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# HP NFV Director



**HP NFV Director**

**Version 1.0**

**Release Notes**

**Edition: 1.1**

**For Linux (RHEL 6.4) Operating System**

**September 2014**

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# Preface

These Release Notes describe critical information related to the HP NFV Director V1.0 on RHEL 6.4 .

## Note

Read this document before installing or using this software.

## Audience

Here are some recommendations based on possible reader profiles:

- Solution Developers
- Software Development Engineers

## Software Versions

The software versions referred to in this document are as follows:

Product Version	Supported Operating systems
HP NFV Director Server 1.0	RedHat Enterprise Linux Server Release RHEL 6.4

Table 1: Software versions

## Associated Documents

- *HP NFV Director Installation Guide v1.1*
- *HP NFV Director User Guide v1.1*
- *HP NFV Director Integration Guide v1.1*
- *HP UCA Automation V1.0 - Installation Guide*
- *OSS Open Mediation V620L01 Installation and Configuration Guide*
- *OM Generic SNMP CA Installation and Configuration Guide*
- *OM HP SiteScope Customization for Generic SNMP CA Installation and Configuration Guide*
- *OM HP VMWare ESXi Customization for Generic SNMP CA Installation and Configuration Guide*
- *HP SiteScope Deployment Guide 11.23*
- *HP Service Activator Installation Guide*

## Typographical Conventions

*Courier Font:*

- Source code and examples of file contents.
- Commands that you enter on the screen.
- Pathnames
- Keyboard key names

*Italic Text:*

- Filenames, programs and parameters.
- The names of other documents referenced in this manual.

**Bold Text:**

- To introduce new terms and to emphasize important words.

## Support

Visit our HP Software Support Online Web site at [www.hp.com/go/hpsoftwaresupport](http://www.hp.com/go/hpsoftwaresupport) for contact information, and details about HP Software products, services, and support.

The Software support area of the Software Web site includes the following:

- Downloadable documentation.
- Troubleshooting information.
- Patches and updates.
- Problem reporting.
- Training information.
- Support program information.

## Features

HP NFV Director provides a common point to ensure consistent management and behavior of VNFs, regardless of the vendor, enabling each VNF to efficiently run on heterogeneous hardware platforms and virtualization environments. The NFV Director automatically manages the end-to-end services across VNF, and network services (NS).

The NFV Director is designed to meet the evolving ETSI specifications for the NFV orchestrator. This orchestrator manages and orchestrates virtual network functions and network services, thus providing a global resource management, and consistently applies global, cross-VNF, and VNF-specific policies.

### 1.1 NFV configuration

- Supports deploying VNF and NS including PNF interaction with custom extensions.
- Supports VNF and NS Descriptor by using internal OpenXML-based format.
- Supports versioning of NS and VNF—Defined using extensible model with a rich set of pre-defined objects and relationships that can be extended.
- Provides OpenXML-based NS Descriptor that is extensible to support other formats, such as TOSCA.
- Manages NS lifecycle, NS creation, tearing down instances and interaction.
- Supports affinity rules (must, must not) on VNF placement—Extensible to support other policies and policies on other objects.
- Supports multiple versions of the same VNF—Extensible to automatically update existing instances.

### 1.2 NFV monitoring

This module provides the following features:

- Automatic monitoring of NS, VNFs, and NFV computes infrastructure with correlation across end-to-end NFV topology.
- Automation rules for actions such as scale-in, scale-out, scale-up, and scale-down.
- Configurable and extensible set of pre-defined monitoring templates.
- Extensible to monitor virtual and physical network infrastructure.
- Easy to add or customize monitoring of any SNMP source.
- Extensible complex monitoring rules and thresholds.



## 1.3 VIM related features

VIM supports the following features:

- Support for OpenStack Havana and others on demand.
- No limitation in terms of number and size of datacenters.
- Affinity rules through the use of resource pools.
- Ability to orchestrate WAN and servers that are not under VIM control.
- Multi-vendor, multi-type VIM through plug-in adaptors. The adaptors can augment VIM capabilities.
- Support for unlimited number of VIMs and underlying virtual resources like VMs and can be from different vendors or of different types.

## 1.4 VNF Manager

The following features are supported by VNF Manager.

- Provide VNF manager feature or work with external VNFM.
- Embedded VNFM can be extended and configured to automate actions.
- Support for direct (VNFM-VIM) and indirect (NFVO as VIM proxy) interaction model with external VNF managers.
- VIM proxy mode model—NFV Director acts as proxy between VNFM and VIM, allowing greater control.
- Extensible to include VNFM-VIM direct model—The NFV Director grants VNFM permission to use resources. VNFM is responsible for directly interacting with the VIM.
- No industry standards are available for VNFM-NFVO interfaces. Hence, integration might require on-demand creation of a VNFM adaptor.
- Hides multiple VIM and VIM interfaces behind a VIM proxy.
- Exposes OpenStack API to VNF Managers for VNF configuration.

## 1.5 Event correlation and autonomous action

The event correlation and autonomous action supports the following features:

- Extensible to correlate events from different sources (VNFM, EMS, Physical resources) and take Automatic actions.
- Configurable simple automated actions (like scale-out if CPU > 80).
- Extensible more complex physical-to-virtual topology-based automated actions.

## 1.6 General

- Simple Pay as you grow model with very low entry price for PoC.
- Carrier-grade
- Scalability—HA and geo-redundant configurations are possible
- Northbound APIs allow Integration with existing OSS.

# Requirements

This chapter provides hardware and software requirements for installing the NFV Director.

### Note

- Single-server setup is recommended only for POC and development environment.
- Distributed setup is recommended for pre-production and production.
- NFV Director can also be installed in multiple distribution modes with products installed in multiple combinations in different systems/VMs.

NFV Director is a Virtual Network function that has several VNF components to perform different functions.

Some of the components work on scale using a particular schema and the others use a different one (depending on the particular needs of each component).

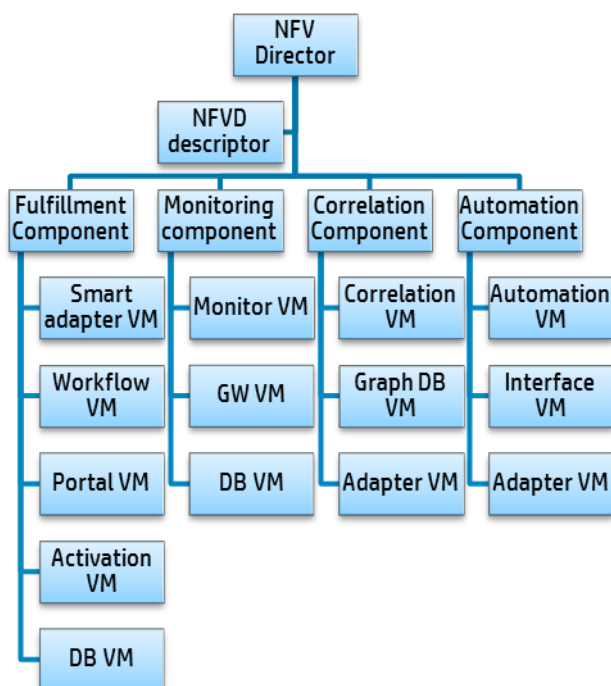


Figure 1: Components of NFV Director

## 2.1 NFVD Fulfillment

### 2.1.1 Hardware Requirements

#### 2.1.1.1 Single server setup

The system must meet the following minimum requirements.

- x86-64 platform
- Red Hat Enterprise Linux 6.4
- The database system requires space for Oracle or Postgres plus Advanced Server database instance of at least 2 GB for Service Activator data.

Components	OS	DB	Server	Core	RAM (in GB)	Disk Space (in GB)
HPSA 6.2  EP 6.2 + WSC  NFV Director Fulfillment	REDHAT 6.4		VM1 or Blade 1	4 (better 8)	8 (better 16)	140 (better 300)
Fulfillment Database	REDHAT 6.4	Oracle/PPAS				

**Table 2: Minimum fulfillment setup hardware recommendation**

The disk space requirements listed in this table are the minimum requirements for the Service Activator and NFVD-Fulfillment. Additional disk space might be required for Oracle/Postgres and Java JDK. To determine minimum disk space requirements for each application, see the respective product documentation.

#### 2.1.1.2 Distributed Server Setup

The specific hardware requirements might vary based on the sizing requirements. The system must meet the following recommended requirements:

- x86-64 platform
- Red Hat Enterprise Linux 6.4
- The database system requires room for an Oracle or Postgres Plus Advanced Server data-base instance of at least 20 GB for Service Activator data.

Components	OS	DB	Server	Core	RAM (in GB)	Disk Space (in GB)
Fulfillment FrontEnd	RedHat 6.4		VM1	8	128	320
Northbound Adapters	RedHat 6.4		VM2	8	128	320
Fulfillment Automation	RedHat 6.4		VM3	8	128	320
Southbound Adapters	RedHat 6.4		VM4	8	128	320
Fulfillment Database	RedHat 6.4	Oracle/PPAS	VM6	16	256	2000

**Table 3: Fulfillment distributed setup hardware recommendation**

## 2.1.2 Software Requirements

The following table lists the various software components required for NFVD fulfillment.

Product	Version	Remark
HP Service Activator	V62-1A	+ Patch V62-1A-2
HP Service Activator Extension Pack	6.1	+ Hotfix EP6.1-1
Java	SE 6 update 37 JDK or later	Do not use JDK version 7
RHEL	6.4	And all available patches
Oracle database	11g	Either Oracle DB or PPAS
PPAS database	9.2	Either Oracle DB or PPAS

**Table 4: NFVD Fulfillment Software requirements**

### 2.1.2.1 Software Licensing

Each software mentioned in the *Software Requirements* section should have license. For applying licenses, refer to the individual product installation guides.

## 2.2 NFVD Assurance

### 2.2.1 Hardware Requirements

#### 2.2.1.1 Single Server Setup

If all the components of NFVD-Assurance are installed on the same system, the system must meet the following minimum requirements.

- x86-64 platform
- RedHat Enterprise Linux 6.4

Components	OS	DB	Server	Core	RAM (in GB)	Disk Space (in GB)
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Components	OS	DB	Server	Core	RAM (in GB)	Disk Space (in GB)
Monitoring (SiteScope 11.23)	Embedded		VM2	4 (better 8)	16	146 (better 300)
Monitoring Database (metrics DB)	Embedded	Embedded				
Correlation and Automation Engine	Embedded	Oracle/PPAS				
Correlation Database	Embedded	GRAPH DB				
		Embedded				

**Table 5: Assurance single server hardware recommendations**

### 2.2.1.2 Distributed server setup

If different components of NFVD-Assurance are installed on disparate systems, refer to the following subsections for individual system requirements.

Components	OS	DB	Server	Core	RAM (in GB)	Disk Space
Assurance Gateway	Red Hat 6.4		VM1	8	128	320 GB
Monitoring (SiteScope)	Red Hat 6.4		VM2	8	128	320 GB
Monitoring Database	Red Hat 6.4		VM3	16	256	2TB
Correlation Engine	Red Hat 6.4		VM4	8	128	320 GB
Automation Engine	Red Hat 6.4	Oracle/PPAS	VM5	8	128	320 GB
Correlation Database	Red Hat 6.4	GRAPH DB	VM6	16	256	2TB
HPSA 6.2	Red Hat 6.4		VM7	8	128	320
Automation HPSA Database	Red Hat.4	Oracle/PPAS	VM8	8	128	320

**Table 6: Assurance distributed server hardware recommendations**

## 2.2.2 Software requirements

The following tables list the various software components required for NFVD Assurance.

Product	Version	Remark
Assurance Gateway	V1.0	Uses JBoss 7.1.3
Java	SE 6 update 37 JDK or later	Do not use JDK version 7.
RHEL	6.4	With all available patches

**Table 7: NFVD Assurance Gateway Software Components**

Product	Version	Remark
HP UCA for EBC	V3.0	+ Patch UCAEBC30SRVLIN_00006
HP UCA for EBC Topology Extension	V3.0	+ Patch UCAEBC30TOPOLIN_00001
HP UCA Automation Console	V1.0-REV A	+ Patch EBCATMLIN_00001
HP Service Activator	V62-1A	+ Patch V62-1A-2
Oracle database	11g	Either Oracle DB or PPAS
PPAS database	9.2	Either Oracle DB or PPAS
OSS Open Mediation and CA		See <a href="#">Table 9: Open Mediation and Channel Adapters</a> .
Java		See <a href="#">Table 7: NFVD Assurance Gateway Software Components</a> .
RHEL		See <a href="#">Table 7: NFVD Assurance Gateway Software Components</a> .

**Table 8: HP UCA Automation Software Components**

Product	Version	Remark
OSS Open Mediation	V620-01	+ Patch OSSOPENMEDIATIONLNKX_00002
UCA EBC Channel Adapter	V3.0	
UCA HPSA Channel Adapter	V1.0	
UCA Autoconsole Channel Adapter	V1.0	
Generic SNMP CA	V1.0	
SiteScope Customization for Generic SNMP CA	V1.0	
VMWare ESXi Customization for Generic SNMP CA	V1.0	
RHEL		See <a href="#">Table 7: NFVD Assurance Gateway Software Components</a> .

**Table 9: Open Mediation and Channel Adapters**

Product	Version	Remark
SiteScope	11.23	+ Patch Sitescope11.23_00276

**Table 10: SiteScope Software Components**

### 2.2.2.1 Software licensing

Each software mentioned in the *Software Requirements* section should have license. For applying licenses, refer to the individual product installation guides.

#### Note

Assurance Gateway product does not require a license.

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## 2.3 Virtual infrastructure manager and hypervisors

The NFV Director supports through a plug-in extension, any type of VIM and even direct connectivity to hypervisor, although the preferred way (provided out-of-the-box) are any OpenStack VIM.

The NFV Director provides an OpenStack southbound interface (Havana v2 version) that can interface any VIM for supporting that interface.

The NFV director is out-of-the-box multi VIM and selects the VIM depending on the server the VM has been assigned to.

Following Virtual infrastructure Manager and hypervisors are supported:

- HP Cloud System (v8)
- OpenStack (Havana release)

## Chapter 3

### Known problems

The following problems are found in this release.

CR ID	Component	Description	Workaround
59	Fulfillment	When uploading artifact definitions XML from GUI, an error message appears even when the artifact definition is successfully uploaded.	Ignore the error message.
161	Assurance	Scale-in operation leaves an artifactId group in SiteScope GUI.	Ignore it as it does not have any impact on the functionality.
162	Fulfillment	Artifact Instance tree does not refresh automatically after a scale-in operation.	Refresh the tree manually.
205	Fulfillment	Sometimes, the Inventory tree displays the following error message: <code>Tree cannot be refreshed.</code>  This error is a database error from HPSA.	Re-open that specific view.

**Table 11: Known Problems in NFVD 1.0**



## Chapter 4

### Known limitations

The following limitations are found in this release.

Component	Description
Fulfillment	<p>Affinity policies</p> <p>Several affinity policies can be applied to different ASSIGNMENT_RELATIONSHIP artifacts, which contain different artifact targets. If several affinity policies are applied to the same artifact, only the first policy is processed and applied, and the rest of the policies are ignored.</p>
Fulfillment	<p>Anti affinity policies</p> <p>Anti affinity policies are not implemented. The NFV director relays the anti-affinity rules configured on the VIM.</p>
Fulfillment	<p>Relationships Types</p> <p>As all relationships are stored in the same database table (when using a database as storage mechanism), create your queries by using type or ID (PK) as filters. The tables are partitioned using type. Hence, filtering using a type is similar to querying only a table with the data of that type and not all the relationships in the system.</p>
Fulfillment	<p>Validation Policies</p> <p>Each policy validates and if any validation fails, creation fails and only a database rollback is performed.</p>
Fulfillment	<p>Assignment Values Policies</p> <p>Each policy assigns values and the last one executed overrides all previous ones, if they interact with the same data.</p>
Fulfillment	<p>Creation from template</p> <p>When a VNF is created from a template, it stores the template ID (in an internal field) that is used. If the creations were triggered from the end to end, the creation stores the assignment tree and the resource tree that were used as well (these IDs are stored in a special category). The assignment tree and the resource tree used are stored only for the VNF artifact.</p>
Fulfillment	<p>Scale in/out operations</p> <p>When a scale in/out operation is called, it needs an assignment tree and a resource tree. If the operation is called without parameters, it tries to find those IDs on a special category. This category exists only for the VNF artifact. The operation fails if those parameters are not passed or not found.</p>

Component	Description
Fulfillment	<p>Scale out</p> <p>When the scale in workflow is called, it tries to scale as many elements as it can. If any element tries to scale above the maximum limit, it does not scale. However, the workflow continues scaling other components and displays a warning.</p> <p>For example, consider a scenario where 2 virtual machine VNF starting as:</p> <p>VM1 = 1 instance, VM2 = 1 instance, where</p> <p>VM1 default=1, scale out=5, max= 2,</p> <p>VM2 default=1, scale out=5, max= 10</p> <p>If it tries to scale, the result is VM1 = 1, instance VM2 = 6 instance 1, because VM1 cannot scale above the maximum and VM2 can.</p>
Fulfillment	<p>Scale in</p> <p>When scale in workflow is called, it tries to scale as many elements as it can. If any element tries to scale below the minimum, it does not scale. However, the workflow continues scaling other components and displays a warning.</p> <p>For example, consider a scenario where a 2 Virtual machine VNF starting as:</p> <p>VM1 = 5 instance, VM2 = 5 instance, where</p> <p>VM1 default=5, scale in=5, min= 2,</p> <p>VM2 default=5, scale in=1, min= 1</p> <p>If it tries to scale, the result is VM1 = 5 instance, VM2 = 4 instance 1, because VM1 cannot scale below the minimum and VM2 can.</p>
Fulfillment	<p>End-to-end creation failure</p> <p>If an end-to-end process needs to create multiple VMs of a VNF, the process iterates and tries to create as many VMs as possible, deploying and starting the corresponding monitors after creating the VM.</p> <p>If any deploying or starting the monitor fails, the workflow returns and shows a warning. However, it continues with the VM creation.</p> <p>This results in having some VMs created without the associated monitoring. The user has to manually deploy and/or start the Monitoring for a VM using Monitoring Web Service calls.</p>
Fulfillment	<p>Activation</p> <p>When an instance is being activated, only the VMs are created. These VMs are attached to a network that already exists on the VIM. The VMs that are in instantiated status are the ones that are activated.</p>
Fulfillment	<p>De-Activation</p> <p>When an instance is being de-activated, only the VMs are deleted. VMs that are in a status other than instantiated are de-activated.</p>
Fulfillment	<p>Over-subscription</p> <p>Over-subscription counts only the number of relationships of the ALLOCATED type. Other types of relationships are not considered.</p>

Component	Description
Fulfillment	<p>Start/stop operation</p> <p>These operations are applicable only to the VMs in this version.</p> <p>The start/stop operation is an atomic task that does not inform the Assurance component to stop or undeploy a monitor.</p> <p>Hence, if a VM is manually stopped and the action is not coordinated, the monitor might be active on the SiteScope and the VM stopped.</p>
	<p>Delete operation</p> <p>If a delete VNF operation is triggered, the operation is performed in the reverse order. The operation starts with de-activating the instance on the VIM, undeploying it, and deleting from DB.</p> <p>If an error occurs when trying to undeploy a monitor due to loss of connectivity or other issues, the virtual machine is deleted from the VIM and the monitor is retained. In the inventory, the VM is shown as active with a deployed monitor. Alarms might be generated showing that VMs are not working as it was deleted. These alarms might be generated if the racing condition matches the deletion of VMs. Before you undeploy or stop the monitor, the monitor tries to determine the status for potentially triggering a non-desirable scale-in or scale-out operation.</p>
Assurance	OpenStack Memory Monitor does not show any memory_usage data.
Assurance	Column names are lost when you move to subsequent pages in UCA Automation Console UI.
Fulfillment	Password is not encrypted in the configuration files.
Assurance	Implement authentication in the web service exposed by Assurance Gateway.
Assurance	Password is not encrypted in the configuration files for Assurance.
Assurance	SiteScope metrics DB script does not support Oracle driver.
Assurance	Error messages should be propagated properly in the responses.
Fulfillment	Many debug messages are in Spanish. The messages should be changed to English for easy debugging.
Fulfillment	During Orchestration, it displays the following error message: <code>Got WfException while invoking EndHandler.</code>
Assurance	When deleting artifacts, the artifacts are always being queried in the graphDB; the artifacts/nodes are not found in the cache.
Fulfillment	VM artifacts are created in Fulfillment and Assurance even when the VM is not created or VM is created in an error state on OpenStack.
Fulfillment	Monitor deployment and activation fail while scaling out VM in VNF from UI when a SiteScope is down.
Fulfillment	Scale-up and scale-down operations are not happening on CS8 and OpenStack.
Fulfillment	Scale-out operation does not return status as unable to scale out when maximum limit is reached as per policy-EnityRange
Assurance	If monitor deployment fails, error message is not displayed to Fulfillment from Assurance gateway.

Component	Description
Fulfillment	<p>If an end-to-end process should delete multiple VMs of a VNF, it iterates and tries to delete the VMs, undeploying and stopping the corresponding monitors after deleting the VMs.</p> <p>If undeploying or stopping any of the monitors fails, the workflow returns an error, it stops, and more VMs are not deleted. This results in some VM not getting deleted and the user has to manually invoke from GUI Delete VM operation.</p>
Fulfillment	<p>Scale up/down</p> <p>These operations affect the database and hence do not increase or decrease the virtual machine resources at the VIM level.</p>
Fulfillment	<p>Rollback</p> <p>The rollback capabilities are limited in this release.</p> <p>For example, if deleting a VNF fails when the system is running, it does not re-create the already deleted VMs. This functioning is the same in case of creating VNFs. If some action fails, it stops creating but does not delete the already created ones.</p>
Fulfillment	<p>Synchronize with Assurance modules</p> <p>In this release, integration with assurance modules is lightly coupled. If fulfillment module creates a VNF instance or a monitor instance on its database, the module notifies the assurance. However, if the notification fails due to loss of connectivity or some other issue, the fulfillment module continues to create VNF and virtual machines.</p>
Fulfillment	<p>Warning messages</p> <p>In this release, warning messages on some GUI operations are not available. You can use the equivalent Northbound operation to get more information about the errors. You can customize the logs as well.</p>
Assurance	<p>End-to-end support for physical server monitoring in Fulfillment is not available in this release.</p>

**Table 12: Known Limitations in NFVD 1.0**