ODEudW5pY2EubG9jYWwwggEiMA0GCSqGSIb3
DQEBAQUAA4IBDwAwggEKAoIBAQDeEiQjZYTkVKKAE8UvTm0HaIgMKumm2HnoipfcuErIJ3VBlD3m
42k22QMXHgSW4w+2urZjYZtrbGs+d/wEcss7aFSo7/SU7DDl9h4ULgxQ3KSg8ozIg2q93X+oDkN0
AP4muhhw8hmstlVjgrpLy2HDBxVe8ruVwaWwCC04ebIOZFKFmdbjfYSJyMQX07tNLkS4jQ88+dTw
5reqZqfgFu2c45JWNOGBoYz9HTFg7UftWE3i5C5EoKA7qgpWwev/6ZKbbhh7EJfH6Xi300pEqdhB
8Q20x2VCZJ4GAP5/r483XE21sXfKPbgRgeK24XHQhHonJc9yMsa5m/e/Og/1muMXAgMBAAGjJD
Ai
```

```
MAsGA1UdDwQEAwIEMDATBgNVHSUEDDAKBggrBgEFBQcDATANBgkqhkiG9w0BAQUFAAOCAQ
EADmyb
MBQR7+sn0lpcOy4J/jJr4TBMfhxeIZ5rjUD3mtGfhCqzVP9xuYycBKPDTovPTi8xW9JZzOWOl8D3
tHBZWRDRciyfyD8uFOc6YotVaWM5Ql410hQ2uxNx6pS0z6+xdccSjjzAbTo3lUSADtm/VSv9YIb3
0HqTS4wgI4rzpBTmLyZiEb891COEO98LWQ28pByyyp2PzIN3te75BlRr2lN70otx57+TsLOuh0P9
bIBmfLBZwCIEHhhD9YzwlHW40HCMf68xav7iYVvelykIe+K8hTcbS7OBiQ7x2gXxfai2PsKX9hLf
tNoec5rJtwtFMd3l50WR55T5+scqUeU3nQ==
-----END CERTIFICATE-----
**********
```

- Stop and restart Fulfillment host.

Note: Refer to NFV Director Administration Guide *"Administering NFVD"* for full description of steps to start, stop and check status of NFVD components.

3.5 Configuring NFVD domain user

On: <FF_HOST>
Login: root

As a starting point to log into the UI, you need to create a User at Domain level
Execute the following command to create a domain user called 'nfvd' (with password Welcome2016!)

```
# /opt/OV/ServiceActivator/solutions/NFVModel/etc/scripts/nfvd_createUser.sh -d
<NFVD_DOMAIN_NAME> -e <NFVD_DOMAIN_USER_EMAIL> <NFVD_DOMAIN_USER>

Typical Example:

# /opt/OV/ServiceActivator/solutions/NFVModel/etc/scripts/nfvd_createUser.sh -d
nfvd.domain -e localuser@localhost.localdomain nfvd
```

3.6 Verifying NFVD installation

3.6.1 Access from NFVD GUI

http://<GUI_HOST>:3000/login
(Typical example: http://16.16.88.200:3000/login)

Login: <NFVD Domain User> / <Password NFVD Domain User>
(Typical example: nfvd/Welcome2016!)

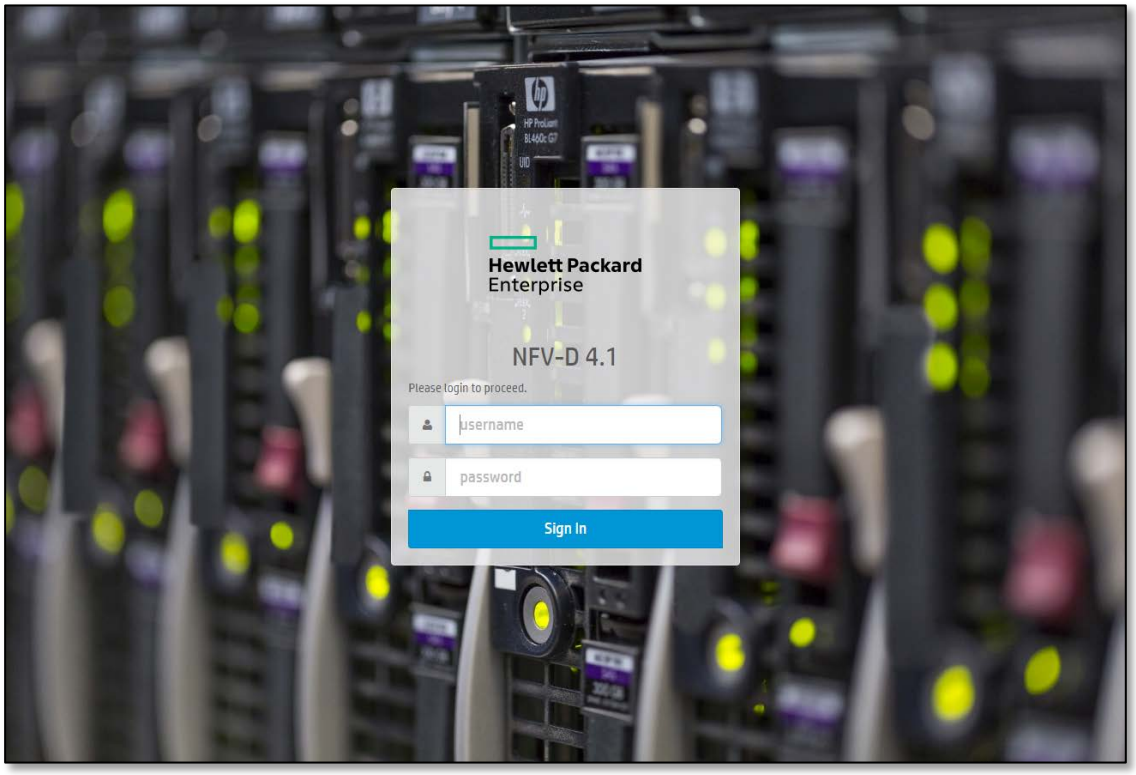


Figure 29 : UI portal

Once logged on, the workspaces available for NFVD Domain user profile are displayed.

3.6.2 Verifying objects synchronization of NFVD

http://<AA_HOST>:7474/webadmin

(typical example: http://16.16.88.200:7474/webadmin)

NFVD components store persistent objects as follows:

- In Oracle database for NFVD Fulfillment component.
- In Neo4J database for NFVD Assurance component.

The run-time objects synchronization process between NFVD Fulfillment and Assurance components is automatically triggered when the Assurance Gateway is started. In order to verify successful completion of synchronization process, Neo4J database content can be checked:
If the number of nodes, properties and relationships is higher than 1, synchronization was successfully done.

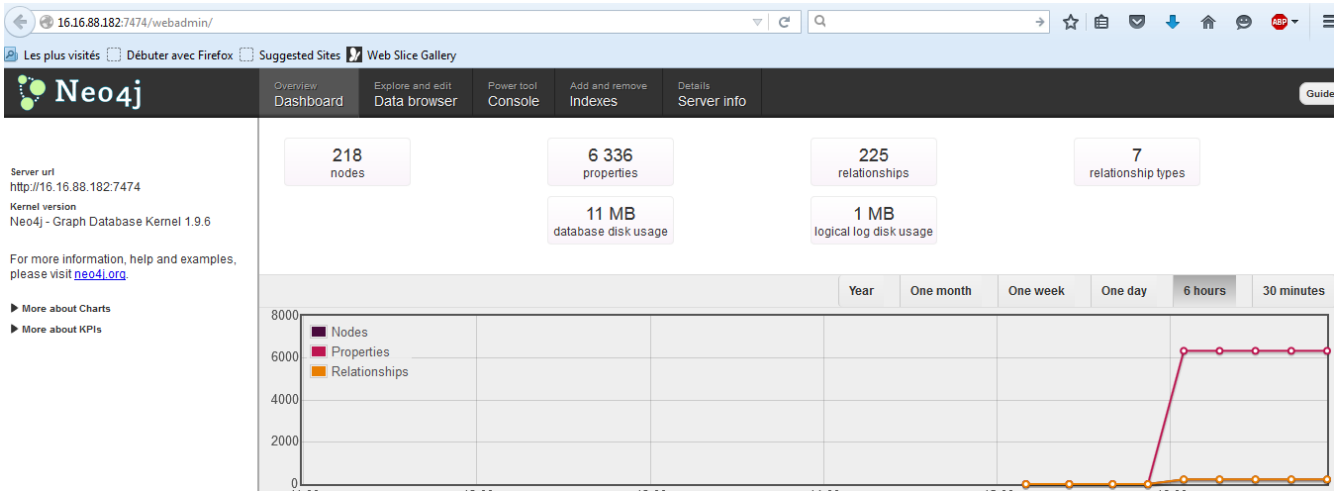


Figure 30 : Neo4J after synchronization

Check also JBOSS log files on Fulfillment host:

On: <FF_HOST> **Login:** root

- Check */opt/HP/jboss/standalone/log/nfvd.log* file for following entry:

```
Element for synchornize:0
```

3.6.3 Verify Assurance component configurations

On: <AA_HOST> **Login:** root

- Run the following tool to verify the various configurations of Assurance components.

```
/opt/HPE/nfvd/bin/config_checker.sh –m <Assurance_protocol_name>

(typical example: /opt/HPE/nfvd/bin/config_checker.sh -m http)
```

If there is a wrong configuration on certain component, they will be marked as 'Failure'.
Details of the tool log can be obtained from /tmp/config_check.log file.

If this last checking is OK, then:

CONGRATULATIONS, YOU HAVE SUCCESSFULLY INSTALLED AND CONFIGURED NFVD !!!

Note: It is recommended to backup NFVD at that step.

Typical next step is to integrate NFVD with an infrastructure/VIM (refer to "VIM Integration Guide" document for more details).