Cisco Ultra Services Platform Deployment Automation Guide, Release 6.0

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CONTENTS

PREFACE

About this Guide xi

Conventions Used xi

Obtaining Documentation xii

Contacting Customer Support xii

CHAPTER 1

Ultra Services Platform (USP) Introduction 1

USP Introduction 1

USP Architecture 2

USP VNF Architecture 3

Ultra Element Manager (UEM) 3

Life Cycle Manager 5

Service Configuration Manager 6

Service Level Agreement Manager 6

Control Function 8

Service Function 9

Network Function 11

Application Function 12

USP VNF Types 13

Ultra Gateway Platform 13

Ultra Service Framework 14

Ultra Automation Services 14

AutoIT 15

AutoDeploy 17

AutoVNF 18

Ultra Web Services 20

USP VNF Component Redundancy and Availability 21

Platform Requirements 21
UEM Redundancy 21
CF Redundancy 22
SF Redundancy 22
NF Redundancy 23
AF Redundancy 23
Ultra Service Component (USC) Redundancy 23
ICSR Support 23

CHAPTER 2 **USP Installation Prerequisites** 25
Ultra M Deployments Using UAS 25
Virtual Machine Recommendations 25
Software Requirements 26
Hardware Requirements 26
Server Functions and Quantities 26
Password Requirements and Login Security 27
VNF Deployments Using AutoVNF 28
Virtual Machine Recommendations 28
Software Requirements 28
Hardware Requirements 29
Server Functions and Quantities 29
Network Requirements 30
Password Requirements and Login Security 31

CHAPTER 3 **Deploying Hyper-Converged Ultra M Models Using UAS** 33
Virtual Infrastructure Manager Installation Automation 33
Introduction 33
VIM Installation Automation Overview 34
Pre-Virtual Infrastructure Manager Installation Verification 35
Install the VIM Orchestrator 36
Install and Configure RHEL 36
Onboard the USP ISO 42
Extract the UAS Bundle 44
Deploy AutoIT 45

Deploy AutoDeploy 47
Prepare the VIM Orchestrator and VIM Configuration File 50
Activate the VIM Orchestrator and VIM Deployment 51
VNF Deployment Automation 52
VNF Deployment Automation Overview 52
Pre-VNF Installation Verification 54
Deploy the USP-based VNF 55
Configure VIM Tenants 55
Configure OpenStack Prerequisites 56
Configure the VNF Rack and the VNF Descriptors 58
Configuring Fully-Defined VM Names for ESC 61

CHAPTER 4 **Deploying VNFs Using AutoVNF 63**
Introduction 63
VNF Deployment Automation Overview 63
Pre-VNF Installation Verification 65
Deploy the USP-based VNF 66
Onboard the USP ISO 66
Extract the UAS Bundle 67
Extract the UEM VM Image 68
Extract the UGP VM Image 69
Upload the USP VM Images to Glance 70
Deploy the AutoVNF VM 71
Activate the AutoVNF Configuration Files 74
Upgrading/Redeploying the Stand-alone AutoVNF VM Instance 76

CHAPTER 5 **VNF Upgrade/Redeployment Automation 77**
Upgrading/Redeploying VNFs for Hyper-Converged Ultra M Model 77
Upgrade/Redeploy Your VNF 77
Upgrading/Redeploying VNFs Deployed Through a Stand-alone AutoVNF Instance 80
Upgrade/Redeploy Your VNF 80
Manually Applying Patch Upgrades to the UEM 82

CHAPTER 6 **UAS Upgrade and Redeployment Operations 87**

Overview 87
Upgrading/Redeploying AutoVNF (Including VNFM) 87
Upgrading/Redeploying AutoDeploy 90

CHAPTER 7 **Post Deployment Operations 91**
Deactivating the USP Deployment 91
Terminating the AutoDeploy VM 92
Terminating the AutoIT VM 92
Deploy and Undeploy the Card with the NCS CLI 93
Monitoring and Troubleshooting the Deployment 94
Pre-Deactivation/Post-Activation Health Check Summary 94
Checking OSP-D Server Health 95
Viewing Stack Status 95
Viewing the Bare Metal Node List 95
Viewing the OpenStack Server List 96
Viewing the OpenStack Stack Resource List 97
Verifying Node Reachability 98
Verify NTP is running 98
Checking OSP-D Server Health 100
Verifying VM and Other Service Status and Quotas 100
Checking Cinder Type 102
Checking Core Project (Tenant) and User Core 102
Checking Nova/Neutron Security Groups 104
Checking Tenant Project Default Quotas 109
Checking the Nova Hypervisor List 111
Checking the Router Main Configuration 111
Checking the External Network Using the core-project-id 113
Checking the Staging Network Configuration 114
Checking the DI-Internal and Service Network Configurations 115
Checking the Flavor List 117
Checking Host Aggregate and Availability Zone Configuration 117
Checking Controller Server Health 118
Checking the Pacemaker Cluster Stack (PCS) Status 118
Checking Ceph Storage Status 119

Checking Controller Node Services 120
Check the RabbitMQ Database Status 121
Checking OSD Compute Server Health 121
Checking Ceph Status 121
Checking OSD Compute Node Services 122
Monitoring AutoDeploy Operations 122
Viewing AutoDeploy Logs 122
AutoDeploy Transaction Logs 123
Checking AutoDeploy Processes 126
Determining the Running AutoDeploy Version 126
Monitoring AutoIT Operations 126
Viewing AutoIT Logs 127
Viewing AutoIT Operational Data 131
Checking AutoIT Processes 131
Monitoring AutoVNF Operations 131
Viewing AutoVNF Logs 132
General AutoVNF Logs 132
AutoVNF Transaction Logs 132
AutoVNF Event Logs 133
Viewing AutoVNF Operational Data 137
Example show confd-state Command Output 139
Example show confd-state ha Command Output 139
Example show log Command Output 139
Example show running-config Command Output 140
Example show uas Command Output 141
Example show vnfr Command Output 142
Example show vnf-packager Command Output 146
Monitoring VNFM Operations 148
Viewing ESC Status 148
Monitoring StatusThrough the ESC Command Line 148
Monitoring Status Through an AutoVNF API 148
Viewing ESC Health 149
Viewing ESC Logs 149
ESC Logs 150

ESC YANG Logs 151
Monitoring VNF Operations 151
Viewing UEM Service Status 151
Viewing UEM Logs 152
Viewing UEM Zookeeper Logs 153
Viewing VNF Information through the Control Function 153
Monitoring and Recovering AutoVNF Through AutoIT 154
Monitoring and Recovering VNFC Through AutoVNF 156
Troubleshooting Deactivation Process and Issues 158
Deactivation Fails Due to Communication Errors with AutoVNF 158
Deactivation Fails Because AutoDeploy Generates an Exception 159
Deactivation Fails Because of AutoVNF-VNFM Communication Issues 160
Deactivation Fails Because of Issue at VNFM 160
Deactivation Fails Because AutoVNF Generates an Exception 161
Troubleshooting UEM Issues 162
UEM VM Stuck in a Boot Loop 162

APPENDIX A **boot_uas.py Help** 167

APPENDIX B **Sample VIM Orchestrator and VIM Configuration File** 171

APPENDIX C **Sample Tenant Configuration File** 175

APPENDIX D **Sample VNF Rack and VNF Descriptor Configuration File** 177

APPENDIX E **Sample system.cfg File** 179

APPENDIX F **Sample ESC VIM Connector Configuration** 181

APPENDIX G **Sample AutoVNF VNFM Configuration File** 183

APPENDIX H **Sample AutoVNF VNF Configuration File** 185

APPENDIX I **USP KPI Descriptions** 191
USP KPI Descriptions 191

APPENDIX J **Backing Up Deployment Information** 193

Overview 193

Identify Component IP Addresses 193

Backup Configuration Files 196

Backup UAS ConfD Databases 197

Collect Logs 198

Collect Charging Detail Records 198

APPENDIX K **Example RedHat Network Interface and Bridge Configuration Files** 201

/etc/sysconfig/network-scripts/ifcfg-eno2 201

/etc/sysconfig/network-scripts/ifcfg-eno1 201

/etc/sysconfig/network-scripts/ifcfg-br-ex 202

/etc/sysconfig/network-scripts/ifcfg-br-ctlplane 202

About this Guide

This preface describes the *Cisco Ultra Services Platform Deployment Automation Guide*, how it is organized, and its document conventions.

The Ultra Services Platform (USP) is a 5G-ready virtual mobility network platform that provides a robust and highly scalable architecture that can quickly deploy mobility services across a distributed network in a virtualized environment.

The USP is a complex Virtual Network Function (VNF) conforming to the European Telecommunications Standards Institute (ETSI) Network Function Virtualization (NFV) and NFV Management and Orchestration (MANO) specifications.

- Conventions Used, on page xi
- Obtaining Documentation, on page xii
- Contacting Customer Support, on page xii

Conventions Used

The following tables describe the conventions used throughout this documentation.

Notice Type	Description
Information Note	Provides information about important features or instructions.
Caution	Alerts you of potential damage to a program, device, or system.
Warning	Alerts you of potential personal injury or fatality. May also alert you of potential electrical hazards.

Typeface Conventions	Description
Text represented as a `screen display`	This typeface represents displays that appear on your terminal screen, for example: `Login:`

Typeface Conventions	Description
Text represented as **commands**	This typeface represents commands that you enter, for example: **show ip access-list** This document always gives the full form of a command in lowercase letters. Commands are not case sensitive.
Text represented as a **command** *variable*	This typeface represents a variable that is part of a command, for example: **show card** *slot_number* *slot_number* is a variable representing the desired chassis slot number.
Text represented as menu or sub-menu names	This typeface represents menus and sub-menus that you access within a software application, for example: Click the **File** menu, then click **New**

Obtaining Documentation

Nephelo Documentation

The most current Nephelo documentation is available on the following website: http://nephelo.cisco.com/page_vPC.html

StarOS Documentation

The most current Cisco documentation is available on the following website: http://www.cisco.com/cisco/web/psa/default.html

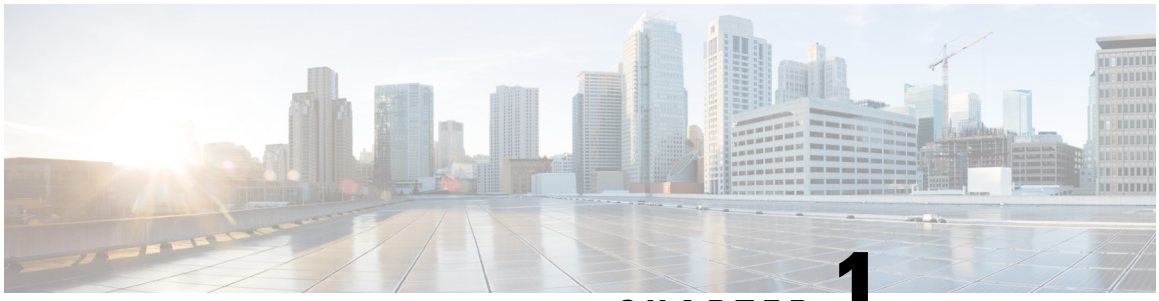
Use the following path selections to access the StarOS documentation:

Products > Wireless > Mobile Internet > Platforms > Cisco ASR 5000 Series > Configure > Configuration Guides

Contacting Customer Support

Use the information in this section to contact customer support.

Refer to the support area of http://www.cisco.com for up-to-date product documentation or to submit a service request. A valid username and password are required to access this site. Please contact your Cisco sales or service representative for additional information.



CHAPTER 1

Ultra Services Platform (USP) Introduction

- USP Introduction, on page 1
- USP Architecture, on page 2
- USP VNF Architecture, on page 3
- Ultra Automation Services, on page 14
- Ultra Web Services, on page 20
- USP VNF Component Redundancy and Availability, on page 21

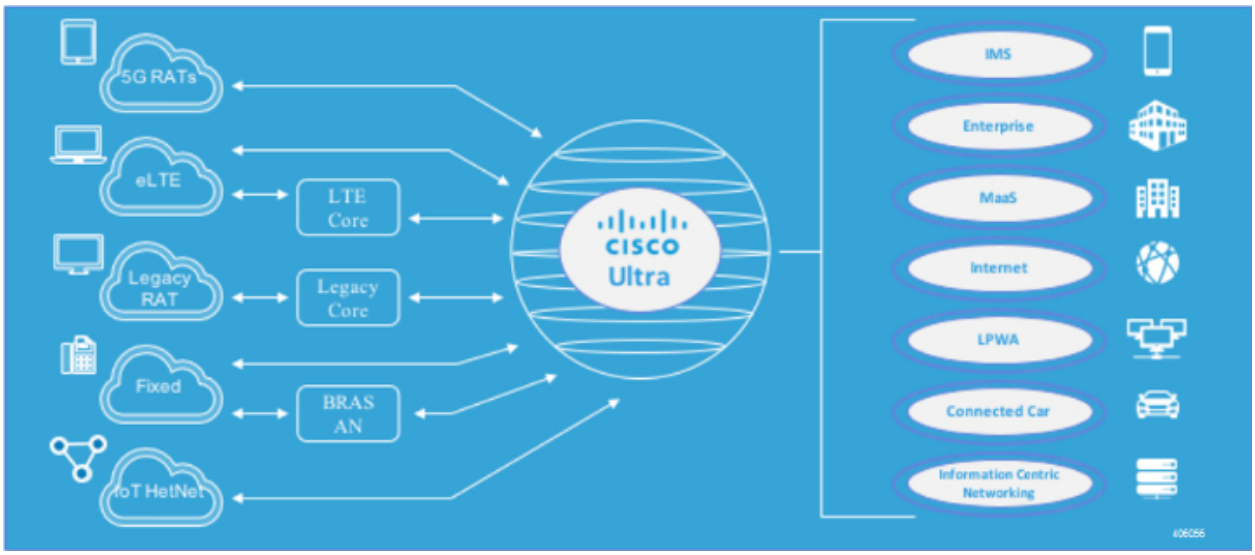
USP Introduction

The Ultra Services Platform (USP) is a 5G-ready virtual mobility network platform that provides a robust and highly scalable architecture that can quickly deploy mobility services across a distributed network in a virtualized environment. 5G will support countless emerging use cases with a variety of applications that drive significant variability in their performance attributes. From delay-sensitive mobile video applications to infrequent connectivity for simple devices, the diversity of use cases will demand substantially increased throughput, lower latency, ultra-high reliability with substantially higher connection densities.

The USP is a complex Virtual Network Function (VNF) conforming to the European Telecommunications Standards Institute (ETSI) Network Function Virtualization (NFV) and NFV Management and Orchestration (MANO) specifications. Unlike simple VNFs constrained to a single Virtual Machine (VM), the USP is a complex VNF comprised of multiple VNF Components (VNFCs) with a variable number of VMs depending on feature optioning and desired performance specifications.

Leveraging these virtualization, automation and orchestration technologies, the USP enables a NFV architecture that allows VNFs to be “sliced” into smaller, customizable end-to-end instances capable of seamless scaling regardless of the use case. The flexibility brings network providers to true Mobility-as-a-Service (MaaS) offering.

Figure 1: USP Network Slicing



USP Architecture

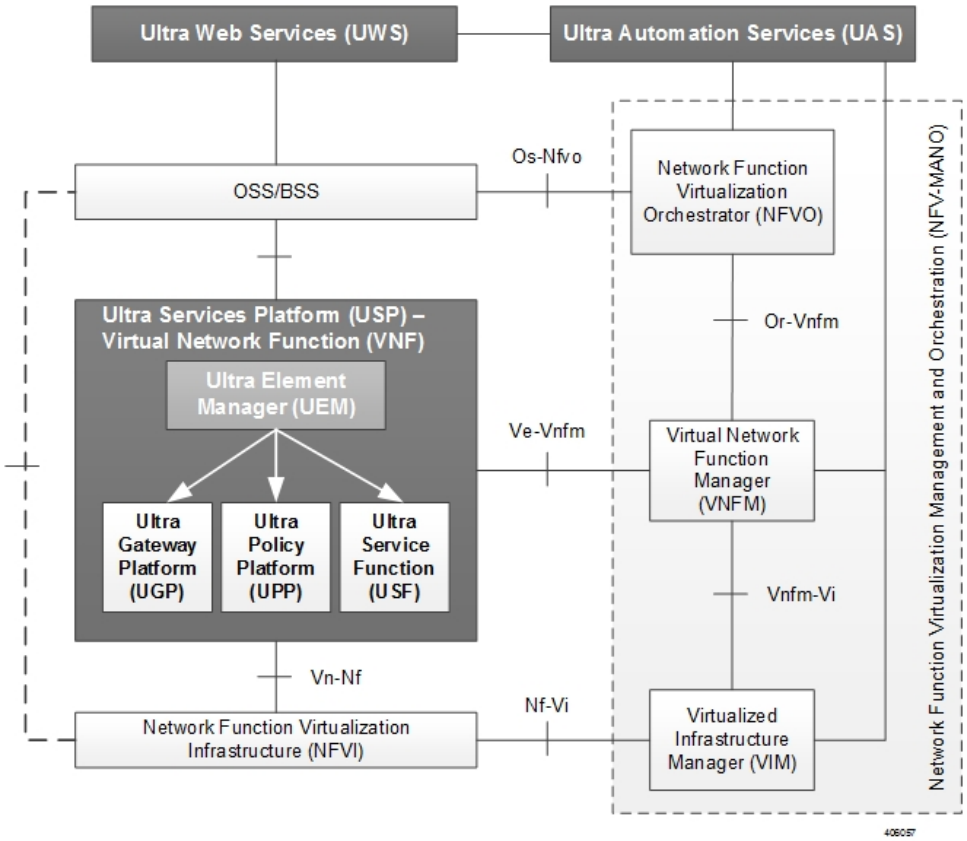
The USP solution comprises the following components:

- **Ultra Service Platform VNF:** The USP couples a Virtual Network Function Element Manager (VNF-EM) and multiple VNF components (VNFCs) into a single complex VNF. This coupling conforms to the European Telecommunications Standards Institute (ETSI) NFV Management and Orchestration (NFV MANO) standard and greatly simplifies MANO operations. A separate web-based customer portal called the Ultra Web Service (UWS) is supported in conjunction with the USP VNF and other network elements to simplify the deployment and management of the VNF.
- **Ultra Web Services (UWS):** The UWS provides an environment to graphically construct the USP VNF by allowing a user to select which VNF components are present and enter the necessary deployment parameters needed to instantiate the solution. Once this composition process is complete, the UWS passes the configuration to Ultra Automation Services which generates an ETSI NFV-compliant VNF Descriptor (VNFD). The VNFD is then on-boarded into an NFV Orchestrator (NFVO).

Important UWS is not supported in 6.x releases.

- **Ultra Automation Services (UAS):** UAS provides a suite of automation tools that simplify the on-boarding process of the USP VNF into any Cisco or third-party NFV infrastructure (NFVI).

Figure 2: USP Solution Components in the ETSI MANO Network



USP VNF Architecture

This section provides information on the VNF components (VNFCs) that comprise the USP architecture.

Ultra Element Manager (UEM)

The UEM manages all the major components of the USP architecture. Conforming to ETSI MANO, the UEM is modeled as the element management system (EMS) for the USP which is a complex VNF comprised of multiple VNFCs. The UEM and the complex VNF are represented to the Management and Orchestration (MANO) infrastructure through their own VNF descriptors (VNFDs).

Although comprised of multiple modules, the UEM provides a single northbound interface (NBI) to external elements such as the OSS/BSS and Ultra Web Service (UWS).

The UEM provides the following network management functions:

- Configuration
- Fault management
- Usage accounting
- Performance measurement

- Security management
- Operational state of VNF

The northbound interface exposes all the information collected, aggregated and exposed through an API interface.

- All the interactions with entities northbound of the UEM happen via a single programmable API interface (e.g. REST, NETCONF, SNMP, etc.) for the purpose of collecting:
  - Configuration data for platform services and for Day-N configuration of its various components
  - Operational data pertaining to the system such as topology (VDU creation and organization) and different levels of VDU and service liveliness and KPIs based on the topology
  - Event streams (NETCONF notifications) that are used by the UEM to asynchronously notify northbound entities
  - Remote Procedure Calls (RPCs) used to expose some of the functionalities offered by the platform or its components such as packet tracing or mirroring
  - Asynchronous notifications: When an event that is relevant to northbound, is received from southbound, the SCM relays the event via a Netconf notification

These functions are provided via several different modules that comprise the UEM:

- **Lifecycle Manager (LCM):** The LCM exposes a single and common interface to the VNFM (Ve-Vnfm) that is used for performing life-cycle management procedures on a VNF. As a component within the UEM, it supports the various middleware application programming interfaces (APIs) required to interact with VNF and its components. Refer to Life Cycle Manager, on page 5 for more information.
- **Service Configuration Manager (SCM):** Leverages a YANG-based information model for configuration to provide configuration information to the VNFC Control Function (CF) VMs and other third-party components. It performs this functionality via NETCONF interfaces using pre-configured templates/network element drivers (NEDs). Configuration information is stored in the configuration database (CDB) and passed to the CF VM over the configuration interface via ConfD. Refer to Service Configuration Manager, on page 6 for more information.
- **Service Level Agreement Manager (SLA-M):** Provides timely access to information such as key performance indicators (KPIs), serviceability events, and diagnostic and troubleshooting information pertaining to components within the USP VNF instance such as:
  - The Lifecycle Manager
  - The Control Function (CF)
  - VMs that are part of the VNFCs
  - Any 3rd party applications related to USF service chains (depending on the VNFC)

  The SLA-M passes the information it collects over the northbound interface of the UEM. Refer to Service Level Agreement Manager , on page 6 for more information.

  Based on the StarOS, the CF is a central sub-system of the VNF that interacts with other sub-systems like service functions (SFs), network functions (NFs), and Application Functions (AFs) using field-tested software tasks that provide robust operation, scalability, and availability. It is equipped with a

corresponding CDB for storing configuration information provided by the SCM via ConfD and/or CLI over the management interface. Refer to Control Function, on page 8 for more information.

High-availability (HA) is ensured across all of these components by the UEM-HA framework via a light-weight protocol that monitors the CF and SLA-M over the High-availability interface. All components are deployed redundantly. In the event of an issue, functions will be switched-over to the standby host. The SLA-M also uses the NETCONF interface to pull KPIs and event/log information from the CF.

Life Cycle Manager

The Life Cycle Manager (LCM) is the UEM component that adapts an USP VNF to an external VNFM. The UEM provides a generic API to manage software, compute, and networking resources. When a VNFM brings up a new USP VNF, the VNFM starts redundant UEM VDUs. The VNFM also provides an initial set of VDUs as specified in the catalog for other USP virtual resources (for example, USP CF or USP SF). As the system initializes, the VNF components can bring VDUs online or offline using the UEM as a proxy to the external VNFM. The UEM provides a generic API to the other USP components, and a set of UEM adapters that attune the UEM to variety of external VNFMs.

Important The Cisco Elastic Services Controller (ESC) is the only supported VNFM in this USP release.

The LCM performs life-cycle management procedures on a VNF through a single and common interface to the VNFM. It can communicate with any off-the-shelf VNFM for resource allocation, configuration, monitoring, and lifecycle event updates. The LCM provides a common API to handle all VNFM instantiation flow requests for USP VNFs. It also communicates with a StarOS agent to provide all service and application level monitoring and lifecycle management.

The LCM provides the following functions:

- VNF registration through the onboarding of a virtualized network function descriptor (VNFD) by the VNFM
- Day-0 VNF configuration
- Handling key performance indicator (KPI) data in real-time
- Handling life-cycle events from VNFCs
- VNF termination

Communication between the Life Cycle Manager (LCM) and the VNFM is made possible through the integration of adapters that support VNFM products from multiple vendors. As an UEM component, the LCM includes middleware APIs that support the interface with SLA-M. The APIs are used to monitor KPIs pertaining to VNFC health and VM resource usage (for example, CPU, memory, etc.). APIs that support VNFC configuration establish interfaces to the CF via both the Management and High-availability buses to:

- Provision VMs based on information contained in virtualization descriptor units (VDUs) within the VNFD and associate the VMs to the internal network
- Add and initialize VMs as needed
- Request VNF infrastructure characteristics (for example, topology, deployment policies, etc.)
- Request VNF termination, migration, or destruction

- Request Day-N configuration for a specific VNFC
- Create and associate network ports to VDUs
- Provision networking configurations
- Provide life-cycle event notifications such as service status, configuration status, and HA events
- Provide an interface for determining NFVI information associated with the VDUs

Service Configuration Manager

The Service Configuration Manager (SCM) provides configuration information to the VNFC Control Function (CF) VMs and other third-party components. It performs this functionality via NETCONF interfaces using pre-configured templates/network element drivers (NEDs). Configuration information is stored in the configuration database (CDB) and passed to the CF VM over the management bus via ConfD data models.

During the initial VNF instantiation process, the SCM component will perform the initial detailed configuration of each VNF Component (gateway, in-line service function, etc.). This process is known as a Day-1 configuration. Additionally, when a change to any of the detailed configuration parameters of any of the VNF components after the VNF has already been deployed, the SCM will modify the specific parts of a detailed service configuration for any of the VNF Components. This is known as a Day-N configuration.

Service Level Agreement Manager

The Service Level Agreement Manager (SLA-M) provides timely access to information such as key performance indicators (KPIs), serviceability events, and diagnostic and troubleshooting information pertaining to components within the USP VNF instance including:

- The Life Cycle Manager (LCM)
- The Control Function (CF)
- VMs that are part of the VNFCs
- Any 3rd party applications related to USF service chains (depending on the VNFC)

This component is responsible for translating the requests from the Northbound layer into requests to the Southbound layer as well as for receiving and processing events and information from the Southbound layer to offer into aggregated form to the Northbound layer. It also populates a data store to maintain and expose historical data.

This component implements the following functionalities according to the way data are exposed northbound:

- **Immediate Access:** Requests coming from northbound (for example, access to the operational state of a particular VDU) are translated into a southbound request (for example, accessing the VDU operational state in a data source).
- **Historical Access:** The history of data or events in a store are maintained for later retrieval. SLA-M uses NCS's CDB for this purpose. The MAAPI session is initiated with NCS and the SLA-M proactively fills the operational data corresponding to historical data whenever it is collected (via periodic polling or notifications). In this scenario, access from northbound takes place by retrieving data directly from CDB instead of invoking a callback registered previously since no callback would have been registered for such data.

- **Aggregated Access:** In this case SLA-M retrieves the "non-aggregated" data from the data sources and then applies aggregation logic using the topology information exposed in the northbound model. When the callback corresponding to the aggregated access is invoked, the SLA-M accesses the northbound operational data describing the topology via MAAPI, and performs the needed aggregation of the retrieved data.

KPIs

Each unit of the system is monitored through a set of KPIs. KPIs are quantities that evolve over time. The SLA-M provides northbound entities with mechanism for accessing a current snapshot of such quantities (instantaneous KPIs) in aggregated or non-aggregated form. In addition, it keeps a history of a user-set number of the most recent KPI samples.

Refer to USP KPI Descriptions, on page 191 for a listing and description of KPIs supported in this release.

Two kinds of KPIs are collected:

- Basic (non-aggregated) KPIs
- Aggregated KPIs

Basic (non-aggregated) KPIs:

These are performance indicators at the VDU level which are provided to the SLA-M by either the CF or the VFNM Proxy Function.

The LCM provides all basic KPIs coming from the NFVI/VIM (for example, host/guest CPU load, memory, etc.), while the CF provides all other basic KPIs such as application specific metrics and process level information.

The following non-aggregate KPIs are provided by the CF to the SLA-M:

- Performance KPIs for each constituent VDR (*/vnfrs/vnfr/deployment-flavor-record/element-group-records /element-group-record/constituent-vdrs/constituent-vdr/performance-stats*).
- The contribution of the Performance KPIs for each constituent VDR to a specific Network Path (*/vnfrs/vnfr/deployment-flavor-record/element-group-records/element-group-record/service-function-chain-records/service-function-chain-record/network-fwd-path-records/network-fwd-path-record/vdr-stats/vdr-stat*).
- Flow Cache KPIs for each constituent VDR (*/vnfrs/vnfr/deployment-flavor-record/element-group-records/element- group-record/constituent-vdrs/constituent-vdr/flow-cache-stats*).

The following non-aggregate KPIs are provided by the VNFM-proxy to the SLA-M:

- NFVI KPIs for each constituent VDR (*/vnfrs/vnfr/deployment-flavor-record/element-group-records/element-group-record/constituent-vdrs/constituent-vdr/nfvi-stats*). These are exposed by the LCM to the UEM and the UEM mirrors them northbound.

Aggregated KPIs:

These are indicators derived by SLA-M from the basic KPIs and that reflect the performance of a group of VDUs.

The SLA-M builds aggregated KPIs at different levels of the grouping hierarchy by leveraging topology information. A typical example is building network throughput at the service chain level or slice level or

system level. Note that while the SLA-M has the responsibility to build the aggregated KPI, it relies on other components to get the topology that drive such aggregation.

Starting from the non-aggregate KPIs described above, the SLA-M builds the following aggregated KPIs:

- Performance KPIs aggregated at:
- Network Path (*/vnfrs/vnfr/deployment-flavor-record/element-group-records/element-group-record /service-function-chain-records/service-function-chain-record/network-fwd-path-records/network-fwd-path -record/performance-stats*)
- Service Function Chain (*/vnfrs/vnfr/deployment-flavor-record/element-group-records/element-group -record/service-function-chain-records/service-function-chain-record/performance-stats*)
- Element Group (*/vnfrs/vnfr/deployment-flavor-record/element-group-records/element-group-record/performance-stats*)
- Vnf (*/vnfrs/vnfr/performance-stats*)
- Vnf for specific Service Function Chain (i.e. Performance-stats for a given service-function-chain across all the element-groups) (*/vnfrs/vnfr/service-function-chain-records/service-function-chain-record/performance-stats*)
- Flow Cache KPIs aggregated at:
  - VNF (*/vnfrs/vnfr/flow-cache-stats*)
- NFVI KPIs aggregated at:
  - Element group (*/vnfrs/vnfr/deployment-flavor-record/element-group-records/element-group-record/nfvi-stats*)
  - VNF (*/vnfrs/vnfr/nfvi-stats*)

Control Function

The Control Function (CF) is a StarOS based central sub-system of the VNF. It interacts with other sub-systems such as service functions (SFs), network functions (NFs), and Application Functions (AFs), and uses field-tested software tasks that provide robust operation, scalability, and availability. The VNFD and VNFR are equipped with a corresponding configuration database (CDB) for storing configuration information provided by the SCM via ConfD and/or CLI NEDs over the management interface.

The CF also communicates over the High-availability (HA) interface for communicating with the LCM and to provide KPIs and event logs to the SLA-M.

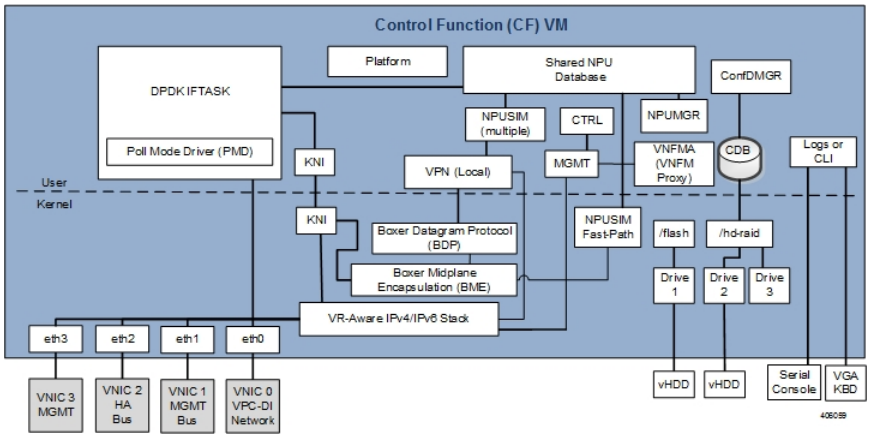
Two CF VMs act as an active:standby (1:1) redundant pair. Within the StarOS, each CF VM is viewed as a virtual card and is responsible for the following functions:

- Hosting Controller tasks
- Hosting the Local context VPNMGR
- Hosting Local context (MGMT) and DI-Network vNICs
- Managing System boot image and configuration storage on vHDD
- Facilitating record storage on vHDD

- Providing Out-of-Band (OOB) management (vSerial and vKVM) for CLI and logging
- Working with the LCM to:
  - Bring VDUs online or offline during system initialization, request more VDUs for scale-out, return VDUs for scale-in lifecycle operations using VPD
  - Facilitate VDU internal management and configuration using predefined artifacts
- Providing KPI, event, and log information to the SLA-M as requested/needed

Note Refer to the Life Cycle Manager, on page 5 section for more information.

Figure 3: CF VM



Important The Intel Data Plane Development Kit (DPDK) Internal Forwarder task (IFTASK) is used to enhance USP system performance. It is required for system operation. Upon CF instantiation, DPDK allocates a certain proportion of the CPU cores to IFTASK depending on the total number of CPU cores.

Service Function

Service Function (SF) VMs provide service context (user I/O ports) and handle protocol signaling and session processing tasks. A UGP instance can have a maximum of 14 SF VMs, of which a maximum of 12 SF VMs can be active. See the *Cisco UGP System Administration Guide*.

Each SF VM dynamically takes on one of three roles as directed by the CF:

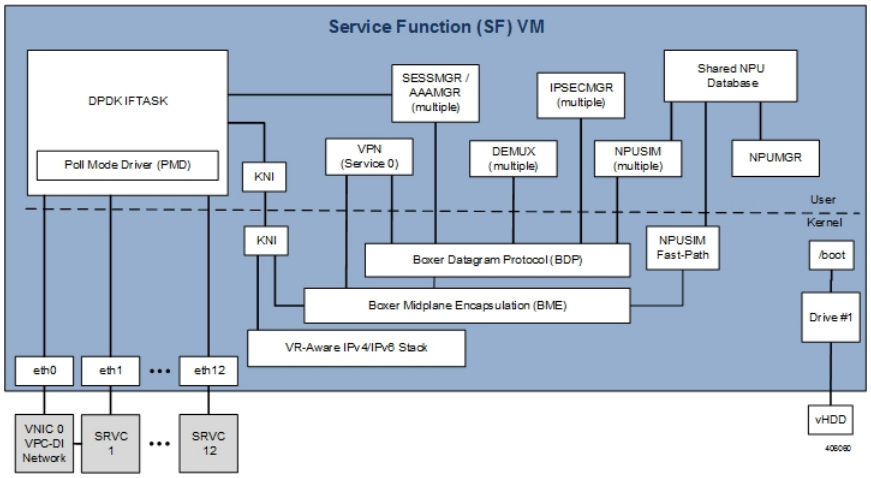
- Demux VM (flow assignments)
- Session VM (traffic handling)
- Standby VM (n+1 redundancy)

An SF provides the following functions:

Function Location	Runs on
NPUSIM fastpath/slow path (NPU emulation and routing to CPU)	Demux VM, Session VM, Standby VM
IFTASK based on the Intel® Data Plane Development Kit (DPDK)	Demux VM, Session VM, Standby VM
Non-local context (SRVC) vNIC ports	Demux VM, Session VM, Standby VM
VPNMGR and Demux for service contexts (first VM)	Demux VM
SESSMGR and AAAMGR for session processing (additional VMs)	Session VM
Egress forwarding decisions	
Crypto processing	

The minimum configuration for an Ultra Gateway Platform instance requires four SFs: two active, one demux, and one standby.

Figure 4: SF VM



Note The Intel Data Plane Development Kit (DPDK) Internal Forwarder task (IFTASK) is used to enhance USP system performance. It is required for system operation. Upon CF instantiation, DPDK allocates a certain proportion of the CPU cores to IFTASK depending on the total number of CPU cores.

When deployed in support of the Ultra Services Framework (USF), the SF facilitates the StarOS software tasks pertaining to the IP Services Gateway (IPSG) traffic detection function (TDF). The IPSG receives subscriber policy information from the Policy and Charging Rules Function (PCRF) over the Gx/Gx+ interface. It uses this policy information to steer subscriber session traffic received over the Gi/SGi interface through the SFC as required.

Network Function

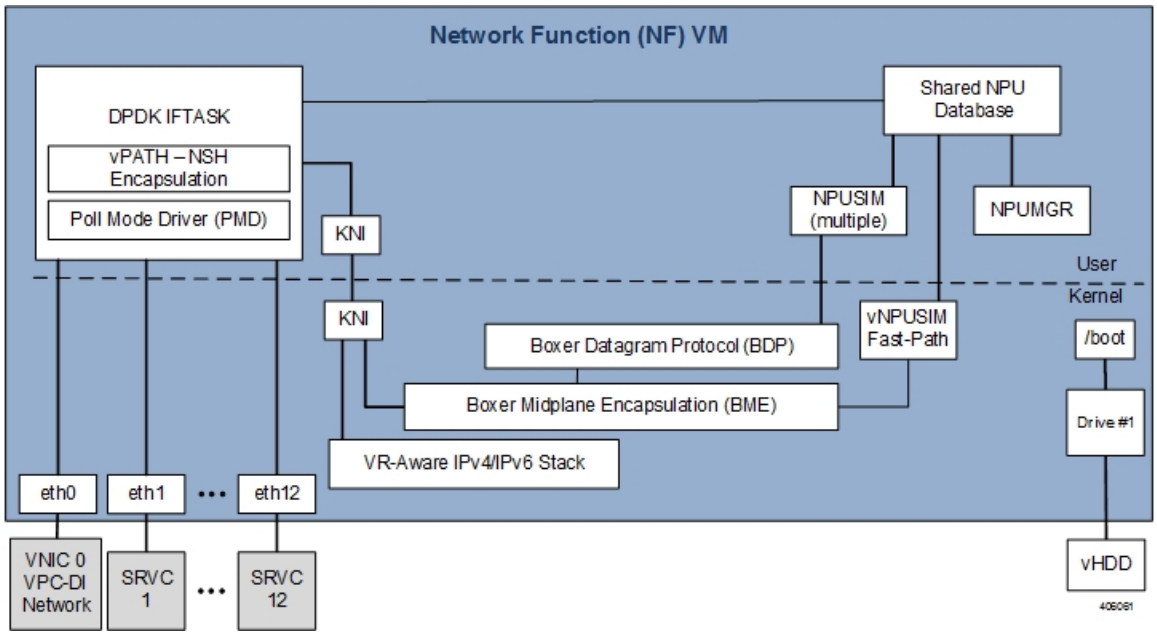
The Network Function (NF) is a virtual machine that is dedicated as a networking adapter between a DI system and external routers. The NF can be used to aggregate the VNF external connection points to a consolidated set of external interfaces. NF virtual machines are typically used for larger DI systems to limit the number of external interfaces to those present on a smaller set of virtual machines. The NF facilitates the building of large scale, high performance systems by providing the virtual equivalent of specialized Network Processing Unit (NPU) hardware.

The NF provides the following functions:

- Serves as a dedicated system for performing high speed traffic classification and flow/counter aggregation based on policies (n-tuple; each NF has access to complete set of policies)
- Limits the number of external interfaces required by aggregating external connection points to a consolidated set of high speed interfaces
- Operates as networking adapter between USP VNFs and external routers
- Subscriber awareness and stickiness as part of flow classification.
- Traffic classification and load balancing

The NF deploys a FAST-PATH architecture leveraging the NPU Manager and NPU SIM software tasks to ensure performance and scalability.

Figure 5: NF VM



The mobility/DPDK internal forwarder (IF) is the core functional block for the USP architecture. It runs NPUSIM with DPDK into NF. The main functions of the mobility forwarder are:

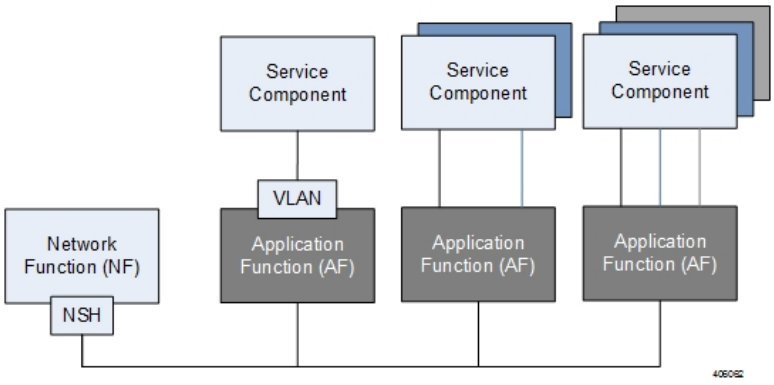
- Performing the flow classification for each incoming packet, based on pre-configured rules.
- Deriving the service chain that needs to be associated with a flow

- Maintaining the subscriber stickiness - Meaning all the flows of a subscriber should land on the same service path (service path maps to AF).
- Performing the NSH encapsulation/ decapsulation. It uses NSH for communicating the service chain information across the nodes.

Application Function

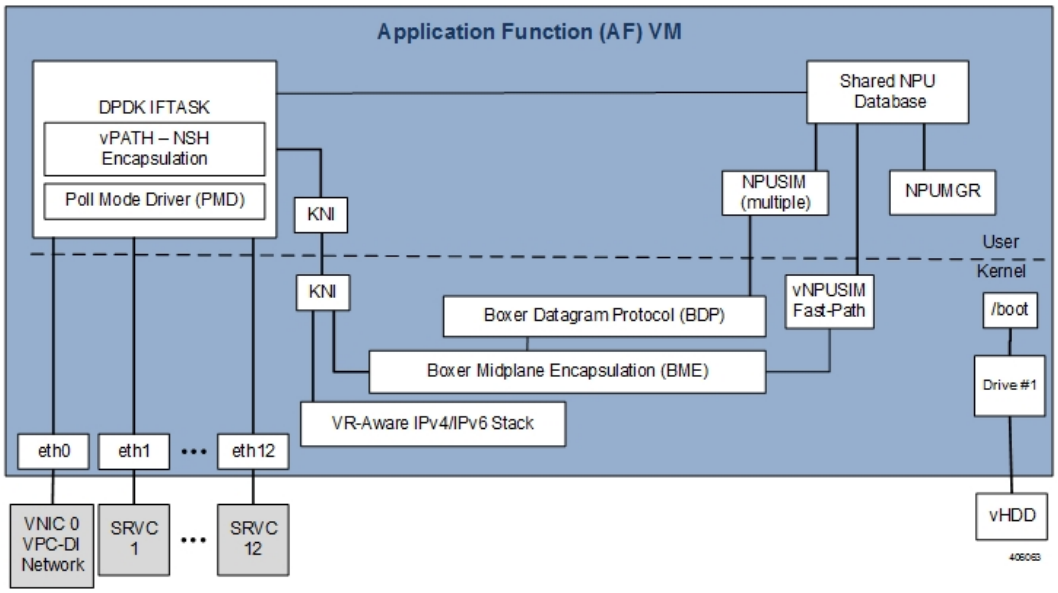
The Application Function (AF) is a virtual machine that is dedicated for Ultra Service Framework within a Gi-LAN Service Function Chain. The CF manages the system initialization, resource management, and high availability of the AF virtual machines. Packets that will be routed through a service function are encapsulated by the NF using NSH chain and routed to the AF. The AF learns of the specific service chain from the NSH header and routes the un-encapsulated packets through the Ultra Service Components (USCs) that comprise the chain. Once the packets are serviced, they are re-encapsulated and routed back to the NF.

Figure 6: AF Network



The AF VM maps the service chain identifier to a local tag representing the link/path between the NF and service component. The service path consists of a single service function, chain of different service functions, or service path spawned over multiple hosts. Like the NF, the AF deploys a FAST-PATH architecture leveraging the network processing unit (NPU) Manager and NPU SIM software tasks to ensure performance and scalability.

Figure 7: AF VM



USP VNF Types

The USP supports different types of VNFs that provide a variety of mobility services. Each VNF consists of components (VNFCs) which run on different virtual machines (VMs). The following VNF types are supported in this release:

- **Ultra Gateway Platform (UGP):** The UGP currently provides virtualized instances of the various 3G and 4G mobile packet core (MPC) gateways that enable mobile operators to offer enhanced mobile data services to their subscribers. The UGP addresses the scaling and redundancy limitations of VPC-SI (Single Instance) by extending the StarOS boundaries beyond a single VM. UGP allows multiple VMs to act as a single StarOS instance with shared interfaces, shared service addresses, load balancing, redundancy, and a single point of management.
- **Ultra Policy Platform (UPP):** Delivers next generation policy and subscriber management functionality by leveraging the Cisco Policy Suite (CPS). CPS is carrier-grade policy, charging, and subscriber data management solution. It helps service providers rapidly create and bring services to market, deliver a positive user experience, and optimize network resources.

  Note The UPP is not supported in this release.

- **Ultra Service Framework (USF):** The USF enables enhanced processing through traffic steering capabilities for subscriber inline services. USF Gi-LAN Service Function Chains (SFC) classify and steer traffic enabling mobile operators to quickly deploy new services and applications to their subscribers.

Ultra Gateway Platform

The UGP currently provides virtualized instances of the various 3G and 4G mobile packet core (MPC) gateways that enable mobile operators to offer enhanced mobile data services to their subscribers. The UGP addresses

the scaling and redundancy limitations of VPC-SI (Single Instance) by extending the StarOS boundaries beyond a single VM. UGP allows multiple VMs to act as a single StarOS instance with shared interfaces, shared service addresses, load balancing, redundancy, and a single point of management.

The UGP includes the following features:

- Software defined, fully featured packet core functionality
- Multi-generational
- Separated management, control and user-planes
- Remotely deployable user plane for ultimate elasticity and scalability

Ultra Service Framework

The Ultra Service Framework (USF) is a Cisco 4G/5G pluggable framework that enables enhanced session processing through traffic steering capabilities for packets received over the Gi/SGi interface. It provides a pluggable framework for in-line, subscriber-aware, enhanced services.

It is integrated as separately upgradeable software packages. These applications are generically referred to enablers or services. However, in the context of USF, they are known as Ultra Service Components (USCs). Mobile operators not only deploy USCs to improve and add value to subscriber experience, but also to optimize and increase performance and efficiency within their network infrastructure.

The USF provides native life-cycle management and configuration automated by the converged platform framework. Leveraging 3GPP Flexible Mobile Service Steering (FMSS) and IETF(S) Gi-LAN Service Function Chaining (SFC) concepts, the USF classifies and steers session traffic (per-session or per-flow) to applications based on defined policies.

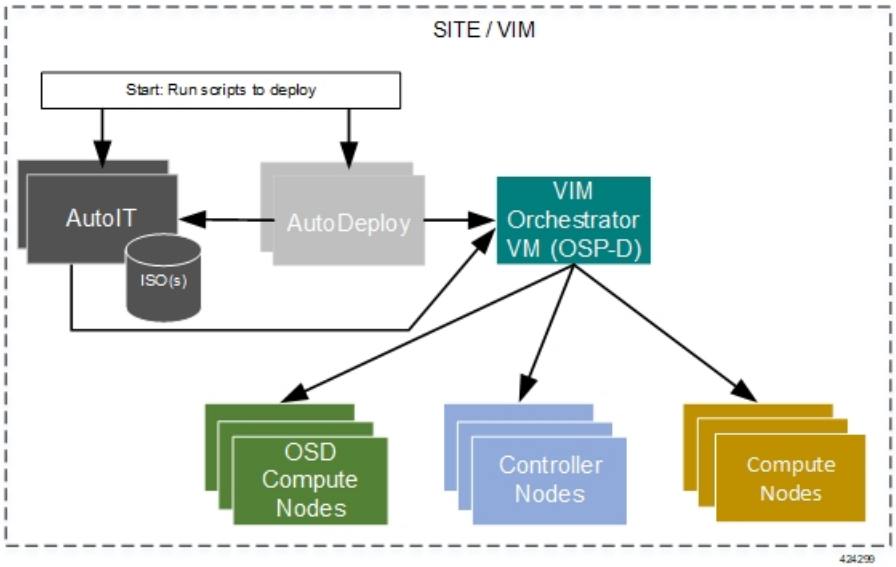
Ultra Automation Services

Ultra Automation Services (UAS) is an automation framework consisting of a set of software roles used to automate the VIM and USP-based VNF deployment as well as related components such as the VNFM. Beyond deployment automation, UAS manages software bundle components within an inventory manager. In addition, it can also be used to automate the deployment of third party components such as NFVI/VIM, test tools, and USFs that are not part of the distributed USP software bundle. The UAS consists of:

- AutoIT, on page 15
- AutoDeploy, on page 17
- AutoVNF, on page 18

Figure 8: VIM Installation Automation Workflow, on page 15 displays a high-level view of the VIM installation automation process workflow using UAS.

Figure 8: VIM Installation Automation Workflow



displays a high-level view of the deployment automation workflow for a single VNF. In a multi-VNF environment, AutoDeploy can deploy up to four VNFs concurrently. Additional details pertaining to the deployment automation process are provided in the deployment automation documentation.

Important In this release, multi-VNF deployments are supported only in the context of the Ultra M solution. Refer to the *Ultra M Solutions Guide* for details.

AutoIT

AutoIT is the UAS software role used to automate the process of:

- Deploying the VIM Orchestrator (synonymous with the OpenStack Undercloud).
- Installing the virtual infrastructure manager (VIM, synonymous with the OpenStack Overcloud) which manages the network function virtualization infrastructure (NFVI).
- Onboarding/upgrading the USP ISO software package onto the Ultra M Manager Node.

AutoIT performs the deployments based on manifests it receives from AutoDeploy. Additionally, also hosts a webserver to facilitate VM deployment and delivery of software packages using REST and ConfD APIs for provisioning Overcloud nodes.

AutoIT can be deployed in the following scenarios:

- As a single VM on the Ultra M Manager Node (the same physical server as AutoDeploy and OSP-D VM) during a bare metal installation.
- In high-availability (HA) mode which provides 1:1 redundancy. When deployed in HA mode, two AutoIT VMs are deployed: one active, one standby.
- As a single VM within an existing OpenStack deployment.

- In HA mode within an existing OpenStack deployment.

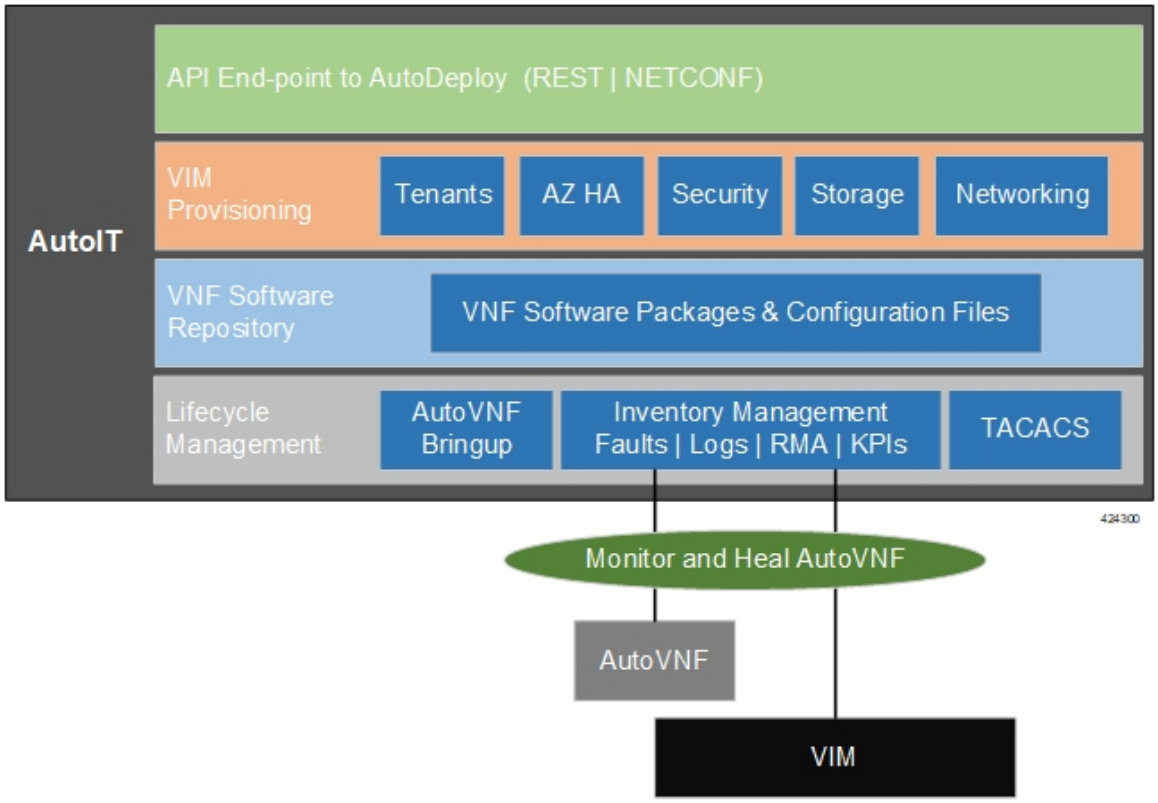
When supporting VIM installation automation processes, AutoIT:

- Sets up AutoIT nodes
- API endpoint based on ConfD to Auto-Deploy and NSO
- Deploys the VIM Orchestrator
- Works through the VIM Orchestrator to deploy the VIM
- Brings up OSP-D as a VM

When supporting VNF deployment automation processes, AutoIT:

- Onboarding Ultra Automation Services (UAS) VMs.
- VIM provisioning to onboard VNFs.
- Manages different version of software packages by hosting into YUM repo.
- APIs to onboard VNF packages.
- Brings up AutoVNF VMs and monitors for failures.
- Stores release public key information in the ISO database for RPM signature verification by YUM through the installation process.

Figure 9: AutoIT Functions



Important In this release, AutoIT is only supported for use with Ultra M solutions based on the Hyper-Converged architecture.

In addition to supporting deployment workflows, AutoIT provides a centralized monitor and management function within the Ultra M solution. This function provides a central aggregation point for events (faults and alarms) and a proxy point for syslogs generated by the different components within the solution.

AutoDeploy

AutoDeploy is the UAS software role that provides single- and multi-Site AutoVNF orchestration. In this context, a "Site" is a single VIM instance. As such, a single AutoDeploy instance is capable of deploying the AutoVNF UAS software roles within multiple deployment scenarios:

- Single VIM/Single VNF
- Single VIM/Multi-VNF

Important In this release, multi-VNF deployments are supported only in the context of the Ultra M solution. Refer to the *Ultra M Solutions Guide* for details.

In a multi-VNF environment, AutoDeploy can deploy up to four VNFs concurrently. Additional details pertaining to the deployment automation process are provided in the deployment automation documentation.

AutoDeploy can be deployed in the following scenarios:

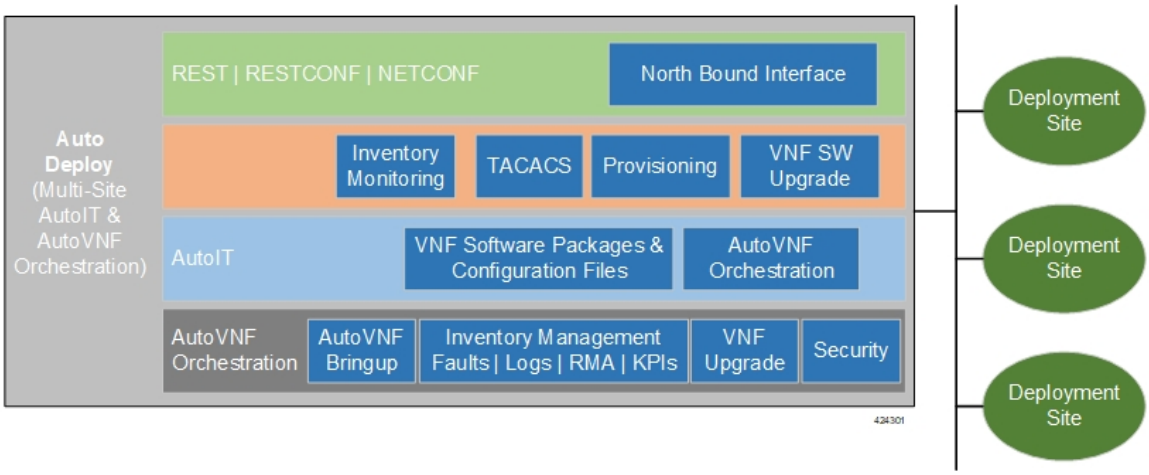
- As part of VIM installation automation process:
  - On bare-metal with high availability (HA) support. HA support provides 1:1 VM redundancy. When deployed in HA mode, two AutoDeploy VMs are deployed on the same physical server: one active, one standby.
  - On bare-metal without HA support. In this scenario, a single AutoDeploy VM is deployed.
- As part of an existing deployment:
  - In HA mode within an existing OpenStack deployment. When deployed in HA mode, two AutoDeploy VMs are deployed on the same physical server: one active, one standby.
  - As a single VM within an existing OpenStack deployment.

In this release, one AutoDeploy VM is deployed per VIM. The AutoDeploy VM must have network access to the VIM in order to provide orchestration.

Once instantiated, AutoDeploy provides the following functionality:

- AutoVNFs bootstrapping and provisioning for deployments (Day-0/Day-1/Day-N).
- AutoVNF Deployments Life-Cycle including start, stop and Inventory management (consolidated).
- Performs release image signing validation by verifying the certificate and public key provided in the release ISO.

Figure 10: AutoDeploy Functions



AutoDeploy operations are performed using any of the following methods:

- ConfD CLI and API based transactions
- WebUI based transactions

AutoVNF

AutoVNF is the software role within UAS that provides deployment orchestration for USP-based VNFs. It does this by emulating an NFVO and VNFM for deployments.

When used in Ultra M solutuon deployments, AutoVNF is instantiated by the AutoDeploy software role based on configuration data you provide. It is deployed with a 1:1 HA redundancy model. Processes across the VMs are monitored and restarted if necessary. ConfD synchronizes the CDB between the active and standby VMs. Each of the VMs are deployed on separate Compute nodes within your VIM.

For VNF deployments brought up using only AutoVNF (e.g. Stand-alone AutoVNF-based deployments), only a single VM is deployed.

Once operational, AutoVNF provides the following functionality:

- Deploys the Elastic Services Controller (ESC), which serves as the VNFM, per configurable YANG-based definitions.

Note The Cisco Elastic Services Controller (ESC) is the only supported VNFM in this USP release.

- Onboards all required UEM VMs via the VNFM.
- Leverages configurable YANG-based definitions to generate the VNF descriptor (VNFD) required to onboard the VNF using UEM workflows.
- Determines all required resources for the VNF including images, flavors, networks, subnets and invokes NETCONF-based APIs to provision all of these resources into OpenStack through the VNFM.

- Ensures all references, network, images, and flavors exist on the VIM, if supplied.
- Monitors for NETCONF-based notifications, submits the transaction, and waits until the given transaction succeeds.
- Monitors inventory in terms of operational state and KPIs and auto-heals the VNFM and UEM.
- Orchestrates USP-based VNF upgrades regardless of whether or not Inter-Chassis Session Recovery (ICSR) is enabled on the VNF.
- Implements a ConfD-based architecture to provide life cycle management (LCM) through VNF-EM, VNFM, and VIM plugins as shown in Figure 12: AutoVNF ConfD-based Architecture for Deployment Automation, on page 20.
- Supports standard, ConfD-based REST/RESTCONF/NETCONF north-bound interfaces (NBIs).
- Provides VNF security, credentials, and SSH keys through the use of secure-tokens.
- Hosts an HTTP server to serve GET URLs supplied into the VNFD that include such things as configuration files, VDU images, etc.
- Supplies the VNFD to the UEM upon instantiation as Day-0 configuration using an appropriate VNFM-supported mechanism (e.g. in the case of ESC as the VNFM, the VNFD is passed as a Day-0 configuration using the ESC's deployment APIs).
- Onboards all Day-0 configuration files onto the UEM to be passed on to VDUs.
- Allocates the management IP for the CF and UEM VMs along with Virtual IP (VIP) addresses.

Figure 11: AutoVNF Functions

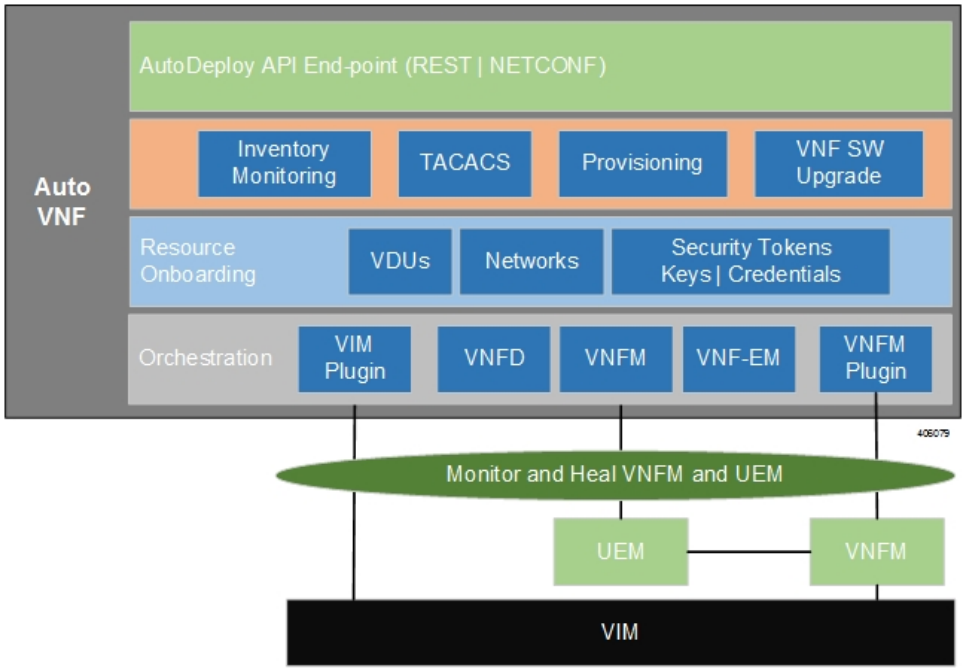
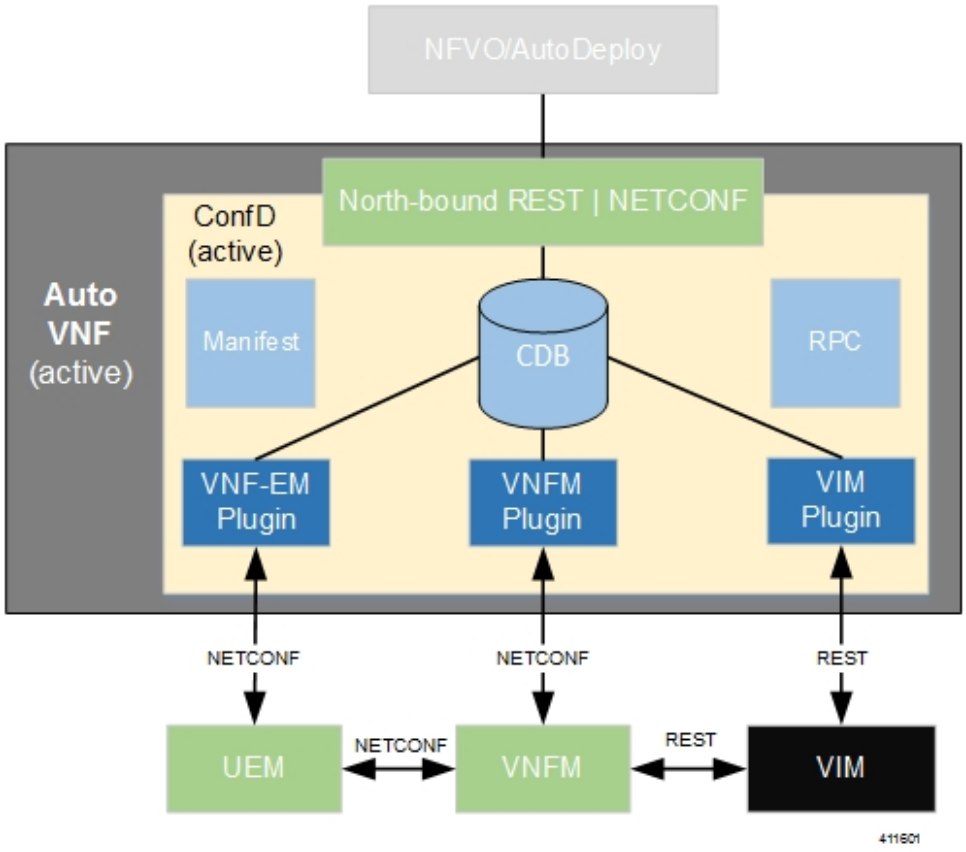


Figure 12: AutoVNF ConfD-based Architecture for Deployment Automation



AutoVNF operations can be performed using any of the following methods:

- ConfD CLI based transactions
- WebUI based transactions
- Netconf based transactions

Ultra Web Services

The Ultra Web Service (UWS) provides a web-based graphical user interface (GUI) and a set of functional modules that enable users to manage and interact with the USP VNF. It provides a single framework and a top-level dashboard for users to interact with the USP VNF. It includes the following features:

- Service Assurance
- Validation
- VNF-EM Virtualization
- VNF Components
- NFVI/VIM

Leveraging backend-APIs, the VNF visualization module of UWS is used to create, deploy and monitor a variety of USP VNFs based on specific use cases and applications. The VNFs can include definitions for the gateway type, policy options, service function chaining features, and more. After the VNFs are created, users can deploy each VNF to a target infrastructure choice. The USP tracks deploy operations. Users can display the tracked information on the dashboard, and can monitor the status of a selected deployment operation. The dashboard also displays aggregate KPIs from all deployed VNFs, allowing users to easily view and monitor aggregate metrics for a given environment.

UWS software is part of the UAS software package and is installed automatically with the AutoDeploy software role.

The following browser versions are supported for use with the UWS GUI:

- Firefox: 55.0.3 (64-bit)
- Safari: Version 10.1.1 (10603.2.5)
- Chrome: 58.0.3029.110 (64-bit)
- Edge: 38.14393.1066.0

Important UWS is not supported in 6.x releases.

USP VNF Component Redundancy and Availability

Platform Requirements

The USP VNF relies on the underlying hardware and hypervisor for overall system redundancy and availability.

The hardware and hypervisor should provide:

- Redundant hardware components where practical (such as power supplies and storage drives)
- Redundant network paths (dual fabric/NICs, with automatic failover)
- Redundant network uplinks (switches, routers, etc.)

High availability can be achieved only if the underlying infrastructure (hosts, hypervisor, and network) can provide availability and reliability that exceeds expected values. The USP VNF is only as reliable as the environment on which it runs.

Inter-Chassis Session Recovery (ICSR) is also recommended to improve availability and recovery time in the case of a non-redundant hardware failure (such as CPU, memory, motherboard, hypervisor software). ICSR provides redundancy at the session level for gateways only. See ICSR Support, on page 23 for more information.

UEM Redundancy

A minimum of three UEM VMs is required to support redundancy.

When three UEM VMs are used, they are deployed as part of an HA cluster which are 1:n redundant for overall management and inter-VNFM communications. The three VMs are deployed as follows: 1 leader or master (active), 1 follower or slave (standby), and 1 follower (standby).

In releases prior to 6.3, the default value was 3 and this parameter was not user configurable. In release 6.3 and beyond, the default value is 2.

CF Redundancy

By default, the UEM deploys two CF VMs which are 1:1 redundant for control of the USP VNF and the local context/management port. This is the recommended configuration.

The management port vNIC on both CFs are 1:1 redundant for each other and must be placed in the same VLAN in the infrastructure. Only one management port is active at a time.

Note The two CF VMs must not run on the same physical host (server or blade) to achieve redundancy in case of the failure of the host or hypervisor.

SF Redundancy

SFs are deployed using 1:N redundancy. It is recommended that you have at least 2 active and 1 standby SF, however, the number of SF instances will change according to your deployment requirements.

Each SF VM provides network connectivity for service ports. Each SF provides one or more ports and associated interfaces, but the SFs do not provide 1:1 port redundancy as they are not paired together. Redundancy of SF ports should be achieved using ECMP or another supported L3 protocol.

The total throughput required of the USP VNF Instance should not exceed N-2 SFs with session recovery enabled so that any single SF can fail while the others take over its load. Use of loopback interfaces for service IP addresses is highly recommended.

Cisco recommends that you use Bidirectional Forwarding Detection (BFD) and Link Aggregation Group (LAG) for detection of path failures between an SF and the peer router so ECMP paths are excluded in the event of a failure.

1:1 session redundancy within a VNF and Inter-Chassis Session Recovery (ICSR) between VNFs is supported. Note that the session state is check-pointed at various call points within a call flow. Although session state is check-pointed in the UGP, the IP flow state and connection tracking tables are not mirrored. Therefore, any state associated with an IP flow will be lost.

When session recovery is enabled, one VM becomes the VPN/Demux and the remainder are session processing VMs. A standby SF can provide redundancy for any other SF.

Note Each SF VM must run on a different physical host to achieve redundancy in case of the failure of the host or hypervisor.

NF Redundancy

NFs are deployed using 1:N redundancy. You may adjust the number of NF instances according to your deployment requirements.

Note Each NF VM must run on a different physical host to achieve redundancy in case of the failure of the host or hypervisor.

AF Redundancy

AFs are deployed using 1:N redundancy. You may adjust the number of AF instances according to your deployment requirements.

Note Each AF VM must run on a different physical host to achieve redundancy in case of the failure of the host or hypervisor.

Ultra Service Component (USC) Redundancy

The Ultra Services Components (USCs) used in the USF are deployed along with the AF into a MANO construct called an Element Group (EG). An EG is set of VDUs arranged for a unit of redundancy. As such, redundancy is available at the EGs-level and not for the individual USCs. An N:1 redundancy model is supported for Element groups.

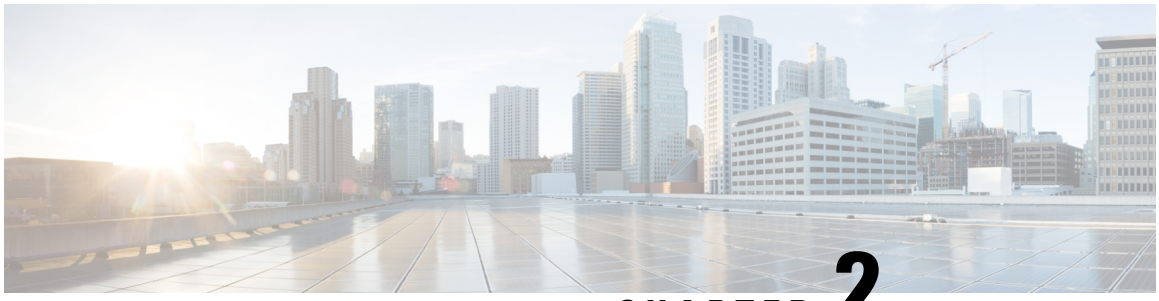
ICSR Support

USP VNFs support Inter-Chassis Session Recovery (ICSR) between two VNF instances for services that support Layer 3 ICSR in the StarOS software release. When more than one service type is in use, only those services that support ICSR will be able to use ICSR.

ICSR supports redundancy for Site/row/rack/host outages, and major software faults. To do so, the two USP VNF instances should be run on non-overlapping hosts and network interconnects. ICSR is supported only between like-configured UGP instances.

Note ICSR between an USP VNF instance and another type of platform (such as an ASR 5500) is not supported.

For additional information, refer to the *Inter-Chassis Session Recovery* chapter in the *System Administration Guide* for your platform.



CHAPTER 2

USP Installation Prerequisites

This chapter contains general installation prerequisites including hardware and software requirements. Though these requirements will support various deployment scenarios, the requirements for your specific use case and deployment scenario may differ.

- Ultra M Deployments Using UAS, on page 25
- VNF Deployments Using AutoVNF, on page 28

Ultra M Deployments Using UAS

Virtual Machine Recommendations

Table 1: Minimum VM Sizing Recommendations, on page 25 lists the minimum recommended VM sizing configurations per VNF component. Your specific requirements for CF and SF VM sizing may vary based on your deployment scenario.

Table 1: Minimum VM Sizing Recommendations

Functions	Minimum Required	vCPU	RAM (GB)	Root Disk (GB)
OSP-D*	1	16	32	200
AutoIT	1**	2	8	80
AutoDeploy	1**	2	8	80
AutoVNF	2	2	4	40
ESC (VNFM)	2	2		40
CF	2	8	16	6
SF	3	12	16	6
* OSP-D is deployed as a VM within the Ultra M solution. Though the recommended root disk size is 200GB, additional space can be allocated if available. ** AutoIT and AutoDeploy each minimally require 1 VM when deployed in non-HA mode. When deployed with HA, each requires 2 VMs.				

Important Ultra M solutions have specific requirements. Refer to the *Ultra M Solutions Guide* for more information.

Software Requirements

Table 2: Software Requirements, on page 26 identifies the software that must be installed on the prerequisite hardware before installing the USP.

Table 2: Software Requirements

Purpose	Software
RedHat Enterprise Linux	Release 6.1 and earlier: RedHat 7.3
Virtual Infrastructure Manager (VIM)	**Hyper-Converged Ultra M Single and Multi-VNF Models:** RedHat OpenStack Platform 10 (OSP 10 - Newton)
VIM Orchestrator	**Hyper-converged Ultra M Single and Multi-VNF Models:** RedHat OpenStack Platform 10 (OSP 10 - Newton)
UAS Component Operating System	

In addition to the preceding software, it is assumed that you have downloaded the latest USP software ISO.

Hardware Requirements

Server Functions and Quantities

The servers host the VMs required by the USP-based VNF. Though server functions and quantity differ depending on your deployment scenario, the following server functions are required for use with UAS in this release:

- **Ultra M Manager Node**: Required only for Ultra M deployments based on the Hyper-Converged architecture, this server hosts the following:
  - AutoIT VM(s)
  - AutoDeploy VM(s)
  - OSP-D VM

Important When AutoIT and/or AutoDeploy are deployed in HA mode, both the active and redundant VMs are deployed on the same physical server.

- **OpenStack Controller Nodes**: These servers host the high availability (HA) cluster that serves as the VIM. In addition, they facilitate the Ceph storage monitor function required by the OSD Compute Nodes.

- **OSD Compute Nodes**: Required only for deployments based on the Hyper-Converged architecture, these servers containing a Ceph Object Storage Daemon (OSD) providing storage capacity for the VNF. In addition to hosting the following:

Table 3: Server Quantities by Function, on page 27 provides information on server quantity requirements per function. Your specific server/node requirements may vary based on your deployment scenario.

Table 3: Server Quantities by Function

Server Quantity (min)	Ultra M Manager Node	Controller Nodes	OSD Compute Nodes	Compute Nodes (min)	Additional Specifications
15	1	3	3	8	Based on node type as described in Table 4: Minimum Server Specifications by Node Type, on page 27.

Table 4: Minimum Server Specifications by Node Type

Node Type	CPU	RAM	Storage
Ultra M Manager Node	2x 2.60 GHz	4x 32GB DDR4-2400-MHz RDIMM/PC4	2x 1.2 TB 12G SAS HDD
Controller	2x 2.60 GHz	4x 32GB DDR4-2400-MHz RDIMM/PC4	2x 1.2 TB 12G SAS HDD
Compute	2x 2.60 GHz	8x 32GB DDR4-2400-MHz RDIMM/PC4	2x 1.2 TB 12G SAS HDD
OSD Compute	2x 2.60 GHz	8x 32GB DDR4-2400-MHz RDIMM/PC4	4x 1.2 TB 12G SAS HDD 2x 300G 12G SAS HDD HDD 1x 480G 6G SAS SATA SSD

Password Requirements and Login Security

All passwords configured for and/or through UAS components (AutoIT, AutoDeploy, and/or AutoVNF) and UEM must meet the following criteria:

- They must be a minimum of 8 alpha and/or numeric characters.
- They must contain at least one uppercase letter.
- They must contain at least one lowercase letter.
- They must contain at least one number.
- They must contain at least one special character (e.g. @, #, $, etc.) with an exception of using exclamation (!) character.

The specified password criteria is applicable to all deployment scenarios — UAS-based Ultra M deployment, Standalone Auto-VNF-based deployment, and UEM-based VNF deployment.

For UAS and UEM components, the following login security restrictions are supported:

- You will be locked out of the system for 10 minutes upon the third incorrect attempt to login to a UAS and UEM VM.
- Should you need/want to change your password, the new password must be different than any of the last five previously configured passwords.

VNF Deployments Using AutoVNF

Virtual Machine Recommendations

Table 5: Minimum VM Sizing Recommendations, on page 28 lists the minimum recommended VM sizing configurations per VNF component. Your specific requirements for CF and SF VM sizing may vary based on your deployment scenario.

Table 5: Minimum VM Sizing Recommendations

Functions	Minimum Required	vCPU	RAM (GB)	Root Disk (GB)
AutoVNF	1	2	4	40
ESC (VNFM)*	2	2		40
CF	2	8	16	6
SF	3	12	16	6
* Though ESC VM sizing recommendations are provided, ESC deployment information and instructions is beyond the scope of this document. Refer to the ESC product documentation for details.				

The VMs identified in Table 5: Minimum VM Sizing Recommendations, on page 28 are deployed in your NFVI as shown in .

Note The above figure depicts an example deployment scenario. The placement of the VMs is based on your deployment requirements.

Software Requirements

Table 6: Software Requirements, on page 29 identifies the software that must be installed on the prerequisite hardware before installing the USP.

Table 6: Software Requirements

Purpose	Software
Cloud Computing Platform	OpenStack Platform 10 (OSP 10 - Newton) **Note** OpenStack Keystone API versions 2 and 3 are supported. Ensure that all aspects of your deployment are configured to use the same API version.
VNFM	In releases prior to 6.0: Cisco Elastic Services Controller 3.1.0.116 In releases 6.0 and 6.1: Cisco Elastic Services Controller 3.1.0.145 In release 6.4 : Cisco Elastic Services Controller 4.3.0.121
UAS Component Operating System	

In addition to the preceding software, it is assumed that you have downloaded the latest USP software ISO.

Hardware Requirements

Server Functions and Quantities

The servers host the VMs required by the USP-based VNF. Though server functions and quantity differ depending on your deployment scenario, the following server functions are required for VNF installation using AutoVNF:

- **Staging Server Node**: This server hosts the AutoVNF VM.
- **OpenStack Controller Nodes**: These servers host the high availability (HA) cluster that serves as the VIM. In addition, they facilitate the Ceph storage monitor function required by the OSD Compute Nodes.
- **OSD Compute Nodes**: Required only for deployments based on the Hyper-Converged architecture, these servers containing a Ceph Object Storage Daemon (OSD) providing storage capacity for the VNF. In addition to hosting the following:
  - Ultra Element Manager (UEM) HA cluster VMs
  - Ultra Service Platform (USP) Control Function (CF) active and standby VMs
- **Compute Nodes**: For all deployments, these servers host the active, standby, and demux USP Service Function (SF) VMs.

Important The above information assumes that the VNFM (ESC) was previously deployed.

Table 7: Server Quantities by Function, on page 30 provides information on server quantity requirements per function. Your specific server/node requirements may vary based on your deployment scenario.

Table 7: Server Quantities by Function

Server Quantity (min)	Red Hat Bare Metal/ Staging Server Node	Controller Nodes	OSD Compute Nodes	Compute Nodes (min)	Additional Specifications
15	1	3	3	8	Based on node type as described in Table 8: Minimum Server Specifications by Node Type, on page 30.

Table 8: Minimum Server Specifications by Node Type

Node Type	CPU	RAM	Storage
Staging Server	2x 2.60 GHz	4x 32GB DDR4-2400-MHz RDIMM/PC4	2x 1.2 TB 12G SAS HDD
Controller	2x 2.60 GHz	4x 32GB DDR4-2400-MHz RDIMM/PC4	2x 1.2 TB 12G SAS HDD
Compute	2x 2.60 GHz	8x 32GB DDR4-2400-MHz RDIMM/PC4	2x 1.2 TB 12G SAS HDD
OSD Compute	2x 2.60 GHz	8x 32GB DDR4-2400-MHz RDIMM/PC4	4x 1.2 TB 12G SAS HDD 2x 300G 12G SAS HDD HDD 1x 480G 6G SAS SATA SSD

Network Requirements

While specific VNF network requirements are described in the documentation corresponding to the VNF, displays the types of networks typically required by USP-based VNFs.

The USP-based VNF networking requirements and the specific roles are described here:

- **Public**: External public network. The router has an external gateway to the public network. All other networks (except DI-Internal and ServiceA-n) have an internal gateway pointing to the router. And the router performs secure network address translation (SNAT).
- **DI-Internal**: This is the DI-internal network which serves as a ‘backplane’ for CF-SF and CF-CF communications. Since this network is internal to the UGP, it does not have a gateway interface to the

router in the OpenStack network topology. A unique DI internal network must be created for each instance of the UGP. The interfaces attached to these networks use performance optimizations.

- **Management**: This is the local management network between the CFs and VNFM. To allow external access, an OpenStack floating IP address from the Public network must be associated with the UGP VIP (CF) address.

Note Prior to assigning floating and virtual IP addresses, make sure that they are not already allocated through OpenStack. If the addresses are already allocated, then they must be freed up for use or you must assign a new IP address that is available in the VIM.

- **Orchestration**: This is the network used for VNF deployment and monitoring. It is used by the VNFM to onboard the USP-based VNF.
- **ServiceA-n**: These are the service interfaces to the SF. Up to 12 service interfaces can be provisioned for the SF with this release. The interfaces attached to these networks use performance optimizations.

VNFCs can be assigned a floating IP address from a fixed pool of IP addresses configured for each network type. This is done using the **ip-allocation-pool** parameter in the Virtual Link Descriptor's Network Descriptor. Refer to the *Ultra Services Platform NETCONF API Guide* for more information.

Password Requirements and Login Security

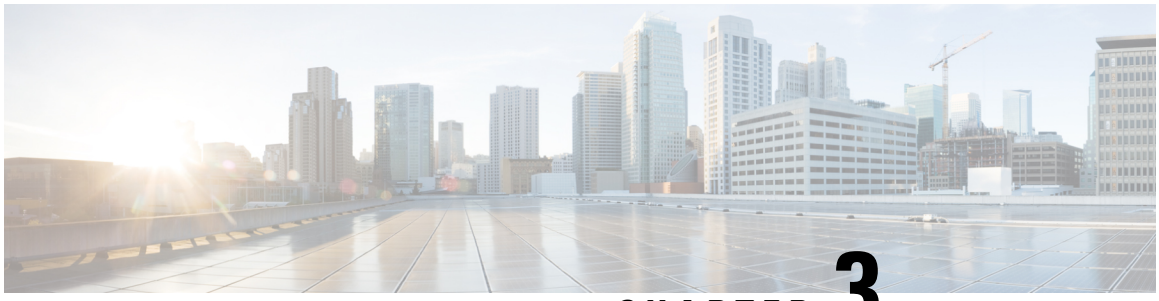
All passwords configured for and/or through UAS components (AutoIT, AutoDeploy, and/or AutoVNF) and UEM must meet the following criteria:

- They must be a minimum of 8 alpha and/or numeric characters.
- They must contain at least one uppercase letter.
- They must contain at least one lowercase letter.
- They must contain at least one number.
- They must contain at least one special character (e.g. @, #, $, etc.) with an exception of using exclamation (!) character.

The specified password criteria is applicable to all deployment scenarios — UAS-based Ultra M deployment, Standalone Auto-VNF-based deployment, and UEM-based VNF deployment.

For UAS and UEM components, the following login security restrictions are supported:

- You will be locked out of the system for 10 minutes upon the third incorrect attempt to login to a UAS and UEM VM.
- Should you need/want to change your password, the new password must be different than any of the last five previously configured passwords.



CHAPTER 3

Deploying Hyper-Converged Ultra M Models Using UAS

This chapter provides information on the following topics:

- Virtual Infrastructure Manager Installation Automation, on page 33
- VNF Deployment Automation, on page 52

Virtual Infrastructure Manager Installation Automation

Introduction

Leveraging RedHat and OpenStack's TripleO project concepts, UAS supports the ability to automate the deployment of both the virtual infrastructure manager (VIM, the Triple O Overcloud) and the VIM Orchestrator (the TripleO Undercloud).

Installing the VIM Orchestrator and the VIM involves deploying the following components as VMs on a RedHat Enterprise Linux (RHEL) server:

- AutoIT
- AutoDeploy
- OpenStack Platform Director (OSP-D)

VIM Orchestrator and VIM settings are maintained in configuration files which are used by AutoDeploy.

AutoDeploy processes the VIM Orchestrator configuration and works with AutoIT to automate the deployment of a VM running OSP-D which serves as the Undercloud. Once this operation is successful, AutoDeploy processes the VIM configuration and works with AutoIT to deploy the OpenStack Overcloud.

Notes:

- This functionality is supported only with Ultra M deployments based on OSP 10 and that leverage the Hyper-Converged architecture.
- Refer to Pre-Virtual Infrastructure Manager Installation Verification, on page 35 for pre-requisites pertaining to this feature.

VIM Installation Automation Overview

Figure 13: NFVI Deployment Automation Workflow, on page 34 provides an overview of the deployment automation process. Details are provided in Table 9: Virtual Infrastructure Manager Installation Automation Workflow Descriptions, on page 34. This information assumes that all prerequisite hardware has been installed, cabled, and configured.

Important The workflow information in this section assumes a new deployment scenario. If you are using this feature in relation with an upgrade process, please contact your support representative for complete details.

Figure 13: NFVI Deployment Automation Workflow

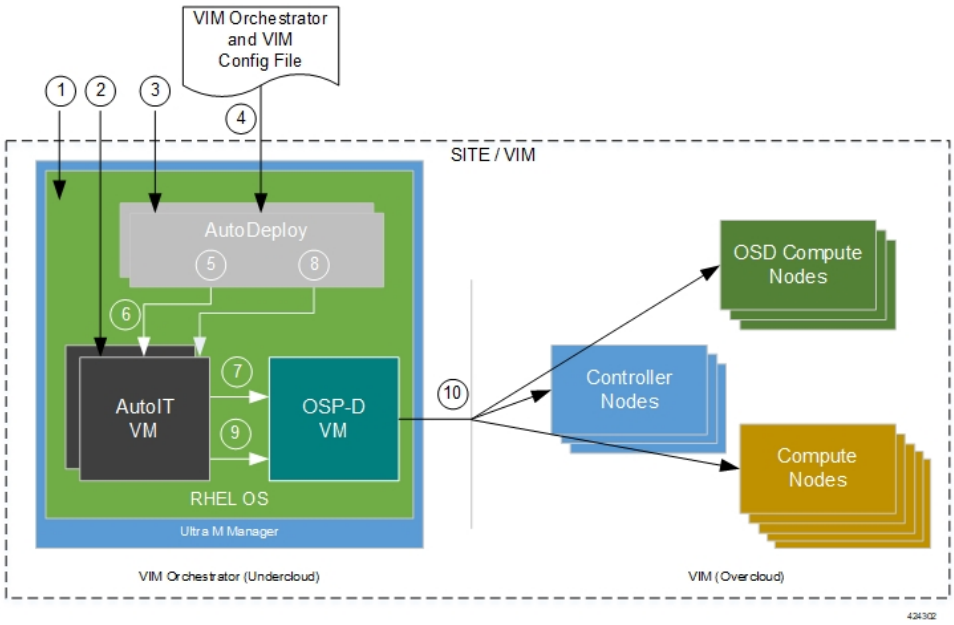


Table 9: Virtual Infrastructure Manager Installation Automation Workflow Descriptions

Callout	Description
1	Install RedHat Enterprise Linux (RHEL) operating system on bare metal hardware (Ultra M Manager Node).
2	Deploy the AutoIT VMs.
3	Deploy the AutoDeploy VMs.
4	Prepare the file containing the VIM Orchestrator and VIM. This file is used by AutoDeploy to initiate the OSP-D VM deployment process and to bring up the VIM. This file includes all the configuration information required to deploy OSP-D VM and VIM including configurations for constructs such as secure tokens, package images, NFVI point-of-presence descriptors (nfvi-popd), the VIM Orchestrator descriptor (vim-orchd), and VIM role and node information. Refer to Sample VIM Orchestrator and VIM Configuration File, on page 171 for more information.

Callout	Description
5	On the AutoDeploy VM, load, commit, and then activate the configuration file prepared in the previous step.
6	AutoDeploy passes data from the activated configuration to AutoIT requesting that it deploy the OSP-D VM for the Undercloud. Refer to Activate the VIM Orchestrator and VIM Deployment, on page 51 for more information.
7	AutoIT deploys the OSP-D VM which serves as the Undercloud.
8	AutoDeploy passes VIM data from the activated configuration to AutoIT for delivery to the OSP-D VM responsible for installing the VIM.
9	AutoIT initiates the VIM installation by passing parameters received from AutoDeploy to the OSP-D VM.
10	The OSP-D VM installs the VIM per the configuration requirements.

Once all the VIM servers have been successfully deployed, the process of deploying the VNF can begin as described in VNF Deployment Automation, on page 52.

Pre-Virtual Infrastructure Manager Installation Verification

Prior to installing the virtual infrastructure manager (VIM) and the VIM Orchestrator, please ensure that the following is true:

- Ensure that all required hardware is installed, powered on, cabled and configured according to the information and instructions in the *Ultra M Solutions Guide*. Refer to the following sections in that document:
  - *Hardware Specifications*
  - *Install and Cable the Hardware*
  - *Configure the Switches*
  - *Prepare the UCS C-Series Hardware*
- Ensure that all required software is available and that you have access to the Cisco-provided USP ISO image. See the *Software Specifications* section of the *Ultra M Solutions Guide* for more details.
- Ensure that the following repos are always enabled for Satellite Server and CDN Server:
  - rhel-7-server-rpms
  - rhel-7-server-rh-common-rpms
  - rhel-7-server-extras-rpms
  - rhel-ha-for-rhel-7-server-rpms
  - rhel-7-server-optional-rpms
  - rhel-7-server-rhscon-2-installer-rpms
  - rhel-7-server-openstack-10-rpms

- rhel-7-server-rhceph-2-mon-rpms
- rhel-7-server-rhceph-2-osd-rpms
- rhel-7-server-rhceph-2-tools-rpms

Install the VIM Orchestrator

The initial part of the Virtual Infrastructure Manager installation automation process is to install the VIM Orchestrator. You cannot install the VIM until after the VIM Orchestration installation is successful.

Important Before proceeding, ensure that all of the items in Pre-Virtual Infrastructure Manager Installation Verification, on page 35 have been verified.

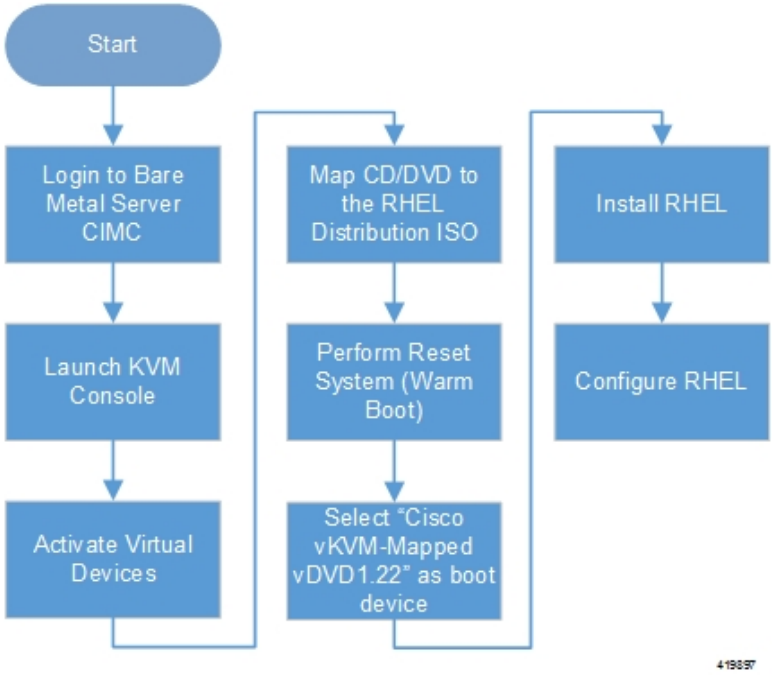
To install the VIM Orchestrator:

1. Install and Configure RHEL, on page 36.
2. Onboard the USP ISO, on page 42.
3. Extract the UAS Bundle, on page 44.
4. Deploy AutoIT, on page 45.
5. Deploy AutoDeploy, on page 47.
6. Prepare the VIM Orchestrator and VIM Configuration File, on page 50 based on your deployment requirements.
7. Activate the VIM Orchestrator and VIM Deployment, on page 51.

Install and Configure RHEL

As described in VIM Installation Automation Overview, on page 34, the VIM Orchestrator (OSP-D) is deployed as a VM on top of RHEL. Figure 14: Installation Process for RHEL Bare Metal Server, on page 37 illustrates the process for installing RHEL.

Figure 14: Installation Process for RHEL Bare Metal Server



General RHEL installation information and procedures are located in the product documentation:

- https://access.redhat.com/documentation/en/red-hat-enterprise-linux/

Prior to installing RHEL, refer to Table 10: Red Hat Installation Settings, on page 37 for settings required for the VIM Orchestrator installation in Ultra M.

Note Table 10: Red Hat Installation Settings, on page 37 assumes that you are using the product's graphical user interface (GUI) for Red Hat installation.

Table 10: Red Hat Installation Settings

Parameters and Settings	Description
Installation Summary > Language Support	
English > English (United States)	Sets the language to English and the region to United States.
Installation Summary > Software Selection	
Base Environment = Virtualization Host Add-Ons for Selected Environment = Virtualization Platform	
Installation Summary > Network & Host Name	

Parameters and Settings	Description
Host name	Configure the desired host name.
Installation Summary > Network & Host Name > Ethernet (eno2) > Configure > IPv4 Setting	
IP Address Netmask Gateway DNS Server Search Domain	Configure and save settings for the network interface by which the server can be accessed externally.
Installation Summary > Installation Destination > CiscoUCSC-MRAID12G (sda) > I will configure partitioning > Click here to create them automatically	
Select all partitions, then click "-" / = 100GB /var = 500GB /swap = 100GB /home = remaining space /boot = 1GB	Removes any previously configured partitions and creates partitions with the required sizes. **Note** You must use LVM-based partitioning.
Installation Summary > KDUMP	
kdump = disabled	It is recommended that kdump be disabled.
Installation Summary > Begin Installation > User Settings	
Root Password	Configure and confirm the root user password.
Create user "nfvi"	Creates a new user account. This account is used during the VIM Orchestration installation to log onto the Ultra M Manager Node. **Note** Ensure that a strong password is used. It must be a minimum of 8 alpha and/or numeric characters and must contain at least 1 uppercase letter, 1 lowercase letter, 1 number, and 1 special character (e.g. @, #, $, etc.).

To install and configure RHEL:

1. Follow the CIMC processes on the bare metal server as identified in Figure 14: Installation Process for RHEL Bare Metal Server, on page 37.
2. Select the option to install Red Hat Enterprise Linux to begin the installation.
3. Configure the settings identified in Table 10: Red Hat Installation Settings, on page 37.
4. Begin the installation and configure the User Setting identified in Table 10: Red Hat Installation Settings, on page 37.
5. Click **Reboot** once the installation is complete.
6. Log in to RedHat as the **nfvi** user.
7. Set password-less sudo access for **nfvi**.

   ```
   echo "nfvi ALL=(root) NOPASSWD:ALL" | tee -a /etc/sudoers.d/nfvi
   chmod 0440 /etc/sudoers.d/nfvi
   ```

8. Configure the network interfaces and network bridges.

Important If any of the network interface or bridge configuration files do not exist, create the related configuration files. Example configuration files are provided in Example RedHat Network Interface and Bridge Configuration Files, on page 201.

a. Configure the eno2 interface by appending the following parameters to the */etc/sysconfig/network-scripts/ifcfg-eno2* file.

```
<--SNIP-->
DEVICE=eno2
ONBOOT=yes
BRIDGE=br-ex
NM_CONTROLLED=no
NETMASK=<netmask>
GATEWAY=<gateway_address>
```

b. Configure the eno1 interface by appending the following parameters to the */etc/sysconfig/network-scripts/ifcfg-eno1* file.

```
<--SNIP-->
DEVICE=eno1
ONBOOT=yes
BRIDGE=br-ctlplane
NM_CONTROLLED=no
```

c. Configure the br-ex network bridge by adding the following parameters to the */etc/sysconfig/network-scripts/ifcfg-br-ex* file.

```
<--SNIP-->
DEVICE=br-ex
DEFROUTE=yes
TYPE=Bridge
ONBOOT=yes
BOOTPROTO=static
NM_CONTROLLED=no
DELAY=0
IPADDR=<external_ip_address>
NETMASK=<netmask>
GATEWAY=<gateway_address>
PREFIX="24"
DNS1="<DNS_server_address>"
DOMAIN="<domain_name>"
IPV4_FAILURE_FATAL="yes"
```

d. Configure the br-ctlplane bridge by adding the following parameters to the */etc/sysconfig/network-scripts/ifcfg-br-ctlplane* file.

```
<--SNIP-->
DEFROUTE=yes
TYPE=Bridge
ONBOOT=yes
BOOTPROTO=static
```

```
NM_CONTROLLED=no
DELAY=0
DEVICE=br-ctlplane
```

Caution Once configured, it is recommended that you do not make any changes to the network interface or bridge configuration. Doing so will require that you redeploy AutoIT and AutoDeploy.

9. Create and prepare the directories required for installing the UAS components.

   ```
   sudo mkdir -p /var/cisco/isos
   sudo mkdir -p /var/cisco/disks
   sudo chmod 777 -R /var/cisco
   ```

10. Reboot the bare metal server.

    ```
    sudo reboot
    ```

11. Login as a root user upon reboot.

Important If the server is not accessible via the configured IP address, login into the server's KVM console and troubleshoot the configuration.

12. Validate the network configuration.

    ```
    ifconfig | more
    ```

    Example output:

```
br-ctlplane: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet6 fe80::22c:c8ff:fed9:f176  prefixlen 64  scopeid 0x20<link>
        ether 00:2c:c8:d9:f1:76  txqueuelen 1000  (Ethernet)
        RX packets 52  bytes 7044 (6.8 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 8  bytes 648 (648.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

br-ex: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.25.22.59  netmask 255.255.255.0  broadcast 172.25.22.255
        inet6 fe80::22c:c8ff:fed9:f177  prefixlen 64  scopeid 0x20<link>
        ether 00:2c:c8:d9:f1:77  txqueuelen 1000  (Ethernet)
        RX packets 1394  bytes 122906 (120.0 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 717  bytes 71762 (70.0 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eno1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet6 fe80::22c:c8ff:fed9:f176  prefixlen 64  scopeid 0x20<link>
        ether 00:2c:c8:d9:f1:76  txqueuelen 1000  (Ethernet)
        RX packets 57  bytes 8072 (7.8 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 16  bytes 1296 (1.2 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device memory 0xc7000000-c70fffff

eno2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
```

```
        inet6 fe80::22c:c8ff:fed9:f177  prefixlen 64  scopeid 0x20<link>
        ether 00:2c:c8:d9:f1:77  txqueuelen 1000  (Ethernet)
        RX packets 1497  bytes 148860 (145.3 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 726  bytes 72476 (70.7 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device memory 0xc6f00000-c6ffffff

enp6s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        ether 00:2c:c8:68:3b:ec  txqueuelen 1000  (Ethernet)
        RX packets 1  bytes 68 (68.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

enp7s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        ether 00:2c:c8:68:3b:ed  txqueuelen 1000  (Ethernet)
        RX packets 1  bytes 68 (68.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1  (Local Loopback)
        RX packets 84  bytes 6946 (6.7 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 84  bytes 6946 (6.7 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 192.168.122.1  netmask 255.255.255.0  broadcast 192.168.122.255
[root@rhel-baremetal nfvi]# brctl show
bridge name bridge id  STP enabled interfaces
br-ctlplane  8000.002cc8d9f176 no  eno1
br-ex  8000.002cc8d9f177 no  eno2
virbr0  8000.5254003d7549 yes  virbr0-nic
```

13. Perform the RHEL subscription-manager registration.

From Content Delivery Network (CDN) servers:

sudo subscription-manager config --server.proxy_hostname=*<proxy_url>* **--server.proxy_port=80**

subscription-manager register --username *<username>* **--password** *<password>*

subscription-manager attach -auto

sudo subscription-manager status

From Satellite Servers:

rpm -Uvh http://*<satellite_server_domain>***/pub/katello-ca-consumer-latest.noarch.rpm**

subscription-manager register --org="*<organization>***" --activationkey="***<activation_key>***"**

Example output:

```
+-------------------------------------------+
   System Status Details
```

```
+----------------------------------------+
Overall Status: Current
```

14. Install the virtualization packages.

    yum install virt-install -y

    Example output:

```
Loaded plugins: langpacks, product-id, search-disabled-repos, subscription-manager
rhel-7-server-rpms                                                    | 3.5 kB
 00:00:00
(1/3): rhel-7-server-rpms/7Server/x86_64/group                        | 709 kB
 00:00:01
(2/3): rhel-7-server-rpms/7Server/x86_64/updateinfo                   | 2.3 MB
 00:00:02
(3/3): rhel-7-server-rpms/7Server/x86_64/primary_db                   |  42 MB
 00:00:16
Resolving Dependencies
Loaded plugins: langpacks, product-id, search-disabled-repos, subscription-manager
rhel-7-server-rpms | 3.5 kB 00:00:00
(1/3): rhel-7-server-rpms/7Server/x86_64/group | 709 kB 00:00:01
(2/3): rhel-7-server-rpms/7Server/x86_64/updateinfo | 2.3 MB 00:00:02
(3/3): rhel-7-server-rpms/7Server/x86_64/primary_db | 42 MB 00:00:16
Resolving Dependencies
```

    yum install virt-viewer -y

```
Loaded plugins: langpacks, product-id, search-disabled-repos, subscription-manager
Resolving Dependencies
--> Running transaction check
---> Package virt-viewer.x86_64 0:5.0-7.el7 will be installed
```

15. Install the Python bindings to the OpenStack Compute API.

    yum install python-novaclient -y

16. Install the OpenStack networking API client.

    yum install python-neutronclient -y

17. Proceed to Onboard the USP ISO, on page 42.

Onboard the USP ISO

The files required to deploy the USP components are distributed as RPMs (called “bundles”) in a single ISO package. They are maintained using YUM on the Ultra M Manager Node. The following bundles are part of the ISO:

USP Bundle Name	Description
usp-em-bundle	The Element Manager (EM) Bundle RPM containing images and metadata for the Ultra Element Manager (UEM) module.
usp-uas-bundle	The Ultra Automation Services Bundle RPM containing AutoIT, AutoDeploy, AutoVNF, Ultra Web Services (UWS), and other automation packages.
usp-ugp-bundle	The Ultra Gateway Platform (UGP) Bundle RPM containing images for Ultra Packet core (VPC-DI). This bundle contains non-trusted images.

USP Bundle Name	Description
usp-vnfm-bundle	The VNFM Bundle RPM containing an image and a boot-up script for ESC (Elastic Service Controller).
usp-yang-bundle	The Yang Bundle RPM containing YANG data models including the VNFD and VNFR.
usp-auto-it-bundle	The bundle containing the AutoIT packages required to deploy the UAS.

In addition to the bundles, the ISO bundle also includes scripts used to deploy the bundles including UAS.

Important This procedure is not necessary if you are deploying a VNF on a Hyper-Converged Ultra M mode and have already deployed the VIM Orchestrator and the VIM using the information and instructions in Virtual Infrastructure Manager Installation Automation, on page 33.

Important Before attempting to deploy the Ultra M Manager Node, ensure that the USP Installation Prerequisites, on page 25 have been met.

To onboard the ISO package:

1. Log on to the Ultra M Manager Node.
2. Download the USP ISO bundle and related files pertaining to the release.
3. Create a mount point on the Ultra M Manager Node and mount the ISO package:

   mkdir /var/usp-iso
4. Mount the USP ISO.

   sudo mount -t iso9660 -o loop *<ISO_download_directory>/<ISO_package_name>* **/var/usp-iso**

   Example: The following command mounts the ISO bundle called *usp-5_5_0-1255.iso* located in a directory called *5_5_0-1283 to /var/usp-iso*:

   sudo mount -t iso9660 -o loop 5_5_0-1064/usp-5_5_0-1064.iso /var/usp-iso

   ```
   mount: /dev/loop1 is write-protected, mounting read-only
   ```
5. Verify the mount configuration.

   df -h

   Example output:

   ```
   Filesystem Size Used Avail Use% Mounted on
   /dev/sda2 187G 178G 316M 100% /
   devtmpfs 63G 0 63G 0% /dev
   tmpfs 63G 4.0K 63G 1% /dev/shm
   tmpfs 63G 1.4M 63G 1% /run
   tmpfs 63G 0 63G 0% /sys/fs/cgroup
   /dev/sda1 477M 112M 336M 25% /boot
   tmpfs 13G 0 13G 0% /run/user/0
   /dev/loop1 4.2G 4.2G 0 100% /var/usp-iso >>>>>
   ```

6. Proceed to Extract the UAS Bundle, on page 44.

Extract the UAS Bundle

Once the USP ISO has been mounted, the UAS bundle must be extracted from the ISO in order to prepare the configuration files required for deployment.

Important These instructions assume you are already logged on to the server on which AutoIT, AutoDeploy, and VIM-Orchestrator VMs are to be installed and that the USP ISO has been mounted.

To extract the UAS bundle:

1. Navigate to the tools directory within the ISO mount.

   cd /var/usp-iso/tools/

2. Launch the *usp-uas-installer.sh* script.

   sudo ./usp-uas-installer.sh

   The script extracts the files that comprise the UAS bundle to */opt/cisco/usp/uas-installer*.

3. Verify that files have been extracted.

   Example output:

   ll /opt/cisco/usp/uas-installer

```
total 20
drwxr-xr-x 5 root root 4096 Aug 18 23:42 ./
drwxr-xr-x 6 root root 4096 Aug 18 23:42 ../
drwxr-xr-x 5 root root 4096 Aug 18 23:42 common/
drwxr-xr-x 2 root root 4096 Aug 18 23:42 images/
drwxr-xr-x 2 root root 4096 Aug 18 23:42 scripts/
```

   ll /opt/cisco/usp/uas-installer/images/

```
total 711940
drwxr-xr-x 2 root root      4096 Aug 18 23:42 ./
drwxr-xr-x 5 root root      4096 Aug 18 23:42 ../
-rw-r--r-- 1 root root 729010688 Aug 17 23:29 usp-uas-1.0.0-1074.qcow2
```

   ll /opt/cisco/usp/uas-installer/scripts/

```
total 80
-rwxr-xr-x. 1 root root   806 Aug 29 18:14 auto-deploy-booting.sh
-rwxr-xr-x. 1 root root  5460 Aug 29 18:14 autoit-user.py
-rwxr-xr-x. 1 root root   811 Aug 29 18:14 auto-it-vnf-staging.sh
-rwxr-xr-x. 1 root root  4762 Aug 29 18:14 encrypt_account.sh
-rwxr-xr-x. 1 root root  3945 Aug 29 18:14 encrypt_credentials.sh
-rwxr-xr-x. 1 root root 14031 Aug 29 18:14 start-ultram-vm.py
-rwxr-xr-x. 1 root root 14605 Aug 29 18:14 boot_uas.py
-rwxr-xr-x. 1 root root  5384 Aug 29 18:14 uas-check.py
-rwxr-xr-x. 1 root root 11283 Aug 29 18:14 usp-tenant.py
```

4. Proceed to Deploy AutoIT, on page 45.

Deploy AutoIT

AutoIT deployment is facilitated through a script. The script relies on user inputs to perform pre-requisite configurations including whether or not to deploy with HA support and account encryptions. Additionally, the script removes existing AutoIT deployments that may already exist.

The following information is required to execute the script:

- **AutoIT VM Login Password for ID 'ubuntu':** The password for the default user account, which is named ubuntu.
- **AutoIT API Access password for 'admin':** The password for the ConfD administrator user, which is named admin.
- **AutoIT API Access password for 'oper':** The password for the ConfD operator user, which is named oper.
- **AutoIT API Access password for 'security-admin':** The password for the ConfD security administrator user, which is named security-admin.
- **Hostname:** The hostname assigned to the AutoIT VM.
- **Image (QCOW2):** The path and file name for the UAS qcow2 file. For example:

  /opt/cisco/usp/uas-installer/images/usp-uas-1.0.0-1074.qcow2
- **External Network HA VIP :** The VIP address to be assigned to AutoIT's external network interface.
- **External Network Details:**
  - **IP Address:** The IP address to be assigned to AutoIT VMs' external network interface. If AutoIT is deployed with HA support, you are prompted to enter separate external IP addresses for both the active and redundant VMs.
  - **Gateway:** The gateway assigned to AutoIT's external network interface.
  - **Netmask:** The mask to be assigned to AutoIT's external network interface.
- **Provisioning Network Details:**
  - **IP Address:** The IP address to be assigned to the provisioning network interface. Within Hyper-Converged Ultra M models, this interface is used by the Ultra M Health Monitoring function.

    If AutoIT is deployed with HA support, you are prompted to enter separate IP provisioning addresses for both the active and redundant VMs.
  - **Netmask:** The netmask to be assigned to the provisioning network interface.

Important

- All passwords must meet the requirements specified in Password Requirements and Login Security, on page 27.
- You may be asked for some of the above pieces of information twice, once for each VM when AutoIT is deployed with HA support.

The script allocates the following resources to the AutoIT VM:

- 2 VCPUs
- 8 GB RAM
- 80 GB Root Disk

Important These instructions assume a bare-metal installation and that you are already logged on to the server on which AutoIT, AutoDeploy, and VIM-Orchestrator VMs are to be installed and on which the USP ISO has been mounted.

To deploy the AutoIT VM:

1. Navigate to the */opt/cisco/usp/uas-installer/scripts* directory:

   `cd /opt/cisco/usp/uas-installer/scripts`

2. Execute the *boot_uas.py* script with the desired options:

   `./boot_uas.py --kvm --autoit --ha`

Important The above command deploys AutoIT with HA support which is recommended for use within Ultra M solutions. Remove the **--ha** if you do not wish to implement HA support for AutoIT.

3. Enter the information requested by the script for your deployment.

   The script displays progress information. For example:

```
2018-01-24 16:06:17,355 - '/home' disk capacity is 1807 GB Loaded plugins: langpacks,
product-id
2018-01-24 16:06:17,397 - Package 'virt-install' is present
2018-01-24 16:06:17,397 - Package 'libvirt' is present
2018-01-24 16:06:17,397 - Package 'virt-viewer' is present
2018-01-24 16:06:17,397 - Interface 'br-ex' is UP
2018-01-24 16:06:17,397 - Interface 'br-ctlplane' is UP
2018-01-24 16:06:17,398 - Removing old deployment 'AutoIT_instance_0', if it exists
2018-01-24 16:06:19,921 - Removing old deployment 'AutoIT_instance_1', if it exists
2018-01-24 16:06:19,946 - Using instance 'AutoIT_instance_0' at location
'/home/cisco/AutoIT/instance_0'
2018-01-24 16:06:19,946 - Staging configuration ISO
2018-01-24 16:06:19,951 - Completed configuration ISO
/home/cisco/AutoIT/instance_0/cfg.iso
2018-01-24 16:06:19,951 - Preparing root disk '/home/cisco/AutoIT/instance_0/uas.qcow2'
2018-01-24 16:06:20,378 - Resizing disk to '80GB'
2018-01-24 16:06:33,417 - Starting deployment 'AutoIT_instance_0'
2018-01-24 16:06:34,124 - Started deployment 'AutoIT_instance_0' successfully
2018-01-24 16:06:34,125 - Using instance 'AutoIT_instance_1' at location
'/home/cisco/AutoIT/instance_1'
2018-01-24 16:06:34,125 - Staging configuration ISO
2018-01-24 16:06:34,130 - Completed configuration ISO
/home/cisco/AutoIT/instance_1/cfg.iso
2018-01-24 16:06:34,130 - Preparing root disk '/home/cisco/AutoIT/instance_1/uas.qcow2'
2018-01-24 16:06:34,557 - Resizing disk to '80GB'
2018-01-24 16:06:42,629 - Starting deployment 'AutoIT_instance_1'
2018-01-24 16:06:43,360 - Started deployment 'AutoIT_instance_1' successfully
```

4. Verify that the AutoIT VM is running.

virsh list -all

Example command output:

```
 Id    Name                           State
----------------------------------------------------
 487   AutoIT_instance_0              running
 488   AutoIT_instance_1              running
```

5. Check the status of AutoIT.
   a. Log on to the master AutoIT VM.

      confd_cli -C -u admin

      Example command output:

      ```
      Welcome to the ConfD CLI
      admin connected from 127.0.0.1 using console on autoit1-0
      ```

   b. View the status.

      show uas

      Example command output:

      ```
      uas version               6.0.0
      uas state                 active
      uas external-connection-point 172.28.185.132
      INSTANCE IP     STATE  ROLE
      -------------------------------------
      172.28.185.133  alive  CONFD-MASTER
      172.28.185.134  alive  CONFD-SLAVE

      NAME           LAST HEARTBEAT
      -------------------------------------
      AutoIT-MASTER  2018-01-24 21:24:30
      USPCFMWorker   2018-01-24 21:24:30
      USPCHBWorker   2018-01-24 21:24:30
      USPCWorker     2018-01-24 21:24:30
      ```

6. Proceed to Deploy AutoDeploy, on page 47.

Deploy AutoDeploy

Important The information and instructions provided here are only applicable when AutoDeploy is used in the VIM Orchestrator installation process.

AutoDeploy deployment is facilitated through a script. The script relies on user inputs to perform pre-requisite configurations including whether or not to deploy with HA support and account encryptions. Additionally, the script removes existing AutoDeploy deployments that may already exist.

The following information is required to execute the script:

- **AutoDeploy VM Login Password for ID 'ubuntu'** The password for the default user account, which is named ubuntu.
- **AutoDeploy API Access password for 'admin':** The password for the ConfD administrator user, which is named admin.

- **AutoDeploy API Access password for 'oper':** The password for the ConfD operator user, which is named oper.
- **AutoDeploy API Access password for 'security-admin':** The password for the ConfD security administrator user, which is named security-admin.
- **Hostname:** The hostname assigned to the AutoDeploy VM.
- **Image (QCOW2):** The path and file name for the UAS qcow2 file. For example:

  /opt/cisco/usp/uas-installer/images/usp-uas-1.0.0-1074.qcow2
- **External Network HA VIP :** The VIP address to be assigned to AutoDeploy's external network interface.
- **External Network Details:**
  - **IP Address:** The IP address to be assigned to AutoDeploy VMs' external network interface. If AutoDeploy is deployed with HA support, you are prompted to enter separate external IP addresses for both the active and redundant VMs.
  - **Gateway:** The gateway assigned to AutoDeploy's external network interface.
  - **Netmask:** The mask to be assigned to AutoDeploy's external network interface.

Important

- All passwords must meet the requirements specified in Password Requirements and Login Security, on page 27.
- You may be asked for some of the above pieces of information twice, once for each VM when AutoDeploy is deployed with HA support.

The script allocates the following resources to the AutoDeploy VM:

- 2 VCPUs
- 8 GB RAM
- 80 GB Root Disk

Important

These instructions assume a bare-metal installation and that you are already logged on to the server on which AutoIT, AutoDeploy, and VIM-Orchestrator VMs are to be installed and on which the USP ISO has been mounted.

To deploy the AutoDeploy VM:

1. Navigate to the */opt/cisco/usp/uas-installer/scripts* directory:

   ```
   cd /opt/cisco/usp/uas-installer/scripts
   ```
2. Execute the *boot_uas.py* script:

   ```
   ./boot_uas.py --kvm --autodeploy --ha
   ```

Note The above command deploys AutoDeploy with HA support. Remove the **--ha** if you do not wish to implement HA support for AutoDeploy.

3. Enter the information requested by the script for your deployment.

   The script displays progress information. For example:

```
2018-01-24 16:28:05,095 - '/home' disk capacity is 1807 GB Loaded plugins: langpacks,
product-id
2018-01-24 16:28:05,134 - Package 'virt-install' is present
2018-01-24 16:28:05,135 - Package 'libvirt' is present
2018-01-24 16:28:05,135 - Package 'virt-viewer' is present
2018-01-24 16:28:05,135 - Interface 'br-ex' is UP
2018-01-24 16:28:05,135 - Interface 'br-ctlplane' is UP
2018-01-24 16:28:05,135 - Removing old deployment 'AutoDeploy_instance_0', if it exists
2018-01-24 16:28:06,980 - Removing old deployment 'AutoDeploy_instance_1', if it exists
2018-01-24 16:28:07,005 - Using instance 'AutoDeploy_instance_0' at location
'/home/cisco/AutoDeploy/instance_0'
2018-01-24 16:28:07,006 - Staging configuration ISO
2018-01-24 16:28:07,010 - Completed configuration ISO
/home/cisco/AutoDeploy/instance_0/cfg.iso
2018-01-24 16:28:07,010 - Preparing root disk
'/home/cisco/AutoDeploy/instance_0/uas.qcow2'
2018-01-24 16:28:07,450 - Resizing disk to '80GB'
2018-01-24 16:28:15,965 - Starting deployment 'AutoDeploy_instance_0'
2018-01-24 16:28:16,649 - Started deployment 'AutoDeploy_instance_0' successfully
2018-01-24 16:28:16,650 - Using instance 'AutoDeploy_instance_1' at location
'/home/cisco/AutoDeploy/instance_1'
2018-01-24 16:28:16,650 - Staging configuration ISO
2018-01-24 16:28:16,655 - Completed configuration ISO
/home/cisco/AutoDeploy/instance_1/cfg.iso
2018-01-24 16:28:16,655 - Preparing root disk
'/home/cisco/AutoDeploy/instance_1/uas.qcow2'
2018-01-24 16:28:17,106 - Resizing disk to '80GB'
2018-01-24 16:28:30,204 - Starting deployment 'AutoDeploy_instance_1'
2018-01-24 16:28:30,892 - Started deployment 'AutoDeploy_instance_1' successfully
```

4. Verify that the AutoDeploy VM is running.

   virsh list -all

```
 Id    Name                           State
----------------------------------------------------
 495   AutoDeploy_instance_0          running
 496   AutoDeploy_instance_1          running
```

Important It is recommended that you do not make any changes to the AutoIT network interface or bridge configuration. Doing so will require that you redeploy AutoDeploy.

5. Check the status of AutoDeploy.

   a. Log on to the master AutoDeploy VM.

      confd_cli -C -u admin

      Example command output:

```
Welcome to the ConfD CLI
admin connected from 127.0.0.1 using console on autodeploy-0
```

b. View the status.

```
show uas
```

Example command output:

```
uas version               6.0.0uas version               6.0.0
uas state                 active
uas external-connection-point 172.28.185.132
INSTANCE IP     STATE  ROLE
-------------------------------------
172.28.185.133  alive  CONFD-MASTER
172.28.185.134  alive  CONFD-SLAVE

NAME               LAST HEARTBEAT
-----------------------------------------
AutoDeploy-MASTER  2018-01-24 21:29:54
USPCFMWorker       2018-01-24 21:29:45
USPCHBWorker       2018-01-24 21:29:45
USPCWorker         2018-01-24 21:29:45
```

6. Choose the desired method by which to continue the deployment process:

- Use the ConfD CLI/APIs to continue the deployment process. To use this method, proceed to Prepare the VIM Orchestrator and VIM Configuration File, on page 50.

Important You will need access to both the OpenStack GUI and CLI to complete the configuration procedures.

Prepare the VIM Orchestrator and VIM Configuration File

As described in VIM Installation Automation Overview, on page 34, the VIM Orchestrator and VIM configuration file is used by AutoDeploy to activate the OSP-D VM and VIM deployment process.

This file includes all of the configuration information required to deploy OSP-D VM and VIM including configurations for constructs such as secure tokens, package images, NFVI point-of-presence descriptors (nfvi-popd), the VIM Orchestrator descriptor (vim-orchd), and VIM role and node information. Refer to Sample VIM Orchestrator and VIM Configuration File, on page 171 for more information. Additional information on the constructs and parameters used in this file are located in the *Cisco Ultra Services Platform NETCONF API Guide*.

You can also refer to RedHat user documentation for information on how to install the satellite server if your deployment requires:

https://access.redhat.com/documentation/en-US/Red_Hat_Network_Satellite/5.0/html/Installation_Guide/s1-intro-sat.html

Note These instructions assume you are already logged on to the AutoDeploy VM as the root user.

To prepare the VIM Orchestrator and VIM configuration file:

1. Create and edit your VIM Orchestrator and VIM configuration file according to your deployment requirements. Use the sample provided in Sample VIM Orchestrator and VIM Configuration File, on page 171 as a reference.
2. Save the VIM Orchestrator and VIM configuration file you have created to your home directory.
3. Proceed to Activate the VIM Orchestrator and VIM Deployment, on page 51.

Activate the VIM Orchestrator and VIM Deployment

Once you have completed preparing your VIM Orchestrator and VIM configuration file, you must load the configuration and activate the deployment in order to bring up the OSP-D VM and the VIM.

Important These instructions assume you are already logged on to the AutoDeploy VM as the root user and that your VIM Orchestrator and VIM configuration file has been prepared for your deployment as per the information and instructions in Prepare the VIM Orchestrator and VIM Configuration File, on page 50.

To activate the OSP-D VM and VIM deployment using AutoDeploy:

1. Login to the ConfD CLI as the *admin* user.

   ```
   confd_cli -u admin -C
   ```

2. Enter the ConfD configuration mode.

   ```
   config
   ```

3. Load the VIM Orchestrator and VIM configuration file to provide the deployment artifacts to the VIM.

   ```
   load merge <your_config_file_name>.cfg
   commit
   end
   ```

Important If changes are made to the VIM Orchestrator and VIM configuration file after it was committed, you can apply the changes using the **load replace** command instead of the **load merge** command. You will also need to **commit** your changes.

4. Activate the VIM Orchestrator configuration aspects of the configuration file.

   ```
   activate nsd-id <nsd_name>
   ```

Important The output of this command is a transaction-id which can be used to monitor the deployment progress. If need be, the VIM deployment can be deactivated using the **deactivate** variant of this command.

5. Monitor the progress of the deployment.
   a. List the transactions.

      ```
      show transaction
      ```

Example command output:

```
TX ID              TX TYPE              ID            DEPLOYMENT TIMESTAMP
    STATUS     DETAIL STATUS
------------------------------------------------------------------------------
1510448403-721303  activate-ns-deployment        test
2017-11-12T01:00:03.721334-00:00  requested     -
1510448404-104189  activate-vim-orch-deployment  ph-vim-orch
2017-11-12T01:00:04.104204-00:00  requested     -
```

b. Monitor the transaction log.

`show log tx-id`

Example command output:

```
show log tx-id
transaction 1510448403-721303
 tx-type       activate-ns-deployment
 deployment-id test
 timestamp     2017-11-12T01:00:03.721334-00:00
 status        success
transaction 1510448404-104189
 tx-type       activate-vim-orch-deployment
 deployment-id ph-vim-orch
 timestamp     2017-11-12T01:00:04.104204-00:00
 status        success
```

c. Check the VIM Orchestrator status.

`show vim-orchr`

Example command output:

```
vim-orch status success
vim-orch steps-total 84
vim-orch steps-completed 84
vim-orch version "Red Hat OpenStack Platform release 10.0 (Newton)"
```

Important If there are any issues seen when executing the above commands, refer to Monitoring and Troubleshooting the Deployment, on page 94 for information on collecting logs.

6. Upon successful completion of the VIM deployment, proceed to for information and instructions on deploying your USP-based VNF.

VNF Deployment Automation

VNF Deployment Automation Overview

USP-based VNF deployment automation is performed through UAS.

Important This information in these sections assume that all of the USP Installation Prerequisites, on page 25 and/or that all requirements identified in the *Ultra M Solutions Guide* have been met.

provide an overview of the VNF deployment automation process for Hyper-Converged Ultra M deployments. Details are provided in Table 11: VNF Deployment Automation Workflow Descriptions, on page 53.

Notes:

- The workflow described in this section is supported only with Ultra M deployments based on OSP 10 and that leverage the Hyper-Converged architecture.
- This information assumes that you have deployed the VIM Orchestrator and the VIM using the information and instructions in Virtual Infrastructure Manager Installation Automation, on page 33.

Table 11: VNF Deployment Automation Workflow Descriptions

Callout	Description
1	Prepare the tenant configuration file. Tenants define the physical resources allocated to specific user groups.
2	Load and activate the tenant configuration file through AutoDeploy. Tenants must be configured after the VIM has been deployed and before deploying the VNF.
3	AutoDeploy works with AutoIT to provision the tenants within the VIM.
4	Prepare the VNF Rack and VNF descriptor configuration files. The parameters in this file identify the Compute Nodes to be used for VNF deployment and the VNFDs for AutoVNF, the VNFM, and for the UGP VNF. Refer to Sample VNF Rack and VNF Descriptor Configuration File, on page 177 for an example VNF Rack and VNF descriptor configuration file.
5	On the AutoDeploy VM, load and commit the configuration file prepared in previous step. Once committed, activate the previously loaded AutoDeploy configuration file. AutoDeploy processes this data to activate the Site and to deploy the functions needed to orchestrate the VNF deployment. Refer to Configure the VNF Rack and the VNF Descriptors, on page 58 for more information.
6	AutoDeploy loads the ISO on to AutoIT.
7	AutoDeploy passes data from the activated configuration to AutoIT requesting that it deploy the AutoVNF VM cluster for the initial VNF.
8	AutoIT deploys the AutoVNF VMs for the VNF.
9	Once the AutoVNF VMs are successfully deployed, AutoDeploy passes configuration information to the AutoVNF VMs. This is used by the AutoVNF to orchestrate the VNFM deployment. For deployments with multiple VNFs, AutoDeploy sends this information in parallel to the active AutoVNF VM for each VNF. **Important** In 6.0, concurrent VNF deployment functionality was not fully qualified and was made available only for testing purposes. In 6.1 and later releases, this functionality is fully qualified. For more information, contact your Cisco Accounts representative.

Callout	Description
10	The active AutoVNF software module leverages the network service descriptor (NSD) information to work with the VIM to deploy the VNFM VMs. Once the VNFM VMs are successfully deployed, AutoVNF also ensures that the various VM catalogs pertaining to other VNFCs are on-boarded by the VNFM. It accomplishes this through a number of YANG-based definitions which are then used to configure various aspects of the virtualized environment using REST and NETCONF APIs. The VNFM mounts the VNFC catalogs and works with AutoVNF to deploy the various components that comprise the desired VNF use-case (e.g. UGP or USF).
11	The VNFM leverages the VNFD information to deploy the UEM VM cluster. Though the USP architecture represents a single VNF to other network elements, it is comprised of multiple VM types each having their own separate catalogs. The UEM component of the USP works with the VNFM to deploy these catalogs based on the intended VNF use case (e.g. UGP, USF, etc.).
12	The UEM processes the Day-0 configuration information it received from the VNFM and deploys the Control Function (CF) and Service Function (SF) VNFC VMs. Once all of the VNF components (VNFCs) have been successfully deployed, AutoVNF notifies AutoDeploy.

Pre-VNF Installation Verification

Prior to installing the USP, please ensure that the following is true:

- The prerequisite hardware is installed and operational with network connectivity.
- The prerequisite software is installed, configured and functioning properly.
  - You have administrative rights to the operating system.
  - VIM Orchestrator is properly installed and operational.
  - VIM components are properly installed and operational. This configuration includes networks, flavors, and sufficient quota allocations to the tenant.

Important Supported and/or required flavors and quota allocations are based on deployment models. Contact your Cisco representative for more information.

  - You have administrative rights to the OpenStack setup.
- The Cisco USP software ISO has been downloaded and is accessible by you.

Deploy the USP-based VNF

The software roles that comprise the Ultra Automation Services (UAS) are used to automate the USP-based VNF deployment. UAS is designed to support deployment automation for all USP-based VNF scenarios.

Important Cisco's Elastic Services Controller (ESC) is the only VNFM supported in this release.

Important These instructions assume that you have verified the requirements identified in Pre-VNF Installation Verification, on page 54.

Configure VIM Tenants

VIM tenants define the physical resources allocated to specific user groups. They are provisioned by executing an API through AutoDeploy which processes parameters provided in a configuration file. The parameters are grouped into a tenant descriptor which is referenced within the VIM Artifact descriptor. Tenants must be configured after the VIM has been deployed and before deploying the VNF.

Refer to Sample Tenant Configuration File, on page 175 for an example tenant configuration file.

Important These instructions assume you are already logged on to the AutoDeploy VM as the root user.

To configure VIM tenants:

1. Prepare the tenant configuration file according to your deployment scenario.

Caution Ensure that the NSD name (nsd-id) specified in the configuration file is identical to the NSD name specified in the VIM Orchestrator and VIM configuration file. Additionally, ensure that only tenant information is referenced within the VIM artifact descriptor.

2. Login to the ConfD CLI as the *admin* user.

   ```
   confd_cli -u admin -C
   ```

3. Enter the ConfD configuration mode.

   ```
   config
   ```

4. Load the *addi-tenant.cfg* configuration file.

   ```
   load merge <your_tenant_file_name>.cfg
   commit
   end
   ```

5. Activate the tenant configuration.

   ```
   activate nsd-id <nsd_name>
   ```

Important The output of this command is a transaction-id which can be used to monitor the deployment progress. If need be, the tenant configuration can be deactivated using the **deactivate** variant of this command.

6. Monitor the progress of the tenant creation by viewing transaction logs:

   show log *<transaction_id>* **| display xml**

   transaction_id is the ID displayed as a result of the **activate** command executed in step 5, on page 55.

7. Verify that the tenants have been created properly by checking the network service record (NSR).

   show nsr

   Example command output:

```
                          VNF       VNF   VIM             VIM       VLR
NSR ID         NSD  VNFR  PACKAGE   RACK  ORCH    VIM     ARTIFACT  ID   NETWORK  VNFR
-------------------------------------------------------------------------------------
sjc-instance   sjc  -     -         -     underc  overc   sjccore
```

8. Proceed to Configure OpenStack Prerequisites, on page 56.

Configure OpenStack Prerequisites

Prior to beginning the USP deployment process, there are several items as described in this section that must first be configured in OpenStack. The deployment automation process requires these items be configured in order for the UAS processes to run properly.

Important This procedure is not necessary if you are deploying a VNF on a Hyper-Converged Ultra M mode and have already deployed the VIM Orchestrator and the VIM using the information and instructions in Virtual Infrastructure Manager Installation Automation, on page 33.

Important The information in this section assumes that your Undercloud and Overcloud were previously installed and are operational as identified in Pre-VNF Installation Verification, on page 54.

Ensure that the following items are configured within the OpenStack CLI interface on the OSP-D Server / Staging Server:

1. Login to OSP-D and make sure to “su - stack” and “source stackrc”. Determine the name of the heat stack_name.

   heat stack-list

2. Source the rc file for the stack.

   source *~/<stack_name>* **rc**

3. Login to OpenStack Horizon with the tenant and username created in Configure VIM Tenants, on page 55 and download the credential file.

4. Source the “*stack_name***rc-core**” file.

```
source ~/<stack_name> rc-core
```

5. Create the volume type for your deployment.

```
cinder type-create LUKS
```

6. Determine the tenant ID for the OpenStack *core* project.

```
openstack project list  | grep core
```

7. Create a neutron router for the core tenant called “main” and associate it with the *core* project tenant ID.

```
neutron router-create main --tenant-id <core_tenant_id>
```

8. Create a public/“external” network.

```
neutron net-create public --router:external True
--provider:physical_network datacentre --provider:network_type vlan
--provider:segmentation_id <vlan_segmentation_id>
```

Important *<vlan_segmentation_id>* is based on your OpenStack configuration and must match the VLAN ID specified for the network.

```
neutron subnet-create public <network_address>/<mask-bits> --name
public-subnet --allocation-pool start= <start_address>, end=<end_address>
--disable-dhcp --gateway <gateway_address>
neutron router-gateway-set main public
```

Important It is recommended that you assign a static IP address to your router if your VNF configuration uses floating IP addresses in order to avoid potential IP address conflicts. The IP address is assigned based on the subnet created for floating IPs on the network. Floating IP address support is configured at the VNFD-level within the AutoDeploy configuration using the **floating-ip enabled** and **floating-ip ip-address** parameters. Static addresses can be assigned to the router using the following command:

```
neutron router-gateway-set main public --fixed-ip subnet_id=`neutron
subnet-list |grep public | awk '{print $2}'`,ip_address= <static_ip_address>
```

9. Create SRIOV networks for use with the DI-internal and Service networks.
   a. Create the SR-IOV network for DI-internal network.

```
neutron net-create di-internal1 --provider:physical_network
phys_pcie1_0 --provider:network_type flat --shared
neutron subnet-create di-internal1 <network_address>/<mask-bits>--name
di-internal1-subnet --enable-dhcp
```

   b. Repeat step 9.a, on page 57 for the redundant DI-network in the case where NIC bonding is used.

```
neutron net-create di-internal2 --provider:physical_network
phys_pcie4_1 --provider:network_type flat --shared
neutron subnet-create di-internal2 <network_address>/<mask-bits>--name
di-internal2-subnet --enable-dhcp
```

c. Create the SR-IOV network for Service 1.

```
neutron net-create service1 --provider:physical_network phys_pcie1_1
 --provider:network_type flat --shared
neutron subnet-create service1 <network_address>/<mask-bits>--name
service1-subnet --enable-dhcp
```

d. Repeat step 9.d, on page 58 for the redundant Service in the case where NIC bonding is used.

```
neutron net-create service2 --provider:physical_network phys_pcie4_0
 --provider:network_type flat --shared
neutron subnet-create service2 <network_address>/<mask-bits>--name
service2-subnet --enable-dhcp
```

e. Repeat steps 9.c, on page 58 and 9.d, on page 58 for each additional Service network required for your deployment.

10. Proceed to Configure the VNF Rack and the VNF Descriptors, on page 58.

Configure the VNF Rack and the VNF Descriptors

Once the VIM tenants and OpenStack prerequisites have been configured, the VNF Rack and VNF descriptors must be configured. Once these items are configured, your VNF can be deployed.

The VNF Rack descriptor is a logical grouping of Compute Nodes. It is used to map the nodes to specific VNFs. It is equivalent to Availability Zones and/or Host Aggregates in OpenStack. Like tenants, VNF Rack descriptors are configured at the network service descriptor (NSD) level and is referenced within the VIM artifact descriptor.

The VNF descriptor (VNFD) defines the deployment flavor for a specific VNF including all the aspects of VNF resources and associated networking. A single NSD can contain multiple VNFDs. For example, a configuration for deploying a UGP VNF on Ultra M will have separate VNFDs for:

- AutoVNF (one instance per VNF)
- VNFM
- UGP VNF

These VNFDs are defined under nested NSDs, one per VNF, within the file. Each VNF must be defined by its own NSD. The file also contains additional parameters related to and required by your specific deployment scenario. These are a mix of basic, operational paramters and enhanced features supported within the USP VNF deployment on the Ultra M solution. For more information on enhanced features, refer to:

- Monitoring and Recovering AutoVNF Through AutoIT, on page 154
- Monitoring and Recovering VNFC Through AutoVNF, on page 156
- Configuring Fully-Defined VM Names for ESC, on page 61
- The "Health Monitoring Within the Ultra M Solution" chapter of the *Ultra M Solutions Guide*

Refer to Sample VNF Rack and VNF Descriptor Configuration File, on page 177 for an example VNF Rack and VNF descriptor configuration file. Detailed information for the parameters used in the configuration constructs within the file is provided in the *Cisco Ultra Services Platform NETCONF API Guide*.

Important User credentials are configured through Secure Tokens specified in the configuration file. Ensure that passwords configured with Secure Token meet the requirements specified in Password Requirements and Login Security, on page 27.

Important These instructions assume you are already logged on to the AutoDeploy VM as the root user.

To configure the VNF Rack and VNF descriptor file:

1. Prepare the VNF Rack and VNF descriptor configuration file according to your deployment scenario.

Caution Ensure that the NSD name (nsd-id) specified in the configuration file is identical to the NSD name specified in the VIM Orchestrator/VIM and tenant configuration files.

   a. Add the VNF Rack descriptor parameter configuration to the file and reference it within the VIM Artifact descriptor.

   b. Add the VNFD and other construct parameter configurations to the file as required for your deployment.

   c. *Optional*. If required, add any other additional parameters to configure the enhanced features like - AutoVNF Health Check, VNFC Health Check, Passing Fully-Defined VM Names, syslog proxy functionality, and so on.

      Example Configuration for Health Check features:

```
nsd <nsd_name>
…
vnfd <vnfd_name>
…
  vnfc <vnfc_name>
    health-check enabled
    health-check probe-frequency 10
    health-check probe-max-miss 6
    health-check retry-count 6
    health-check recovery-type restart-then-redeploy
    health-check boot-time 300
…
```

      Example Configuration for Passing VM Names:

```
nsd <nsd_name>
<---SNIP--->
vnfd <uas_vnfd_name>
vnf-type usp-uas
…
configuration set-vim-instance-name true
<---SNIP--->
vnfd <vnfm_vnfd_name>
vnf-type esc
…
configuration set-vim-instance-name true
<---SNIP--->
```

      Example syslog proxy functionality:

```
nsd <nsd_name>
…
vnfd <vnfd_name>
…
  vnfc <vnfc_name>
    uas-proxy
…
```

d. Save the file.

2. Login to the ConfD CLI as the *admin* user.

   confd_cli -u admin -C

3. Enter the ConfD configuration mode.

   config

4. Load the VNF Rack and VNF descriptor configuration file.

   load merge *<your_config_file_name>***.cfg**

   commit

   end

5. Activate the VNF rack and VNF descriptor configuration.

   activate nsd-id*<nsd_name>*

Important The output of this command is a transaction-id which can be used to monitor the deployment progress. If needed, the VIM deployment can be deactivated using the **deactivate** variant of this command.

6. Monitor the progress of the tenant creation by viewing transaction logs:

   show log *<transaction_id>* **| display xml**

   transaction_id is the ID displayed as a result of the command executed in step 5, on page 60.

7. Verify that the VNFs have been created properly by checking the network service record (NSR).

   show nsr

   Example command output:

```
                                            VNF     VIM
                                 VLR
NSR ID                      NSD                        VNFR
              VNF PACKAGE  VNF RACK  VIM ORCH  VIM ARTIFACT  NSR ID  VLR NETWORK  VNFR
-----------------------------------------------------------------------------------------
ab-autovnf-instance   ab-autovnf      [ ab-autovnf-vnf1-em ab-autovnf-vnf1-esc
ab-autovnf-vpc-up1 ]   [ usp_6_0 ]     -         -       vim_art_rack    -        -
      -
ss-autoit-instance    ss-autoit       [ ss-autoit-f-autovnf ]
               [ usp_6_0 ]     -         -       vim_art_rack    -        -          -
```

Configuring Fully-Defined VM Names for ESC

Leveraging capabilities in the VNFM (ESC version 3.0 and later), UAS supports the ability to generate and pass VM names to the VNFM. This is applicable to all VMs deployed on OpenStack including ESC and AutoVNF.

VM name generation is based on known algorithms using the following parameters:

- VNF Component (VNFC) name
- Network Service Descriptor (NSD) name
- VNF Descriptor (VNFD) name
- VIM tenant name

VM instance names are assembled as follows:

For CF/SF:

```
<nsd_name>-<vnfd_name>-<vim_tenant_name>-<vdu_id>-X
```

For example: abcUAS-LBPCF401-UGP-core-LBPCF401-CF-VDU-0

For UEM:

```
<nsd_name>-<vnfd_name>-<vim_tenant_name>-<vnfc_instance_id>-X
```

For example: abcUAS-LBPCF401-UGP-core-EM1-1

Important There may be one or more VNFC instances depending on the redundancy and scaling.

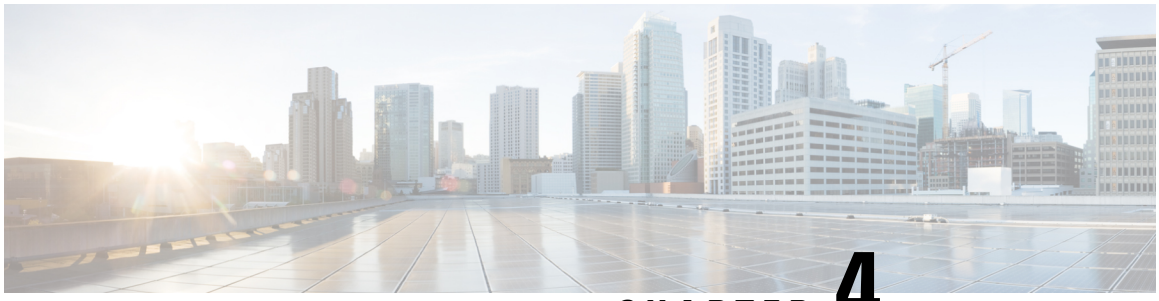
This functionality is controlled in the UAS through a YANG-based configurable in the VNFD.

Important In 6.0, this functionality was not fully qualified and was made available only for testing purposes. In 6.1 and later releases, this functionality is fully qualified. For more information, contact your Cisco Accounts representative.

```
nsd <nsd_name>
<---SNIP--->
  vnfd <uas_vnfd_name>
    vnf-type          usp-uas
    …
configuration set-vim-instance-name true
<---SNIP--->
  vnfd <vnfm_vnfd_name>
    vnf-type          esc
    …
```

```
    configuration set-vim-instance-name true
<---SNIP--->
```

This functionality is enabled (e.g. set to “true”) by default.



CHAPTER 4

Deploying VNFs Using AutoVNF

This chapter describes the following topics:

- Introduction, on page 63
- VNF Deployment Automation Overview, on page 63
- Pre-VNF Installation Verification, on page 65
- Deploy the USP-based VNF, on page 66
- Upgrading/Redeploying the Stand-alone AutoVNF VM Instance, on page 76

Introduction

USP-based VNFs can be deployed using a stand-alone AutoVNF instance in environments with a pre-installed network function virtualization orchestrator (NFVO). In this scenario, a single AutoVNF VM is deployed on the VIM and communicates with a pre-existing VNFM installation to deploy the VNF(s). The VNFM can be installed in a tenant other than the one in which AutoVNF is installed.

Important Cisco Elastic Services Controller (ESC) is the only VNFM supported in this release.

A single AutoVNF VM can deploy one or more VNFs in one or more tenants within the same VIM.

VNF Deployment Automation Overview

provide an overview of the VNF deployment automation process for when using a stand-alone AutoVNF instance. Details are provided in Table 12: VNF Deployment Automation Workflow Descriptions, on page 64.

NOTES:

- The workflow described in this section is supported only with VNF deployments performed through AutoVNF and that are based on OSP 10.
- This information assumes that you have deployed the NFVI, VIM, and VNFM.
- This information assumes that all artifacts required during configuration must be pre-created in OpenStack.

Table 12: VNF Deployment Automation Workflow Descriptions

Callout	Description
1	On the Onboarding Server, deploy AutoVNF using the *boot_uas.py* script provided as part of the release ISO. Refer to Deploy the AutoVNF VM, on page 71 for more information. The release ISO also includes the software images for the VNFM and VNFCs.
2	Prepare the system.cfg file to the AutoVNF VM. This file provides the VNF's Day-0 configuration. Refer to Sample system.cfg File, on page 179 for an example configuration file.
3	Copy the VNFM scripts supplied in the UAS ISO from the AutoVNF VM to the VNFM VMs.
4	Confirm that the VNFM has been configured with the VIM connectors for the VNF tenants. A connector is needed for each tenant. Refer to Sample ESC VIM Connector Configuration, on page 181 for an example configuration.
5	Prepare the VNFM configuration file that provides AutoVNF with the necessary information for communicating with a pre-existing VNFM installation. Refer to Sample AutoVNF VNFM Configuration File, on page 183 for more information.
6	Prepare the VNF configuration file that is used by AutoVNF to initiate the VNF deployment process. This file includes all of the configuration information required to deploy all of the VNF components (VNFCs) such as secure tokens, network catalogs, VDU catalogs, and VDUs. Refer to Sample AutoVNF VNF Configuration File, on page 185 for more information.
7	On the AutoVNF VM, load and commit the VNFM configuration file prepared in the previous step. Once commited, activate the loaded AutoVNF VNFM configuration file. AutoVNF processes this data to deploy the VNFCs. Refer to Activate the AutoVNF Configuration Files, on page 74 for more information.
8	On the AutoVNF VM, load and commit the VNF configuration file prepared in the previous step. Once committed, activate the loaded AutoVNF VNF configuration file. AutoVNF processes this data to deploy the VNFCs. Refer to Activate the AutoVNF Configuration Files, on page 74 for more information.

Callout	Description
9	AutoVNF passes the VNF configuration to the pre-created VNFM VM instance. It ensures that the various VM catalogs pertaining to other VNFCs are on-boarded by the VNFM. It accomplishes this through a number of YANG-based definitions which are then used to configure various aspects of the virtualized environment using REST and NETCONF APIs. That VNFM mounts the VNFC catalogs and works with AutoVNF to deploy the various components that comprise the desired VNF use-case (e.g. UGP or USF).
10, 12	The VNFM leverages the VNFC information to deploy the UEM VMs cluster. Though the USP architecture represents a single VNF to other network elements, it is comprised of multiple VM types each having their own separate catalogs. The UEM component of the USP works with the VNFM to deploy these catalogs based on the intended VNF use case (e.g. UGP, USF, etc.).
11, 13	The UEM processes the Day-0 configuration information it received from the VNFM and deploys the Control Function (CF) and Service Function (SF) VNFC VMs. Once all of the VNF components (VNFCs) have been successfully deployed, AutoVNF notifies AutoDeploy. **Important** In multi-VNF deployments, AutoVNF waits until it receives confirmation that all of the VNFCs have been on-boarded successfully for the current VNF deployment before it initiates the deployment of the next VNF.

Pre-VNF Installation Verification

Prior to installing the USP, please ensure that the following is true:

- The prerequisite hardware is installed and operational with network connectivity.
- The prerequisite software is installed and configured and functioning properly:
  - You have administrative rights to the operating system.
  - VIM Orchestrator is properly installed and operational.
  - VIM components are properly installed and operational. This configuration includes networks, flavors, and sufficient quota allocations to the tenant.

  Note Supported and/or required flavors and quota allocations are based on deployment models. Contact your Cisco representative for more information.

  - You have administrative rights to the OpenStack setup.
  - The VNFM software is in properly installed and operational.

Note Cisco's Elastic Services Controller (ESC) is the only VNFM supported in this release.

- The Cisco USP software ISO has been downloaded and is accessible by you.

Deploy the USP-based VNF

The AutoVNF software roles within the Ultra Automation Services (UAS) is used to automate the USP-based VNF deployment. The automated deployment process through AutoVNF is described in VNF Deployment Automation Overview, on page 63.

To deploy the USP-based VNF using AutoDeploy:

1. Onboard the USP ISO, on page 66.
2. Extract the UAS Bundle, on page 67.
3. Extract the UEM VM Image, on page 68.
4. Extract the UGP VM Image, on page 69.
5. Upload the USP VM Images to Glance, on page 70.
6. Deploy the AutoVNF VM, on page 71.
7. Activate the AutoVNF Configuration Files, on page 74.

Onboard the USP ISO

The files required to deploy the USP components are distributed as RPMs (called "bundles") in a single ISO package. They are maintained using YUM on the Onboarding Server. The following bundles are part of the ISO:

USP Bundle Name	Description
usp-em-bundle	The Element Manager (EM) Bundle RPM containing images and metadata for the Ultra Element Manager (UEM) module.
usp-uas-bundle	The Ultra Automation Services Bundle RPM containing AutoIT, AutoDeploy, AutoVNF, Ultra Web Services (UWS), and other automation packages.
usp-ugp-bundle	The Ultra Gateway Platform (UGP) Bundle RPM containing images for Ultra Packet core (VPC-DI). This bundle contains non-trusted images.
usp-vnfm-bundle	The VNFM Bundle RPM containing an image and a boot-up script for ESC (Elastic Service Controller).
usp-yang-bundle	The Yang Bundle RPM containing YANG data models including the VNFD and VNFR.

USP Bundle Name	Description
usp-auto-it-bundle	The bundle containing the AutoIT packages required to deploy the UAS.
ultram-manager	This package contains the script and relevant files needed to deploy the Ultra Health Service.

In addition to the bundles, the ISO bundle also includes scripts used to deploy the bundles including UAS.

Before proceeding with these instructions, ensure that the perquisites identified in USP Installation Prerequisites, on page 25 have been met.

To onboard the ISO package:

1. Log on to the Onboarding Server.
2. Download the USP ISO bundle and related files pertaining to the release.
3. Create a mount point on the Onboarding Server and mount the ISO package:

   mkdir /var/usp-iso
4. Mount the USP ISO.

   sudo mount -t iso9660 -o loop *<ISO_download_directory>/<ISO_package_name>* **/var/usp-iso**

   Example: The following command mounts the ISO bundle called *usp-5_5_0-1255.iso* located in a directory called *5_5_0-1283* to */var/usp-iso*:

   sudo mount -t iso9660 -o loop 5_5_0-1064/usp-5_5_0-1064.iso /var/usp-iso

   ```
   mount: /dev/loop1 is write-protected, mounting read-only
   ```
5. Verify the mount configuration.

   df -h

   Example output:

   ```
   Filesystem      Size  Used Avail Use% Mounted on
   /dev/sda2       187G  178G  316M 100% /
   devtmpfs         63G     0   63G   0% /dev
   tmpfs            63G  4.0K   63G   1% /dev/shm
   tmpfs            63G  1.4M   63G   1% /run
   tmpfs            63G     0   63G   0% /sys/fs/cgroup
   /dev/sda1       477M  112M  336M  25% /boot
   tmpfs            13G     0   13G   0% /run/user/0
   /dev/loop1      4.2G  4.2G     0 100% /var/usp-iso
   ```
6. Proceed to Extract the UAS Bundle, on page 67.

Extract the UAS Bundle

Once the USP ISO has been mounted, the UAS bundle must be extracted from the ISO in order to prepare the configuration files required for deployment.

These instructions assume you are already logged on to the Onboarding Server.

To extract the UAS bundle:

1. Navigate to the tools directory within the ISO mount.

   cd /var/usp-iso/tools/

2. Launch the *usp-uas-installer.sh* script.

   sudo ./usp-uas-installer.sh

   The script extracts the files that comprise the UAS bundle to */opt/cisco/usp/uas-installer*.

3. Verify that files have been extracted.

   Example output:

   ll /opt/cisco/usp/uas-installer

   ```
   total 12
   drwxr-xr-x. 5 root root 4096 May 11 08:04 common
   drwxr-xr-x. 2 root root 4096 May 11 08:04 images
   drwxr-xr-x. 2 root root 4096 May 11 08:04 scripts
   ```

   ll /opt/cisco/usp/uas-installer/images/

   ```
   total 707580
   -rw-r--r--. 1 root root 723898880 May 10 15:40 usp-uas-1.0.0-601.qcow2
   ```

   ll /opt/cisco/usp/uas-installer/scripts/

   ```
   total 56
   -rwxr-xr-x. 1 root root  5460 May 11 08:04 autoit-user.py
   -rwxr-xr-x. 1 root root  4762 May 11 08:04 encrypt_account.sh
   -rwxr-xr-x. 1 root root  3945 May 11 08:04 encrypt_credentials.sh
   -rwxr-xr-x. 1 root root 13846 May 11 08:04 uas-boot.py
   -rwxr-xr-x. 1 root root  5383 May 11 08:04 uas-check.py
   -rwxr-xr-x. 1 root root 10385 May 11 08:04 usp-tenant.py
   ```

4. Proceed to Extract the UEM VM Image, on page 68.

Extract the UEM VM Image

The image files required to deploy the UEM are distributed as part of an RPM bundle. The bundle is called "usp-em-bundle-<*version*>-1.x86_64.rpm" and it is distributed as part of the USP ISO image.

The UEM image file is called "em-<*version*>.qcow2". Prior to installing the UGP VNF, you must extract this file from the ISO.

Important These instructions assume that you have already mounted the USP ISO.

To extract the files:

1. Navigate to the directory containing the rpm bundles.

   cd /var/usp-iso/repo

2. View the contents of, and information about the bundle.

   rpm -qilp usp-em-bundle-*<version>***-1.x86_64.rpm**

   Example output:

```
<---SNIP--->
/opt/cisco/usp/bundles/em-bundle/em-5_7_0_1481.qcow
/opt/cisco/usp/bundles/em-bundle/usp-build-info.json
/opt/cisco/usp/bundles/em-bundle/usp-bundle-manifest.yml
<---SNIP--->
```

3. Extract the required artifacts from the bundle.
   a. Make a directory and ensure that it is empty.

      mkdir -p /tmp/artifacts; rm -rf /tmp/artifacts/*

   b. Navigate to the directory just created.

      cd /tmp/artifacts/

   c. Extract the UEM image file.

      rpm2cpio /var/usp-iso/repo/usp-em-bundle-*<version>***-1.x86_64.rpm | cpio -idmv ./opt/cisco/usp/bundles/em-bundle/em-***<version>***.qcow2**

   d. Ensure that the image has been extracted.

      ls -l ./opt/cisco/usp/bundles/em-bundle/em-*<version>***.qcow2**

4. Proceed to Extract the UGP VM Image, on page 69.

Extract the UGP VM Image

The image files required to deploy the UGP are distributed as part of an RPM bundle. The bundle is called "usp-ugp-bundle-<*version*>.x86_64.rpm" and it is distributed as part of the USP ISO image.

Prior to installing the UGP VNF, you must extract the image files from the ISO.

Important These instructions assume that you have already mounted the USP ISO.

To extract the files:

1. Navigate to the directory containing the rpm bundles.

   cd /var/usp-iso/repo

2. View the contents of, and information about the bundle.

   rpm -qilp usp-ugp-bundle-*<version>***-1.x86_64.rpm**

   Example output:

```
<---SNIP--->
/opt/cisco/usp/bundles/ugp-bundle/qvpc-di-21.4.v0.qcow2.tgz
/opt/cisco/usp/bundles/ugp-bundle/qvpc-di-21.4.v0.qcow2.tgz.md5
/opt/cisco/usp/bundles/ugp-bundle/qvpc-di-21.4.v0.qcow2.tgz.sha1
/opt/cisco/usp/bundles/ugp-bundle/qvpc-di-21.4.v0.qcow2.tgz.sha512

<---SNIP--->
```

3. Extract the required artifacts from the bundle.
   a. Make a directory and ensure that it is empty.

```
mkdir -p /tmp/artifacts; rm -rf /tmp/artifacts/*
```

b. Navigate to the directory just created.

```
cd /tmp/artifacts/
```

c. Extract the UGP image files.

```
rpm2cpio /var/usp-iso/repo/usp-ugp-bundle-<version>-1.x86_64.rpm |
cpio -idmv
./opt/cisco/usp/bundles/ugp-bundle/qvpc-di-<version>.qcow2.tgz
```

d. Ensure that the images have been extracted.

```
ls -l ./opt/cisco/usp/bundles/ugp-bundle/qvpc-di-<version>.qcow2.tgz
```

4. Extract the CF qcow2 image.

```
tar -zxvf qvpc-di-<version>.qcow2.tgz qvpc-di-cf-<version>.qcow2
```

5. Extract the SF qcow2 image.

```
tar -zxvf qvpc-di-<version>.qcow2.tgz qvpc-di-sf-<version>.qcow2
```

6. Proceed to Upload the USP VM Images to Glance, on page 70.

Upload the USP VM Images to Glance

The UAS, UEM, and UGP VM images extracted from the USP ISO must be uploaded into OpenStack Glance.

To upload the images to Glance:

1. Login to OSP-D and make sure to “su - stack” and “source stackrc”. Determine the name of the heat *stack_name*.

```
heat stack-list
```

2. Source the rc file for the stack.

```
source ~/  <stack_name> rc
```

3. Upload the UAS image.

```
glance image-create --file usp-uas- <version> .qcow2 --container-format
 bare --disk-format qcow2 --name ultra-autovnf- <version>
```

4. Upload the UEM image.

```
glance image-create --file em- <version> .qcow2 --container-format bare
 --disk-format qcow2 --name ultra-em- <version>
```

5. Upload the CF image.

```
glance image-create --file qvpc-di-cf- <version> .qcow2 --container-format
 bare --disk-format qcow2 --name ultra-cf- <version>
```

6. Upload the SF image.

```
glance image-create --file qvpc-di-xf- <version> .qcow2 --container-format
 bare --disk-format qcow2 --name ultra-sf- <version>
```

7. Proceed to Deploy the AutoVNF VM, on page 71.

Deploy the AutoVNF VM

The VM for AutoVNF is deployed using *boot_uas.py* script provided with the UAS bundle. The script is located in the following directory:

/opt/cisco/usp/bundles/uas-bundle/tools

This script includes a number of deployment parameters for the VM. These parameters are described in the help information pertaining to the script which can be accessed by executing the following command:

```
./boot_uas.py -h
```

The help information is provided as an appendix in this document. Refer to .

Important These instructions assume you are already logged on to the Onboarding Server.

To deploy the AutoVNF VM:

1. Navigate to the directory containing the *boot_uas.py* file.

   ```
   cd /opt/cisco/usp/bundles/uas-bundle/tools
   ```

2. Deploy the AutoVNF VM.

   ```
   ./boot_uas.py  --autovnf --openstack --image <image_name> --flavor
   <flavor_name> --net <network_name>
   ```

   There are additional arguments that can be executed with this script based on your deployment scenario. Refer to for details.

Important Both version 2 and 3 of OpenStack Keystone APIs are supported. You can specify the desired version using the **--os_identity_api_version** argument with this script. For example to specify the use of version 3, add the argument **--os_identity_api_version 3**. The default is version 2.

   Upon executing the script, you are prompted to enter user crendentials for performing operations within the AutoVNF VM.

3. Provide the requested information.

   - **AutoVNF VM Login Password**: The password for the default user account, which is named *ubuntu*.
   - **AutoVNF API Access password for "admin"**: The password for the ConfD administrator user, which is named admin.
   - **AutoVNF API Access password for "oper"**: The password for the ConfD operator user, which is named oper.
   - **AutoVNF API Access password for "security"**: The password for the ConfD security administrator user, which is named security-admin.

Important Ensure that all passwords meet the requirements specified in Password Requirements and Login Security, on page 27.

4. Log on to the AutoVNF VM as *ubuntu*. Use the password that was created earlier for this user.
5. Become the root user.

   ```
   sudo -i
   ```

6. Prepare the *system.cfg* file. This will serve as the Day-0 config for the VNF. Refer to Sample system.cfg File, on page 179 for an example configuration file.

Important Though administrative user credentials can be specified in clear text in the system.cfg file, it is not recommended. For security purposes, it is recommended that you configure a secure token for the user account in the VNF configuration file and reference that file as part of the VDU catalog pertaining to the CF using the **login-credential** parameter. In the *system.cfg* file, use the *$CF_LOGIN_USER* and *$CF_LOGIN_PASSWORD* variables as follows to call the values configured for the secure token:

```
configure
  context local
    administrator $CF_LOGIN_USER password $CF_LOGIN_PASSWORD ftp
```

7. Upload the *system.cfg* to the */opt/cisco/usp/uploads/* directory on the AutoVNF VM.
8. Copy the ESC scripts from the */opt/cisco/usp/uas/autovnf/vnfms/esc-scripts* directory on the AutoVNF VM to the VNFM (ESC) VMs.

   These are custom scripts which aid in the VNF instantiation.

   a. Connect to the master VNFM (ESC) VM and copy the scripts.

      ```
      cd /opt/cisco/usp/uas/autovnf/vnfms/esc-scripts
      scp esc-vpc-di-internal-keys.sh <esc_user>@<master_esc_vm_address>:
      opt/cisco/esc/esc-scripts/esc-vpc-di-internal-keys.sh
      scp esc_vpc_chassis_id.py<esc_user>@<master_esc_vm_address>:
      opt/cisco/esc/esc-scripts/esc_vpc_chassis_id.py
      scp esc_volume_em_staging.sh <esc_user>@<master_esc_vm_address>:
      /opt/cisco/esc/esc-scripts/esc_volume_em_staging.sh
      ```

   b. Connect to the standby VNFM (ESC) VM and copy the scripts.

      ```
      scp esc-vpc-di-internal-keys.sh <esc_user>@<standby_esc_vm_address>:
      opt/cisco/esc/esc-scripts/esc-vpc-di-internal-keys.sh
      scp esc_vpc_chassis_id.py<esc_user>@<standby_esc_vm_address>:
      opt/cisco/esc/esc-scripts/esc_vpc_chassis_id.py
      scp esc_volume_em_staging.sh <esc_user>@<standby_esc_vm_address>:
      /opt/cisco/esc/esc-scripts/esc_volume_em_staging.sh
      ```

9. Confirm that the VNFM has been configured with the VIM connectors for the VNF tenants. A connector is needed for each tenant. Refer to Sample ESC VIM Connector Configuration, on page 181 for an example configuration.

a. Connect to the master VNFM (ESC) VM.

b. Log on to the ConfD command line.

```
/opt/cisco/esc/confd/bin/confd_cli -C
```

c. Confirm the VIM connector configuration.

```
show running-config esc_system_config vim_connectors vim_connector
 <vim_connector_name>
```

If the connectors have not been configured, refer to the documentation for the appropriate version of ESC software. ESC product documentation is available here: https://www.cisco.com/c/en/us/support/cloud-systems-management/elastic-services-controller-esc/tsd-products-support-series-home.html

Important The OpenStack Keystone configuration version specified for the authentication URL in the connector must match the version used when deploying AutoVNF and the version specified in the AutoVNF configuration file.

d. Repeat step 9.c, on page 73 for each VIM connector.

Important If the ESC VMs are upgraded or redeployed at any time, ensure that you reload the VIM connectors on the new or upgraded ESC VM deployment.

10. Prepare the AutoVNF VNFM configuration file.

    This file provides the information necessary to allow AutoVNF to communicate with the VNFM (ESC).

    A sample configuration file is provided for reference in Sample AutoVNF VNFM Configuration File, on page 183.

Important The OpenStack Keystone configuration version specified in the VNFM configuration file used by AutoVNF must match the version used when deploying AutoVNF and the version specified in the ESC VIM connector(s). Set the **api-version** parameter to the appropriate version type.

Important If the ESC VMs are upgraded or redeployed at any time after the AutoVNF is deployed, you may need to change the ESC endpoint details in the AutoVNF VNFM configuration file and reload it.

11. Save the AutoVNF VNFM configuration file to your home directory on the AutoVNF VM.

12. Prepare the AutoVNF VNF configuration file.

    This file provides the VNF configuration information used by AutoVNF during the deployment process. A sample configuration file is provided for reference in Sample AutoVNF VNF Configuration File, on page 185.

Caution Ensure that the network service descriptor (NSD) identified in the AutoVNF VNF configuration file is identical to the one specified in the AutoVNF VNFM configuration file.

13. Save the AutoVNF VNF configuration file to your home directory on the AutoVNF VM.
14. Proceed to Activate the AutoVNF Configuration Files, on page 74.

Activate the AutoVNF Configuration Files

Once you have completed preparing your AutoVNF VNFM and VNF configuration files, you must load the configuration and activate the deployment.

Important User credentials are configured through Secure Tokens specified in the configuration file. Ensure that passwords configured with Secure Token meet the requirements specified in Password Requirements and Login Security, on page 27.

Once activated, AutoVNF proceeds with the deployment automation workflow as described in VNF Deployment Automation Overview, on page 63.

Important These instructions assume you are already logged on to the AutoVNF VM as the *root* user and that your configuration files have been prepared for your deployment as per the information and instructions in Deploy the AutoVNF VM, on page 71. These instructions also assume that AutoVNF has access to the VNFC image files (either locally or on a remote server) provided with the USP ISO.

To activate the USP deployment using AutoVNF:

1. Login to the ConfD CLI as the admin user.

   ```
   confd_cli -u admin -C
   ```

2. Enter the ConfD configuration mode.

   ```
   config
   ```

3. Load the AutoVNF VNFM configuration file to load the VNFM information into the AutoVNF database.

   ```
   load merge <your_vnfm_file_name> .cfg
   commit
   end
   ```

Important If you are performing this process as a result of an upgrade or redeployment, you must use the load replace variant of this command:

```
load replace <your_vnfm_file_name> .cfg
commit
end
```

4. Activate the AutoVNF VNFM configuration file.

   activate nsd *<nsd_name>*

Important The output of this command is a transaction-id which can be used to monitor the deployment progress. If need be, the VIM deployment can be deactivated using the **deactivate** variant of this command.

5. Load the AutoVNF VNF configuration file to load the deployment name and its attributes in the AutoVNF database.

   load merge *<your_vnf_file_name>* **.cfg**
   commit
   end

Important If you are performing this process as a result of an upgrade or redeployment, you must use the load replace variant of this command:

load replace *<your_vnf_file_name>* **.cfg**
commit
end

6. Activate the AutoVNF VNF configuration file.

   activate nsd *<nsd_name>*

Important The output of this command is a transaction-id which can be used to monitor the deployment progress. If need be, the VIM deployment can be deactivated using the **deactivate** variant of this command.

7. Monitor the progress of the deployment by viewing transaction logs:

   show log *<transaction_id>* **| display xml**

   transaction_id is the ID displayed as a result of the **activate-deployment** command.

   The logs display status messages for each node in each VNF that the configuration file defines. Example success messages for the different components deployed through AutoVNF are shown below:

   - VNF:

     ```
     Fri May 12 21:44:35 UTC 2017 [Task: 1494624612779/tb1vnfd2] Successfully completed
     all Vnf Deployments.
     ```

   - Entire Deployment:

     ```
     Fri May 12 21:57:38 UTC 2017 [Task: 1494624612779] Success
     ```

Important If there are any issues seen when executing the above commands, refer to Monitoring and Troubleshooting the Deployment, on page 94.

Upgrading/Redeploying the Stand-alone AutoVNF VM Instance

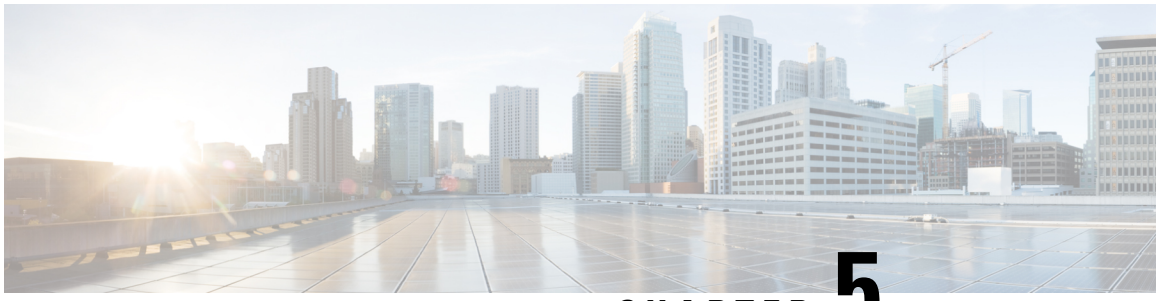
Use the following procedure to upgrade or redeploy the AutoVNF software image in scenarios where AutoVNF was brought up as stand-alone instance.

Important These instructions assume you are already logged on to the Onboarding Server.

1. Delete the AutoVNF VM instance.

   `./boot_uas.py --openstack --autovnf --delete` *`<transaction_id>`*

2. *Optional.* If required remove the OpenStack artifacts which were created manually to bring up AutoVNF.
3. Follow the procedures in Deploy the USP-based VNF, on page 66 to redeploy AutoVNF with the new software version.



CHAPTER 5

VNF Upgrade/Redeployment Automation

- Upgrading/Redeploying VNFs for Hyper-Converged Ultra M Model, on page 77
- Upgrading/Redeploying VNFs Deployed Through a Stand-alone AutoVNF Instance, on page 80
- Manually Applying Patch Upgrades to the UEM, on page 82

Upgrading/Redeploying VNFs for Hyper-Converged Ultra M Model

USP-based VNF software upgrade and redeployment procedures are performed by executing a single remote procedure call from AutoDeploy. From an upgrade/redeployment perspective, the VNF comprises the UEM, CF, and SF. As such, performing the upgrade/redeployment operation affects each of these components.

While it is recommended to create backups of important information prior to performing the upgrade/redeployment, volumes containing call detail records (CDRs) generated by the VNF can be preserved. If this functionality is enabled, the preserved volumes are reattached to the VNF once the upgrade is completed.

Information and instructions for performing the upgrade/redeployment procedures are located in Upgrade/Redeploy Your VNF, on page 77.

Though the UEM can be upgraded with other VNF components, patch updates may be made available for the UEM under certain circumstances. Information and instructions for performing the UEM patch upgrade procedures are located in Manually Applying Patch Upgrades to the UEM, on page 82.

Upgrade/Redeploy Your VNF

This section provides instructions for upgrading VNFs deployed within Hyper-Converged Ultra M solution models.

⚠

Caution Upgrade/redeployment operations are disruptive as they involve terminating VMs for the UEM, CF, and SF components that comprise the VNF. It is strongly recommended that you backup all files related to the deployment including configuration files, logs, and images before performing the upgrade or redeployment. Refer to Backing Up Deployment Information, on page 193 for more information.

Important The process described in this section is supported only with Ultra M deployments based on OSP 10 and that leverage the Hyper-Converged architecture.

To upgrade or redeploy your VNF:

1. Verify that the deployment is ready for an upgrade by performing the checks identified in Pre-Deactivation/Post-Activation Health Check Summary, on page 94.
2. Log on to the active AutoDeploy VM as *ubuntu*. Use the password that was created earlier for this user.
3. Become the *root* user.

   ```
   sudo -i
   ```

4. Modify the VNF package descriptor within your VNF rack and VNF descriptor configuration file to refer to the desired USP ISO.

   ```
   <--- SNIP --->
   vnf-packaged <vnf-pkg-name>
    location          <URL/package-name>
    validate-signature true
    configuration <day0_dayN_cfg_identifier>
     external-url <URL/day0_dayN_cfg_name>
    !
   !
   <--- SNIP --->
   ```

Important The VNF package name and version must be different than the previously deployed VNF package version. If the versions are identical, no actions will be taken.

For example, if you previously deployed a configuration with the following parameters:

```
<--- SNIP --->
vnf-packaged vnf-pkg1
 location home/ubuntu/6_0-1234/isos/usp-6_0-1234.iso
 validate-signature true
 configuration staros
  external-url /root/system.cfg
 !
!
<--- SNIP --->
```

Your upgrade configuration would have to specify a different name for “vnf-package” and a different ISO name in “package-location”. For example:

```
<--- SNIP --->
vnf-packaged vnf-pkg2
 location home/ubuntu/6_0-1342/isos/usp-6_0-1342.iso
 validate-signature true
 configuration staros
  external-url /root/system.cfg
 !
```

```
!
<--- SNIP --->
```

5. Modify the VNF package descriptor identifier at the NSD-level of your VNF rack and VNF descriptor configuration to reference the new VNF package.

```
nsd <nsd_name>
...
 vnf-package <vnf-pkg-name>
<--- SNIP --->
```

6. *Optional.* Modify the VNF package descriptor identifier at the VDU-levels (e.g. VNFM, UEM, CF, SF, AutoVNF) of your VNF rack and VNF descriptor configuration to reference the new VNF package.

```
<--- SNIP --->
vdu <vdu_name>
...
  image vnf-package <vnf-pkg-name>
<--- SNIP --->
```

7. Modify your cf-cdr volume catalog within theAutoDeploy configuration file to ensure that the volume containing charging detail records (CDRs) is preserved through the VNF upgrade/redeployment.

```
<--- SNIP --->
volume-catalog cf-cdr
  volume type         LUKS
  volume size         200
  volume bus          ide
  volume bootable     false
volume preserve-on-upgrade true
 !
<--- SNIP --->
```

8. *Optional.* If you're upgrading from a pre-6.0 release (e.g. 5.8) to a 6.x release (e.g. 6.0), perform this stepprefer to . If not, proceed to step 9, on page 79.

   a. Deactivate your current deployment at the Service level using the information and instructions in UAS Upgrade and Redeployment Operations, on page 87.

   b. Deploy the new VNF release using the information and instructions in Deploying Hyper-Converged Ultra M Models Using UAS, on page 33.

   c. Proceed to step 11, on page 80.

9. Load the modified configuration.

   a. Login to the ConfD CLI as the admin user.

   ```
   confd_cli -u admin -C
   ```

   b. Enter the ConfD configuration mode.

   ```
   config
   ```

   c. Load the VNF rack and VNF descriptor configuration file to provide the deployment artifacts to the VIM.

   ```
   load replace <your_ad_file_name>.cfg
   commit
   end
   ```

Important The **load replace** command replaces the config file with the new config file.

10. Activate the VNF rack and VNF descriptor configuration.

    activate nsd *<nsd_name>*

11. Verify that all the deployed resources have been added to the VIM once the activation process is complete.
12. Confirm that the software functions are running the desired version. Refer to the following sections for more information:
    - Determining the Running AutoDeploy Version, on page 126
    - Monitoring VNF Operations, on page 151 -execute the **show version verbose** command through the VNF's Control Function

Upgrading/Redeploying VNFs Deployed Through a Stand-alone AutoVNF Instance

USP-based VNF software upgrade and redeployment procedures are performed by deactivating the existing deployment and then reactivating it with the new images and any related configuration changes. From an upgrade/redeployment perspective, the VNF comprises the UEM, CF, and SF. As such, performing the upgrade/redeployment operation affects each of these components.

Information and instructions for performing the upgrade/redeployment procedures are located in Upgrade/Redeploy Your VNF, on page 80.

Though the UEM can be upgraded with other VNF components, patch updates may be made available for the UEM under certain circumstances. Information and instructions for performing the UEM patch upgrade procedures are located in Manually Applying Patch Upgrades to the UEM, on page 82.

Upgrade/Redeploy Your VNF

This section provides instructions for upgrading VNFs deployed through a stand-alone AutoVNF instance.

Caution Upgrade/redeployment operations are disruptive as they involve terminating VMs for the UEM, CF, and SF components that comprise the VNF. It is strongly recommended that you backup all files related to the deployment including configuration files, logs, and images before performing the upgrade or redeployment. Refer to Backing Up Deployment Information, on page 193 for more information.

Important This procedure assumes that you have access to the USP ISO containing the desired VNF component (VNFC) images.

To upgrade or redeploy a VNF deployed through a stand-alone AutoVNF instance:

1. Verify that the deployment is ready for an upgrade by performing the applicable checks identified in Pre-Deactivation/Post-Activation Health Check Summary, on page 94.
2. *Optional.* Onboard the ISO as described in Onboard the USP ISO, on page 66 if you haven't already done so.
3. *Optional.* Extract the UEM image as described in Extract the UEM VM Image, on page 68 if you haven't already done so.
4. *Optional.* Extract the UGP images as described in Extract the UGP VM Image, on page 69 if you haven't already done so.
5. *Optional.* Upload the USP images to Glance as described in Upload the USP VM Images to Glance, on page 70 if you haven't already done so.
6. Log on to the active AutoVNF VM as *ubuntu*. Use the password that was created earlier for this user.
7. Become the *root* user.

   ```
   sudo -i
   ```
8. *Optional.* If you're upgrading from a pre-6.0 release (e.g. 5.8) to a 6.x release (e.g. 6.0), perform this step. If not, proceed to step 9, on page 81.
   a. Delete the AutoVNF installation.

      ```
      ./boot_uas.py --autofvnf --delete
      ```
   b. Deploy the new VNF release using the information and instructions in Deploying VNFs Using AutoVNF, on page 63.
   c. Proceed to step 14, on page 82.
9. Modify the VNF package descriptor within your VNF rack and VNF descriptor configuration file to refer to the desired USP ISO.

   ```
   <--- SNIP --->
   vnf-packaged <vnf-pkg-name>
    location          <URL/package-name>
    validate-signature true
    configuration <day0_dayN_cfg_identifier>
     external-url <URL/day0_dayN_cfg_name>
    !
   !
   <--- SNIP --->
   ```

Important The VNF package name and version must be different than the previously deployed VNF package version. If the versions are identical, no actions will be taken.

For example, if you previously deployed a configuration with the following parameters:

```
<--- SNIP --->
vnf-packaged vnf-pkg1
 location home/ubuntu/5_5_1-1234/isos/usp-5_5_1-1234.iso
 validate-signature true
 configuration staros
```

```
  external-url /root/system.cfg
 !
!
<--- SNIP --->
```

Your upgrade configuration would have to specify a different name for “vnf-package” and a different ISO name in “package-location”. For example:

```
<--- SNIP --->
vnf-packaged vnf-pkg2
 location home/ubuntu/6_0-1342/isos/usp-6_0-1342.iso
 validate-signature true
 configuration staros
  external-url /root/system.cfg
 !
!
<--- SNIP --->
```

10. Modify the VNF package descriptor identifier at the NSD-level of your VNF rack and VNF descriptor configuration to reference the new VNF package.

```
nsd <nsd_name>
...
 vnf-package <vnf-pkg-name>
<--- SNIP --->
```

11. *Optional.* Modify the VNF package descriptor identifier at the VDU-levels (e.g. VNFM, UEM, CF, SF, AutoVNF) of your VNF rack and VNF descriptor configuration to reference the new VNF package.

```
<--- SNIP --->
vdu <vdu_name>
...
  image vnf-package <vnf-pkg-name>
<--- SNIP --->
```

12. Load the AutoVNF VNF configuration file to load the deployment name and its attributes in the AutoVNF database.

```
load replace <your_vnfm_file_name>.cfg
commit
end
```

13. Activate the AutoVNF VNF configuration file.

```
activate nsd <nsd_name>
```

14. Verify that all the deployed resources have been added to the VIM once the activation process is complete.

Manually Applying Patch Upgrades to the UEM

Under normal circumstances, available software updates are perfomed on the UEM through the standard USP upgrade process as described above. However, under certain circumstances patch updates may be made available for the UEM to minimize system downtime. The patched software files are applied manually as per the instructions that follow.

As described in Ultra Element Manager (UEM), on page 3, the UEM is comprised of the following software modules:

- Service Configuration Manager (SCM)
- Life Cycle Manager (LCM; note that this is also sometimes referred to as the VNFM-Proxy)
- Service Level Agreement Manager (SLA-M)

The UEM patch process allows for each of these modules to be updated individually.

UEM software patches are distributed as a single .tar.gz file (e.g *em_patch.tar.gz*). This file containing a number of binary files for each of the three software modules identified above. The files are organized into separate directories based on the module:

- SCM patch upgrade files are contained in *scm/*:
  - cisco-asa
  - cisco-staros-cli
  - cisco-staros-nc
  - em-sdk
  - juniper-junos
  - manual-ha
  - usc-manager
  - vnf-auto-mount
  - vnfm-proxy
- LCM patch upgrade files are contained in *vnfm-proxy/*:
  - vnfmadpt-api.jar
  - vnfmadpt-esc.jar
  - vnfmadpt-static.jar
  - vnfmproxy-core.jar
  - vnfmproxy-persistence.jar
- SLAM-M patch upgrade files are contained in *sla-m/*:
  - sla-m-<*version*>-SNAPSHOT-all.jar

Important UEM VMs are deployed in an HA cluster. (Refer to UEM Redundancy, on page 21.) The patch update process must be performed on each of these VMs as described in the procedure that follows.

Caution The patch upgrade procedure is a manual process that requires copying and replacing files. Extreme caution must be exercised to ensure that the correct files are copied or removed.

To apply patch updates to the UEM software:

1. Login to the master (active) UEM VM using its VIP address. The default username is *ubuntu*.
2. Copy the UEM patch upgrade file to /tmp directory on the master (active) UEM VM.
3. Unzip and extract the new binaries.

   ```
   cd /tmp
   tar xvfz em_patch.tar.gz
   ```

   This extracts the new binaries/patch files to the */tmp/em_patch* directory.
4. Open an SSH connection to the follower (slave/standby) UEM VM using its VIP address. The default username is *ubuntu*.
5. Replace the files identified in the distribution.

   Updating SCM files:

   a. Make a backup copy of the existing SCM package.

      ```
      sudo cp -R /opt/cisco/em/git/em-scm/packages
      /opt/cisco/em/git/em-scm/packages_backup
      ```

      This creates a directory named *packages_backup* and copies the existing SCM package files to it.

   b. Delete the existing SCM files.

      ```
      sudo rm -rf /opt/cisco/em/git/em-scm/packages/*
      ```

   c. Copy updated SCM files to the load path.

      ```
      cp -r scm /opt/cisco/em/git/em-scm/packages/
      ```

   d. Verify that the files have been correctly transferred and replaced by checking the date stamps and files sizes of each file.

   e. Delete the cached files that are currently in use.

      ```
      sudo rm -rf /opt/cisco/em/git/em-scm/state/packages-in-use*
      ```

   Updating SLA-M files:

   a. Make a backup copy of the existing SLA-M package.

      ```
      sudo cp -R /opt/cisco/em/bin/sla /opt/cisco/em/bin/sla_backup
      ```

      This creates a directory named *sla_backup* and copies the existing SLA-M file(s) to it.

   b. Delete the existing SLA-M file.

      ```
      sudo rm /opt/cisco/em/bin/sla/sla-m-5.0.0-SNAPSHOT-all.jar
      ```

   c. Copy updated SLA-M file to the load path.

      ```
      sudo cp sla-m/sla-m-5.0.0-SNAPSHOT-all.jar /opt/cisco/em/bin/sla
      ```

d. Verify that the files have correctly transferred and have been replaced by checking the date stamps and files sizes of each file.

Updating LCM files:

a. Make a backup copy of the existing LCM package.

```
sudo cp -R /opt/cisco/em/bin/vnfm-proxy/bundles/
/opt/cisco/em/bin/vnfm-proxy/bundles_backup
```

This creates a directory called bundles_backup and copies the existing LCM package files to it.

b. Delete the existing SCM files.

```
sudo rm /opt/cisco/em/bin/vnfm-proxy/bundles/*
```

c. Copy updated SCM files to the load path.

```
sudo cp vnfm-proxy/*.jar /opt/cisco/em/bin/vnfm-proxy/bundles/
```

d. Verify that the files have been correctly transferred and replaced by checking the date stamps and files sizes of each file.

e. Delete the cached files that are currently in use.

```
sudo rm -rf /opt/cisco/usp/apps/karaf/apache-karaf-4.0.7/data
```

Important Deleting the data folder causes Karaf to reboot. This in turn triggers the UEM VM to reboot.

6. Reboot the UEM VM.

Important If you upgraded the LCM files as part of step 5, on page 84, you can skip this step since the UEM VM would have already rebooted.

```
sudo reboot
```

7. Upon reboot, log back into the VM and verify that the modules have been properly updated.

a. Verify that the modules have started and are being monitored.

```
sudo -i
ncs_cli -u admin -C
show ems
```

```
EM VNFM
ID SLA SCM PROXY

2 UP UP UP
3 UP UP UP
```

b. Verify that the files have been loaded are in use.

```
ls /opt/cisco/em/git/em-scm/state/packages-in-use
```

```
1 2
```

c. Login to the SCM and check the HA state.

```
sudo -i
ncs_cli -u admin -C
show ncs-state ha
```

```
ncs-state ha mode connected-slave
ncs-state ha node-id 3-1500421436
ncs-state ha master [ 2-1500421473 ]
```

d. Verify that Karaf created a new cache.

```
ls /opt/cisco/usp/apps/karaf/apache-karaf-4.0.7/data
```

```
cache generated-bundles kar log port security tmp
```

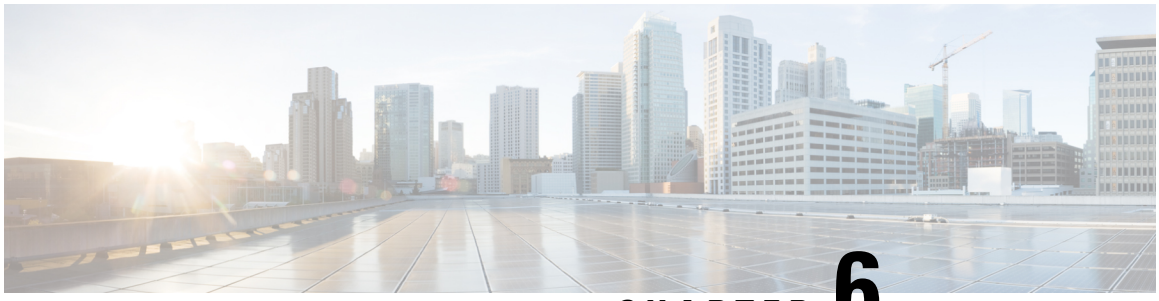
Important If there are any issues, replace the updated files with the backup copies you have made, reboot the VM, and contact your local service representative. Do not proceed to the next step.

8. Log off the follower (standby) UEM VM and login to the follower UEM VM (the third UEM VM in the HA cluster) using its VIP address. The default username is *ubuntu*.
9. Repeat steps 5, on page 84 through 7, on page 85 on the follower UEM VM.

Important If there are any issues, replace the updated files with the backup copies you have made, reboot the VM, and contact your local service representative. You will also need to replace the files on the follower (slave/standby) UEM VM that was initially patched and then reboot it. Do not proceed to the next step.

10. Log off the follower UEM VM.
11. Repeat steps 5, on page 84 through 7, on page 85 on the master (active) VM. When reloading the VM, the follower (standby) UEM VM will become active with the newly patched software files.

Important If there are any issues, replace the updated files with the backup copies you have made, reboot the VM, and contact your local service representative. You will also need to replace the files on the follower (slave/standby) and follower (standby) UEM VMs that were patched earlier in this process and then reboot them.



CHAPTER 6

UAS Upgrade and Redeployment Operations

This chapter describes the following topics:

- Overview, on page 87
- Upgrading/Redeploying AutoVNF (Including VNFM), on page 87
- Upgrading/Redeploying AutoDeploy, on page 90

Overview

Activation and deactivation procedures provide a mechanism for starting/stopping your deployment in order to implement configuration changes, upgrade or redeploy UAS components (e.g. AutoIT or AutoDeploy), and/or to recover from certain errors that may occur.

Important The information provided for activations and deactivations in these sections pertain only to Ultra M solutions based on the Hyper-Converged architecture that were deployed through UAS.

Upgrading/Redeploying AutoVNF (Including VNFM)

AutoVNF VMs can be upgraded or redeployed to incorporate different software releases than the one currently deployed. This process includes and applies to VNFM as well.

Important The information provided in this section pertains only to Ultra M solutions based on the Hyper-Converged architecture that were deployed through UAS.

Caution This operation also requires bringing down the VNF associated with the AutoVNF instance.

Caution Upgrade/redeployment operations are disruptive as they involve terminating VMs for the various components that comprise the deployment. When upgrading UAS software roles, all related data is lost. As such, it is strongly recommended that you backup all files related to the deployment including configuration files, logs, and images before performing the upgrade or redeployment. Refer to Backing Up Deployment Information, on page 193 for more information.

To upgrade or redeploy the AutoVNF and VNFM components:

1. Deactivate the VNF rack and VNF descriptor configuration file.

   ```
   deactivate nsd <nsd-name>
   ```

2. Modify the VNF package descriptor within your VNF rack and VNF descriptor configuration file to refer to the desired USP ISO.

   ```
   <--- SNIP --->
   vnf-packaged <vnf-pkg-name>
    location          <URL/package-name>
    validate-signature true
    configuration <day0_dayN_cfg_identifier>
     external-url <URL/day0_dayN_cfg_name>
    !
   !
   <--- SNIP --->
   ```

Important The VNF package name and version must be different than the previously deployed VNF package version. If the versions are identical, no actions will be taken.

For example, if you previously deployed a configuration with the following parameters:

```
<--- SNIP --->
vnf-packaged vnf-pkg1
 location home/ubuntu/6_0-1234/isos/usp-6_0-1234.iso
 validate-signature true
 configuration staros
  external-url /root/system.cfg
 !
!
<--- SNIP --->
```

Your upgrade configuration would have to specify a different name for “vnf-package” and a different ISO name in “package-location”. For example:

```
<--- SNIP --->
vnf-packaged vnf-pkg2
 location home/ubuntu/6_0-1342/isos/usp-6_0-1342.iso
 validate-signature true
 configuration staros
  external-url /root/system.cfg
 !
!
<--- SNIP --->
```

3. Modify the VNF package descriptor identifier at the NSD-level of your VNF rack and VNF descriptor configuration to reference the new VNF package.

```
nsd <nsd_name>
...
 vnf-package <vnf-pkg-name>
<--- SNIP --->
```

4. *Optional.* Modify the VNF package descriptor identifier at the VDU-levels (e.g. VNFM, UEM, CF, SF, AutoVNF) of your VNF rack and VNF descriptor configuration to reference the new VNF package.

```
<--- SNIP --->
vdu <vdu_name>
...
  image vnf-package <vnf-pkg-name>
<--- SNIP --->
```

5. Load the modified configuration.
   a. Login to the ConfD CLI as the admin user.

      ```
      confd_cli -u admin -C
      ```

   b. Enter the ConfD configuration mode.

      ```
      config
      ```

   c. Load the VNF rack and VNF descriptor configuration file to provide the deployment artifacts to the VIM.

      ```
      load replace <your_ad_file_name>.cfg
      commit
      end
      ```

Important The **load replace** command replaces the config file with the new config file.

6. Activate the VNF rack and VNF descriptor configuration.

   ```
   activate nsd <nsd_name>
   ```

7. Verify that all the deployed resources have been added to the VIM once the activation process is complete.
8. Confirm that the software functions are running the desired version. Refer to the following sections for more information:
   - Determining the Running AutoDeploy Version, on page 126
   - Monitoring VNF Operations, on page 151 -execute the **show version verbose** command through the VNF's Control Function

Upgrading/Redeploying AutoDeploy

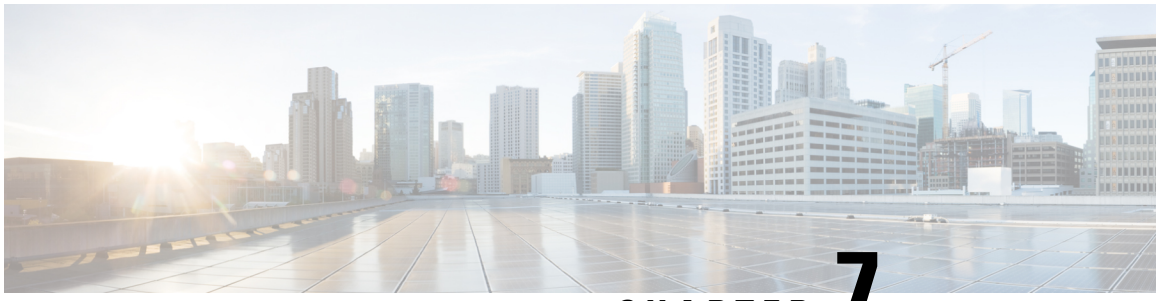
AutoDeploy VMs can be upgraded or redeployed to incorporate different software releases than the one currently deployed.

Caution Redeploying AutoDeploy also requires bringing down AutoVNF and the related VNF.

Caution Upgrade/redeployment operations are disruptive as they involve terminating VMs for the various components that comprise the deployment. When upgrading UAS software roles, all related data is lost. As such, it is strongly recommended that you backup all files related to the deployment including configuration files, logs, and images before performing the upgrade or redeployment. Refer to Backing Up Deployment Information, on page 193 for more information.

To upgrade or redeploy the AutoDeploy components:

1. Deactivate your deployment using the information and instructions in Deactivating the USP Deployment, on page 91, if you have not already done so.
2. Terminate the AutoDeploy VM using the information and instructions in Terminating the AutoDeploy VM, on page 92.
3. Redeploy the system using the information and instructions in Pre-VNF Installation Verification, on page 54.



CHAPTER 7

Post Deployment Operations

- Deactivating the USP Deployment, on page 91
- Terminating the AutoDeploy VM, on page 92
- Terminating the AutoIT VM, on page 92
- Deploy and Undeploy the Card with the NCS CLI, on page 93
- Monitoring and Troubleshooting the Deployment, on page 94
- Monitoring AutoDeploy Operations, on page 122
- Monitoring AutoIT Operations, on page 126
- Monitoring AutoVNF Operations, on page 131
- Monitoring VNFM Operations, on page 148
- Monitoring VNF Operations, on page 151
- Monitoring and Recovering AutoVNF Through AutoIT, on page 154
- Monitoring and Recovering VNFC Through AutoVNF, on page 156
- Troubleshooting Deactivation Process and Issues, on page 158
- Troubleshooting UEM Issues, on page 162

Deactivating the USP Deployment

Caution It is recommended that you perform the checks identified in Pre-Deactivation/Post-Activation Health Check Summary, on page 94 before performing any deactivations. It is also recommended that you back up relevant data before proceeding. Refer to Backing Up Deployment Information, on page 193 for more information.

Execute the following command to deactivate the entire USP deployment:

deactivate nsd *<nsd_name>*

The output of this command is a transaction-id which can be used to monitor the deactivation progress using the following command

show log *<transaction_id>* **| display xml**

Example output for a successful USP deactivation:

Terminating the AutoDeploy VM

Terminating the AutoDeploy VM leverages the same *boot_uas.py* script used to instantiate the AutoDeploy VM.

Important

- Ensure that no changes have been made to this file since it was used to deploy AutoDeploy.
- Be sure to take a backup of the VM content if you are terminating the VM in order to upgrade with a new ISO.
- If AutoDeploy was deployed with HA support, this process terminates both VMs.

To terminate the AutoDeploy VM:

1. Log on to the Ultra M Manager Node.
2. Terminate the AutoDeploy VM.

   `./boot_uas.py --kvm --autodeploy --ha --delete-uas`

   Example command output:

   ```
   2018-01-24 16:30:23,821 - Removing old deployment 'AutoDeploy_instance_0', if it exists
   2018-01-24 16:30:24,176 - Removing old deployment 'AutoDeploy_instance_1', if it exists
   ```

3. View the status.

   `show uas`

   Example command output:

   ```
    Id    Name                                 State
   ----------------------------------------------------
   ```

Terminating the AutoIT VM

Terminating the AutoIT VM leverages the same *boot_uas.py* script used to instantiate the AutoIT-VNF VM.

Important

- Ensure that no changes have been made to this file since it was used to deploy AutoIT.
- Be sure to take a backup of the VM content if you are terminating the VM in order to upgrade with a new ISO.
- If AutoIT was deployed with HA support, this process terminates both VMs.

To terminate the AutoIT VM:

1. Log on to the Ultra M Manager Node.
2. Terminate the AutoIT VM.

./boot_uas.py --kvm --autoit --ha --delete-uas

Example command output:

```
2018-01-24 16:25:23,734 - Removing old deployment 'AutoIT_instance_0', if it exists
2018-01-24 16:25:24,056 - Removing old deployment 'AutoIT_instance_1', if it exists
```

3. View the status.

   show uas

   Example command output:

```
 Id    Name                               State
----------------------------------------------------
```

Deploy and Undeploy the Card with the NCS CLI

To undeploy and redeploy the card (service or session function) using the NCS CLI:

1. Log on to the master UEM VM.
2. Access the NCS CLI.

   sudo -i

   ncs_cli -u admin -C

3. Undeploy or suspend the card.

   suspend-vnfci vnfid *<name>* **vdu** *<VDU>* **vnfci** *<VNFCI Instance>*

   For example:

   suspend-vnfci vnfid abc vdu sf vnfci sf1 success true

4. Verify the operational status of VNF, card, VDUs. Suspending card removes the card, e.g. from CF.

   show vnf-state

```
vnf-state running

vnf-state running
```

   show card table

```
Slot         Card Type                              Oper State     SPOF  Attach
-----------  -------------------------------------  -------------  ----  ------
 1: CFC      Control Function Virtual Card          Active         No
 2: CFC      Control Function Virtual Card          Standby        -
 4: FC       1-Port Service Function Virtual Card   Standby        -
```

   show vdus

```
                                                 CONSTITUENT
                                        MEMORY  STORAGE
                           DEVICE     DEVICE     ELEMENT      IS
                                 CPU    UTILS   USAGE
ID  CARD TYPE         ID   NAME        GROUP      GROUP        INFRA  INITIALIZED  VIM
ID                                UTILS  BYTES   BYTES
----------------------------------------------------------------------------------------
cf  control-function  cf1  scm-cf-nc  scm-cf-nc  ugp          true   true
```

```
76e2f28a-4427-4b1d-9c44-72ff51e0d124  -      -       -
                     cf2  scm-cf-nc  scm-cf-nc  ugp          true   true
b1155c6e-26f1-44c1-8832-0e9a02f7acd3  -      -       -
sf  session-function  sf1  -          -          ugp          true   false
7822cea9-1707-4790-abb3-33bb4d26b567  -      -       -
                     sf2  -          -          ugp          true   false
7fd8f37f-59cf-4c9a-811f-faa0abd30b58  -      -       -
```

UEM changes the status of suspended card to *undeployed*. For example, UEM Zookeeper:

```
[zk: localhost:2181(CONNECTED) 0] get /config/vnf
{"state":"run","name":"abcabc-autovnf-vpc-abcabc"}

[zk: localhost:2181(CONNECTED) 1] get /config/vnfd
{"name":"abcabc-autovnf-vpc-abcabc","version":"6.0","deployment-flavor-id":["generic"],
"anti-affinity-cards":["control-function","session-function"],"card-type-to-vdu":{"control-function":["cf"],"session-function":["sf"]}}

[zk: localhost:2181(CONNECTED) 2] get /config/vdus/sf/sf1
{"cpts":[{"vnfc":"sf-vnfc-ugp","cpid":null,"vl":null}],"affinity":null,
"initvars":[{"dest_path":"staros_param.cfg","path_vars":[{"name":"CARD_TYPE_NUM","val":"0x42020100"},{"name":"SLOT_CARD_NUMBER","val":"3"},
{"name":"VNFM_PROXY_ADDRS","val":"101.101.14.9,101.101.14.16,101.101.14.13"}]}],"operation":"create","ceg-id":"ugp","vnfci-id":"sf1",
"context-vars":null,"nat-pool":null,"vim-id":"abcabc-autovnf-vpc-abcabc-sf-1","volume":null}

[zk: localhost:2181(CONNECTED) 3] get /oper/vdus/sf/sf1
{"id":"sf1","state":"undeployed","vnfcId":"sf-vnfc-ugp",
"uuid":"sf1","host":"tb1ano-osd-compute-2.localdomain","vimId":"7822cea9-1707-4790-abb3-33bb4d26b567",
"cpts":[{"cpid":"eth0","state":"undeployed","subnet":"94c4ea79-eb81-4a7d-b726-4f780a05436f","netmask":"255.255.255.0",
"dhcp":true,"vl":"vl-di-internal1","vnfc":"sf-vnfc-ugp","port_id":"0b5ddc23-5c43-463b-ae14-f1f0b94f90dc","ip_address":"192.168.1.124",
"mac_address":"fa:16:3e:b6:26:da","network":"55d41c29-f8ed-4006-b29c-5ad3bf73bf42"},{"cpid":"eth1","state":"undeployed","nicid":1,
"subnet":"472e0423-a9d8-4eb6-9782-a741afe5b93a","netmask":"255.255.0","dhcp":true,"vl":"vl-autoit-abcabc_orch","vnfc":"sf-vnfc-ugp",
[illegible]

[zk: localhost:2181(CONNECTED) 4] get /oper/vnf
{"state":"running","name":"abcabc-autovnf-vpc-abcabc"}

[zk: localhost:2181(CONNECTED) 5] get /oper/vdrs/sf1
[illegible]
```

5. Redeploy or resume the card by executing the following command:

   resume-vnfci vnfid *<name>* **vdu** *<VDU>* **vnfci** *<VNFC Instance>*

Monitoring and Troubleshooting the Deployment

Pre-Deactivation/Post-Activation Health Check Summary

Table 13: Pre-deactivation/Post-activation Health Checks, on page 94 contains a summary of items to check/verify before performing a deactivation and/or after an activation.

Table 13: Pre-deactivation/Post-activation Health Checks

Item to Check	Notes
Checking OSP-D Server Health	Perform all identified checks.
Checking Controller Server Health	Perform all identified checks.

Item to Check	Notes
Checking OSD Compute Server Health	Perform all identified checks.
Viewing AutoVNF Operational Data	In particular, check the outputs of the following commands: • **show uas** • In releases prior to 6.0: **show autovnf-oper:vip-port** In 6.0 and later releases: **show vnfr** • In releases prior to 6.0: **show autovnf-oper:vnf-em** In 6.0 and later releases: **show vnfr** • In releases prior to 6.0: **show autovnf-oper:vnfm** In 6.0 and later releases: **show vnfr**
Viewing ESC Status	Perform all identified checks.
Viewing ESC Health	Perform all identified checks.
Viewing UEM Service Status	Perform all identified checks.
Viewing VNF Information through the Control Function	Perform all identified checks.

Checking OSP-D Server Health

Viewing Stack Status

Log on to the server on which OSP-D is running to view the stack status by executing the following command:

```
openstack stack list
```

Example output:

```
| ID                                   | Stack Name | Stack Status    | Creation Time
   | Updated Time |
+--------------------------------------+------------+-----------------+----------------------+--------------+
| db229d67-212d-4086-a266-e635b2902708 | tb3-ultram | CREATE_COMPLETE | 2017-06-20T02:31:31Z
 | None         |
+--------------------------------------+------------+-----------------+----------------------+--------------+
```

Note Prior to an update, the stack status may be "CREATE_COMPLETE" at the beginning of the update procedure. The stack status should read "UPDATE_COMPLETE" and list and update time at the successful completion of the update procedure.

Viewing the Bare Metal Node List

Log on to the server on which OSP-D is running to view the node list by executing the following command:

openstack baremetal node list

Example command output:

```
+--------------------------------------+------+--------------------------------------+-------------+--------------------+-------------+
| UUID                                 | Name | Instance UUID                        | Power
 State | Provisioning State | Maintenance |
+--------------------------------------+------+--------------------------------------+-------------+--------------------+-------------+
| 6725bb18-2895-4a8a-86ad-96b00cc9df4d | None | bc903f51-8483-4522-bcd7-ac396ac626b1 | power
 on    | active             | False       |
| f1aa6356-40a0-41de-be1b-fa6033c9affb | None | 05fbfb44-ccd9-475d-b263-58b2deaf8554 | power
 on    | active             | False       |
| f02357a3-6f9b-46ae-b31f-1a21f6d33543 | None | dd0596b1-bd35-451a-85bc-c635e7fa6d14 | power
 on    | active             | False       |
| ca1153d6-ffaf-481a-ac9b-bc2afc450152 | None | 96d2725c-9c70-4a66-9d3c-4a0356faf1c0 | power
 on    | active             | False       |
| 8f338102-c114-4a7a-94f0-9e1a54494519 | None | 85a9a708-5eae-4ea2-8b29-dc2acd6e515d | power
 on    | active             | False       |
| 5d3d3525-2528-4801-b885-6c4b340393a6 | None | 315c7aea-acef-4341-aa9e-bcd594cae592 | power
 on    | active             | False       |
| ac21208b-36fd-4404-8e68-53a90df3a29f | None | 9f0b2ff3-5234-42e9-81dd-c0ef5e454137 | power
 on    | active             | False       |
| a6d92bfc-0136-4c22-9988-0108df775a03 | None | 2a3e2086-3516-40ac-a584-3714e91858f5 | power
 on    | active             | False       |
| 5f0593b7-31de-4291-b43f-a549699cd470 | None | f4cc50d4-441e-4728-9984-53df29f0b7f7 | power
 on    | active             | False       |
| 99225e1b-085e-4ef7-8173-4687900b741a | None | 200a918e-abb3-4539-a1c4-7e30f2d8ebc2 | power
 on    | active             | False       |
| c6ec143b-a522-4d69-ab31-5b4934ad3c42 | None | 7c675ed5-17d9-47ad-a2ef-592353e27713 | power
 on    | active             | False       |
| e1026c43-f2a3-44ad-a385-4d4462552977 | None | 45b45041-656f-4ee1-8be2-976c71a35b1f | power
 on    | active             | False       |
| 122188ea-09ae-486c-b225-17cf0defe025 | None | bd38818e-36ca-4fd9-a65f-c4b0e5b34977 | power
 on    | active             | False       |
| f6ecf896-6e5e-4735-8727-942478dee58a | None | 82a79351-5520-4e89-ae19-48c7b6f6b39f | power
 on    | active             | False       |
| e6db159e-008e-4186-8967-92a9faeee368 | None | 986affe6-23ba-48ba-ae4e-0d2226aabf55 | power
 on    | active             | False       |
| 44f3a434-eaf8-4b1a-97e5-6340d277fa4e | None | 1f385454-3ddb-40bd-bc6e-a55ad69fff47 | power
 on    | active             | False       |
| 7ab70571-64ea-439b-a0f4-34147d01dfbf | None | 6f9f76ac-3cf7-4002-94ba-39bc6f0b4c40 | power
 on    | active             | False       |
| 6d478a22-874c-4611-834d-21f4809f90ce | None | 8e37407f-c784-4f5f-942f-2e2c36aa3fa4 | power
 on    | active             | False       |
| 0a57a5ad-d160-477e-807f-11997307bc9c | None | 25b53356-9f02-4810-b722-efb6fd887879 | power
 on    | active             | False       |
| 6fff3d83-ed37-4934-89e0-d632aeb37b15 | None | 0ea048c0-6f4b-460d-99b2-796dd694c226 | power
 on    | active             | False       |
| 5496919c-c269-4860-b49a-e0d103a6a460 | None | 6a8e05aa-26fe-43bb-b464-ede86b9f4639 | power
 on    | active             | False       |
| 513b936d-1c52-4b0a-9ac4-4101fe812f07 | None | b92c5720-7db9-417b-b3d5-023046788c8e | power
 on    | active             | False       |
+--------------------------------------+------+--------------------------------------+-------------+--------------------+-------------+
```

Viewing the OpenStack Server List

Log on to the server on which OSP-D is running to ensure that stack components and verify they are active and running the same image by executing the following command:

openstack server list

Example command output:

```
+--------------------------------------+--------------------------+--------+-------------------------+--------------------------+
| ID                                   | Name                     | Status | Networks
         | Image Name                   |
+--------------------------------------+--------------------------+--------+-------------------------+--------------------------+
| 9f0b2ff3-5234-42e9-81dd-c0ef5e454137 | tb3-ultram-compute-3     | ACTIVE |
ctlplane=192.200.0.133 | overcloud-full_20170620T011048 |
| 25b53356-9f02-4810-b722-efb6fd887879 | tb3-ultram-compute-15    | ACTIVE |
ctlplane=192.200.0.131 | overcloud-full_20170620T011048 |
| 986affe6-23ba-48ba-ae4e-0d2226aabf55 | tb3-ultram-compute-11    | ACTIVE |
ctlplane=192.200.0.128 | overcloud-full_20170620T011048 |
| 45b45041-656f-4ee1-8be2-976c71a35b1f | tb3-ultram-compute-8     | ACTIVE |
ctlplane=192.200.0.130 | overcloud-full_20170620T011048 |
| bd38818e-36ca-4fd9-a65f-c4b0e5b34977 | tb3-ultram-compute-9     | ACTIVE |
ctlplane=192.200.0.127 | overcloud-full_20170620T011048 |
| 82a79351-5520-4e89-ae19-48c7b6f6b39f | tb3-ultram-compute-10    | ACTIVE |
ctlplane=192.200.0.126 | overcloud-full_20170620T011048 |
| 1f385454-3ddb-40bd-bc6e-a55ad69fff47 | tb3-ultram-compute-12    | ACTIVE |
ctlplane=192.200.0.118 | overcloud-full_20170620T011048 |
| 8e37407f-c784-4f5f-942f-2e2c36aa3fa4 | tb3-ultram-compute-14    | ACTIVE |
ctlplane=192.200.0.117 | overcloud-full_20170620T011048 |
| 315c7aea-acef-4341-aa9e-bcd594cae592 | tb3-ultram-compute-2     | ACTIVE |
ctlplane=192.200.0.114 | overcloud-full_20170620T011048 |
| 2a3e2086-3516-40ac-a584-3714e91858f5 | tb3-ultram-compute-4     | ACTIVE |
ctlplane=192.200.0.120 | overcloud-full_20170620T011048 |
| b92c5720-7db9-417b-b3d5-023046788c8e | tb3-ultram-osd-compute-2 | ACTIVE |
ctlplane=192.200.0.110 | overcloud-full_20170620T011048 |
| 7c675ed5-17d9-47ad-a2ef-592353e27713 | tb3-ultram-compute-7     | ACTIVE |
ctlplane=192.200.0.111 | overcloud-full_20170620T011048 |
| 0ea048c0-6f4b-460d-99b2-796dd694c226 | tb3-ultram-osd-compute-0 | ACTIVE |
ctlplane=192.200.0.112 | overcloud-full_20170620T011048 |
| f4cc50d4-441e-4728-9984-53df29f0b7f7 | tb3-ultram-compute-5     | ACTIVE |
ctlplane=192.200.0.108 | overcloud-full_20170620T011048 |
| dd0596b1-bd35-451a-85bc-c635e7fa6d14 | tb3-ultram-controller-2  | ACTIVE |
ctlplane=192.200.0.115 | overcloud-full_20170620T011048 |
| 85a9a708-5eae-4ea2-8b29-dc2acd6e515d | tb3-ultram-compute-1     | ACTIVE |
ctlplane=192.200.0.102 | overcloud-full_20170620T011048 |
| bc903f51-8483-4522-bcd7-ac396ac626b1 | tb3-ultram-controller-0  | ACTIVE |
ctlplane=192.200.0.105 | overcloud-full_20170620T011048 |
| 6a8e05aa-26fe-43bb-b464-ede86b9f4639 | tb3-ultram-osd-compute-1 | ACTIVE |
ctlplane=192.200.0.106 | overcloud-full_20170620T011048 |
| 200a918e-abb3-4539-a1c4-7e30f2d8ebc2 | tb3-ultram-compute-6     | ACTIVE |
ctlplane=192.200.0.109 | overcloud-full_20170620T011048 |
| 05fbfb44-ccd9-475d-b263-58b2deaf8554 | tb3-ultram-controller-1  | ACTIVE |
ctlplane=192.200.0.113 | overcloud-full_20170620T011048 |
| 96d2725c-9c70-4a66-9d3c-4a0356faf1c0 | tb3-ultram-compute-0     | ACTIVE |
ctlplane=192.200.0.107 | overcloud-full_20170620T011048 |
| 6f9f76ac-3cf7-4002-94ba-39bc6f0b4c40 | tb3-ultram-compute-13    | ACTIVE |
ctlplane=192.200.0.103 | overcloud-full_20170620T011048 |
+--------------------------------------+--------------------------+--------+-------------------------+--------------------------+
```

Viewing the OpenStack Stack Resource List

Log on to the server on which OSP-D is running to view the stack resources and their status by executing the following command:

openstack stack resource list *name*

Example command output:

```
+--------------------------+--------------------------------------+-----------------+---------------+
| resource_name            | physical_resource_id                 |
resource_type            | resource_status | updated_time         |
+--------------------------+--------------------------------------+-----------------+---------------+
```

```
| UpdateWorkflow                          | 94270702-cd8b-4441-a09e-5c9da0c2d02b   |
OS::TripleO::Tasks::UpdateWorkflow      | CREATE_COMPLETE | 2017-06-27T22:04:00Z |
| CephStorageHostsDeployment             | 196dbba7-5d66-4a9c-9308-f47ff4ddbe2d   |
OS::Heat::StructuredDeployments         | CREATE_COMPLETE | 2017-06-27T22:04:00Z |
| OsdComputeAllNodesDeployment           | 6a5775c0-03d8-453f-92d8-be6ea5aed853   |
OS::Heat::StructuredDeployments         | CREATE_COMPLETE | 2017-06-27T22:04:00Z |
| BlockStorageHostsDeployment            | 97b2f70a-c295-4437-9222-8248ec30badf   |
OS::Heat::StructuredDeployments         | CREATE_COMPLETE | 2017-06-27T22:04:00Z |
| CephStorage                            | 1bc20bb0-516a-4eb5-85e2-be9d30e2f6e8   |
OS::Heat::ResourceGroup                 | CREATE_COMPLETE | 2017-06-27T22:04:00Z |
| AllNodesDeploySteps                    | da9ead69-b83e-4cc9-86e8-8d823c02843b   |
OS::TripleO::PostDeploySteps            | CREATE_COMPLETE | 2017-06-27T22:04:00Z |
| CephStorageAllNodesDeployment          | e5ee9df8-fae1-4641-9cfb-038c8f4eca85   |
OS::Heat::StructuredDeployments         | CREATE_COMPLETE | 2017-06-27T22:04:00Z |
```

Verifying Node Reachability

Log on to the server on which OSP-D is running to ensure the node reachability and availability by executing the following command:

```
for i in $(nova list| grep ACTIVE| awk '{print $12}' | sed 's\ctlplane=\\g'
 ) ; do ssh heat-admin@${i} uptime ; done
```

This command establishes an SSH session with each node and report the system uptime. Investigate any node that does not reply or has an unexpected uptime.

Example command output:

```
 14:47:10 up 18:15,  0 users,  load average: 0.01, 0.02, 0.05
 14:47:11 up 18:14,  0 users,  load average: 9.50, 9.15, 12.32
 14:47:11 up 18:14,  0 users,  load average: 9.41, 9.09, 12.26
 14:47:11 up 18:14,  0 users,  load average: 10.41, 10.28, 10.49
 14:47:12 up 18:15,  0 users,  load average: 0.00, 0.02, 0.05
 14:47:12 up 18:14,  0 users,  load average: 0.18, 0.06, 0.06
 14:47:12 up 18:15,  0 users,  load average: 0.00, 0.03, 0.05
 14:47:12 up 18:15,  0 users,  load average: 0.00, 0.01, 0.05
 14:47:13 up 18:14,  0 users,  load average: 0.02, 0.02, 0.05
 14:47:13 up 18:14,  0 users,  load average: 8.23, 8.66, 12.29
 14:47:13 up 18:14,  0 users,  load average: 8.76, 8.87, 12.14
 14:47:14 up 18:15,  0 users,  load average: 0.01, 0.04, 0.05
 14:47:14 up 18:15,  0 users,  load average: 9.30, 9.08, 10.12
 14:47:14 up 18:15,  0 users,  load average: 0.01, 0.06, 0.05
 14:47:14 up 18:14,  0 users,  load average: 8.31, 8.61, 11.96
 14:47:15 up 18:14,  0 users,  load average: 17.08, 12.09, 11.06
 14:47:15 up 17:09,  0 users,  load average: 1.64, 1.33, 1.10
 14:47:15 up 17:04,  0 users,  load average: 1.02, 0.77, 0.79
 14:47:16 up 16:58,  0 users,  load average: 0.55, 0.63, 0.72
 14:47:16 up 23:46,  0 users,  load average: 2.68, 3.46, 3.89
 14:47:16 up 1 day, 5 min,  0 users,  load average: 4.10, 4.27, 4.44
 14:47:17 up 23:53,  0 users,  load average: 1.90, 2.32, 2.24
```

Verify NTP is running

To verify the operational status of NTP server:

1. Log on to the server on which OSP-D is running to ensure that NTP is running on all nodes in the cluster by executing the following command:

   ```
   for i in $(nova list| grep ACTIVE| awk '{print $12}' | sed
   's\ctlplane=\\g' ) ; do ssh heat-admin@${i} systemctl status ntpd |grep
    Active; done
   ```

This command establishes an SSH session with each node and lists the ntpd status.

Example command output:

```
Active: active (running) since Tue 2017-07-11 20:32:25 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:28 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:50 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:28 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:14 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:30 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:22 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:16 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:35 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:31 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:30 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:25 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:19 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:14 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:41 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 20:32:30 UTC; 18h ago
Active: active (running) since Tue 2017-07-11 21:37:32 UTC; 17h ago
Active: active (running) since Tue 2017-07-11 21:43:16 UTC; 17h ago
Active: active (running) since Tue 2017-07-11 21:48:57 UTC; 17h ago
Active: active (running) since Tue 2017-07-11 15:01:30 UTC; 23h ago
Active: active (running) since Tue 2017-07-11 14:42:10 UTC; 24h ago
Active: active (running) since Tue 2017-07-11 14:54:06 UTC; 23h ago
```

2. Verify that all the Overcloud nodes are synced to NTP server.

`for i in $(nova list | grep -i overc- | awk '{print $12}'| sed 's/ctlplane=//g') ; do (ssh -o StrictHostKeyChecking=no heat-admin@$i sudo ntpstat | grep NTP) ; done`

```
[stack@j19bxb-ospd ~]$ for i in $(nova list | grep -i overc- | awk '{print $12}'| sed
's/ctlplane=//g') ; do (ssh -o StrictHostKeyChecking=no heat-admin@$i sudo ntpstat |
grep NTP) ; done
synchronised to NTP server (10.84.96.130) at stratum 3
synchronised to NTP server (10.84.96.130) at stratum 3
synchronised to NTP server (10.84.96.130) at stratum 3
synchronised to NTP server (10.84.96.130) at stratum 3
synchronised to NTP server (10.84.96.130) at stratum 3
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synchronised to NTP server (10.84.96.130) at stratum 3
synchronised to NTP server (10.84.96.130) at stratum 3
synchronised to NTP server (10.84.96.130) at stratum 3
```

3. Check the NTP status on the server on which OSP-D is running by executing the following command:

`systemctl status ntpd |grep Active`

Investigate any node that is not actively running NTP.

Checking OSP-D Server Health

Verifying VM and Other Service Status and Quotas

Log on to the server on which OSP-D is running to verify that Overcloud VMs are active and running by executing the following commands:

```
cd /home/stack
source ~/<stack_name>rc-core
nova list
```

Note Overcloud VM status can also be checked through the Horizon GUI.

Example command output:

```
+--------------------------------------+--------------------------------------------------------------------------------+
| ID                                   | Name
              | Status | Task State | Power State | Networks


                                |
+--------------------------------------+--------------------------------------------------------------------------------+
| 407891a2-85bb-4b84-a023-bca4ff304fc5 | auto-deploy-vm-uas-0
              | ACTIVE | -          | Running     | mgmt=172.16.181.21, 10.84.123.13


                               |
| bb4c06c5-b328-47bd-ac57-a72a9b4bb496 | auto-it-vm-uas-0
              | ACTIVE | -          | Running     | mgmt=172.16.181.19, 10.84.123.12


                               |
| fc0e47d3-e59e-41a3-9d8d-99371de1c4c5 | tb3-bxb-autovnf1-uas-0
              | ACTIVE | -          | Running     |
tb3-bxb-autovnf1-uas-orchestration=172.17.180.10; tb3-bxb-autovnf1-uas-management=172.17.181.8

                                                                |
| 8056eff1-913e-479a-ac44-22eba42ceee1 | tb3-bxb-autovnf1-uas-1
              | ACTIVE | -          | Running     |
tb3-bxb-autovnf1-uas-orchestration=172.17.180.6; tb3-bxb-autovnf1-uas-management=172.17.181.12

                                                                |
| 4e9fab14-dad0-4789-bc52-1fac3e40b7cc | tb3-bxb-autovnf1-uas-2
              | ACTIVE | -          | Running     |
tb3-bxb-autovnf1-uas-orchestration=172.17.180.13; tb3-bxb-autovnf1-uas-management=172.17.181.3

                                                                |
| 1a4e65e3-9f9d-429f-a604-6dfb45ef2a45 | tb3-bxb-vnfm1-ESC-0
              | ACTIVE | -          | Running     |
tb3-bxb-autovnf1-uas-orchestration=172.17.180.3; tb3-bxb-autovnf1-uas-management=172.17.181.4

                                                                 |
| 7f4ec2dc-e8a8-4f6c-bfce-8f29735e9fca | tb3-bxb-vnfm1-ESC-1
              | ACTIVE | -          | Running     |
tb3-bxb-autovnf1-uas-orchestration=172.17.180.14; tb3-bxb-autovnf1-uas-management=172.17.181.5
```

```
                                                                                |
| 1c9fc0bd-dc16-426f-b387-c2b75b3a1c16 |
tb3-bxb-vnfm1-em_tb3-bx_0_190729a1-c703-4e15-b0b3-795e2e876f55 | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.4;
tb3-bxb-autovnf1-uas-management=172.17.181.9

                |
| 9a407a06-929a-49ce-8bae-4df35b5f8b40 |
tb3-bxb-vnfm1-em_tb3-bx_0_92c5224b-1f1f-4f3f-8ac8-137be69ce473 | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.5;
tb3-bxb-autovnf1-uas-management=172.17.181.10

                |
| e4528022-6e7b-43f9-94f6-a6ab6289478d |
tb3-bxb-vnfm1-em_tb3-bx_0_d9f7ecb2-a7dc-439b-b492-5ce0402264ea | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.2;
tb3-bxb-autovnf1-uas-management=172.17.181.7

                |
| 2ca11e5b-8eec-456d-9001-1f2600605ad4 |
vnfd1-deployment_c1_0_5b287829-6a9d-4c0a-97d0-a5e0f645b767     | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.16;
tb3-bxb-vnfm1-di-internal1=192.168.1.4; tb3-bxb-autovnf1-uas-management=172.17.181.15;
tb3-bxb-vnfm1-di-internal2=192.168.2.5
                 |
| 0bdbd9e3-926a-4abe-81b3-95dc42ea0676 |
vnfd1-deployment_c2_0_7074a450-5268-4c94-965b-8fb809410d14     | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.15;
tb3-bxb-vnfm1-di-internal1=192.168.1.2; tb3-bxb-autovnf1-uas-management=172.17.181.18;
tb3-bxb-vnfm1-di-internal2=192.168.2.6
                  |
| 8b07a9b1-139f-4a12-b16e-d35cb17f6668 |
vnfd1-deployment_s10_0_f6d110f9-9e49-43fe-be14-4ab87ca3334c    | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.7;
tb3-bxb-vnfm1-di-internal1=192.168.1.8; tb3-bxb-vnfm1-service-network1=10.10.10.3,
10.10.10.10; tb3-bxb-vnfm1-service-network2=20.20.20.5, 20.20.20.4;
tb3-bxb-vnfm1-di-internal2=192.168.2.12      |
| 4ff0ce2e-1d97-4056-a7aa-018412c0385d |
vnfd1-deployment_s3_0_5380ef6c-6fe3-4e92-aa44-d94ef6e94235     | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.19;
tb3-bxb-vnfm1-di-internal1=192.168.1.5; tb3-bxb-vnfm1-service-network1=10.10.10.7, 10.10.10.2;
 tb3-bxb-vnfm1-service-network2=20.20.20.9, 20.20.20.6; tb3-bxb-vnfm1-di-internal2=192.168.2.8
       |
| 3954cd6e-0f12-4d4b-8558-2e035c126d9a |
vnfd1-deployment_s4_0_e5ae4aa9-a90e-4bfe-aaff-82ffd8f7fe34     | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.8;
tb3-bxb-vnfm1-di-internal1=192.168.1.9; tb3-bxb-vnfm1-service-network1=10.10.10.13,
10.10.10.8; tb3-bxb-vnfm1-service-network2=20.20.20.12, 20.20.20.10;
tb3-bxb-vnfm1-di-internal2=192.168.2.3     |
| 2cc6728c-2982-42bf-bb8b-198a14fdcb31 |
vnfd1-deployment_s5_0_1d57c15d-a1de-40d4-aac2-1715f01ac50a     | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.17;
tb3-bxb-vnfm1-di-internal1=192.168.1.7; tb3-bxb-vnfm1-service-network1=10.10.10.5,
10.10.10.18; tb3-bxb-vnfm1-service-network2=20.20.20.11, 20.20.20.2;
tb3-bxb-vnfm1-di-internal2=192.168.2.4     |
| 876cc650-ae8b-497b-805a-24a305be6c13 |
vnfd1-deployment_s6_0_05e13a62-623c-4749-ae2a-15c70dd12e16     | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.11;
tb3-bxb-vnfm1-di-internal1=192.168.1.6; tb3-bxb-vnfm1-service-network1=10.10.10.12,
10.10.10.9; tb3-bxb-vnfm1-service-network2=20.20.20.13, 20.20.20.18;
tb3-bxb-vnfm1-di-internal2=192.168.2.16   |
| 89f7245e-c2f7-4041-b5e6-1eee48641cfd |
vnfd1-deployment_s7_0_3a4d7273-e808-4b5f-8877-7aa182483d93     | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.24;
```

```
tb3-bxb-vnfm1-di-internal1=192.168.1.12; tb3-bxb-vnfm1-service-network1=10.10.10.14,
10.10.10.6; tb3-bxb-vnfm1-service-network2=20.20.20.20, 20.20.20.8;
tb3-bxb-vnfm1-di-internal2=192.168.2.7    |
| 535b0bca-d3c5-4d99-ba41-9953da6339f4 |
vnfd1-deployment_s8_0_1e0f3ebf-b6e0-4bfe-9b1c-985dc32e1519     | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.18;
tb3-bxb-vnfm1-di-internal1=192.168.1.14; tb3-bxb-vnfm1-service-network1=10.10.10.17,
10.10.10.11; tb3-bxb-vnfm1-service-network2=20.20.20.17, 20.20.20.15;
tb3-bxb-vnfm1-di-internal2=192.168.2.9  |
| dfdffafb-a624-4063-bae6-63c4a757473f |
vnfd1-deployment_s9_0_26db8332-8dac-43fc-84c5-71a8b975fd17     | ACTIVE | -          |
Running     | tb3-bxb-autovnf1-uas-orchestration=172.17.180.22;
tb3-bxb-vnfm1-di-internal1=192.168.1.10; tb3-bxb-vnfm1-service-network1=10.10.10.21,
10.10.10.24; tb3-bxb-vnfm1-service-network2=20.20.20.23, 20.20.20.22;
tb3-bxb-vnfm1-di-internal2=192.168.2.19 |
+--------+---------------+---+---+---+-------------------------------------------------------------------------------+
```

Checking Cinder Type

Log on to the server on which OSP-D is running to check the Cinder vilome type by executing the following commands:

```
cd /home/stack
source ~/<stack_name>rc-core
cinder type-list
```

Example command output:

```
+--------------------------------------+------+-------------+-----------+
| ID                                   | Name | Description | Is_Public |
+--------------------------------------+------+-------------+-----------+
| 208ef179-dfe4-4735-8a96-e7beee472944 | LUKS | -           | True      |
+--------------------------------------+------+-------------+-----------+
```

```
cinder type-show LUKS
```

Example command output:

```
+---------------------------------+--------------------------------------+
| Property                        | Value                                |
+---------------------------------+--------------------------------------+
| description                     | None                                 |
| extra_specs                     | {}                                   |
| id                              | bf855b0f-8b3f-42bf-9497-05013b4ddad9 |
| is_public                       | True                                 |
| name                            | LUKS                                 |
| os-volume-type-access:is_public | True                                 |
| qos_specs_id                    | None                                 |
+---------------------------------+--------------------------------------+
```

Checking Core Project (Tenant) and User Core

Log on to the server on which OSP-D is running to check the core projects and users by executing the following commands:

```
cd /home/stack
source~/<stack_name> rc-core
openstack project list
```

Example command output:

```
+----------------------------------+---------+
| ID                               | Name    |
+----------------------------------+---------+
| 271ab207a197465f9d166c2dc7304b18 | core    |
| 52547e0fca994cd682aa733b941d0f68 | service |
| 9543ad9db4dd422ea5aedf04756d3682 | admin   |
+----------------------------------+---------+
```

openstack project show core

Example command output:

```
+-------------+----------------------------------+
| Field       | Value                            |
+-------------+----------------------------------+
| description | core tenant                      |
| enabled     | True                             |
| id          | 271ab207a197465f9d166c2dc7304b18 |
| name        | core                             |
| properties  |                                  |
+-------------+----------------------------------+
```

openstack project show service

Example command output:

```
+-------------+----------------------------------+
| Field       | Value                            |
+-------------+----------------------------------+
| description | Tenant for the openstack services |
| enabled     | True                             |
| id          | 52547e0fca994cd682aa733b941d0f68  |
| name        | service                          |
| properties  |                                  |
+-------------+----------------------------------+
```

openstack project show admin

Example command output:

```
+-------------+----------------------------------+
| Field       | Value                            |
+-------------+----------------------------------+
| description | admin tenant                     |
| enabled     | True                             |
| id          | 9543ad9db4dd422ea5aedf04756d3682 |
| name        | admin                            |
| properties  |                                  |
+-------------+----------------------------------+
```

openstack user list

Example command output:

```
+----------------------------------+------------+
| ID                               | Name       |
+----------------------------------+------------+
| 1ac7208b033a41ccba805d86bf60dbb7 | admin      |
| a6adac4ee79c4206a29de5165d7c7a6a | neutron    |
| 79da40fe88c64de7a93bc691a42926ea | heat       |
| 525048a99816474d91d692d9516e951c | nova       |
| 8d6688db8d19411080eeb4c84c1d586b | glance     |
| 9aadd12171474d1e8bcbacf890e070ab | cinder     |
| d2ee641a72c4493995de70a1a9671f2b | heat-cfn   |
| 7fbb088c15e1428ab6ce677aad5415f4 | swift      |
| 828cbf69cf564747a81bb313208a1c21 | core       |
```

```
| 40563efc469d4c1295de0d6d4cf545c2 | tom        |
+----------------------------------+------------+
```

openstack user show core

Example command output:

```
+------------+----------------------------------+
| Field      | Value                            |
+------------+----------------------------------+
| email      | None                             |
| enabled    | True                             |
| id         | 828cbf69cf564747a81bb313208a1c21 |
| name       | core                             |
| project_id | 271ab207a197465f9d166c2dc7304b18 |
| username   | core                             |
+------------+----------------------------------+
```

openstack role list

Example command output:

```
+----------------------------------+-----------------+
| ID                               | Name            |
+----------------------------------+-----------------+
| 315d3058519a4b1a9385e11aa5ffe25b | admin           |
| 585de968688e4257bc76f6dec13752cb | ResellerAdmin   |
| 9717fe8079ba49e9ba9eadd5a37689e7 | swiftoperator   |
| 9fe2ff9ee4384b1894a90878d3e92bab | _member_        |
| d75dcf507bfa4a6abee3aee3bb0323c6 | heat_stack_user |
+----------------------------------+-----------------+
```

openstack role show admin

Example command output:

```
+-----------+----------------------------------+
| Field     | Value                            |
+-----------+----------------------------------+
| domain_id | None                             |
| id        | 315d3058519a4b1a9385e11aa5ffe25b |
| name      | admin                            |
+-----------+----------------------------------+
```

Checking Nova/Neutron Security Groups

Log on to the server on which OSP-D is running to check Nova and Neutron security groups by executing the following commands:

nova secgroup-list

Example command output:

```
WARNING: Command secgroup-list is deprecated and will be removed after Nova 15.0.0 is
released. Use python-neutronclient or python-openstackclient instead.
+--------------------------------------+---------+------------------------+
| Id                                   | Name    | Description            |
+--------------------------------------+---------+------------------------+
| ce308d67-7645-43c1-a83e-89d3871141a2 | default | Default security group |
+--------------------------------------+---------+------------------------+
```

neutron security-group-list

Example command output:

```
+--------------------------------------+---------+-----------------------------------------------------------------+
| id                                   | name    | security_group_rules
                                |
+--------------------------------------+---------+-----------------------------------------------------------------+
| 4007a7a4-e7fa-4ad6-bc74-fc0b20f0b60c | default | egress, IPv4
                                |
|                                      |         | egress, IPv6
                                |
|                                      |         | ingress, IPv4, remote_group_id:
4007a7a4-e7fa-4ad6-bc74-fc0b20f0b60c |
|                                      |         | ingress, IPv6, remote_group_id:
4007a7a4-e7fa-4ad6-bc74-fc0b20f0b60c |
| 8bee29ae-88c0-4d5d-b27a-a123f20b6858 | default | egress, IPv4
                                |
|                                      |         | egress, IPv6
                                |
|                                      |         | ingress, IPv4, 1-65535/tcp,
remote_ip_prefix: 0.0.0.0/0              |
|                                      |         | ingress, IPv4, 1-65535/udp,
remote_ip_prefix: 0.0.0.0/0              |
|                                      |         | ingress, IPv4, icmp, remote_ip_prefix:
0.0.0.0/0                        |
|                                      |         | ingress, IPv4, remote_group_id:
8bee29ae-88c0-4d5d-b27a-a123f20b6858 |
|                                      |         | ingress, IPv6, remote_group_id:
8bee29ae-88c0-4d5d-b27a-a123f20b6858 |
| b6b27428-35a3-4be4-af9b-38559132d28e | default | egress, IPv4
                                |
|                                      |         | egress, IPv6
                                |
|                                      |         | ingress, IPv4, remote_group_id:
b6b27428-35a3-4be4-af9b-38559132d28e |
|                                      |         | ingress, IPv6, remote_group_id:
b6b27428-35a3-4be4-af9b-38559132d28e |
| ce308d67-7645-43c1-a83e-89d3871141a2 | default | egress, IPv4
                                |
|                                      |         | egress, IPv6
                                |
|                                      |         | ingress, IPv4, 1-65535/tcp,
remote_ip_prefix: 0.0.0.0/0              |
|                                      |         | ingress, IPv4, 1-65535/udp,
remote_ip_prefix: 0.0.0.0/0              |
|                                      |         | ingress, IPv4, icmp, remote_ip_prefix:
0.0.0.0/0                        |
|                                      |         | ingress, IPv4, remote_group_id:
ce308d67-7645-43c1-a83e-89d3871141a2 |
|                                      |         | ingress, IPv6, remote_group_id:
ce308d67-7645-43c1-a83e-89d3871141a2 |
+--------------------------------------+---------+-----------------------------------------------------------------+
```

neutron security-group-show ce308d67-7645-43c1-a83e-89d3871141a2

Example command output:

```
+----------------------+-------------------------------------------------------------------------+
| Field                | Value
  |
+----------------------+-------------------------------------------------------------------------+
| created_at           | 2017-06-03T04:57:01Z
  |
| description          | Default security group
  |
| id                   | ce308d67-7645-43c1-a83e-89d3871141a2
  |
```

```
| name                  | default
|
| project_id            | 271ab207a197465f9d166c2dc7304b18
|
| revision_number       | 4
|
| security_group_rules | {
|
|                       |      "remote_group_id": null,
|
|                       |      "direction": "egress",
|
|                       |      "protocol": null,
|
|                       |      "description": null,
|
|                       |      "ethertype": "IPv4",
|
|                       |      "remote_ip_prefix": null,
|
|                       |      "port_range_max": null,
|
|                       |      "updated_at": "2017-06-03T04:57:01Z",
|
|                       |      "security_group_id": "ce308d67-7645-43c1-a83e-89d3871141a2",
|
|                       |      "port_range_min": null,
|
|                       |      "revision_number": 1,
|
|                       |      "tenant_id": "271ab207a197465f9d166c2dc7304b18",
|
|                       |      "created_at": "2017-06-03T04:57:01Z",
|
|                       |      "project_id": "271ab207a197465f9d166c2dc7304b18",
|
|                       |      "id": "337838dd-0612-47f8-99e8-7d4f58dc09d6"
|
|                       | }
|
|                       | {
|
|                       |      "remote_group_id": null,
|
|                       |      "direction": "ingress",
|
|                       |      "protocol": "udp",
|
|                       |      "description": "",
|
|                       |      "ethertype": "IPv4",
|
|                       |      "remote_ip_prefix": "0.0.0.0/0",
|
|                       |      "port_range_max": 65535,
|
|                       |      "updated_at": "2017-06-03T04:57:20Z",
|
|                       |      "security_group_id": "ce308d67-7645-43c1-a83e-89d3871141a2",
|
|                       |      "port_range_min": 1,
|
|                       |      "revision_number": 1,
|
```

```
|                       |      "tenant_id": "271ab207a197465f9d166c2dc7304b18",
|
|                       |      "created_at": "2017-06-03T04:57:20Z",
|
|                       |      "project_id": "271ab207a197465f9d166c2dc7304b18",
|
|                       |      "id": "48b04902-d617-4e25-ad0d-4d087128f3b9"
|
|                       | }
|
|                       | {
|
|                       |      "remote_group_id": null,
|
|                       |      "direction": "ingress",
|
|                       |      "protocol": "icmp",
|
|                       |      "description": "",
|
|                       |      "ethertype": "IPv4",
|
|                       |      "remote_ip_prefix": "0.0.0.0/0",
|
|                       |      "port_range_max": null,
|
|                       |      "updated_at": "2017-06-03T04:57:33Z",
|
|                       |      "security_group_id": "ce308d67-7645-43c1-a83e-89d3871141a2",
|
|                       |      "port_range_min": null,
|
|                       |      "revision_number": 1,
|
|                       |      "tenant_id": "271ab207a197465f9d166c2dc7304b18",
|
|                       |      "created_at": "2017-06-03T04:57:33Z",
|
|                       |      "project_id": "271ab207a197465f9d166c2dc7304b18",
|
|                       |      "id": "68913f31-6788-4473-8b3b-90a264e9ef62"
|
|                       | }
|
|                       | {
|
|                       |      "remote_group_id": null,
|
|                       |      "direction": "ingress",
|
|                       |      "protocol": "tcp",
|
|                       |      "description": "",
|
|                       |      "ethertype": "IPv4",
|
|                       |      "remote_ip_prefix": "0.0.0.0/0",
|
|                       |      "port_range_max": 65535,
|
|                       |      "updated_at": "2017-06-03T04:57:02Z",
|
|                       |      "security_group_id": "ce308d67-7645-43c1-a83e-89d3871141a2",
|
```

```
|                       |      "port_range_min": 1,
|
|                       |      "revision_number": 1,
|
|                       |      "tenant_id": "271ab207a197465f9d166c2dc7304b18",
|
|                       |      "created_at": "2017-06-03T04:57:02Z",
|
|                       |      "project_id": "271ab207a197465f9d166c2dc7304b18",
|
|                       |      "id": "85ece95b-d361-4986-8db0-78d1a404dd3c"
|
|                       | }
|
|                       | {
|
|                       |      "remote_group_id": null,
|
|                       |      "direction": "egress",
|
|                       |      "protocol": null,
|
|                       |      "description": null,
|
|                       |      "ethertype": "IPv6",
|
|                       |      "remote_ip_prefix": null,
|
|                       |      "port_range_max": null,
|
|                       |      "updated_at": "2017-06-03T04:57:01Z",
|
|                       |      "security_group_id": "ce308d67-7645-43c1-a83e-89d3871141a2",
|
|                       |      "port_range_min": null,
|
|                       |      "revision_number": 1,
|
|                       |      "tenant_id": "271ab207a197465f9d166c2dc7304b18",
|
|                       |      "created_at": "2017-06-03T04:57:01Z",
|
|                       |      "project_id": "271ab207a197465f9d166c2dc7304b18",
|
|                       |      "id": "88320991-5232-44f6-b74b-8cfe934165d0"
|
|                       | }
|
|                       | {
|
|                       |      "remote_group_id": "ce308d67-7645-43c1-a83e-89d3871141a2",
|
|                       |      "direction": "ingress",
|
|                       |      "protocol": null,
|
|                       |      "description": null,
|
|                       |      "ethertype": "IPv4",
|
|                       |      "remote_ip_prefix": null,
|
|                       |      "port_range_max": null,
|
```

```
|                       |      "updated_at": "2017-06-03T04:57:01Z",
  |
|                       |      "security_group_id": "ce308d67-7645-43c1-a83e-89d3871141a2",
  |
|                       |      "port_range_min": null,
  |
|                       |      "revision_number": 1,
  |
|                       |      "tenant_id": "271ab207a197465f9d166c2dc7304b18",
  |
|                       |      "created_at": "2017-06-03T04:57:01Z",
  |
|                       |      "project_id": "271ab207a197465f9d166c2dc7304b18",
  |
|                       |      "id": "ba306ee2-d21f-48be-9de2-7f04bea5e43a"
  |
|                       | }
  |
|                       | {
  |
|                       |      "remote_group_id": "ce308d67-7645-43c1-a83e-89d3871141a2",
  |
|                       |      "direction": "ingress",
  |
|                       |      "protocol": null,
  |
|                       |      "description": null,
  |
|                       |      "ethertype": "IPv6",
  |
|                       |      "remote_ip_prefix": null,
  |
|                       |      "port_range_max": null,
  |
|                       |      "updated_at": "2017-06-03T04:57:01Z",
  |
|                       |      "security_group_id": "ce308d67-7645-43c1-a83e-89d3871141a2",
  |
|                       |      "port_range_min": null,
  |
|                       |      "revision_number": 1,
  |
|                       |      "tenant_id": "271ab207a197465f9d166c2dc7304b18",
  |
|                       |      "created_at": "2017-06-03T04:57:01Z",
  |
|                       |      "project_id": "271ab207a197465f9d166c2dc7304b18",
  |
|                       |      "id": "deb7752c-e642-462e-92f0-5dff983f0739"
  |
|                       | }
  |
| tenant_id             | 271ab207a197465f9d166c2dc7304b18
  |
| updated_at            | 2017-06-03T04:57:33Z
  |
+-----------------------+------------------------------------------------------------------------+
```

Checking Tenant Project Default Quotas

Log on to the server on which OSP-D is running to check default project quotas by executing the following commands:

nova quota-show

Example command output:

```
+-----------------------------+----------+
| Quota                       | Limit    |
+-----------------------------+----------+
| instances                   | 1000     |
| cores                       | 1000     |
| ram                         | 51200000 |
| metadata_items              | 128      |
| injected_files              | 100      |
| injected_file_content_bytes | 1024000  |
| injected_file_path_bytes    | 255      |
| key_pairs                   | 100      |
| server_groups               | 10       |
| server_group_members        | 10       |
+-----------------------------+----------+
```

openstack project list | grep core

Example command output:

```
| 271ab207a197465f9d166c2dc7304b18 | core |
```

nova quota-class-show 271ab207a197465f9d166c2dc7304b18

Example command output:

```
+-----------------------------+-------+
| Quota                       | Limit |
+-----------------------------+-------+
| instances                   | 10    |
| cores                       | 20    |
| ram                         | 51200 |
| floating_ips                | 10    |
| fixed_ips                   | -1    |
| metadata_items              | 128   |
| injected_files              | 5     |
| injected_file_content_bytes | 10240 |
| injected_file_path_bytes    | 255   |
| key_pairs                   | 100   |
| security_groups             | 10    |
| security_group_rules        | 20    |
+-----------------------------+-------+
```

neutron quota-show

Example command output:

```
+---------------------+-------+
| Field               | Value |
+---------------------+-------+
| floatingip          | 100   |
| network             | 1000  |
| port                | 4092  |
| rbac_policy         | 10    |
| router              | 100   |
| security_group      | 100   |
| security_group_rule | 300   |
| subnet              | 1000  |
| subnetpool          | -1    |
| trunk               | -1    |
+---------------------+-------+
```

openstack project list | grep core

Example command output:

```
| 271ab207a197465f9d166c2dc7304b18 | core |
```

cinder quota-show 271ab207a197465f9d166c2dc7304b18

Example command output:

```
+----------------------+-------+
| Property             | Value |
+----------------------+-------+
| backup_gigabytes     | 1000  |
| backups              | 10    |
| gigabytes            | 8092  |
| gigabytes_LUKS       | -1    |
| per_volume_gigabytes | -1    |
| snapshots            | 300   |
| snapshots_LUKS       | -1    |
| volumes              | 500   |
| volumes_LUKS         | -1    |
+----------------------+-------+
```

Checking the Nova Hypervisor List

Log on to the server on which OSP-D is running to check the status of nova api on all compute nodes by executing the following command:

nova hypervisor-list

Example command output:

```
+----+--------------------------------------+-------+---------+
| ID | Hypervisor hostname                  | State | Status  |
+----+--------------------------------------+-------+---------+
| 3  | tb3-ultram-compute-7.localdomain     | up    | enabled |
| 6  | tb3-ultram-compute-6.localdomain     | up    | enabled |
| 9  | tb3-ultram-osd-compute-0.localdomain | up    | enabled |
| 12 | tb3-ultram-compute-9.localdomain     | up    | enabled |
| 15 | tb3-ultram-compute-0.localdomain     | up    | enabled |
| 18 | tb3-ultram-compute-14.localdomain    | up    | enabled |
| 21 | tb3-ultram-compute-2.localdomain     | up    | enabled |
| 24 | tb3-ultram-compute-8.localdomain     | up    | enabled |
| 27 | tb3-ultram-compute-13.localdomain    | up    | enabled |
| 30 | tb3-ultram-compute-15.localdomain    | up    | enabled |
| 33 | tb3-ultram-compute-12.localdomain    | up    | enabled |
| 36 | tb3-ultram-compute-5.localdomain     | up    | enabled |
| 39 | tb3-ultram-osd-compute-1.localdomain | up    | enabled |
| 42 | tb3-ultram-compute-10.localdomain    | up    | enabled |
| 45 | tb3-ultram-compute-11.localdomain    | up    | enabled |
| 48 | tb3-ultram-compute-3.localdomain     | up    | enabled |
| 51 | tb3-ultram-osd-compute-2.localdomain | up    | enabled |
| 54 | tb3-ultram-compute-4.localdomain     | up    | enabled |
| 57 | tb3-ultram-compute-1.localdomain     | up    | enabled |
+----+--------------------------------------+-------+---------+
```

Checking the Router Main Configuration

Log on to the server on which OSP-D is running to check the Neutron router by entering the following commands:

neutron router-list

Example command output:

```
+--------------------------------------+------+-----------------------------------------------------------+-------------+------+
| id                                   | name | external_gateway_info
                 | distributed | ha   |
+--------------------------------------+------+-----------------------------------------------------------+-------------+------+
| 2d0cdee4-bb5e-415b-921c-97caf0aa0cd1 | main | {"network_id":
"1c46790f-cab5-4b1d-afc7-a637fe2dbe08",      | False       | True |
|                                      |      | "enable_snat": true, "external_fixed_ips":
 [{"subnet_id":  |             |      |
|                                      |      | "a23a740e-3ad0-4fb1-8526-3353dfd0010f",
"ip_address":      |             |      |
|                                      |      | "10.169.127.176"}]}
                 |             |      |
+--------------------------------------+------+-----------------------------------------------------------+-------------+------+
```

```
[stack@lbucs001-ospd ~]$ neutron router-show
2d0cdee4-bb5e-415b-921c-97caf0aa0cd1
```

Example command output:

```
+-------------------------+------------------------------------------------------------------------------------------+
| Field                   | Value
                                 |
+-------------------------+------------------------------------------------------------------------------------------+
| admin_state_up          | True
                                 |
| availability_zone_hints |
                                 |
| availability_zones      | nova
                                 |
| created_at              | 2017-06-03T05:05:08Z
                                 |
| description             |
                                 |
| distributed             | False
                                 |
| external_gateway_info   | {"network_id": "1c46790f-cab5-4b1d-afc7-a637fe2dbe08",
"enable_snat": true, "external_fixed_ips": [{"subnet_id":         |
|                         | "a23a740e-3ad0-4fb1-8526-3353dfd0010f", "ip_address":
"10.169.127.176"}]}                                                |
| flavor_id               |
                                 |
| ha                      | True
                                 |
| id                      | 2d0cdee4-bb5e-415b-921c-97caf0aa0cd1
                                 |
| name                    | main
                                 |
| project_id              | 271ab207a197465f9d166c2dc7304b18
                                 |
| revision_number         | 94
                                 |
| routes                  |
                                 |
| status                  | ACTIVE
                                 |
| tenant_id               | 271ab207a197465f9d166c2dc7304b18
                                 |
| updated_at              | 2017-07-28T00:44:27Z
                                 |
+-------------------------+------------------------------------------------------------------------------------------+
```

Checking the External Network Using the core-project-id

Log on to the server on which OSP-D is running to check the external network configuration by entering the following commands:

neutron net-list

Example command output:

```
+--------------------------------------+-----------------------------------------+-----------------------------------------+
| id                                   | name
  | subnets                                               |
+--------------------------------------+-----------------------------------------+-----------------------------------------+
| 1236bd98-5389-42f9-bac8-433997525549 | LBUCS001-AUTOIT-MGMT
  | c63451f2-7e44-432e-94fc-167f6a31e4aa 172.16.182.0/24   |
| 1c46790f-cab5-4b1d-afc7-a637fe2dbe08 | LBUCS001-EXTERNAL-MGMT
  | a23a740e-3ad0-4fb1-8526-3353dfd0010f 10.169.127.160/27 |
| 1c70a9ab-212e-4884-b7d5-4749c44a87b6 | LBPGW101-DI-INTERNAL1
  |                                                       |
| e619b02e-84e0-48d9-9096-f16adc84f1cc | HA network tenant 271ab207a197465f9d166c2dc7304b18
 | cefd5f5f-0c97-4027-b385-ca1a57f2cfac 169.254.192.0/18  |
+--------------------------------------+-----------------------------------------+-----------------------------------------+
```

neutron net-show 1c46790f-cab5-4b1d-afc7-a637fe2dbe08

Example command output:

```
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | True                                 |
| availability_zone_hints   |                                      |
| availability_zones        |                                      |
| created_at                | 2017-06-05T07:18:59Z                 |
| description               |                                      |
| id                        | 1c46790f-cab5-4b1d-afc7-a637fe2dbe08 |
| ipv4_address_scope        |                                      |
| ipv6_address_scope        |                                      |
| is_default                | False                                |
| mtu                       | 1500                                 |
| name                      | LBUCS001-EXTERNAL-MGMT               |
| port_security_enabled     | True                                 |
| project_id                | 271ab207a197465f9d166c2dc7304b18     |
| provider:network_type     | vlan                                 |
| provider:physical_network | datacentre                           |
| provider:segmentation_id  | 101                                  |
| qos_policy_id             |                                      |
| revision_number           | 6                                    |
| router:external           | True                                 |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   | a23a740e-3ad0-4fb1-8526-3353dfd0010f |
| tags                      |                                      |
| tenant_id                 | 271ab207a197465f9d166c2dc7304b18     |
| updated_at                | 2017-06-05T07:22:51Z                 |
+---------------------------+--------------------------------------+
```

Note down the **provider:segmentation_id**. In this example, 101 is the vlan for the external interface.

neutron subnet-list

Example command output:

```
+------------------------------------------+------------------------------------------+----------------+------------------------------------+
| id                                   | name                                 | cidr
           | allocation_pools                       |
+------------------------------------------+------------------------------------------+----------------+------------------------------------+
| a23a740e-3ad0-4fb1-8526-3353dfd0010f | LBUCS001-EXTERNAL-MGMT               |
10.169.127.160/27 | {"start": "10.169.127.168", "end":       |
|                                      |                                      |
           | "10.169.127.190"}                      |
| c63451f2-7e44-432e-94fc-167f6a31e4aa | LBUCS001-AUTOIT-MGMT                 |
172.16.182.0/24   | {"start": "172.16.182.2", "end":         |
|                                      |                                      |
           | "172.16.182.254"}                      |
| cefd5f5f-0c97-4027-b385-ca1a57f2cfac | HA subnet tenant                     |
169.254.192.0/18  | {"start": "169.254.192.1", "end":        |
|                                      | 271ab207a197465f9d166c2dc7304b18     |
           | "169.254.255.254"}                     |
+------------------------------------------+------------------------------------------+----------------+------------------------------------+
```

neutron subnet-show a23a740e-3ad0-4fb1-8526-3353dfd0010f

Example command output:

```
+-------------------+------------------------------------------------------+
| Field             | Value                                                |
+-------------------+------------------------------------------------------+
| allocation_pools  | {"start": "10.169.127.168", "end": "10.169.127.190"} |
| cidr              | 10.169.127.160/27                                    |
| created_at        | 2017-06-05T07:22:51Z                                 |
| description       |                                                      |
| dns_nameservers   |                                                      |
| enable_dhcp       | False                                                |
| gateway_ip        | 10.169.127.163                                       |
| host_routes       |                                                      |
| id                | a23a740e-3ad0-4fb1-8526-3353dfd0010f                 |
| ip_version        | 4                                                    |
| ipv6_address_mode |                                                      |
| ipv6_ra_mode      |                                                      |
| name              | LBUCS001-EXTERNAL-MGMT                               |
| network_id        | 1c46790f-cab5-4b1d-afc7-a637fe2dbe08                 |
| project_id        | 271ab207a197465f9d166c2dc7304b18                     |
| revision_number   | 2                                                    |
| service_types     |                                                      |
| subnetpool_id     |                                                      |
| tenant_id         | 271ab207a197465f9d166c2dc7304b18                     |
| updated_at        | 2017-06-05T07:22:51Z                                 |
+-------------------+------------------------------------------------------+
```

Checking the Staging Network Configuration

Log on to the server on which OSP-D is running to check the staging network configuration by entering the following commands:

neutron subnet-show *<ext-mgmt-id>*

<ext-mgmt-id> is the ID for the external management interface as obtained through the **neutron subnet-list** command output.

Example output:

```
+-------------------+------------------------------------------------------+
| Field             | Value                                                |
+-------------------+------------------------------------------------------+
| allocation_pools  | {"start": "10.169.127.168", "end": "10.169.127.190"} |
```

```
| cidr              | 10.169.127.160/27                                  |
| created_at        | 2017-06-05T07:22:51Z                               |
| description       |                                                    |
| dns_nameservers   |                                                    |
| enable_dhcp       | False                                              |
| gateway_ip        | 10.169.127.163                                     |
| host_routes       |                                                    |
| id                | a23a740e-3ad0-4fb1-8526-3353dfd0010f               |
| ip_version        | 4                                                  |
| ipv6_address_mode |                                                    |
| ipv6_ra_mode      |                                                    |
| name              | LBUCS001-EXTERNAL-MGMT                             |
| network_id        | 1c46790f-cab5-4b1d-afc7-a637fe2dbe08               |
| project_id        | 271ab207a197465f9d166c2dc7304b18                   |
| revision_number   | 2                                                  |
| service_types     |                                                    |
| subnetpool_id     |                                                    |
| tenant_id         | 271ab207a197465f9d166c2dc7304b18                   |
| updated_at        | 2017-06-05T07:22:51Z                               |
+-------------------+----------------------------------------------------+
```

neutron subnet-show *<autoit-mgmt-id>*

<autoit-mgmt-id> is the ID for the AutoIT management interface as obtained through the **neutron subnet-list** command output.

Example output:

```
+-------------------+-----------------------------------------------------+
| Field             | Value                                               |
+-------------------+-----------------------------------------------------+
| allocation_pools  | {"start": "172.16.182.2", "end": "172.16.182.254"} |
| cidr              | 172.16.182.0/24                                     |
| created_at        | 2017-06-05T07:41:45Z                                |
| description       |                                                     |
| dns_nameservers   |                                                     |
| enable_dhcp       | True                                                |
| gateway_ip        | 172.16.182.1                                        |
| host_routes       |                                                     |
| id                | c63451f2-7e44-432e-94fc-167f6a31e4aa                |
| ip_version        | 4                                                   |
| ipv6_address_mode |                                                     |
| ipv6_ra_mode      |                                                     |
| name              | LBUCS001-AUTOIT-MGMT                                |
| network_id        | 1236bd98-5389-42f9-bac8-433997525549                |
| project_id        | 271ab207a197465f9d166c2dc7304b18                    |
| revision_number   | 2                                                   |
| service_types     |                                                     |
| subnetpool_id     |                                                     |
| tenant_id         | 271ab207a197465f9d166c2dc7304b18                    |
| updated_at        | 2017-06-05T07:41:45Z                                |
+-------------------+-----------------------------------------------------+
```

Checking the DI-Internal and Service Network Configurations

Log on to the server on which OSP-D is running to check the DI-internal and service network configuration by entering the following commands:

neutron net-list

Example command output:

```
+--------------------------------------+--------------------------------------+----------------------------------------------------+
| id                                   | name
```

```
  | subnets                                                        |
+--------------------------+-----------------------------------+--------------------------------------+
| 1236bd98-5389-42f9-bac8-433997525549 | LBUCS001-AUTOIT-MGMT
  | c63451f2-7e44-432e-94fc-167f6a31e4aa 172.16.182.0/24   |
| 1c46790f-cab5-4b1d-afc7-a637fe2dbe08 | LBUCS001-EXTERNAL-MGMT
  | a23a740e-3ad0-4fb1-8526-3353dfd0010f 10.169.127.160/27 |
| 1c70a9ab-212e-4884-b7d5-4749c44a87b6 | LBPGW101-DI-INTERNAL1
  |                                                        |
| e619b02e-84e0-48d9-9096-f16adc84f1cc | HA network tenant 271ab207a197465f9d166c2dc7304b18
 | cefd5f5f-0c97-4027-b385-ca1a57f2cfac 169.254.192.0/18  |
+--------------------------+-----------------------------------+--------------------------------------+
```

neutron net-show LBPGW101-DI-INTERNAL1

Example command output:

```
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | True                                 |
| availability_zone_hints   |                                      |
| availability_zones        |                                      |
| created_at                | 2017-07-28T22:25:53Z                 |
| description               |                                      |
| id                        | 1c70a9ab-212e-4884-b7d5-4749c44a87b6 |
| ipv4_address_scope        |                                      |
| ipv6_address_scope        |                                      |
| mtu                       | 1500                                 |
| name                      | LBPGW101-DI-INTERNAL1                |
| port_security_enabled     | True                                 |
| project_id                | 271ab207a197465f9d166c2dc7304b18     |
| provider:network_type     | flat                                 |
| provider:physical_network | phys_pcie1_0                         |
| provider:segmentation_id  |                                      |
| qos_policy_id             |                                      |
| revision_number           | 3                                    |
| router:external           | False                                |
| shared                    | True                                 |
| status                    | ACTIVE                               |
| subnets                   |                                      |
| tags                      |                                      |
| tenant_id                 | 271ab207a197465f9d166c2dc7304b18     |
| updated_at                | 2017-07-28T22:25:53Z                 |
+---------------------------+--------------------------------------+
```

neutron subnet-list

Example command output:

```
+--------------------------+--------------------------+------------+--------------------------+
| id                                   | name                                    | cidr
           | allocation_pools                 |
+--------------------------+--------------------------+------------+--------------------------+
| 96ae7e6e-f2e9-4fa5-a816-769c5a79f8f4 | LBPGW101-DI-INTERNAL1-SUBNET            |
192.168.1.0/24    | {"start": "192.168.1.2", "end":          |
|                                      |                                         |
           | "192.168.1.254"}                 |
| a23a740e-3ad0-4fb1-8526-3353dfd0010f | LBUCS001-EXTERNAL-MGMT                  |
10.169.127.160/27 | {"start": "10.169.127.168", "end":       |
|                                      |                                         |
           | "10.169.127.190"}                |
| c63451f2-7e44-432e-94fc-167f6a31e4aa | LBUCS001-AUTOIT-MGMT                    |
172.16.182.0/24   | {"start": "172.16.182.2", "end":         |
|                                      |                                         |
           | "172.16.182.254"}                |
```

```
| cefd5f5f-0c97-4027-b385-ca1a57f2cfac | HA subnet tenant                      |
169.254.192.0/18  | {"start": "169.254.192.1", "end":        |
|                                       | 271ab207a197465f9d166c2dc7304b18          |
            | "169.254.255.254"}                          |
+--------------------------------------+--------------------------+-------------+----------------------------+
```

Checking the Flavor List

Log on to the server on which OSP-D is running to check the flavor list and to by entering the following command:

nova flavor-list

Example command output:

```
+--------------------------------------+--------------------+--------+------+----------+------+------+---------+------+
| ID                                   | Name                  | Memory_MB | Disk | Ephemeral
 | Swap | VCPUs | RXTX_Factor | Is_Public |
+--------------------------------------+--------------------+--------+------+----------+------+------+---------+------+
| eff0335b-3374-46c3-a3de-9f4b1ccaae04 | DNUCS002-AUTOIT-FLAVOR | 8192      | 80   | 0
     |      | 2     | 1.0         | True      |
+--------------------------------------+--------------------+--------+------+----------+------+------+---------+------+
```

Checking Host Aggregate and Availability Zone Configuration

Log on to the server on which OSP-D is running to check the host aggregate and availability zone configurations for the OSD Compute and for the AutoDeploy and AutoIT VMs.

Note It is assumed that the AutoDeploy and AutoIT VMs reside on the same OSD Compute node.

This is done by executing the following commands:

cd /home/stack
source~/<*stack_name*>**rc-core**
nova aggregate-list

Example command output:

```
+-----+-------------------+-------------------+
| Id  | Name              | Availability Zone |
+-----+-------------------+-------------------+
| 108 | LBUCS001-AUTOIT   | mgmt              |
| 147 | LBPGW101-EM-MGMT1 | -                 |
| 150 | LBPGW101-SERVICE1 | -                 |
| 153 | LBPGW101-CF-MGMT1 | -                 |
+-----+-------------------+-------------------+
```

nova aggregate-show LBUCS001-AUTOIT

```
+-----+-----------------+-----------------+--------------------------------+------------------------------+
| Id  | Name            | Availability Zone | Hosts                                   | Metadata
                                 |
+-----+-----------------+-----------------+--------------------------------+------------------------------+
| 108 | LBUCS001-AUTOIT | mgmt              | 'newtonoc-osd-compute-0.localdomain' |
'availability_zone=mgmt', 'mgmt=true' |
+-----+-----------------+-----------------+--------------------------------+------------------------------+
```

Note This information can also be verified through the Horizon GUI. Login to Horizon as the user core and navigate to **Project** > **Compute** > **Instances**. Check each instance to verify that the status is Active and the power state is Running.

Correct any instance that does not meet these criteria before continuing.

Checking Controller Server Health

Note The commands in this section should be executed on any one of the Controller nodes and do not need to be repeated on the other Controller nodes unless an issue is observed.

Checking the Pacemaker Cluster Stack (PCS) Status

Log on to one of the Controller nodes and verify that the group of resources in the PCS cluster are active and in the expected state by executing the following command:

```
sudo pcs status
```

Example command output:

```
Cluster name: tripleo_cluster
Stack: corosync
Current DC: tb3-ultram-controller-0 (version 1.1.15-11.el7_3.4-e174ec8) - partition with
quorum
Last updated: Wed Jul 12 13:28:56 2017          Last change: Tue Jul 11 21:45:09 2017 by
root via crm_attribute on tb3-ultram-controller-0

3 nodes and 22 resources configured

Online: [ tb3-ultram-controller-0 tb3-ultram-controller-1 tb3-ultram-controller-2 ]

Full list of resources:

 ip-192.200.0.104       (ocf::heartbeat:IPaddr2):       Started tb3-ultram-controller-1
 ip-10.84.123.6 (ocf::heartbeat:IPaddr2):       Started tb3-ultram-controller-0
 ip-11.119.0.42 (ocf::heartbeat:IPaddr2):       Started tb3-ultram-controller-0
 Clone Set: haproxy-clone [haproxy]
     Started: [ tb3-ultram-controller-0 tb3-ultram-controller-1 tb3-ultram-controller-2 ]
 Master/Slave Set: galera-master [galera]
     Masters: [ tb3-ultram-controller-0 tb3-ultram-controller-1 tb3-ultram-controller-2 ]
 ip-11.120.0.47 (ocf::heartbeat:IPaddr2):       Started tb3-ultram-controller-1
 ip-11.118.0.49 (ocf::heartbeat:IPaddr2):       Started tb3-ultram-controller-0
 Clone Set: rabbitmq-clone [rabbitmq]
     Started: [ tb3-ultram-controller-0 tb3-ultram-controller-1 tb3-ultram-controller-2 ]
 ip-11.120.0.48 (ocf::heartbeat:IPaddr2):       Started tb3-ultram-controller-1
 Master/Slave Set: redis-master [redis]
     Masters: [ tb3-ultram-controller-0 ]
     Slaves: [ tb3-ultram-controller-1 tb3-ultram-controller-2 ]
 openstack-cinder-volume        (systemd:openstack-cinder-volume):      Started
tb3-ultram-controller-0
 my-ipmilan-for-controller-0    (stonith:fence_ipmilan):        Started
tb3-ultram-controller-0
 my-ipmilan-for-controller-1    (stonith:fence_ipmilan):        Started
tb3-ultram-controller-1
```

```
 my-ipmilan-for-controller-2    (stonith:fence_ipmilan):        Started
tb3-ultram-controller-0

Daemon Status:
  corosync: active/enabled
  pacemaker: active/enabled
  pcsd: active/enabled
```

From the output of this command, ensure that:

- All 3 controllers are listed as Online
- haproxy-clone is started on all 3 controllers
- galera-master lists all 3 controllers as Masters
- rabbitmq-clone is started on all 3 controllers
- redis-master lists one controller as master and the other 2 controllers as slaves
- openstack-cinder-volume is started on one node
- my-ipmilan/stonith is started on all 3 controllers
- Daemons corosync, pacemaker and pcsd are active and enabled

Note If the output displays any "Failed Actions", execute the **sudo pcs resource cleanup** command and then re-execute the **sudo pcs status** command.

Checking Ceph Storage Status

Log on to the Controller node and verify the health of the Ceph storage from the Controller node by executing the following command:

`sudo ceph status`

Example command output:

```
cluster eb2bb192-b1c9-11e6-9205-525400330666
     health HEALTH_OK
     monmap e1: 3 mons at
{tb3-ultram-controller-0=11.118.0.10:6789/0,tb3-ultram-controller-1=11.118.0.11:6789/0,
tb3-ultram-controller-2=11.118.0.12:6789/0}
            election epoch 152, quorum 0,1,2
tb3-ultram-controller-0,tb3-ultram-controller-1,tb3-ultram-controller-2
     osdmap e158: 12 osds: 12 up, 12 in
            flags sortbitwise,require_jewel_osds
      pgmap v1417251: 704 pgs, 6 pools, 321 GB data, 110 kobjects
            961 GB used, 12431 GB / 13393 GB avail
                 704 active+clean
  client io 53755 B/s wr, 0 op/s rd, 7 op/s wr
```

From the output of this command, ensure that:

- health is listed as HEALTH_OK
- The correct number of monitors are listed in the monmap
- The correct number of OSDs are listed in the osdmap

Checking Controller Node Services

Log on to the Controller node and check the status of all services by executing the following command:

```
sudo systemctl list-units "openstack*" "neutron*" "openvswitch*"
```

Example command output:

```
UNIT                                          LOAD   ACTIVE SUB     DESCRIPTION
neutron-dhcp-agent.service                    loaded active running OpenStack Neutron DHCP
Agent
neutron-l3-agent.service                      loaded active running OpenStack Neutron Layer
 3 Agent
neutron-metadata-agent.service              loaded active running OpenStack Neutron Metadata
 Agent
neutron-openvswitch-agent.service             loaded active running OpenStack Neutron Open
vSwitch Agent
neutron-ovs-cleanup.service                   loaded active exited  OpenStack Neutron Open
vSwitch Cleanup Utility
neutron-server.service                       loaded active running OpenStack Neutron Server
openstack-cinder-api.service                  loaded active running OpenStack Cinder API
Server
openstack-cinder-scheduler.service          loaded active running OpenStack Cinder Scheduler
 Server
openstack-cinder-volume.service               loaded active running Cluster Controlled
openstack-cinder-volume
openstack-glance-api.service                  loaded active running OpenStack Image Service
 (code-named Glance) API server
openstack-glance-registry.service             loaded active running OpenStack Image Service
 (code-named Glance) Registry server
openstack-heat-api-cfn.service                loaded active running Openstack Heat
CFN-compatible API Service
openstack-heat-api-cloudwatch.service       loaded active running OpenStack Heat CloudWatch
 API Service
openstack-heat-api.service                  loaded active running OpenStack Heat API Service
openstack-heat-engine.service                 loaded active running Openstack Heat Engine
Service
openstack-nova-api.service                   loaded active running OpenStack Nova API Server
openstack-nova-conductor.service              loaded active running OpenStack Nova Conductor
 Server
openstack-nova-consoleauth.service          loaded active running OpenStack Nova VNC console
 auth Server
openstack-nova-novncproxy.service             loaded active running OpenStack Nova NoVNC
Proxy Server
openstack-nova-scheduler.service             loaded active running OpenStack Nova Scheduler
 Server
openstack-swift-account-auditor.service      loaded active running OpenStack Object Storage
 (swift) - Account Auditor
openstack-swift-account-reaper.service       loaded active running OpenStack Object Storage
 (swift) - Account Reaper
openstack-swift-account-replicator.service   loaded active running OpenStack Object Storage
 (swift) - Account Replicator
openstack-swift-account.service              loaded active running OpenStack Object Storage
 (swift) - Account Server
openstack-swift-container-auditor.service    loaded active running OpenStack Object Storage
 (swift) - Container Auditor
openstack-swift-container-replicator.service loaded active running OpenStack Object Storage
 (swift) - Container Replicator
openstack-swift-container-updater.service    loaded active running OpenStack Object Storage
 (swift) - Container Updater
openstack-swift-container.service            loaded active running OpenStack Object Storage
 (swift) - Container Server
openstack-swift-object-auditor.service       loaded active running OpenStack Object Storage
 (swift) - Object Auditor
```

```
openstack-swift-object-expirer.service      loaded active running OpenStack Object Storage
 (swift) - Object Expirer
openstack-swift-object-replicator.service   loaded active running OpenStack Object Storage
 (swift) - Object Replicator
openstack-swift-object-updater.service      loaded active running OpenStack Object Storage
 (swift) - Object Updater
openstack-swift-object.service              loaded active running OpenStack Object Storage
 (swift) - Object Server
openstack-swift-proxy.service               loaded active running OpenStack Object Storage
 (swift) - Proxy Server
openvswitch.service                          loaded active exited  Open vSwitch

LOAD   = Reflects whether the unit definition was properly loaded.
ACTIVE = The high-level unit activation state, i.e. generalization of SUB.
SUB    = The low-level unit activation state, values depend on unit type.

43 loaded units listed. Pass --all to see loaded but inactive units, too.
To show all installed unit files use 'systemctl list-unit-files'.
```

Check the RabbitMQ Database Status

From each of the controller nodes, determine if the rabbitmq database is in a good state by executing the following command:

sudo rabbitmqctl eval 'rabbit_diagnostics:maybe_stuck().'

Example command output:

```
2017-07-20 01:58:02 There are 11020 processes.
2017-07-20 01:58:02 Investigated 0 processes this round, 5000ms to go.
2017-07-20 01:58:03 Investigated 0 processes this round, 4500ms to go.
2017-07-20 01:58:03 Investigated 0 processes this round, 4000ms to go.
2017-07-20 01:58:04 Investigated 0 processes this round, 3500ms to go.
2017-07-20 01:58:04 Investigated 0 processes this round, 3000ms to go.
2017-07-20 01:58:05 Investigated 0 processes this round, 2500ms to go.
2017-07-20 01:58:05 Investigated 0 processes this round, 2000ms to go.
2017-07-20 01:58:06 Investigated 0 processes this round, 1500ms to go.
2017-07-20 01:58:06 Investigated 0 processes this round, 1000ms to go.
2017-07-20 01:58:07 Investigated 0 processes this round, 500ms to go.
2017-07-20 01:58:07 Found 0 suspicious processes.
ok
```

If the database is healthy, the command returns “Found 0 suspicious processes.” If the database is not healthy, the command returns 1 or more suspicious processes. Contact your local support representative if suspicious processes are found.

Checking OSD Compute Server Health

Checking Ceph Status

Log on to the OSD Compute and check the Ceph storage status by executing the following command:

sudo ceph status

Example command output:

```
sudo ceph status
    cluster eb2bb192-b1c9-11e6-9205-525400330666
     health HEALTH_OK
     monmap e1: 3 mons at
{tb3-ultram-controller-0=11.118.0.10:6789/0,tb3-ultram-controller-1=11.118.0.11:6789/0,
```

```
tb3-ultram-controller-2=11.118.0.12:6789/0}
            election epoch 152, quorum 0,1,2
tb3-ultram-controller-0,tb3-ultram-controller-1,tb3-ultram-controller-2
     osdmap e158: 12 osds: 12 up, 12 in
            flags sortbitwise,require_jewel_osds
      pgmap v1417867: 704 pgs, 6 pools, 321 GB data, 110 kobjects
            961 GB used, 12431 GB / 13393 GB avail
                 704 active+clean
  client io 170 kB/s wr, 0 op/s rd, 24 op/s wr
```

Checking OSD Compute Node Services

Log on to each OSD Compute node and check the status of all services by executing the following command:

sudo systemctl list-units "openstack*" "neutron*" "openvswitch*"

Example command output:

```
UNIT                                    LOAD   ACTIVE SUB     DESCRIPTION
neutron-openvswitch-agent.service       loaded active running OpenStack Neutron Open vSwitch
Agent
neutron-ovs-cleanup.service             loaded active exited  OpenStack Neutron Open vSwitch
Cleanup Utility
neutron-sriov-nic-agent.service         loaded active running OpenStack Neutron SR-IOV NIC
Agent
openstack-nova-compute.service          loaded active running OpenStack Nova Compute Server
openvswitch.service                     loaded active exited  Open vSwitch

LOAD   = Reflects whether the unit definition was properly loaded.
ACTIVE = The high-level unit activation state, i.e. generalization of SUB.
SUB    = The low-level unit activation state, values depend on unit type.

6 loaded units listed. Pass --all to see loaded but inactive units, too.
To show all installed unit files use 'systemctl list-unit-files'.
```

Monitoring AutoDeploy Operations

This section identifies various commands that can be used to determine the status and health of AutoDeploy.

To use them, you must:

1. Log on to the AutoDeploy VM as *ubuntu*. Use the password that was created earlier for this user.
2. Become the root user.

   sudo -i

Viewing AutoDeploy Logs

AutoDeploy logs are available on the AutoDeploy VM in the following directory:

/var/log/upstart/autodeploy.log

Important To access the command used to view logs, you must be logged in to the Confd CLI as the *admin* user on the AutoDeploy VM:

confd_cli -u admin -C

AutoDeploy Transaction Logs

Execute the following command to display AutoDeploy transaction logs:

show log *$TX-ID* **| display xml**

Example VIM-ORCH and VIM Activation Log:

```
2018-01-23 22:01:56,266 - Send Deployment notification for: autoit-instance
2018-01-23 22:08:36,876 - Deployment activate-ns-deployment: autoit initiated
2018-01-23 22:08:36,919 - Send Deployment notification for: autoit-instance
2018-01-23 22:08:36,951 - Deployment activate-ns-deployment: autoit initiated
2018-01-23 22:08:37,004 - Send Deployment notification for: autoit-deploy
2018-01-23 22:08:37,029 - Image '/var/cisco/isos/rhel-server-7.3-x86_64-dvd.iso' exists
2018-01-23 22:08:37,134 - Send Deployment notification for: autoit-instance
2018-01-23 22:08:37,165 - Deployment activate-ns-deployment: autoit started
2018-01-23 22:08:37,181 - Adding NSR: autoit-instance
2018-01-23 22:08:37,215 - Start pipeline of 1 tasks
2018-01-23 22:08:37,257 - Scheduling Task: autoit
2018-01-23 22:08:37,269 - Waiting for all workers to finish the transactions
2018-01-23 22:08:37,364 - Send Deployment notification for: autoit-deploy
2018-01-23 22:08:37,387 - Deployment activate-ns-deployment: autoit started
2018-01-23 22:08:37,395 - Skipping VNF pre-deployment , since VNFD is not defined
2018-01-23 22:08:37,424 - Skipping VNF-Package pre-deployment, since is not defined
2018-01-23 22:08:37,440 - Skipping VIM-Artifact pre-deployment, since VIM-Artifact is not
defined
2018-01-23 22:08:37,463 - VIM-Orchestrator deployment pre-check success, entry already
exists. Continuing...
2018-01-23 22:08:37,470 - VIM deployment pre-check success, entry already exists.
Continuing...
2018-01-23 22:08:37,501 - NS pre-check success
2018-01-23 22:08:37,513 - Copying '/var/cisco/isos/rhel-server-7.3-x86_64-dvd.iso' to
'/var/cisco/isos/underc_rhel-server-7.3-x86_64-dvd.iso'
/tmp/_MEIulQrBS/Crypto/Cipher/blockalgo.py:141: FutureWarning: CTR mode needs counter
parameter, not IV
2018-01-23 22:09:00,685 - Connected to AutoIT[172.21.203.121]
2018-01-23 22:09:02,281 - Skipping VNFDs
2018-01-23 22:09:02,298 - Skipping VNF-PACKAGE
2018-01-23 22:09:02,314 - Skipping VIM-Artifact
2018-01-23 22:09:02,332 - XML:[<config>
  <nsd xmlns="http://www.cisco.com/usp/nfv/usp-nsds">
    <nsd-id>autoit</nsd-id>
    <vim-orch>underc</vim-orch>
    <vim>overc</vim>
  </nsd>
  <vim-orchd xmlns="http://www.cisco.com/usp/nfv/usp-vim-orch">
    <vim-orch-id>underc</vim-orch-id>
    <hostname>tb3-undercloud</hostname>
    <domain-name>cisco.com</domain-name>
.
.
.
2018-01-23 22:38:53,531 - VIM-ORCH: in-progress:84/84
2018-01-23 22:38:53,781 - Received vim-orchestrator-deployment-event for
underc:1516745343-313472/1516745343-460684 with status:success
2018-01-23 22:38:53,811 - VIM-ORCH: success:None/None
2018-01-23 22:38:53,983 - Received vim-deployment-event for
overc:1516745343-313472/1516745343-581981 with status:in-progress
2018-01-23 22:38:54,426 - Received vim-deployment-event for
overc:1516745343-313472/1516745343-581981 with status:in-progress
2018-01-23 23:39:15,038 - Received vim-deployment-event for
overc:1516745343-313472/1516745343-581981 with status:success
2018-01-23 23:39:15,113 - Received ns-deployment-event for autoit:1516745343-313472 with
status:success
```

```
2018-01-23 23:39:15,167 - RPC NS[autoit:autoit-instance] success
2018-01-23 23:39:15,271 - Deployment activate-ns-deployment: autoit succeeded
2018-01-23 23:39:15,344 - Send Deployment notification for: autoit-deploy
No handlers could be found for logger "AutoVNF-Traces"
2018-01-23 23:39:15,518 - All workers finished the job
2018-01-23 23:39:15,532 - Deployment activate-ns-deployment: autoit succeeded
2018-01-23 23:39:15,571 - Send Deployment notification for: autoit-instance
```

Example Tenant Creation Log:

```
2018-01-23 23:48:54,420 - Deployment activate-ns-deployment: autoit initiated
2018-01-23 23:48:54,449 - Send Deployment notification for: autoit-instance
2018-01-23 23:48:54,465 - Parsing role for tenant 'sjccore'
2018-01-23 23:48:54,473 - Parsing credentials for tenant 'sjccore'
2018-01-23 23:48:54,484 - Parsing attributes for tenant 'sjccore'
2018-01-23 23:48:54,540 - Deployment activate-ns-deployment: autoit initiated
2018-01-23 23:48:54,574 - Send Deployment notification for: autoit-deploy
2018-01-23 23:48:54,599 - Image '/var/cisco/isos/rhel-server-7.3-x86_64-dvd.iso' exists
2018-01-23 23:48:54,666 - Send Deployment notification for: autoit-instance
2018-01-23 23:48:54,689 - Deployment activate-ns-deployment: autoit started
2018-01-23 23:48:54,691 - Adding NSR: autoit-instance
2018-01-23 23:48:54,712 - Start pipeline of 1 tasks
2018-01-23 23:48:54,723 - Scheduling Task: autoit
2018-01-23 23:48:54,749 - Waiting for all workers to finish the transactions
2018-01-23 23:48:54,804 - Send Deployment notification for: autoit-deploy
2018-01-23 23:48:54,806 - Deployment activate-ns-deployment: autoit started
2018-01-23 23:48:54,822 - Skipping VNF pre-deployment , since VNFD is not defined
2018-01-23 23:48:54,829 - Skipping VNF-Package pre-deployment, since is not defined
2018-01-23 23:48:54,862 - VIM-Artifact deployment pre-check success
2018-01-23 23:48:54,866 - VIM-Orchestrator deployment pre-check success, entry already
exists. Continuing...
2018-01-23 23:48:54,879 - VIM deployment pre-check success, entry already exists.
Continuing...
2018-01-23 23:48:54,885 - NS pre-check success
2018-01-23 23:48:54,895 - Skipping copy, file
'/var/cisco/isos/underc_rhel-server-7.3-x86_64-dvd.iso' already exists
/tmp/_MEIulQrBS/Crypto/Cipher/blockalgo.py:141: FutureWarning: CTR mode needs counter
parameter, not IV
2018-01-23 23:48:55,244 - Connected to AutoIT[172.21.203.121]
2018-01-23 23:48:55,259 - Skipping VNFDs
2018-01-23 23:48:55,274 - Skipping VNF-PACKAGE
2018-01-23 23:48:55,279 - XML:[<config>
  <nsd xmlns="http://www.cisco.com/usp/nfv/usp-nsds">
    <nsd-id>autoit</nsd-id>
    <vim-identity>vim1</vim-identity>

.
.
.
2018-01-23 23:48:56,419 - Received vim-orchestrator-deployment-event for
underc:1516751336-209342/1516751336-428695 with status:success
2018-01-23 23:48:56,441 - VIM-ORCH: success:None/None
2018-01-23 23:48:56,540 - Received vim-deployment-event for
overc:1516751336-209342/1516751336-532373 with status:in-progress
2018-01-23 23:48:56,671 - Received vim-deployment-event for
overc:1516751336-209342/1516751336-532373 with status:success
2018-01-23 23:48:56,802 - Received vim-deployment-event for
sjccore:1516751336-209342/1516751336-654858 with status:in-progress
2018-01-23 23:49:13,305 - Received vim-deployment-event for
sjccore:1516751336-209342/1516751336-654858 with status:success
2018-01-23 23:49:13,387 - Received ns-deployment-event for autoit:1516751336-209342 with
status:success
2018-01-23 23:49:13,414 - RPC NS[autoit:autoit-instance] success
2018-01-23 23:49:13,496 - Deployment activate-ns-deployment: autoit succeeded
2018-01-23 23:49:13,540 - Send Deployment notification for: autoit-deploy
```

```
No handlers could be found for logger "AutoVNF-Traces"
2018-01-23 23:49:13,670 - All workers finished the job
2018-01-23 23:49:13,689 - Deployment activate-ns-deployment: autoit succeeded
2018-01-23 23:49:13,723 - Send Deployment notification for: autoit-instance
```

Example AutoVNF Creation Log:

```
<config xmlns="http://tail-f.com/ns/config/1.0">
  <log xmlns="http://www.cisco.com/usp/nfv/usp-transaction">
    <tx-id>1516900912-955117</tx-id>
    <log>
2018-01-25 17:21:54,162 - Send Deployment notification for: autoit-instance
2018-01-25 17:21:54,195 - Deployment activate-ns-deployment: autoit started
2018-01-25 17:21:54,225 - Adding NSR: autoit-instance
2018-01-25 17:21:54,288 - Start pipeline of 1 tasks
2018-01-25 17:21:54,312 - Scheduling Task: autoit
2018-01-25 17:21:54,342 - Waiting for all workers to finish the transactions
2018-01-25 17:23:19,325 - All workers finished the job
2018-01-25 17:23:19,365 - Deployment activate-ns-deployment: autoit succeeded
2018-01-25 17:23:19,517 - Send Deployment notification for: autoit-instance
2018-01-25 17:24:28,117 - Deployment activate-ns-deployment: tb3-autovnf_vpc initiated
2018-01-25 17:24:28,209 - Send Deployment notification for: tb3-autovnf_vpc-instance
2018-01-25 17:21:54,505 - Send Deployment notification for: autoit-deploy
2018-01-25 17:21:54,550 - Deployment activate-vnf-deployment: autoit started
2018-01-25 17:21:54,588 - Adding NSR: autoit-instance, VNFR: autoit-tb3-autovnf1, vlrs:
None
2018-01-25 17:21:54,661 - VNF deployment pre-check success(all-not-present)
2018-01-25 17:21:55,001 - Connected to AutoIT[10.84.123.51]
2018-01-25 17:21:55,039 - XML:[&lt;config>
  &lt;nsd xmlns="http://www.cisco.com/usp/nfv/usp-nsds">
    &lt;nsd-id>autoit&lt;/nsd-id>
    &lt;vim-identity>vim2&lt;/vim-identity>

.
.
.
2018-01-25 17:25:04,646 - &lt;?xml version="1.0" encoding="UTF-8"?>
&lt;rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0"
message-id="urn:uuid:1d0dd00b-a3a9-4e10-9a71-376680d05dca"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">&lt;transaction-id
xmlns='http://www.cisco.com/usp/nfv/usp-nsds'>1516901142-922838&lt;/transaction-id>
&lt;/rpc-reply>
2018-01-25 17:25:04,736 - Waiting for deployment notifications for tx-id '1516901142-922838'
2018-01-25 17:25:04,816 - Received ns-deployment-event for tb3-autovnf_vpc:1516901142-922838
 with status:requested
2018-01-25 17:25:04,851 - Received vim-deployment-event for
tb3-vnf1-rack:1516901142-922838/1516901143-301032 with status:requested
2018-01-25 17:25:04,908 - VIM: requested:None/None
2018-01-25 17:25:04,977 - Received vnf-package-deployment-event for
usp_6_0:1516901142-922838/1516901143-337769 with status:requested
2018-01-25 17:25:05,034 - VNF-PKG[usp_6_0]: requested, activate-vnf-package
2018-01-25 17:25:05,118 - Received vnf-deployment-event for
esc:1516901142-922838/1516901143-372586 with status:requested
2018-01-25 17:25:05,166 - Received vnf-deployment-event for
vpc:1516901142-922838/1516901143-418832 with status:requested
2018-01-25 17:25:05,201 - Received ns-deployment-event for tb3-autovnf_vpc:1516901142-922838
 with status:in-progress
2018-01-25 17:25:05,235 - Received vim-deployment-event for
tb3-vnf1-rack:1516901142-922838/1516901143-301032 with status:in-progress
2018-01-25 17:25:05,269 - VIM: in-progress:None/None
2018-01-25 17:25:15,753 - Received vim-deployment-event for
tb3-vnf1-rack:1516901142-922838/1516901143-301032 with status:success
2018-01-25 17:25:15,786 - VIM: success:None/None
2018-01-25 17:25:15,889 - Received vnf-package-deployment-event for
usp_6_0:1516901142-922838/1516901143-337769 with status:in-progress
```

```
2018-01-25 17:25:15,927 - VNF-PKG[usp_6_0]: in-progress, activate-vnf-package
2018-01-25 17:27:44,479 - Received vnf-package-deployment-event for
usp_6_0:1516901142-922838/1516901143-337769 with status:success
2018-01-25 17:27:44,566 - VNF-PKG[usp_6_0]: success, activate-vnf-package
2018-01-25 17:27:44,624 - Received vnf-deployment-event for
esc:1516901142-922838/1516901143-372586 with status:in-progress
2018-01-25 17:31:13,916 - Received vnf-deployment-event for
esc:1516901142-922838/1516901143-372586 with status:success
2018-01-25 17:31:13,972 - Received vnf-deployment-event for
vpc:1516901142-922838/1516901143-418832 with status:in-progress
2018-01-25 17:45:29,291 - Received vnf-deployment-event for
vpc:1516901142-922838/1516901143-418832 with status:success
2018-01-25 17:45:29,318 - Received ns-deployment-event for tb3-autovnf_vpc:1516901142-922838
 with status:success
2018-01-25 17:45:29,382 - RPC NS[tb3-autovnf_vpc:tb3-autovnf_vpc-instance] success
2018-01-25 17:45:30,000 - Deployment activate-ns-deployment: tb3-autovnf_vpc succeeded
2018-01-25 17:45:30,141 - Send Deployment notification for: tb3-autovnf_vpc-deploy</log>
  </log>
</config>
```

Checking AutoDeploy Processes

Check the status of AutoDeploy VM by entering the following commands:

service autodeploy status

service uas-confd status

Determining the Running AutoDeploy Version

To display the version of the AutoDeploy software role that is currently operational:

show uas

Example output:

```
uas version               6.0.0
uas state                 active
uas external-connection-point 172.28.185.132
INSTANCE IP     STATE  ROLE
-------------------------------------
172.28.185.133  alive  CONFD-MASTER
172.28.185.134  alive  CONFD-SLAVE

NAME               LAST HEARTBEAT
----------------------------------------
AutoDeploy-MASTER  2018-01-24 21:29:54
USPCFMWorker       2018-01-24 21:29:45
USPCHBWorker       2018-01-24 21:29:45
USPCWorker         2018-01-24 21:29:45
```

Monitoring AutoIT Operations

This section identifies various commands that can be used to determine the status and health of AutoIT.

To use them, you must:

1. Log on to the AutoIT VM as *ubuntu*. Use the password that was created earlier for this user.

2. Become the *root* user.

```
sudo -i
```

Viewing AutoIT Logs

AutoIT maintains logs containing information pertaining to UAS deployment and termination transactions. The *autoit.log* file is located in the following directory on the Ultra M Manager Node:

/var/log/cisco/usp/auto-it/autoit.log

Example Deployment Log:

```
tail -100f /var/log/cisco/usp/auto-it/autoit.log &^C
```

```
2017-05-25 22:04:57,527 - INFO: Received a request to list config folder names.
2017-05-25 22:04:57,527 - INFO: config contents are:
2017-05-25 22:04:57,536 - INFO: Received a request to list config folder names.
2017-05-25 22:04:57,536 - INFO: config contents are:
2017-05-25 22:04:57,545 - INFO: Received a request to create a configuration folder.
2017-05-25 22:04:57,551 - INFO: Received a request to create a configuration folder.
2017-05-25 22:04:57,553 - INFO: Received request to download package: system.cfg from ISO
2017-05-25 22:04:57,563 - INFO: Received request to download package: system.cfg from ISO
2017-05-25 22:04:57,565 - INFO: Received request to download package: system.cfg from ISO
2017-05-25 22:04:57,566 - INFO: Received request to upload config file system.cfg to config
 named vnf-pkg1
2017-05-25 22:04:57,567 - INFO: Uploaded file system.cfg to config named vnf-pkg1

2017-05-25 22:05:54,268 - INFO: Received request to upload ISO usp-5_1_0.iso
2017-05-25 22:05:54,268 - INFO: Saving ISO to /tmp/tmpxu7MuO/usp-5_1_0.iso
2017-05-25 22:06:30,678 - INFO: Mounting ISO to /tmp/tmpxu7MuO/iso_mount
2017-05-25 22:06:30,736 - INFO: ISO version already installed, (5.1.0-662)
2017-05-25 22:06:31,355 - INFO: Received a request to list file names in config named
vnf-pkg1.
2017-05-25 22:06:31,355 - INFO: config contents are: system.cfg
2017-05-25 22:06:31,362 - INFO: Received a request to list file names in config named
vnf-pkg1-images.
2017-05-25 22:06:31,362 - INFO: config contents are:
2017-05-25 22:06:31,370 - INFO: Received request to get ISO details 5.1.0-662
2017-05-25 22:06:31,391 - INFO: Received a request to get an Host Aggregate details
2017-05-25 22:06:31,857 - INFO: Getting Host Aggregate failed: Aggregate
'auto-test-sjc-service1' not found on OpenStack setup
2017-05-25 22:06:31,872 - INFO: Received a request to deploy an Host Aggregate
2017-05-25 22:06:32,415 - INFO: Deploying Host Aggregate 'auto-test-sjc-service1' completed
2017-05-25 22:06:32,427 - INFO: Received a request to get an Host Aggregate details
2017-05-25 22:06:32,975 - INFO: Getting Host Aggregate failed: Aggregate
'auto-test-sjc-cf-esc-mgmt1' not found on OpenStack setup
2017-05-25 22:06:32,986 - INFO: Received a request to deploy an Host Aggregate
2017-05-25 22:06:33,513 - INFO: Deploying Host Aggregate 'auto-test-sjc-cf-esc-mgmt1'
completed
2017-05-25 22:06:33,524 - INFO: Received a request to get an Host Aggregate details
2017-05-25 22:06:33,881 - INFO: Getting Host Aggregate failed: Aggregate
'auto-test-sjc-em-autovnf-mgmt1' not found on OpenStack setup
2017-05-25 22:06:33,891 - INFO: Received a request to deploy an Host Aggregate
2017-05-25 22:06:34,535 - INFO: Deploying Host Aggregate 'auto-test-sjc-em-autovnf-mgmt1'
completed
2017-05-25 22:06:34,580 - INFO: Received a request to deploy AutoVnf
2017-05-25 22:06:40,340 - INFO: Creating AutoVnf deployment (3 instance(s)) on
'http://172.21.201.217:5000/v2.0' tenant 'core' user 'core', ISO '5.1.0-662'
2017-05-25 22:06:40,340 - INFO: Creating network 'auto-testautovnf1-uas-management'
2017-05-25 22:06:42,241 - INFO: Created network 'auto-testautovnf1-uas-management'
2017-05-25 22:06:42,241 - INFO: Creating network 'auto-testautovnf1-uas-orchestration'
```

```
2017-05-25 22:06:42,821 - INFO: Created network 'auto-testautovnf1-uas-orchestration'
2017-05-25 22:06:42,888 - INFO: Created flavor 'auto-testautovnf1-uas'
2017-05-25 22:06:42,888 - INFO: Loading image 'auto-testautovnf1-usp-uas-1.0.0-601.qcow2'
from '/opt/cisco/usp/bundles/5.1.0-662/uas-bundle/usp-uas-1.0.0-601.qcow2'
2017-05-25 22:06:53,927 - INFO: Loaded image 'auto-testautovnf1-usp-uas-1.0.0-601.qcow2'
2017-05-25 22:06:53,928 - INFO: Creating volume 'auto-testautovnf1-uas-vol-0' with command

[/opt/cisco/usp/apps/auto-it/vnf/../common/autoit/../autoit_os_utils/scripts/autoit_volume_staging.sh
 OS_USERNAME core OS_TENANT_NAME core OS_PASSWORD **** OS_AUTH_URL
http://172.21.201.217:5000/v2.0 ARG_TENANT core ARG_DEPLOYMENT test-uas ARG_VM_NAME
auto-testautovnf1-uas-vol-0 ARG_VOLUME_TYPE LUKS  FILE_1 /tmp/tmphsTAj6/encrypted.cfg]
2017-05-25 22:07:06,104 - INFO: Created volume 'auto-testautovnf1-uas-vol-0'
2017-05-25 22:07:06,104 - INFO: Creating volume 'auto-testautovnf1-uas-vol-1' with command

[/opt/cisco/usp/apps/auto-it/vnf/../common/autoit/../autoit_os_utils/scripts/autoit_volume_staging.sh
 OS_USERNAME core OS_TENANT_NAME core OS_PASSWORD **** OS_AUTH_URL
http://172.21.201.217:5000/v2.0 ARG_TENANT core ARG_DEPLOYMENT test-uas ARG_VM_NAME
auto-testautovnf1-uas-vol-1 ARG_VOLUME_TYPE LUKS  FILE_1 /tmp/tmphsTAj6/encrypted.cfg]
2017-05-25 22:07:17,598 - INFO: Created volume 'auto-testautovnf1-uas-vol-1'
2017-05-25 22:07:17,598 - INFO: Creating volume 'auto-testautovnf1-uas-vol-2' with command

[/opt/cisco/usp/apps/auto-it/vnf/../common/autoit/../autoit_os_utils/scripts/autoit_volume_staging.sh
 OS_USERNAME core OS_TENANT_NAME core OS_PASSWORD **** OS_AUTH_URL
http://172.21.201.217:5000/v2.0 ARG_TENANT core ARG_DEPLOYMENT test-uas ARG_VM_NAME
auto-testautovnf1-uas-vol-2 ARG_VOLUME_TYPE LUKS  FILE_1 /tmp/tmphsTAj6/encrypted.cfg]
2017-05-25 22:07:29,242 - INFO: Created volume 'auto-testautovnf1-uas-vol-2'
2017-05-25 22:07:30,477 - INFO: Assigned floating IP '172.21.201.59' to IP '172.57.11.101'
2017-05-25 22:07:33,843 - INFO: Creating instance 'auto-testautovnf1-uas-0' and attaching
volume 'auto-testautovnf1-uas-vol-0'
2017-05-25 22:08:00,717 - INFO: Created instance 'auto-testautovnf1-uas-0'
2017-05-25 22:08:00,717 - INFO: Creating instance 'auto-testautovnf1-uas-1' and attaching
volume 'auto-testautovnf1-uas-vol-1'
2017-05-25 22:08:27,577 - INFO: Created instance 'auto-testautovnf1-uas-1'
2017-05-25 22:08:27,578 - INFO: Creating instance 'auto-testautovnf1-uas-2' and attaching
volume 'auto-testautovnf1-uas-vol-2'
2017-05-25 22:08:58,345 - INFO: Created instance 'auto-testautovnf1-uas-2'
2017-05-25 22:08:58,345 - INFO: Deploy request completed
2017-05-25 22:14:07,201 - INFO: Received request to download file system.cfg from config
named vnf-pkg1
2017-05-25 22:19:05,050 - INFO: Received a request to list config folder names.
2017-05-25 22:19:05,051 - INFO: config contents are: vnf-pkg1-images,vnf-pkg1
2017-05-25 22:19:05,059 - INFO: Received a request to list config folder names.
2017-05-25 22:19:05,059 - INFO: config contents are: vnf-pkg1-images,vnf-pkg1
2017-05-25 22:19:05,066 - INFO: Received a request to create a configuration folder.
2017-05-25 22:19:05,073 - INFO: Received a request to create a configuration folder.
2017-05-25 22:19:05,076 - INFO: Received request to download package: system.cfg from ISO
2017-05-25 22:19:05,083 - INFO: Received request to download package: system.cfg from ISO
2017-05-25 22:19:05,085 - INFO: Received request to download package: system.cfg from ISO
2017-05-25 22:19:05,086 - INFO: Received request to upload config file system.cfg to config
 named vnf-pkg2
2017-05-25 22:19:05,087 - INFO: Uploaded file system.cfg to config named vnf-pkg2
2017-05-25 22:19:59,895 - INFO: Received request to upload ISO usp-5_1_0.iso
2017-05-25 22:19:59,895 - INFO: Saving ISO to /tmp/tmpWbdnxm/usp-5_1_0.iso
2017-05-25 22:20:21,395 - INFO: Mounting ISO to /tmp/tmpWbdnxm/iso_mount
2017-05-25 22:20:22,288 - INFO: ISO version already installed, (5.1.0-662)
2017-05-25 22:20:23,203 - INFO: Received a request to list file names in config named
vnf-pkg2.
2017-05-25 22:20:23,203 - INFO: config contents are: system.cfg
2017-05-25 22:20:23,211 - INFO: Received a request to list file names in config named
vnf-pkg2-images.
2017-05-25 22:20:23,211 - INFO: config contents are:
2017-05-25 22:20:23,220 - INFO: Received request to get ISO details 5.1.0-662
2017-05-25 22:20:23,251 - INFO: Received a request to get an Host Aggregate details
2017-05-25 22:20:23,621 - INFO: Getting Host Aggregate failed: Aggregate
```

```
'auto-test-sjc-em-autovnf-mgmt2' not found on OpenStack setup
2017-05-25 22:20:23,633 - INFO: Received a request to deploy an Host Aggregate
2017-05-25 22:20:24,301 - INFO: Deploying Host Aggregate 'auto-test-sjc-em-autovnf-mgmt2'
completed
2017-05-25 22:20:24,313 - INFO: Received a request to get an Host Aggregate details
2017-05-25 22:20:24,843 - INFO: Getting Host Aggregate failed: Aggregate
'auto-test-sjc-service2' not found on OpenStack setup
2017-05-25 22:20:24,853 - INFO: Received a request to deploy an Host Aggregate
2017-05-25 22:20:25,524 - INFO: Deploying Host Aggregate 'auto-test-sjc-service2' completed
2017-05-25 22:20:25,537 - INFO: Received a request to get an Host Aggregate details
2017-05-25 22:20:25,898 - INFO: Getting Host Aggregate failed: Aggregate
'auto-test-sjc-cf-esc-mgmt2' not found on OpenStack setup
2017-05-25 22:20:25,909 - INFO: Received a request to deploy an Host Aggregate
2017-05-25 22:20:26,540 - INFO: Deploying Host Aggregate 'auto-test-sjc-cf-esc-mgmt2'
completed
2017-05-25 22:20:26,584 - INFO: Received a request to deploy AutoVnf
2017-05-25 22:20:31,604 - INFO: Creating AutoVnf deployment (3 instance(s)) on
'http://172.21.201.217:5000/v2.0' tenant 'core' user 'core', ISO '5.1.0-662'
2017-05-25 22:20:31,605 - INFO: Creating network 'auto-testautovnf2-uas-management'
2017-05-25 22:20:33,720 - INFO: Created network 'auto-testautovnf2-uas-management'
2017-05-25 22:20:33,720 - INFO: Creating network 'auto-testautovnf2-uas-orchestration'
2017-05-25 22:20:34,324 - INFO: Created network 'auto-testautovnf2-uas-orchestration'
2017-05-25 22:20:34,402 - INFO: Created flavor 'auto-testautovnf2-uas'
2017-05-25 22:20:34,402 - INFO: Loading image 'auto-testautovnf2-usp-uas-1.0.0-601.qcow2'
from '/opt/cisco/usp/bundles/5.1.0-662/uas-bundle/usp-uas-1.0.0-601.qcow2'
2017-05-25 22:20:43,169 - INFO: Loaded image 'auto-testautovnf2-usp-uas-1.0.0-601.qcow2'
2017-05-25 22:20:43,169 - INFO: Creating volume 'auto-testautovnf2-uas-vol-0' with command

[/opt/cisco/usp/apps/auto-it/vnf/../common/autoit/../autoit_os_utils/scripts/autoit_volume_staging.sh
 OS_USERNAME core OS_TENANT_NAME core OS_PASSWORD **** OS_AUTH_URL
http://172.21.201.217:5000/v2.0 ARG_TENANT core ARG_DEPLOYMENT test-uas ARG_VM_NAME
auto-testautovnf2-uas-vol-0 ARG_VOLUME_TYPE LUKS  FILE_1 /tmp/tmpe1mMIL/encrypted.cfg]
2017-05-25 22:20:54,713 - INFO: Created volume 'auto-testautovnf2-uas-vol-0'
2017-05-25 22:20:54,714 - INFO: Creating volume 'auto-testautovnf2-uas-vol-1' with command

[/opt/cisco/usp/apps/auto-it/vnf/../common/autoit/../autoit_os_utils/scripts/autoit_volume_staging.sh
 OS_USERNAME core OS_TENANT_NAME core OS_PASSWORD **** OS_AUTH_URL
http://172.21.201.217:5000/v2.0 ARG_TENANT core ARG_DEPLOYMENT test-uas ARG_VM_NAME
auto-testautovnf2-uas-vol-1 ARG_VOLUME_TYPE LUKS  FILE_1 /tmp/tmpe1mMIL/encrypted.cfg]
2017-05-25 22:21:06,203 - INFO: Created volume 'auto-testautovnf2-uas-vol-1'
2017-05-25 22:21:06,204 - INFO: Creating volume 'auto-testautovnf2-uas-vol-2' with command

[/opt/cisco/usp/apps/auto-it/vnf/../common/autoit/../autoit_os_utils/scripts/autoit_volume_staging.sh
 OS_USERNAME core OS_TENANT_NAME core OS_PASSWORD **** OS_AUTH_URL
http://172.21.201.217:5000/v2.0 ARG_TENANT core ARG_DEPLOYMENT test-uas ARG_VM_NAME
auto-testautovnf2-uas-vol-2 ARG_VOLUME_TYPE LUKS  FILE_1 /tmp/tmpe1mMIL/encrypted.cfg]
2017-05-25 22:21:18,184 - INFO: Created volume 'auto-testautovnf2-uas-vol-2'
2017-05-25 22:21:19,626 - INFO: Assigned floating IP '172.21.201.64' to IP '172.67.11.101'
2017-05-25 22:21:22,762 - INFO: Creating instance 'auto-testautovnf2-uas-0' and attaching
volume 'auto-testautovnf2-uas-vol-0'
2017-05-25 22:21:49,741 - INFO: Created instance 'auto-testautovnf2-uas-0'
2017-05-25 22:21:49,742 - INFO: Creating instance 'auto-testautovnf2-uas-1' and attaching
volume 'auto-testautovnf2-uas-vol-1'
2017-05-25 22:22:16,881 - INFO: Created instance 'auto-testautovnf2-uas-1'
2017-05-25 22:22:16,881 - INFO: Creating instance 'auto-testautovnf2-uas-2' and attaching
volume 'auto-testautovnf2-uas-vol-2'
2017-05-25 22:22:43,304 - INFO: Created instance 'auto-testautovnf2-uas-2'
2017-05-25 22:22:43,304 - INFO: Deploy request completed
2017-05-25 22:28:08,865 - INFO: Received request to download file system.cfg from config
named vnf-pkg2
2017-05-25 22:40:03,550 - INFO: Received request to download file system.cfg from config
named vnf-pkg1
```

Example Termination Log:

```
2017-05-25 22:53:30,970 - INFO: Received a request to destroy AutoVnf
2017-05-25 22:53:31,310 - INFO: Destroying AutoVnf deployment on
'http://172.21.201.217:5000/v2.0' tenant 'core' user 'core', ISO '5.1.0-662'
2017-05-25 22:53:32,698 - INFO: Removed floating IP '172.21.201.64'
2017-05-25 22:53:34,114 - INFO: 3 instance(s) found with name matching 'auto-testautovnf2'
2017-05-25 22:53:34,448 - INFO: Removing volume 'auto-testautovnf2-uas-vol-2'
2017-05-25 22:53:43,481 - INFO: Removed volume 'auto-testautovnf2-uas-vol-2'
2017-05-25 22:53:43,481 - INFO: Removing instance 'auto-testautovnf2-uas-2'
2017-05-25 22:53:47,080 - INFO: Removed instance 'auto-testautovnf2-uas-2'
2017-05-25 22:53:47,283 - INFO: Removing volume 'auto-testautovnf2-uas-vol-1'
2017-05-25 22:53:56,508 - INFO: Removed volume 'auto-testautovnf2-uas-vol-1'
2017-05-25 22:53:56,508 - INFO: Removing instance 'auto-testautovnf2-uas-1'
2017-05-25 22:54:00,290 - INFO: Removed instance 'auto-testautovnf2-uas-1'
2017-05-25 22:54:00,494 - INFO: Removing volume 'auto-testautovnf2-uas-vol-0'
2017-05-25 22:54:04,714 - INFO: Removed volume 'auto-testautovnf2-uas-vol-0'
2017-05-25 22:54:04,714 - INFO: Removing instance 'auto-testautovnf2-uas-0'
2017-05-25 22:54:11,647 - INFO: Removed instance 'auto-testautovnf2-uas-0'
2017-05-25 22:54:15,107 - INFO: 1 image(s) 'auto-testautovnf2-usp-uas-1.0.0-601.qcow2'
found, removing
2017-05-25 22:54:19,289 - INFO: Removed network 'auto-testautovnf2-uas-management'
2017-05-25 22:54:20,463 - INFO: Removed network 'auto-testautovnf2-uas-orchestration'
2017-05-25 22:54:20,541 - INFO: Removed flavor 'auto-testautovnf2-uas'
2017-05-25 22:54:20,541 - INFO: Destroy request completed
2017-05-25 22:54:20,562 - INFO: Received a request to get an Host Aggregate details
2017-05-25 22:54:20,925 - INFO: Getting Host Aggregate 'auto-test-sjc-em-autovnf-mgmt2'
completed
2017-05-25 22:54:20,940 - INFO: Received a request to destroy an Host Aggregate
2017-05-25 22:54:21,564 - INFO: Destroying Host Aggregate 'auto-test-sjc-em-autovnf-mgmt2'
 completed
2017-05-25 22:54:21,575 - INFO: Received a request to get an Host Aggregate details
2017-05-25 22:54:21,930 - INFO: Getting Host Aggregate 'auto-test-sjc-service2' completed
2017-05-25 22:54:21,947 - INFO: Received a request to destroy an Host Aggregate
2017-05-25 22:54:22,456 - INFO: Destroying Host Aggregate 'auto-test-sjc-service2' completed
2017-05-25 22:54:22,468 - INFO: Received a request to get an Host Aggregate details
2017-05-25 22:54:22,826 - INFO: Getting Host Aggregate 'auto-test-sjc-cf-esc-mgmt2' completed
2017-05-25 22:54:22,840 - INFO: Received a request to destroy an Host Aggregate
2017-05-25 22:54:23,394 - INFO: Destroying Host Aggregate 'auto-test-sjc-cf-esc-mgmt2'
completed
2017-05-25 22:56:55,925 - INFO: Received a request to destroy AutoVnf
2017-05-25 22:56:56,391 - INFO: Destroying AutoVnf deployment on
'http://172.21.201.217:5000/v2.0' tenant 'core' user 'core', ISO '5.1.0-662'
2017-05-25 22:56:57,507 - INFO: Removed floating IP '172.21.201.59'
2017-05-25 22:56:58,614 - INFO: 3 instance(s) found with name matching 'auto-testautovnf1'
2017-05-25 22:56:58,949 - INFO: Removing volume 'auto-testautovnf1-uas-vol-2'
2017-05-25 22:57:08,166 - INFO: Removed volume 'auto-testautovnf1-uas-vol-2'
2017-05-25 22:57:08,166 - INFO: Removing instance 'auto-testautovnf1-uas-2'
2017-05-25 22:57:15,117 - INFO: Removed instance 'auto-testautovnf1-uas-2'
2017-05-25 22:57:15,323 - INFO: Removing volume 'auto-testautovnf1-uas-vol-1'
2017-05-25 22:57:24,501 - INFO: Removed volume 'auto-testautovnf1-uas-vol-1'
2017-05-25 22:57:24,502 - INFO: Removing instance 'auto-testautovnf1-uas-1'
2017-05-25 22:57:28,275 - INFO: Removed instance 'auto-testautovnf1-uas-1'
2017-05-25 22:57:28,722 - INFO: Removing volume 'auto-testautovnf1-uas-vol-0'
2017-05-25 22:57:37,702 - INFO: Removed volume 'auto-testautovnf1-uas-vol-0'
2017-05-25 22:57:37,703 - INFO: Removing instance 'auto-testautovnf1-uas-0'
2017-05-25 22:57:44,622 - INFO: Removed instance 'auto-testautovnf1-uas-0'
2017-05-25 22:57:47,921 - INFO: 1 image(s) 'auto-testautovnf1-usp-uas-1.0.0-601.qcow2'
found, removing
2017-05-25 22:57:52,453 - INFO: Removed network 'auto-testautovnf1-uas-management'
2017-05-25 22:57:53,677 - INFO: Removed network 'auto-testautovnf1-uas-orchestration'
2017-05-25 22:57:53,760 - INFO: Removed flavor 'auto-testautovnf1-uas'
2017-05-25 22:57:53,760 - INFO: Destroy request completed
```

Viewing AutoIT Operational Data

View the AutoIT operational data by executing the following command:

show uas

Example show uas Command Output

```
uas version               6.0.0
uas state                 active
uas external-connection-point 172.28.185.132
INSTANCE IP     STATE  ROLE
-------------------------------------
172.28.185.133  alive  CONFD-MASTER
172.28.185.134  alive  CONFD-SLAVE

NAME           LAST HEARTBEAT
-------------------------------------
AutoIT-MASTER  2018-01-24 21:24:30
USPCFMWorker   2018-01-24 21:24:30
USPCHBWorker   2018-01-24 21:24:30
USPCWorker     2018-01-24 21:24:30
```

Important In case of standalone mode (non-HA) deployments, the *uas external-connection-point* information and *Instance IP* table are not applicable and are not displayed.

Checking AutoIT Processes

Verify that key processes are running on the AutoIT VM:

With Ubuntu 14.04:

service autoit status

Example output:

```
AutoIT is running.
```

Check ConfD.

service uas-confd status

Monitoring AutoVNF Operations

This section identifies various commands that can be used to determine the status and health of AutoVNF.

To use them, you must:

1. Log on to the AutoVNF VM as *ubuntu*. Use the password that was created earlier for this user.
2. Become the root user.

   sudo -i

Viewing AutoVNF Logs

General AutoVNF Logs

AutoVNF logs are available on the AutoVNF VM in the following file:

/var/log/upstart/autovnf.log

To collect AutoVNF logs:

1. Navigate to the *scripts* directory.

   cd /opt/cisco/usp/uas/scripts

2. Launch the *collect-uas-logs.sh* script to collect the logs.

   sudo ./collect-uas-logs.sh

   Example log output:

```
Creating log tarball uas-logs-2017-05-26_00.24.55_UTC.tar.bz2 ...
uas-logs/
uas-logs/autovnf/
uas-logs/autovnf/autovnf_server.log
uas-logs/autovnf/a15bf26c-41a1-11e7-b3ab-fa163eccaffc/
uas-logs/autovnf/a15bf26c-41a1-11e7-b3ab-fa163eccaffc/netconf_traces
uas-logs/autovnf/a15bf26c-41a1-11e7-b3ab-fa163eccaffc/vnfd
uas-logs/autovnf/audit.log
uas-logs/autovnf/579b4546-41a2-11e7-b3ab-fa163eccaffc/
uas-logs/autovnf/579b4546-41a2-11e7-b3ab-fa163eccaffc/netconf_traces
uas-logs/autovnf/579b4546-41a2-11e7-b3ab-fa163eccaffc/vnfd
uas-logs/ha/
uas-logs/ha/info.log
uas-logs/uas_manager/
uas-logs/uas_manager/info.log
uas-logs/zk/
uas-logs/zk/zookeeper.out
uas-logs/zk/zookeeper.log
uas-logs/upstart/
uas-logs/upstart/uas-confd.log
uas-logs/upstart/zk.log
uas-logs/upstart/autovnf.log
uas-logs/upstart/uws-ae.log
uas-logs/upstart/ensemble.log

=============== Tarball available at: /tmp/uas-logs-2017-05-26_00.24.55_UTC.tar.bz2
===============

To extract the tarball, run: "tar jxf /tmp/uas-logs-2017-05-26_00.24.55_UTC.tar.bz2"
```

AutoVNF Transaction Logs

AutoVNF server and transaction logs are available on the Ultra M Manager Node in the following directory on the UAS VM:

/var/log/cisco-uas/autovnf

Inside this directory are transaction sub-directories, VNFD information and NETCONF traces are provided for the given transaction.

Example:

```
total 3568
drwxr-xr-x 4 root root    4096 May 25 23:31 ./
drwxr-xr-x 7 root root    4096 May 25 19:39 ../
drwxr-xr-x 2 root root    4096 May 25 23:31 579b4546-41a2-11e7-b3ab-fa163eccaffc/
drwxr-xr-x 2 root root    4096 May 25 23:29 a15bf26c-41a1-11e7-b3ab-fa163eccaffc/
-rw-r--r-- 1 root root 3632813 May 26 18:33 audit.log
-rw-r--r-- 1 root root       0 May 25 23:26 autovnf_server.log

cd a15bf26c-41a1-11e7-b3ab-fa163eccaffc
total 2568
drwxr-xr-x 2 root root    4096 May 25 23:29 ./
drwxr-xr-x 4 root root    4096 May 25 23:31 ../
-rw-r--r-- 1 root root 2614547 May 25 23:37 netconf_traces
-rw-r--r-- 1 root root       0 May 25 23:29 vnfd
```

AutoVNF Event Logs

Event logs provide useful information on UAS task progress. These logs are located in the *autovnf.log* file within the following directory on the UAS VM:

/var/log/upstart

Event logs are filed by transaction ID. To view transaction IDs:

1. Login to the ConfD CLI as the *admin* user.

   confd_cli -u admin -C

2. List the transactions.

   show transactions

   Example output:

```
TX ID                                  TX TYPE          DEPLOYMENT ID       TIMESTAMP
                      STATUS
-------------------------------------------------------------------------------------
562c18b0-4199-11e7-ad05-fa163ec6a7e4  vnf-deployment   vnfd2-deployment
2017-05-25T22:27:28.962293-00:00  deployment-success
abf51428-4198-11e7-ad05-fa163ec6a7e4  vnfm-deployment  ab-auto-test-vnfm2
2017-05-25T22:22:43.389059-00:00  deployment-success
```

   To view the logs associated with a specific transaction:

   show log *<transaction_id>* **| display xml**

   Example log pertaining to VNFM deployment:

```
<config xmlns="http://tail-f.com/ns/config/1.0">
  <logs xmlns="http://www.cisco.com/usp/nfv/usp-autovnf-oper">
    <tx-id>abf51428-4198-11e7-ad05-fa163ec6a7e4</tx-id>
    <log>2017-05-25 22:22:43,402 - VNFM Deployment RPC triggered for deployment:
ab-auto-test-vnfm2, deactivate: 0
2017-05-25 22:22:43,446 - Notify deployment
2017-05-25 22:22:43,472 - VNFM Transaction: abf51428-4198-11e7-ad05-fa163ec6a7e4 for
deployment: ab-auto-test-vnfm2 started
2017-05-25 22:22:43,497 - Downloading Image:
http://172.21.201.63:80/bundles/5.1.0-662/vnfm-bundle/ESC-2_3_2_143.qcow2
2017-05-25 22:22:49,146 - Image: //opt/cisco/vnf-staging/vnfm_image downloaded
successfully
2017-05-25 22:22:49,714 - Checking network 'public' existence
2017-05-25 22:22:49,879 - Checking flavor 'ab-auto-test-vnfm2-ESC-flavor' non existence
2017-05-25 22:22:50,124 - Checking image 'ab-auto-test-vnfm2-ESC-image' non existence
2017-05-25 22:22:50,598 - Checking network 'auto-testautovnf2-uas-management' existence
2017-05-25 22:22:50,752 - Checking network 'auto-testautovnf2-uas-orchestration' existence
```

```
2017-05-25 22:22:50,916 - Checking instance 'ab-auto-test-vnfm2-ESC-0' non existence
2017-05-25 22:22:51,357 - Checking instance 'ab-auto-test-vnfm2-ESC-1' non existence
2017-05-25 22:22:52,084 - Creating flavor 'ab-auto-test-vnfm2-ESC-flavor'
2017-05-25 22:22:52,184 - Loading image 'ab-auto-test-vnfm2-ESC-image' from
'//opt/cisco/vnf-staging/vnfm_image'...
2017-05-25 22:23:06,444 - ESC HA mode is ON
2017-05-25 22:23:07,118 - Allocated these IPs for ESC HA: ['172.67.11.3', '172.67.11.4',
 '172.67.11.5']
2017-05-25 22:23:08,228 - Creating VNFM 'ab-auto-test-vnfm2-ESC-0' with [python
//opt/cisco/vnf-staging/bootvm.py ab-auto-test-vnfm2-ESC-0 --flavor
ab-auto-test-vnfm2-ESC-flavor --image b29e7a72-9ad0-4178-aa35-35df0a2b23b7 --net
auto-testautovnf2-uas-management --gateway_ip 172.67.11.1 --net
auto-testautovnf2-uas-orchestration
 --os_auth_url http://172.21.201.217:5000/v2.0 --os_tenant_name core --os_username ******
 --os_password ****** --bs_os_auth_url http://172.21.201.217:5000/v2.0 --bs_os_tenant_name
 core --bs_os_username ****** --bs_os_password ****** --esc_ui_startup false
 --esc_params_file /tmp/esc_params.cfg --encrypt_key ****** --user_pass ******
--user_confd_pass ****** --kad_vif eth0 --kad_vip 172.67.11.5 --ipaddr 172.67.11.3 dhcp
 --ha_node_list 172.67.11.3 172.67.11.4 --file
root:0755:/opt/cisco/esc/esc-scripts/esc_volume_em_staging.sh:
/opt/cisco/usp/uas/autovnf/vnfms/esc-scripts/esc_volume_em_staging.sh
 --file
root:0755:/opt/cisco/esc/esc-scripts/esc_vpc_chassis_id.py:/opt/cisco/usp/uas/autovnf/vnfms/esc-scripts/esc_vpc_chassis_id.py
 --file
root:0755:/opt/cisco/esc/esc-scripts/esc-vpc-di-internal-keys.sh:/opt/cisco/usp/uas/autovnf/vnfms/esc-scripts/esc-vpc-di-internal-keys.sh]...
2017-05-25 22:24:13,329 - ESC started!
2017-05-25 22:24:13,803 - Creating VNFM 'ab-auto-test-vnfm2-ESC-1' with [python
//opt/cisco/vnf-staging/bootvm.py ab-auto-test-vnfm2-ESC-1 --flavor
ab-auto-test-vnfm2-ESC-flavor --image b29e7a72-9ad0-4178-aa35-35df0a2b23b7 --net
auto-testautovnf2-uas-management --gateway_ip 172.67.11.1 --net
auto-testautovnf2-uas-orchestration
 --os_auth_url http://172.21.201.217:5000/v2.0 --os_tenant_name core --os_username ******
 --os_password ****** --bs_os_auth_url http://172.21.201.217:5000/v2.0 --bs_os_tenant_name
 core --bs_os_username ****** --bs_os_password ****** --esc_ui_startup false
--esc_params_file /tmp/esc_params.cfg --encrypt_key ****** --user_pass ******
--user_confd_pass ****** --kad_vif eth0 --kad_vip 172.67.11.5 --ipaddr 172.67.11.4 dhcp
 --ha_node_list 172.67.11.3 172.67.11.4
 --file root:0755:/opt/cisco/esc/esc-scripts/esc_volume_em_staging.sh:
/opt/cisco/usp/uas/autovnf/vnfms/esc-scripts/esc_volume_em_staging.sh --file
root:0755:/opt/cisco/esc/esc-scripts/esc_vpc_chassis_id.py:/opt/cisco/usp/uas/autovnf/vnfms/esc-scripts/esc_vpc_chassis_id.py
 --file
root:0755:/opt/cisco/esc/esc-scripts/esc-vpc-di-internal-keys.sh:/opt/cisco/usp/uas/autovnf/vnfms/esc-scripts/esc-vpc-di-internal-keys.sh]...
2017-05-25 22:25:12,660 - ESC started!
2017-05-25 22:25:12,677 - Waiting for VIM to declare 2 instance(s) active
2017-05-25 22:25:18,254 - Instance(s) are active
2017-05-25 22:25:18,271 - Waiting for VNFM to be ready...
2017-05-25 22:25:18,292 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:25:21,313 - Could not estabilish NETCONF session to 172.67.11.5
2017-05-25 22:25:31,341 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:25:31,362 - Could not estabilish NETCONF session to 172.67.11.5
2017-05-25 22:25:41,379 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:25:41,397 - Could not estabilish NETCONF session to 172.67.11.5
2017-05-25 22:25:51,424 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:25:51,495 - Could not estabilish NETCONF session to 172.67.11.5
2017-05-25 22:26:01,521 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:26:01,539 - Could not estabilish NETCONF session to 172.67.11.5
2017-05-25 22:26:11,563 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:26:11,591 - Could not estabilish NETCONF session to 172.67.11.5
2017-05-25 22:26:21,617 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:26:21,635 - Could not estabilish NETCONF session to 172.67.11.5
2017-05-25 22:26:31,662 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:26:31,680 - Could not estabilish NETCONF session to 172.67.11.5
2017-05-25 22:26:41,706 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:26:41,726 - Could not estabilish NETCONF session to 172.67.11.5
```

```
2017-05-25 22:26:51,748 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:26:51,765 - Could not estabilish NETCONF session to 172.67.11.5
2017-05-25 22:27:01,791 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:27:02,204 - NETConf Sessions (Transaction/Notifications) estabilished
2017-05-25 22:27:02,507 - Notify VNFM Up
2017-05-25 22:27:02,525 - VNFM Transaction: abf51428-4198-11e7-ad05-fa163ec6a7e4 for
deployment: ab-auto-test-vnfm2 completed suc-cessfully.
2017-05-25 22:27:02,545 - Notify deployment</log>
  </logs>
</config>
```

Example log pertaining to VNF deployment:

```
<config xmlns="http://tail-f.com/ns/config/1.0">
  <logs xmlns="http://www.cisco.com/usp/nfv/usp-autovnf-oper">
    <tx-id>562c18b0-4199-11e7-ad05-fa163ec6a7e4</tx-id>
    <log>2017-05-25 22:27:29,039 - Notify deployment
2017-05-25 22:27:29,062 - Connection to VNFM (esc) at 172.67.11.5
2017-05-25 22:27:29,404 - NETConf Sessions (Transaction/Notifications) estabilished
2017-05-25 22:27:29,420 - Get Images
2017-05-25 22:27:29,435 - NETCONF get-config Request sent, waiting for reply
2017-05-25 22:27:29,560 - NETCONF Transaction success!
2017-05-25 22:27:29,570 - Get Flavors List
2017-05-25 22:27:29,582 - Adding images ...
2017-05-25 22:27:29,592 - Creating Images
2017-05-25 22:27:29,603 -   image: ab-auto-test-vnfm2-element-manager
2017-05-25 22:27:29,620 -     src:
http://172.21.201.63:80/bundles/5.1.0-662/em-bundle/em-1_0_0_532.qcow2
2017-05-25 22:27:29,630 -     disk_format: qcow2
2017-05-25 22:27:29,641 -     container_format: bare
2017-05-25 22:27:29,655 -     serial_console: True
2017-05-25 22:27:29,665 -     disk_bus: virtio
2017-05-25 22:27:29,674 - NETCONF edit-config Request sent, waiting for reply
2017-05-25 22:27:29,901 - NETCONF Transaction success!
2017-05-25 22:27:29,911 - Waiting for VNFM to process CREATE_IMAGE transaction
2017-05-25 22:27:46,987 - | CREATE_IMAGE | ab-auto-test-vnfm2-element-manager | SUCCESS
 | (1/1)
2017-05-25 22:27:47,004 - NETCONF transaction completed successfully!
2017-05-25 22:27:47,749 - Creating Images
2017-05-25 22:27:47,764 -   image: ab-auto-test-vnfm2-control-function
2017-05-25 22:27:47,776 -     src:
http://172.21.201.63:80/bundles/5.1.0-662/ugp-bundle/qvpc-di-cf.qcow2
2017-05-25 22:27:47,793 -     disk_format: qcow2
2017-05-25 22:27:47,805 -     container_format: bare
2017-05-25 22:27:47,819 -     serial_console: True
2017-05-25 22:27:47,831 -     disk_bus: virtio
2017-05-25 22:27:47,841 - NETCONF edit-config Request sent, waiting for reply
2017-05-25 22:27:48,317 - NETCONF Transaction success!
2017-05-25 22:27:48,331 - Waiting for VNFM to process CREATE_IMAGE transaction
2017-05-25 22:27:56,403 - | CREATE_IMAGE | ab-auto-test-vnfm2-control-function | SUCCESS
 | (1/1)
2017-05-25 22:27:56,434 - NETCONF transaction completed successfully!
2017-05-25 22:27:56,822 - Creating Images
2017-05-25 22:27:56,838 -   image: ab-auto-test-vnfm2-session-function
2017-05-25 22:27:57,267 -     src:
http://172.21.201.63:80/bundles/5.1.0-662/ugp-bundle/qvpc-di-sf.qcow2
2017-05-25 22:27:57,412 -     disk_format: qcow2
2017-05-25 22:27:57,423 -     container_format: bare
2017-05-25 22:27:57,523 -     serial_console: True
2017-05-25 22:27:57,535 -     disk_bus: virtio
2017-05-25 22:27:57,550 - NETCONF edit-config Request sent, waiting for reply
2017-05-25 22:27:58,378 - NETCONF Transaction success!
2017-05-25 22:27:58,391 - Waiting for VNFM to process CREATE_IMAGE transaction
2017-05-25 22:28:06,339 - | CREATE_IMAGE | ab-auto-test-vnfm2-session-function | SUCCESS
 | (1/1)
```

```
2017-05-25 22:28:06,355 - NETCONF transaction completed successfully!
2017-05-25 22:28:06,367 - Images added successfully
2017-05-25 22:28:06,378 - Creating flavors ...
2017-05-25 22:28:06,388 - Creating flavors
2017-05-25 22:28:06,432 -   flavor: ab-auto-test-vnfm2-element-manager
2017-05-25 22:28:06,444 -     vcpus: 2
2017-05-25 22:28:06,457 -     memory_mb: 4096
2017-05-25 22:28:06,469 -     root_disk_mb: 40960
2017-05-25 22:28:06,481 -     ephemeral_disk_mb: 0
2017-05-25 22:28:06,491 -     swap_disk_mb: 0
2017-05-25 22:28:06,505 - NETCONF edit-config Request sent, waiting for reply
2017-05-25 22:28:06,781 - NETCONF Transaction success!
2017-05-25 22:28:06,793 - Waiting for VNFM to process CREATE_FLAVOR transaction
2017-05-25 22:28:07,286 - | CREATE_FLAVOR | ab-auto-test-vnfm2-element-manager | SUCCESS
 | (1/1)
2017-05-25 22:28:07,298 - NETCONF transaction completed successfully!
2017-05-25 22:28:07,310 - Creating flavors
2017-05-25 22:28:07,328 -   flavor: ab-auto-test-vnfm2-control-function
2017-05-25 22:28:07,341 -     vcpus: 8
2017-05-25 22:28:07,358 -     memory_mb: 16384
2017-05-25 22:28:07,374 -     root_disk_mb: 6144
2017-05-25 22:28:07,386 -     ephemeral_disk_mb: 0
2017-05-25 22:28:07,398 -     swap_disk_mb: 0
2017-05-25 22:28:07,410 - NETCONF edit-config Request sent, waiting for reply
2017-05-25 22:28:07,586 - NETCONF Transaction success!
2017-05-25 22:28:07,603 - Waiting for VNFM to process CREATE_FLAVOR transaction
2017-05-25 22:28:07,818 - | CREATE_FLAVOR | ab-auto-test-vnfm2-control-function | SUCCESS
 | (1/1)
2017-05-25 22:28:07,830 - NETCONF transaction completed successfully!
2017-05-25 22:28:07,842 - Creating flavors
2017-05-25 22:28:07,853 -   flavor: ab-auto-test-vnfm2-session-function
2017-05-25 22:28:07,865 -     vcpus: 8
2017-05-25 22:28:07,877 -     memory_mb: 16384
2017-05-25 22:28:07,889 -     root_disk_mb: 6144
2017-05-25 22:28:07,901 -     ephemeral_disk_mb: 0
2017-05-25 22:28:07,917 -     swap_disk_mb: 0
2017-05-25 22:28:07,928 - NETCONF edit-config Request sent, waiting for reply
2017-05-25 22:28:08,204 - NETCONF Transaction success!
2017-05-25 22:28:08,216 - Waiting for VNFM to process CREATE_FLAVOR transaction
2017-05-25 22:28:08,455 - | CREATE_FLAVOR | ab-auto-test-vnfm2-session-function | SUCCESS
 | (1/1)
2017-05-25 22:28:08,473 - NETCONF transaction completed successfully!
2017-05-25 22:28:08,489 - Flavors created successfully
2017-05-25 22:28:08,501 - Onboarding configuration file: ('control-function',
'staros_config.txt', 'http://172.21.201.63:5001/configs/vnf-pkg2/files/system.cfg')
2017-05-25 22:28:08,547 - NETCONF get-operational Request sent, waiting for reply
2017-05-25 22:28:08,724 - NETCONF Transaction success!
2017-05-25 22:28:08,855 - Notify VDU Create Catalog for : element-manager, status:
SUCCESS, txid: 562c18b0-4199-11e7-ad05-fa163ec6a7e4
2017-05-25 22:28:08,892 - Notify VDU Create Catalog for : control-function, status:
SUCCESS, txid: 562c18b0-4199-11e7-ad05-fa163ec6a7e4
2017-05-25 22:28:09,008 - Notify VDU Create Catalog for : session-function, status:
SUCCESS, txid: 562c18b0-4199-11e7-ad05-fa163ec6a7e4
2017-05-25 22:28:09,024 - NETCONF get-config Request sent, waiting for reply
2017-05-25 22:28:09,151 - NETCONF Transaction success!
2017-05-25 22:28:14,837 - Deployment: vnfd2-deployment started ...
2017-05-25 22:28:14,858 - Generating VNFD
2017-05-25 22:28:14,930 - VNFD generated successfully.
2017-05-25 22:28:14,966 - Generating configuration files for EM
2017-05-25 22:28:14,979 - Creating VIP Ports
2017-05-25 22:28:16,970 - VIP ports created successfully
2017-05-25 22:28:16,987 - Deploging EM
2017-05-25 22:28:17,000 - Added anti-affinity placement policy for ab-auto-test-vnfm2-em-1
2017-05-25 22:28:17,012 - Added anti-affinity placement policy for ab-auto-test-vnfm2-em-2
```

```
2017-05-25 22:28:17,025 - Added anti-affinity placement policy for ab-auto-test-vnfm2-em-3
2017-05-25 22:28:17,041 - Starting Service Deployment: ab-auto-test-vnfm2-em
2017-05-25 22:28:17,054 - Start VM: ab-auto-test-vnfm2-em-1
2017-05-25 22:28:17,066 - Start VM: ab-auto-test-vnfm2-em-2
2017-05-25 22:28:17,077 - Start VM: ab-auto-test-vnfm2-em-3
2017-05-25 22:28:17,089 - NETCONF edit-config Request sent, waiting for reply
2017-05-25 22:28:17,721 - NETCONF Transaction success!
2017-05-25 22:28:17,733 - Waiting for VNFM to process SERVICE_ALIVE transaction
2017-05-25 22:29:37,185 - | VM_DEPLOYED | ab-auto-test-vnfm2-em-1 | SUCCESS | Waiting
for: SERVICE_ALIVE|
2017-05-25 22:29:59,679 - | VM_ALIVE | ab-auto-test-vnfm2-em-1 | SUCCESS | Waiting for:
 SERVICE_ALIVE|
2017-05-25 22:30:42,170 - | VM_DEPLOYED | ab-auto-test-vnfm2-em-2 | SUCCESS | Waiting
for: SERVICE_ALIVE|
2017-05-25 22:30:59,620 - | VM_ALIVE | ab-auto-test-vnfm2-em-2 | SUCCESS | Waiting for:
 SERVICE_ALIVE|
2017-05-25 22:31:51,510 - | VM_DEPLOYED | ab-auto-test-vnfm2-em-3 | SUCCESS | Waiting
for: SERVICE_ALIVE|
2017-05-25 22:32:13,584 - | VM_DEPLOYED | c2 | SUCCESS | Waiting for: SERVICE_ALIVE|
2017-05-25 22:32:29,639 - | VM_ALIVE | ab-auto-test-vnfm2-em-3 | SUCCESS | Waiting for:
 SERVICE_ALIVE|
2017-05-25 22:32:29,661 - | SERVICE_ALIVE | ab-auto-test-vnfm2-em | SUCCESS | (1/1)
2017-05-25 22:32:29,674 - NETCONF transaction completed successfully!
2017-05-25 22:32:29,687 - EM Online !
2017-05-25 22:32:29,699 - HA-VIP[element-manager] : 172.67.11.12
2017-05-25 22:32:29,716 - HA-VIP[control-function] : 172.67.11.13
2017-05-25 22:32:29,729 - Deployment: vnfd2-deployment completed successfully.
2017-05-25 22:32:29,742 - NETCONF get-operational Request sent, waiting for reply
2017-05-25 22:32:30,221 - NETCONF Transaction success!
2017-05-25 22:32:30,261 - Notify EM Up
2017-05-25 22:32:30,274 - VNF Transaction completed successfully!
2017-05-25 22:32:30,292 - Notify deployment</log>
  </logs>
</config>
```

Viewing AutoVNF Operational Data

AutoVNF maintains history information for all transactions, associated events, and related error/information logs in persistent storage. These logs are useful for monitoring deployment progress and for troubleshooting issues.

These logs can be retrieved at time using the “task-id” returned as well as by running ConfD “show” commands.

To access these commands, you must be logged in to the Confd CLI as the *admin* user on the AutoVNF VM:

confd_cli -u admin -C

Table 14: ConfD Log Descriptions, on page 137 provides a list of the available commands and describes the information in the output.

Table 14: ConfD Log Descriptions

ConfD Command	Purpose
In releases prior to 6.0: **show autovnf-oper:errors** In 6.0 and later releases: **show uas**	Displays a list of any deployment errors that may have occurred.

ConfD Command	Purpose
In releases prior to 6.0: **show autovnf-oper:logs | display xml** In 6.0 and later releases: **show log | display xml**	Displays log messages for AutoVNF transactions.
In releases prior to 6.0: **show autovnf-oper:network-catalog** In 6.0 and later releases: **show vnf-packager**	Displays information for the networks deployed with USP.
In releases prior to 6.0: **show autovnf-oper:transactions** In 6.0 and later releases: **show transaction**	Displays a list of transaction IDs that correspond to the USP deployment along with their execution date, time, and status.
In releases prior to 6.0: **show autovnf-oper:vdu-catalog** In 6.0 and later releases: **show vnfr**	Displays information pertaining to the virtual descriptor units (VDUs) used to deploy USP.
In releases prior to 6.0: **show autovnf-oper:vip-port** In 6.0 and later releases: **show vnfr**	Displays information port, network, and virtual IP addresses information.
In releases prior to 6.0: **show autovnf-oper:vnfm** In 6.0 and later releases: **show vnfr**	Displays information pertaining to the VNFM deployment and UEM VM deployment.
show confd-state	Displays information pertaining to confd-state on AutoVNF.
show confd-state ha	Displays information pertaining to HA specific confd-state on AutoVNF.
show log <*transaction_id*>	Displays detailed log information for a specific transaction ID.
show running-config	Displays the configuration running on the AutoVNF.
show uas	Displays information pertaining to the AutoVNF VM deployment.

ConfD Command	Purpose
In releases prior to 6.0: **show usp** In 6.0 and later releases: **show vnfr**	Displays information pertaining to the overall USP VM deployment.

NOTES:

- Log information can be saved out of ConfD to a file for later retrieval using one of the following commands:

  show log *transaction_id* **| save** *url*

  OR

  show autovnf-oper: *command* **| save** *url*

  Where *transaction_id* is a specific ID, *url* is a valid directory path, and *command* is one of the command operators identified in Table 14: ConfD Log Descriptions, on page 137.

Example show confd-state Command Output

show confd-state

```
confd-state version 6.3.1
confd-state epoll false
confd-state daemon-status started
confd-state ha mode master
confd-state ha node-id confd-master
confd-state ha connected-slave [ a2dd5178-afae-4b3a-8b2b-910216583501 ]

                    EXPORTED
NAME                        REVISION    NAMESPACE
      PREFIX         TO ALL    EXPORTED TO
-------------------------------------------------------------------------------------------
iana-crypt-hash             2014-08-06  urn:ietf:params:xml:ns:yang:iana-crypt-hash
      ianach         X         -
ietf-inet-types             2013-07-15  urn:ietf:params:xml:ns:yang:ietf-inet-types
      inet           X         -
ietf-netconf-acm            2012-02-22  urn:ietf:params:xml:ns:yang:ietf-netconf-acm
      nacm           X         -
ietf-netconf-monitoring     2010-10-04  urn:ietf:params:xml:ns:yang:ietf-netconf-monitoring
     ncm            X          -
<-- SNIP -->
```

Example show confd-state ha Command Output

show confd-state ha

```
confd-state ha mode master
confd-state ha node-id confd-master
confd-state ha connected-slave [ a2dd5178-afae-4b3a-8b2b-910216583501 ]
```

Example show log Command Output

show log *<transaction_id>* **| display xml**

Example show running-config Command Output

show running-config

```
<-- SNIP -->
autovnf:secure-token autovnf-admin
 user     $8$YQiswhu0QLpA4N2kBo7t5eZN2uUW0L19m8WaaBzkVoc=
 password $8$mSaszfxjZ8My8Y/FqLL3Sasn1b/DmRh3pdblatq49cM=
!
autovnf:secure-token autovnf-oper
 user     $8$kTEQZ4YNdV6BcnH3ggRHJPmhk6lsh5KQFqhsQnh/KV8=
 password $8$KdTBd7ZeYuHrpdkLk5m888ckE3ZGIM7RbEMJwMwCjfo=
!
autovnf:secure-token em-login
 user     $8$jVDkSMi/W1XzkZj/qx07kEfHB9PlpPlnzCKUSjWiPXA=
 password $8$52ELrKMilGT/nad5WcPgUh7cijHiizAt8A8Tly79Q/I=
!
autovnf:secure-token confd-auth
 user     $8$bHYvP179/hlGWO8qoTnJFmm8A1HqqlREsasX+GlSAPw=
 password $8$S52APq1vb9WhLjbSPNSWiBmAmaG1tzTTmSkktKs8reo=
!
volume-catalog em-volume
 volume type LUKS
 volume size 1024
 volume bus ide
 volume bootable false
!
volume-catalog cf-boot
 volume type LUKS
 volume size 16
 volume bus ide
 volume bootable true
!
volume-catalog cf-cdr
 volume type LUKS
 volume size 200
 volume bus ide
 volume bootable false
!
autovnf:network-catalog di-internal1
 pre-created di-internal1
 type        sriov-flat
 physnet     phys_pcie1_0
 ip-prefix   192.168.1.0/24
 dhcp        true
 vlan-tag    true
 vlan        2110
<-- SNIP -->

<-- SNIP -->
autovnf:vdu-catalog control-function
 ha-type                one-to-one
 health-check-frequency 10
 health-probe-max-miss  6
 recovery-type          recovery-restart
 image location http://172.21.201.63:80/bundles/5.1.0-662/ugp-bundle/qvpc-di-cf.qcow2
 neds netconf
  ned-id         cisco-staros-nc
  port-number    830
  authentication confd-auth
 !
 volumes cf-cdr
 !
 volumes cf-boot
```

```
 !
 flavor host-aggregate   auto-test-sjc-cf-esc-mgmt1
 flavor vcpus            8
 flavor ram              16384
 flavor root-disk        6
 flavor ephemeral-disk   0
 flavor swap-disk        0
 flavor anti-affinity-placement true
 configuration staros_config.txt
  apply-at   day-zero
  source-url http://172.21.201.63:5001/configs/vnf-pkg1/files/system.cfg
<-- SNIP -->
```

Example show uas Command Output

```
show uas
uas version               6.0.0
uas state                 active
uas external-connection-point 50.50.50.67 INSTANCE
IP         STATE  ROLE
-------------------------------
10.2.3.6   alive  CONFD-MASTER
10.2.3.11  alive  CONFD-SLAVE

NAME                                        LAST HEARTBEAT
-------------------------------------------------------------
AutoVNF-MASTER                              2018-01-20 02:35:03
ESCHeartBeatMonitor-fremont-autovnf-vpc  2018-01-20 02:35:00
USPCFMWorker                                2018-01-20 02:34:51
USPCHBWorker                                2018-01-20 02:35:00
USPCWorker                                  2018-01-20 02:35:00
```

Important In this example, 10.2.3.6 is the confd-master and the active UAS VM.

Important In case of standalone mode (non-HA) deployments, the *uas external-connection-point* information and *Instance IP* table are not applicable and are not displayed.

Example output that shows the floating IP for AutoVNF:

```
-SNIP-
nsd autoit
 vim-identity vim1
 vim-artifact vim_artifact_one
 vnf-package  [ usp_5_7 ]
 vld mgmt
  vl-type          management
  network-instance bmarconi-management
 !
 vld orch
  vl-type orchestration
  network sjc-orch
 !
 vnfd f-autovnf
  vnf-type          usp-uas
  version           6.0
  high-availability true
  nsd               fremont-autovnf
```

```
  configuration boot-time 1800
  configuration set-vim-instance-name true
  external-connection-point avf
   connection-point eth0
   floating-ip enabled
   floating-ip external-network public
  !
  vnfc avf
   health-check disabled
   health-check boot-time 300
   vdu vdu-id autovnf
   connection-point eth0
    virtual-link service-vl mgmt
   !
   connection-point eth1
    virtual-link service-vl orch
   !
  !
 !
!
-SNIP-
```

The current version of AutoVNF software can also be seen through the USP UWS – AutoVNF User Interface under –

- the Site Overview screen (Service Deployment > Site) only if the AutoVNF configuration type is a record.
- the Auto-Vnf Configuration Overview screen only if the AutoVNF configuration type is a record.
- the UWS – AutoVNF dashboard.

Example show vnfr Command Output

show vnfr

```
vnfr sj-autovnf-esc
 vnfd     esc
 vnf-type esc
 state    deployed
 external-connection-point esc
  connection-point-instance-id sj-autovnf-esc-ha-vip
  virtual-link-ref             uas-management
  ip-address                   12.12.12.40
  mac-address                  fa:16:3e:6a:db:9b
  connection-point-type        virtual-port
  port-id                      37a14e07-52f7-48c0-9dbb-471146a709a5
 vdu esc
  vnfc-instance sj-autovnf-esc-esc-1
   state      deployed
   vnfc       esc
   flavor-key sj-autovnf-esc
   uuid       83f44e0f-380e-4320-a35a-34de82cf84dd
   image name /vnfm-bundle/ESC-4_2_0_74.qcow2
   image version "Version: 4.2.0.74, SHA1: de45b53, Date: Sat Sep 01 08:51:12 EDT 2018"
   image package usp_6_0
   image uuid c35c2a86-6d60-4259-85cc-d023803c7245
   host       tb2-compute-15.localdomain
   vdu-type   cisco-esc
   connection-point-instance eth0
    virtual-link-ref      uas-management
    ip-address            12.12.12.22
    mac-address           fa:16:3e:e8:d6:b1
    connection-point-type virtual-port
```

```
     port-id               f0f6b82f-336f-4f9f-aae5-d581be8cfa63
    connection-point-instance eth1
     virtual-link-ref      uas-orchestration
     ip-address            22.22.22.27
     mac-address           fa:16:3e:16:32:4c
     connection-point-type virtual-port
     port-id               f2b7aeae-83f1-4f83-b45e-f92b3a1f6600
   vnfc-instance sj-autovnf-esc-esc-2
    state      deployed
    vnfc       esc
    flavor-key sj-autovnf-esc-esc
    uuid       087a5b48-db45-4002-a157-51fa37236545
    image name /vnfm-bundle/ESC-4_2_0_74.qcow2
    image version "Version: 4.2.0.74, SHA1: de45b53, Date: Sat Sep 01 08:51:12 EDT 2018"
    image package usp_6_0
    image uuid c35c2a86-6d60-4259-85cc-d023803c7245
    host       tb2-compute-12.localdomain
    vdu-type   cisco-esc
    connection-point-instance eth0
     virtual-link-ref      uas-management
     ip-address            12.12.12.37
     mac-address           fa:16:3e:48:c4:6c
     connection-point-type virtual-port
     port-id               8cb138ab-c575-4eb2-a622-d2648042f48f
    connection-point-instance eth1
     virtual-link-ref      uas-orchestration
     ip-address            22.22.22.28
     mac-address           fa:16:3e:98:78:07
     connection-point-type virtual-port
     port-id               7d73aeae-81e1-410b-ac3a-e34c1bd23c16
vnfr sj-autovnf-vpc
 vnfd     vpc
 vnf-type ugp
 state    ha-error
 external-connection-point cf
  connection-point-instance-id CF-sj-autovnf-vpc-vip
  virtual-link-ref             uas-management
  ip-address                   12.12.12.43
  mac-address                  fa:16:3e:04:80:b7
  connection-point-type        virtual-port
  port-id                      984a6e8b-107a-48f7-b0b4-398a308aff9a
 external-connection-point em
  connection-point-instance-id em-sj-autovnf-vpc-vip
  virtual-link-ref             uas-management
  ip-address                   12.12.12.35
  mac-address                  fa:16:3e:b4:7e:b8
  connection-point-type        virtual-port
  port-id                      f47c2150-932c-455f-99c1-7b77fe47a9d7
 vdu cf
  vnfc-instance sj-autovnf-vpc-cf-0
   state      alive
   vnfc       cf
   flavor-key sj-autovnf-vpc-cf
   uuid       a46de643-b76d-4307-91e8-996b79da4c1e
   image name /ugp-bundle/qvpc-di-cf.qcow2
   image version "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
   image package usp_6_0
   image uuid 6d63f613-9b46-4bd9-853d-024dcf27f1a7
   host       tb2-compute-9.localdomain
   vdu-type   control-function
   connection-point-instance eth0
    virtual-link-ref      di-internal1
    ip-address            192.168.10.105
    mac-address           fa:16:3e:46:f8:79
```

```
    connection-point-type pnic-sriov
    port-id               b408eedd-8650-44e2-930c-95ee2c9ae380
   connection-point-instance eth1
    virtual-link-ref      uas-management
    ip-address            12.12.12.44
    mac-address           fa:16:3e:5e:e0:bc
    connection-point-type virtual-port
    port-id               3e94bcdb-0e58-44e1-99a5-366f7453df02
   connection-point-instance eth2
    virtual-link-ref      uas-orchestration
    ip-address            22.22.22.33
    mac-address           fa:16:3e:c5:58:c6
    connection-point-type virtual-port
    port-id               e0a51253-5740-4e34-b4a2-ba6cdaa504cf
  vnfc-instance sj-autovnf-vpc-cf-1
   state      alive
   vnfc       cf
   flavor-key sj-autovnf-vpc-cf
   uuid       10b1e4c2-d3e5-494c-bec9-26bd38e4c705
   image name /ugp-bundle/qvpc-di-cf.qcow2
   image version "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
   image package usp_6_0
   image uuid 6d63f613-9b46-4bd9-853d-024dcf27f1a7
   host       tb2-compute-12.localdomain
   vdu-type   control-function
   connection-point-instance eth0
    virtual-link-ref      di-internal1
    ip-address            192.168.10.99
    mac-address           fa:16:3e:94:3d:38
    connection-point-type pnic-sriov
    port-id               c1df9769-fcdc-4cb1-b7ea-f791ef80ff65
   connection-point-instance eth1
    virtual-link-ref      uas-management
    ip-address            12.12.12.47
    mac-address           fa:16:3e:66:27:71
    connection-point-type virtual-port
    port-id               7d77aac2-6409-499a-a4b0-afc4c70e6904
   connection-point-instance eth2
    virtual-link-ref      uas-orchestration
    ip-address            22.22.22.45
    mac-address           fa:16:3e:c3:c1:a4
    connection-point-type virtual-port
    port-id               75d7b8c7-1801-4cce-b665-64a060414abd
 vdu em
  vnfc-instance sj-autovnf-vpc-em-1
   state      ha-error
   vnfc       em
   flavor-key sj-autovnf-vpc-em
   uuid       119edc4c-9ba0-48f8-a928-63e0c3c88f22
   image name /em-bundle/em-6_3_0_4148.qcow2
   image version "Version: 6.3.0, SHA1: 40d8f29, Date: Thu Aug 30 22:15:22 EDT 2018"
   image package usp_6_0
   image uuid d21b6d92-9964-4db8-8376-4a645fecfbf2
   host       tb2-compute-14.localdomain
   vdu-type   element-manager
   connection-point-instance eth0
    virtual-link-ref      uas-orchestration
    ip-address            22.22.22.40
    mac-address           fa:16:3e:33:57:a6
    connection-point-type virtual-port
    port-id               050d8843-f309-45b3-889a-a1516a338c9f
   connection-point-instance eth1
    virtual-link-ref      uas-management
    ip-address            12.12.12.26
```

```
    mac-address           fa:16:3e:02:b8:4a
    connection-point-type virtual-port
    port-id               ae8036c5-1a91-488d-98f2-65a8fe57a033
  vnfc-instance sj-autovnf-vpc-em-2
   state      ha-error
   vnfc       em
   flavor-key sj-autovnf-vpc-em
   uuid       dd2c9327-c954-49bf-803c-ca38d718da2c
   image name /em-bundle/em-6_3_0_4148.qcow2
   image version "Version: 6.3.0, SHA1: 40d8f29, Date: Thu Aug 30 22:15:22 EDT 2018"
   image package usp_6_0
   image uuid d21b6d92-9964-4db8-8376-4a645fecfbf2
   host       tb2-compute-15.localdomain
   vdu-type   element-manager
   connection-point-instance eth0
    virtual-link-ref      uas-orchestration
    ip-address            22.22.22.46
    mac-address           fa:16:3e:e5:f7:18
    connection-point-type virtual-port
    port-id               30816589-9a12-4c1d-840c-c84100f714f4
   connection-point-instance eth1
    virtual-link-ref      uas-management
    ip-address            12.12.12.45
    mac-address           fa:16:3e:f3:ff:4e
    connection-point-type virtual-port
    port-id               cf9d991f-e45b-41ed-9ac1-7e6f0bee620b
vdu sf
 vnfc-instance sj-autovnf-vpc-sf-0
  state      alive
  vnfc       sf
  flavor-key sj-autovnf-vpc-sf
  uuid       d9b13253-a67e-4078-a75c-04d834577cc2
  image name /ugp-bundle/qvpc-di-xf.qcow2
  image version "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
  image package usp_6_0
  image uuid c65df544-0230-4e86-88bf-4aa93e0e268d
  host       tb2-compute-14.localdomain
  vdu-type   session-function
  connection-point-instance eth0
   virtual-link-ref      di-internal1
   ip-address            192.168.10.95
   mac-address           fa:16:3e:87:49:22
   connection-point-type pnic-sriov
   port-id               5d9a9a89-5857-48cb-8081-7273c4b9354c
  connection-point-instance eth1
   virtual-link-ref      uas-orchestration
   ip-address            22.22.22.18
   mac-address           fa:16:3e:8f:47:ce
   connection-point-type virtual-port
   port-id               d7dd7006-0134-4767-af02-1922d351d1d5
  connection-point-instance eth2
   virtual-link-ref      vpc-svc
   ip-address            22.11.11.8
   mac-address           fa:16:3e:a6:fa:9e
   connection-point-type virtual-port
   port-id               1c5dda23-65f0-4541-ace5-0d6e5e1564ea
 vnfc-instance sj-autovnf-vpc-sf-1
  state      alive
  vnfc       sf
  flavor-key sj-autovnf-vpc-sf
  uuid       868158de-e202-4af4-9f3e-c5c7722c5a7f
  image name /ugp-bundle/qvpc-di-xf.qcow2
  image version "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
  image package usp_6_0
```

```
  image uuid c65df544-0230-4e86-88bf-4aa93e0e268d
  host       tb2-compute-15.localdomain
  vdu-type   session-function
  connection-point-instance eth0
   virtual-link-ref      di-internal1
   ip-address            192.168.10.97
   mac-address           fa:16:3e:bb:ee:38
   connection-point-type pnic-sriov
   port-id               c166c76d-3ef9-4f52-a243-25b49ae0886f
  connection-point-instance eth1
   virtual-link-ref      uas-orchestration
   ip-address            22.22.22.47
   mac-address           fa:16:3e:b0:8e:75
   connection-point-type virtual-port
   port-id               9dd61ba8-9455-4f0a-a6ce-13ef28ce6c39
  connection-point-instance eth2
   virtual-link-ref      vpc-svc
   ip-address            22.11.11.13
   mac-address           fa:16:3e:25:5a:56
   connection-point-type virtual-port
   port-id               3f8b60aa-4155-4192-b537-afb812d784da
```

Example show vnf-packager Command Output

show vnf-packager

```
version     "Version: 6.4.M0, SHA1: cdd46bcm, Build-Number: 0"
image application-function
 image-uri   /ugp-bundle/qvpc-di-xf.qcow2
 vim-id      c65df544-0230-4e86-88bf-4aa93e0e268d
 version     "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
 disk-format qcow2
image automation-service
 image-uri   /uas-bundle/usp-uas-6.3.0-0.qcow2
 vim-id      b32d2aeb-9dbe-42f0-99bf-982db8ae7ae8
 version     "Version: 6.3.0, SHA1: 175ea8em, Date: Thu Sep 06 16:17:26 PDT 2018"
 disk-format qcow2
image cisco-esc
 image-uri   /vnfm-bundle/ESC-4_2_0_74.qcow2
 vim-id      c35c2a86-6d60-4259-85cc-d023803c7245
 version     "Version: 4.2.0.74, SHA1: de45b53, Date: Sat Sep 01 08:51:12 EDT 2018"
 disk-format qcow2
image control-function
 image-uri   /ugp-bundle/qvpc-di-cf.qcow2
 vim-id      6d63f613-9b46-4bd9-853d-024dcf27f1a7
 version     "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
 disk-format qcow2
image element-manager
 image-uri   /em-bundle/em-6_3_0_4148.qcow2
 vim-id      d21b6d92-9964-4db8-8376-4a645fecfbf2
 version     "Version: 6.3.0, SHA1: 40d8f29, Date: Thu Aug 30 22:15:22 EDT 2018"
 disk-format qcow2
image network-function
 image-uri   /ugp-bundle/qvpc-di-xf.qcow2
 vim-id      c65df544-0230-4e86-88bf-4aa93e0e268d
 version     "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
 disk-format qcow2
image session-function
 image-uri   /ugp-bundle/qvpc-di-xf.qcow2
 vim-id      c65df544-0230-4e86-88bf-4aa93e0e268d
 version     "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
 disk-format qcow2
image user-plane-function
```

```
  image-uri   /ugp-bundle/qvpc-si-21.10.M0.70226.qcow2
  vim-id      078bc882-d29c-4974-a21d-dbf2bc59149b
  version     "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
  disk-format qcow2
 configuration bootvm
  data-id 1538437650-071830
 configuration staros
  data-id 1538437650-060109
vnf-packager 6.4.M0-6133
 vnf-package usp_6_t
 version     "Version: 6.4.M0, SHA1: cdd46bcm, Build-Number: 6133"
 image application-function
  image-uri   /ugp-bundle/qvpc-di-xf.qcow2
  vim-id      d3b3dd85-464d-4b49-90f1-5dc59c9a111b
  version     "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
  disk-format qcow2
 image automation-service
  image-uri   /uas-bundle/usp-uas-6.3.0-4206.qcow2
  vim-id      294e5f52-453a-4bd8-8192-b8144607759f
  version     "Version: 6.3.0, SHA1: 175ea8e, Date: Wed Sep 05 06:15:40 EDT 2018"
  disk-format qcow2
 image cisco-esc
  image-uri   /vnfm-bundle/ESC-4_2_0_74.qcow2
  vim-id      87a322cc-3736-407d-855f-f2a566fadd22
  version     "Version: 4.2.0.74, SHA1: de45b53, Date: Sat Sep 01 08:51:12 EDT 2018"
  disk-format qcow2
 image control-function
  image-uri   /ugp-bundle/qvpc-di-cf.qcow2
  vim-id      22b34ebf-060c-4e99-8083-e702cef96aca
  version     "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
  disk-format qcow2
 image element-manager
  image-uri   /em-bundle/em-6_3_0_4148.qcow2
  vim-id      c4424476-a9b6-4308-98b3-4aa0f441d5c1
  version     "Version: 6.3.0, SHA1: 40d8f29, Date: Thu Aug 30 22:15:22 EDT 2018"
  disk-format qcow2
 image network-function
  image-uri   /ugp-bundle/qvpc-di-xf.qcow2
  vim-id      d3b3dd85-464d-4b49-90f1-5dc59c9a111b
  version     "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
  disk-format qcow2
 image session-function
  image-uri   /ugp-bundle/qvpc-di-xf.qcow2
  vim-id      d3b3dd85-464d-4b49-90f1-5dc59c9a111b
  version     "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
  disk-format qcow2
 image user-plane-function
  image-uri   /ugp-bundle/qvpc-si-21.10.M0.70226.qcow2
  vim-id      8c78ef58-4556-4e8c-bef6-8f98a33bf6c1
  version     "Version: 21.10.M0.70226, SHA1: NA, Date: Thu Sep 06 10:07:27 EDT 2018"
  disk-format qcow2
 configuration bootvm
  data-id 1538437651-235460
 configuration staros
  data-id 1538437651-221341
```

Monitoring VNFM Operations

Note The Cisco Elastic Services Controller (ESC) is the only VNFM supported in this release.

Viewing ESC Status

ESC status can be viewed from the ESC command line or by executing a REST API from AutoVNF.

Monitoring StatusThrough the ESC Command Line

Log on to the primary ESC VM and execute the following command from the command line:

escadm status

Example command output:

```
0 ESC status=0 ESC Master Healthy
```

Monitoring Status Through an AutoVNF API

Log on to the master AutoVNF VM and execute the following command:

curl -u admin:*<password>* **-k https://***<master_vnfm_address>***:60000/esc/health**

Example command output:

```
{"message": "ESC services are running.", "status_code": "2000"}
```

Status code and message display information about ESC health conditions as identified in Table 15: ESC Status Code Messages, on page 148. Status codes in the 2000s imply ESC is operational, 5000 status codes imply at least one of the ESC components is not in service.

Table 15: ESC Status Code Messages

Code	Message
2000	ESC services are running
2010	ESC services are running. ESC High-Availability node not reachable.
2020	ESC services are running. One or more VIM services (keystone, nova) not reachable.*
2030	ESC services are running. VIM credentials not provided.
2040	ESC services running. VIM is configured, ESC initializing connection to VIM.
2100	ESC services are running. ESC High-Availability node not reachable. One or more VIM services (nova) not reachable
5010	ESC service ESC_MANAGER not running.

Code	Message
5020	ESC service CONFD not running.
5030	ESC service MONA not running.
5040	ESC service VIM_MANAGER not running.
5090	More than one ESC service (confd, mona) not running.**

Viewing ESC Health

ESC health can be viewed by logging on to the primary ESC VM and executing the following command from the command line:

`health.sh`

Example command output:

```
esc ui is disabled -- skipping status check
esc_monitor start/running, process 840
esc_mona is up and running ...
vimmanager start/running, process 2807

vimmanager start/running, process 2807
esc_confd is started
tomcat6 (pid 2973) is running...                           [  OK  ]
postgresql-9.4 (pid  2726) is running...
ESC service is running...
Active VIM = OPENSTACK
ESC Operation Mode=OPERATION

/opt/cisco/esc/esc_database is a mountpoint
============== ESC HA (MASTER) with DRBD =================
DRBD_ROLE_CHECK=0
MNT_ESC_DATABSE_CHECK=0
VIMMANAGER_RET=0
ESC_CHECK=0
STORAGE_CHECK=0
ESC_SERVICE_RET=0
MONA_RET=0
ESC_MONITOR_RET=0
=======================================
ESC HEALTH PASSED
```

Viewing ESC Logs

ESC logs are available on the VNFM VM in the following directory:

/var/log/esc/

Two levels of logs are available for ESC:

- ESC Logs, on page 150
- ESC YANG Logs, on page 151

Refer also to the ESC user documentation for additional information on monitoring and maintaining the software.

ESC Logs

To collect ESC logs:

1. Log on to the primary VNFM VM.
2. Navigate to the scripts directory.

   cd /opt/cisco/esc/esc-scripts
3. Launch the *collect-esc-logs.sh* script to collect the logs.

   sudo ./collect-esc-logs.sh

Example log output:

```
We trust you have received the usual lecture from the local System
Administrator. It usually boils down to these three things:

    #1) Respect the privacy of others.
    #2) Think before you type.
    #3) With great power comes great responsibility.

[sudo] password for admin: Creating log tarball:
/var/tmp/esc_log-2017-05-25_18.09.31_UTC.tar.bz2
Creating temporary working directory: /var/tmp/esc_log-2017-05-25_18.09.31_UTC

Dumping thread status of ESCManager from tomcat pid 2973 to catalina.out
escadm-output.txt
vm_info.txt
esc_version.txt
esc/
esc/vimmanager/
esc/vimmanager/operations_vimmanager.log
esc/vimmanager/vimmanager.log
esc/esc_gc.log.2.current
esc/esc_gc.log.0
esc/escmanager.log
esc/event_escmanager.log
esc/escmanager_tagged.log
esc/esc_gc.log.1
esc/custom_script/
esc/pgstartup.log
esc/mona/
esc/mona/actions_mona.log
esc/mona/mona_gc.log.0.current
esc/mona/rules_mona.log
esc/mona/mona.log
tar: esc/mona/mona.log: file changed as we read it
esc/confd/
esc/confd/global.data
esc/confd/devel.log
esc/confd/confd.log
esc/confd/browser.log
esc/confd/audit.log
esc/confd/netconf.trace
esc/confd/netconf.log
esc/spy.log
esc/error_escmanager.log
esc/esc_monitor.log
```

```
esc/esc_haagent.log
esc/yangesc.log
esc/debug_yangesc.log
esc/esc_confd.log
boot.log
secure
messages
dmesg
tomcat6/
tomcat6/localhost.2017-05-24.log
tomcat6/host-manager.2017-05-24.log
tomcat6/manager.2017-05-24.log
tomcat6/catalina.out
tomcat6/catalina.2017-05-24.log
audit/
audit/audit.log
postgresql/data/pg_log/
postgresql/data/pg_log/postgresql-Thu.log
postgresql/data/pg_log/postgresql-Wed.log
esc-config/esc-config.xml
Warning: tar completed with status: 1

Tarball file:  /var/tmp/esc_log-2017-05-25_18.09.31_UTC.tar.bz2
Symbolic link: /tmp/esc_log-2017-05-25_18.09.31_UTC.tar.bz2

Suggestions:
 1. Transfer the tarball file from the esc vm
 2. Remove the tarball and symbolic link (to save ESC disk space):
     sudo rm /var/tmp/esc_log-2017-05-25_18.09.31_UTC.tar.bz2
     sudo rm /tmp/esc_log-2017-05-25_18.09.31_UTC.tar.bz2
 3. Command to list contents of tarball:
     tar jtvf esc_log-2017-05-25_18.09.31_UTC.tar.bz2
 4. Command to extract from the tarball:
     tar jxf esc_log-2017-05-25_18.09.31_UTC.tar.bz2
```

ESC YANG Logs

ESC YANG logs are stored in the following file:

/var/log/esc/yangesc.log

Monitoring VNF Operations

Viewing UEM Service Status

1. Log on to the master UEM VM as the user *ubuntu*.
2. Access the NCS CLI.

   /opt/cisco/usp/packages/nso/ncs-4.1.1/bin/ncs_cli -C -u admin
3. Check the NCS state.

   show ncs-state ha

   Example command output:

   ```
   ncs-state ha mode master
   ncs-state ha node-id 3-1501714180
   ncs-state ha connected-slave [ 4-1501714262 ]
   ```

4. Display the health of cluster.

   show ems

   Example command output:

```
EM            VNFM
ID  SLA  SCM  PROXY  VERSION
------------------------------
3   UP   UP   UP     5.7.0
6   UP   UP   UP     5.7.0
```

Viewing UEM Logs

To collect UEM logs:

1. Navigate to the *scripts* directory.

   cd /opt/cisco/em-scripts

2. Launch the *collect-em-logs.sh* script to collect the logs.

   sudo ./collect-em-logs.sh

   Example log output:

```
Collecting Zookeeper nodes...
Traceback (most recent call last):
  File "/opt/cisco/em-scripts/zk_dump.py", line 2, in <module>
    from kazoo.client import KazooClient
ImportError: No module named kazoo.client

Creating log tarball em-logs-2017-05-26_00.37.28_UTC.tar.bz2 ...
em-logs/
em-logs/upstart/
em-logs/upstart/proxy.log
em-logs/upstart/zk.log
em-logs/upstart/ncs.log
em-logs/scm/
em-logs/scm/audit.log.1.gz
em-logs/scm/ncserr.log.1
em-logs/scm/ncs-java-vm.log.2.gz
em-logs/scm/xpath.trace.1.gz
em-logs/scm/ncs-java-vm.log.1.gz
em-logs/scm/xpath.trace.2.gz
em-logs/scm/ncs-java-vm.log
em-logs/scm/ncserr.log.siz
em-logs/scm/xpath.trace
em-logs/scm/audit.log
em-logs/scm/audit.log.2.gz
em-logs/scm/ncserr.log.idx
em-logs/sla/
em-logs/sla/sla-mgr.log
em-logs/sla/sla-system.log
em-logs/zookeeper/
em-logs/zookeeper/zookeeper.out
em-logs/zookeeper/zookeeper.log
em-logs/vnfm-proxy/
em-logs/vnfm-proxy/vnfm-proxy.log

=============== Tarball available at: /tmp/em-logs-2017-05-26_00.37.28_UTC.tar.bz2
===============
```

```
To extract the tarball, run: "tar jxf /tmp/em-logs-2017-05-26_00.37.28_UTC.tar.bz2"
```

Viewing UEM Zookeeper Logs

The UEM maintains logs on the Zookeeper process. The logs are located in the following directories:

```
/var/log/em/zookeeper/zookeeper.log
```

```
/var/log/em/zookeeper/zookeeper.out
```

Viewing VNF Information through the Control Function

Information on the VNF deployment can be obtained by executing commands on the Control Function (CF) VNFC. To access the CF CLI:

1. Open an SSH connection to the IP address of the management interface associated with CF1.
2. Press **Enter** to bring up the log in prompt.
3. Enter the username and password.
4. At the Exec mode prompt, enter each of the following commands and observe the results to ensure that the VNF components have been properly deployed according to the desired configuration:

Command	Purpose
show card table	Displays all VM types (e.g. CF, SF, NF, and AF) that have been deployed.
show crash list	Displays software crash events records and associated dump files (minicore, NPU or kernel) for all crashes or a specified crash event. Verify that there are no new or unexpected crashes listed.
show emctrl vdu list	Displays card to VM mappings for the VNF. Each card should have a valid universally unique identifier (UUID).
show rct stats	Displays statistics associated with Recovery Control Task (RCT) events, including migrations, switchovers and shutdowns. RCT statistics are associated with card-to-card session recovery activities.
show session progress	Displays session progress information for the current context filtered by the options specified. Check for any active or new calls before proceeding with a deactivation.
show version verbose	Displays the software version that has been deployed.
show vdu summary	Displays general information pertaining to the virtual descriptor units (VDUs) that have been deployed.

Command	Purpose
In releases prior to 6.0: **show usf vdu all** In 6.0 and later releases: **show vnfr vdu all**	Displays detailed information for the VDUs that have been deployed for the USF VDU.
In releases prior to 6.0: **show usf vdu-group all** In 6.0 and later releases: **show vnfr vdu-group all**	Displays information for VDU groups pertaining to the USF VNF use case (if deployed).
In releases prior to 6.0: **show usf network-path all** In 6.0 and later releases: **show vnfr network-path all**	Displays network path information for USF VNF components (if deployed).
In releases prior to 6.0: **show usf service-function-chain all** In 6.0 and later releases: **show vnfr service-function-chain all**	Displays SFC information for the USF VNF (if deployed).

Monitoring and Recovering AutoVNF Through AutoIT

AutoIT provides the ability to monitor and auto-recover AutoVNF instances.

This functionality is enabled through configuration of the AutoVNF VNFC(s) at the time of deployment. Once enabled, AutoIT automatically monitors for faults/failures of the AutoVNF VNFC(s) for which the functionality is enabled. If a fault/failure is detected, AutoIT automatically attempts to auto-heal/recover (redeploy) the VNFC(s).

Important The Provisioning Network (floating) IP address is required to leverage the health monitoring functionality.

The following parameters must be configured at the VNFC-level:

Table 16: Health Check Descriptor Parameters

Parameter	Required	Type	Description
enabled	O	bool	Enable/Disable health monitoring.

Parameter	Required	Type	Description
probe-frequency	O	uint16	Health Check Frequency in seconds. UAS uses this as health probe time, meaning every polling interval UAS will invoke health check. Default value is 10 seconds.
probe-max-miss	O	uint16	Maximum number of health probe misses before VNFC instance is declared dead. Default value is 6.
recovery-type	O	choice string	Recovery type. It can be one of the following: • restart: Recovery only by restarting, move the VNFC instance to error after max retries • external: Recovery performed by external entity. No auto-recovery • restart-then-redeploy: Restart the VM on failure. After maximum retries, redeploy the failed VNFC instances. Default value is restart-then-redeploy.
retry-count	O	uint16	Number of retries to recover the VNFC Instance. Default value is set to restart-then-redeploy.
boot-time	O	uint16	Initial Bootup time for the VNFC. Default value is 300 seconds.
script	O	string	Script to check VNFC health, by default UAS ICMP script will be used.

The above parameters are configured at the VNFC-level within the VNF descriptor information that is part of the deployment network service descriptor (NSD) as shown in the following example configuration:

```
nsd <nsd_name>
…
 vnfd <autovnf_vnfd_name>
…
  vnfc <autovnf_vnfc_name>
   health-check enabled
   health-check probe-frequency 10
   health-check probe-max-miss 6
   health-check retry-count 6
   health-check recovery-type restart-then-redeploy
   health-check boot-time 300
…
```

Refer to the *Cisco Ultra Services Platform NETCONF API Guide* for more information on the use of these and other parameters related to VNF configuration and deployment.

In the event that automatic recovery is not possible, an API is available to manually recover the VNFC(s).

VNFC status can be viewed by executing the **show vnfr** command from AutoIT. Additional details can be found in the transaction logs for the deployment.

To manually recover a failed AutoVNF VNFC, execute the following command:

recover nsd-id *<nsd_name>* **vnfd** *<vnfd_name>*

Monitoring and Recovering VNFC Through AutoVNF

The UEM, CF, and SF VNFCs were autorecovered through the VNFM (ESC). In these situations, AutoVNF was not informed of these events. With this release, the AutoVNF monitors these VNFC VMs and can auto-recover them if required. Additionally, the AutoVNF can also monitor the VNFM (ESC) VMs and provide auto-recovery as needed.

This functionality is enabled through configuration of the VNFC(s) at the time of deployment. Once enabled, AutoVNF automatically monitors for faults/failures of the VNFCs for which the functionality is enabled. If a fault/failure is detected, AutoVNF automatically attempts to auto-heal/recover (redeploy) the VNFC(s).

Important The Provisioning Network (floating) IP address is required to leverage the health monitoring functionality.

This functionality is currently only supported for the following VNFCs:

- VNFM (ESC)
- UEM
- CF
- SF

Important Ultra M Manager sends fault notification when VMs are down and/or recovered.

The following parameters must be configured at the VNFC-level:

Table 17: Health Check Descriptor Parameters

Parameter	Required	Type	Description
enabled	O	bool	Enable/disable health monitoring.
probe-frequency	O	uint16	Health Check Frequency in seconds. UAS uses this as health probe time, meaning every polling interval UAS will invoke health check. Default value is 10 seconds.
probe-max-miss	O	uint16	Maximum number of health probe misses before VNFC instance is declared dead. Default value is 6.

Parameter	Required	Type	Description
recovery-type	O	choice string	Recovery type. It can be one of the following: • restart: Recovery only by restarting, move the VNFC instance to error after max retries • external: Recovery performed by external entity. No auto-recovery • restart-then-redeploy: Restart the VM on failure. After maximum retries, redeploy the failed VNFC instances. Default value is restart-then-redeploy.
retry-count	O	uint16	Number of retries to recover the VNFC Instance. Default value is set to restart-then-redeploy.
boot-time	O	uint16	Initial bootup time for the VNFC. Default value is 300 seconds.
script	O	string	Script to check VNFC health, by default UAS ICMP script will be used.

The above parameters are configured at the VNFC-level within the VNF descriptor information that is part of the deployment network service descriptor (NSD) as shown in the following example configuration:

```
nsd <nsd_name>
…
 vnfd <autovnf_vnfd_name>
…
  vnfc <vnfm_vnfc_name>
   health-check enabled
   health-check probe-frequency 10
   health-check probe-max-miss 6
   health-check retry-count 6
   health-check recovery-type restart-then-redeploy
   health-check boot-time 300
…
  vnfc <uem_vnfc_name>
   health-check enabled
   health-check probe-frequency 10
   health-check probe-max-miss 6
   health-check retry-count 6
   health-check recovery-type restart-then-redeploy
   health-check boot-time 300
…
  vnfc <cf_vnfc_name>
   health-check enabled
   health-check probe-frequency 10
   health-check probe-max-miss 6
   health-check retry-count 6
   health-check recovery-type restart-then-redeploy
   health-check boot-time 300
…
  vnfc <sf_vnfc_name>
   health-check enabled
   health-check probe-frequency 10
   health-check probe-max-miss 6
```

```
   health-check retry-count 6
   health-check recovery-type restart-then-redeploy
   health-check boot-time 300
…
```

Refer to the *Cisco Ultra Services Platform NETCONF API Guide* for more information on the use of these and other parameters related to VNF configuration and deployment.

In the event that automatic recovery is not possible, an API is available to manually recover the VNFC(s).

VNFC status can be viewed by executing the **show vnfr** command from AutoIT. Additional details can be found in the transaction logs for the deployment.

To manually recover a failed VNFC, execute the following command:

recover nsd-id *<nsd_name>* **vnfd** *<vnfd_name>*

Troubleshooting Deactivation Process and Issues

NOTES:

- The deactivate process is idempotent and can be multiple times and without error. The system will retry to remove any resources that remain.
- If a deactivation fails (a transaction failure occurs), look at the logs on various UAS software components (AutoDeploy, AutoIT, and AutoVNF), VNFM (ESC), and UEM.
- If deactivation has failed, you must ensure that a clean up is performed either using automation tools or manually if necessary.
- Activation must not be reattempted until all of the previous artifacts have been removed.

Deactivation Fails Due to Communication Errors with AutoVNF

Problem Description

During the AutoVNF deactivation process, AutoDeply indicates that it is unable to deactivate the AutoVNF. This is observed through:

- AutoDeploy transaction log
- AutoDeploy upstart log

Possible Cause(s)

- AutoDeploy is not able to communicate with AutoVNF.

Action(s) to Take

- Check network connectivity between the AutoDeploy VM and the AutoVNF VIP.
- Check the management and orchestration network.
- Address any connectivity issues.

Next Steps

- Once connectivity issues are addressed, perform the deactivate procedure again.

Deactivation Fails Because AutoDeploy Generates an Exception

Problem Description

AutoDeploy generates an exception error during the deactivation process.

Possible Cause(s)

- Connectivity issues
- Configuration issues
- OpenStack/VIM specific issues
- Hardware issues

Action(s) to Take

1. Capture logs from */var/log/upstart/autodeploy.log* along with exception error message.
2. Log on to AutoIT and collect the logs from */var/log/upstart/autoit.log* along with the exception message, if any.
3. Log on to VIP of the active (master) AutoVNF VM and perform a cleanup by running the **deactivate** command from there.
   a. Log on to the AutoVNF VM as the default user, *ubuntu*.
   b. Switch to the root user.
      ```
      sudo su
      ```
   c. Enter the ConfD CLI.
      ```
      confd_cli -C -u admin
      ```
   d. Deactivate the deployment.
      ```
      deactivate nsd-id <nsd_name>
      ```
4. Check the last transaction log to verify that the deactivation was successful. (Transactions are auto-sorted by timestamp, so it should be the last one in the list.)

   Example commands and outputs:

   ```
   show transactions
   ```

   ```
   TX ID              TX TYPE         ID          TIMESTAMP                          STATUS
              DETAIL
   ------------------------------------------------------------------------------------------------
   1500605583-055162  vnf-deployment  dep-5-5  2017-07-21T02:53:03.055205-00:00
   deployment-failed   -
   1500606090-581863  vnf-deployment  dep-5-5  2017-07-21T03:01:30.581892-00:00
   deployment-success  -
   1500606127-221084  vnf-deployment  dep-5-5  2017-07-21T03:02:07.221114-00:00
   deployment-success  -

   show log 1500606127-221084 | display xml
   <config xmlns="http://tail-f.com/ns/config/1.0">
   ```

```
  <log xmlns="http://www.cisco.com/usp/nfv/usp-autovnf-oper">
    <tx-id>1500606127-221084</tx-id>
    <log>2017-07-21 03:02:07,276 - Notify deployment
2017-07-21 03:02:07,297 - Connection to VNFM (esc) at 172.16.181.107
2017-07-21 03:02:07,418 - NETConf Sessions (Transaction/Notifications) estabilished
…
```

5. Manually delete the AutoDeploy VM using the information in Terminating the AutoDeploy VM, on page 92.

Next Steps

- Open a support case providing all of the log information that was collected.

Deactivation Fails Because of AutoVNF-VNFM Communication Issues

Problem Description

During the AutoVNF deactivation process, AutoVNF indicates that it is unable to deactivate the VNFM. This is observed through:

- AutoVNF transaction log
- AutoVNF upstart log

Possible Cause(s)

- AutoVNF is not able to communicate with the VNFM.

Action(s) to Take

- Check network connectivity between the master AutoVNF VM and the VNFM VIP.
- Check the management and orchestration network.
- Address any connectivity issues.

Next Steps

- Once connectivity issues are addressed, perform the deactivate procedure again.

Deactivation Fails Because of Issue at VNFM

Problem Description

During the AutoVNF deactivation process, the VNFM returns an error. This is observed through:

- AutoVNF transaction log
- AutoVNF upstart log
- ESC logs

Possible Cause(s)

- ESC health is not good due to an issue or network connectivity.

- ESC is not able to communicate with the VIM.
- ESC has an internal error.
- AutoVNF is unable to create/delete OpenStack artifacts.

Action(s) to Take

1. Check */var/log/esc/yangesc.log* for any issues or error messages.
2. Run **health.sh** to determine the health of ESC.
3. Check network connectivity and address an issues. Retry the deactivation.
4. Check network connectivity with the VIM and address any issues. Retry the deactivation.
5. Determine if ESC has a deployment configuration. From the active ESC VM:

   ```
   /opt/cisco/esc/confd/bin/confd_cli -C
   show running-config
   ```

   If a configuration is present, most likely ESC is still retrying the deactivation, allow more time for the process to continue.

   If no configuration exists, check if there are deployment artifacts still on the VIM. Retry the deactivation.
6. Collect logs by running *collect_esc_log.sh* from both the active and standby ESC VMs.
7. Perform a manual cleanup.

Note Only artifacts which UAS created need to be removed. Any pre-created artifacts must remain in place.

   a. Login on to the VIM as tenant.
   b. Remove all VMs.
   c. Remove all VIP Ports.
   d. Remove all networks.
   e. Remove all flavors.
   f. Remove all volumes.
   g. Remove all images.
   h. Remove host-aggregate created as part of automation.

Next Steps

- Open a support case providing all of the log information that was collected.

Deactivation Fails Because AutoVNF Generates an Exception

Problem Description

AutoVNF generates an exception error during the deactivation process.

Possible Cause(s)

- Connectivity issues
- Configuration issues
- OpenStack/VIM specific issues
- Hardware issues

Action(s) to Take

1. Collect all logs from */var/log/cisco-uas*.
2. Perform a manual cleanup.

Note Only artifacts which UAS created need to be removed. Any pre-created artifacts can remain in place.

   a. Login on to the VIM as tenant.
   b. Remove all VMs.
   c. Remove all VIP Ports.
   d. Remove all networks.
   e. Remove all flavors.
   f. Remove all volumes.
   g. Remove all images.
   h. Remove host-aggregate created as part of automation.

Next Steps

- Open a support case providing all of the log information that was collected.

Troubleshooting UEM Issues

This section contains information on troubleshooting UEM issues.

UEM VM Stuck in a Boot Loop

Problem Description

Processes that normally run on the UEM VM are unable to start and the VM is stuck in a boot-loop.

Possible Cause(s)

There is an error with the Zookeeper database keeping the Zookeeper process and other UEM processes from starting. (No other UEM process can be started unless the Zookeeper process has started.)

Action(s) to Take

1. Check the UEM Zookeeper logs. Refer to Viewing UEM Zookeeper Logs, on page 153.
2. Look for error messages similar to the following:

```
[myid:4] - INFO  [main:FileSnap@83] - Reading snapshot
/var/lib/zookeeper/data/version-2/snapshot.5000004ba
[myid:4] - ERROR [main:QuorumPeer@557] - Unable to load database on disk
java.io.EOFException
```

   If the above errors exist, proceed to the next step. If not, further debugging is required. Please contact your local support representative.

3. Rebuild the Zookeeper database.
   a. Check the health of Master and Slave EM instances. Execute the following commands on each instance.

Master UEM VM:

```
sudo -i
ncs_cli -u admin -C
admin connected from 127.0.0.1 using console on deploymentem-1

show ems
EM            VNFM
ID  SLA  SCM  PROXY  VERSION
------------------------------
3   UP   UP   UP     5.7.0
6   UP   UP   UP     5.7.0

exit
```

Important Only the master UEM status may be displayed in the above command because the slave UEM is in the boot loop.

```
show ncs-state ha
ncs-state ha mode master
ncs-state ha node-id 6-1506059686
ncs-state ha connected-slave [ 3-1506059622 ]
```

Slave UEM VM:

Important The slave UEM may not be accessible if it is experiencing the boot loop issue.

```
sudo -i
ncs_cli -u admin -C
admin connected from 127.0.0.1 using console on deploymentem-1

show ems
EM            VNFM
ID  SLA  SCM  PROXY  VERSION
------------------------------
3   UP   UP   UP     5.7.0
6   UP   UP   UP     5.7.0

exit
```

```
show ncs-state ha
ncs-state ha mode slave
ncs-state ha node-id 3-1506059622
ncs-state ha master-node-id 6-1506059686
```

b. Log on to the node on which Zookeeper data is corrupted.

c. Enable the debug mode.

```
/opt/cisco/em-scripts/enable_debug_mode.sh
Disable EM reboot. Enable debug mode
```

d. Reboot the VM in order to enter the debug mode.

e. Remove the corrupted data.

```
cd /var/lib/zookeeper/data/
ls
myid  version-2  zookeeper_server.pid

mv version-2 version-2_old
```

Important This process removes the Zookeeper database by renaming it for additional debugging/recovery.

f. Reboot the node instance for it to reconcile and rebuild the Zookeeper database from a healthy UEM instance.

```
reboot
```

g. Log on to the UEM VM upon reboot.

h. Validate that the database has been successfully rebuilt on the previously failing UEM node.

```
sudo -i
ncs_cli -u admin -C
admin connected from 127.0.0.1 using console on vnfddeploymentem-0

show ems
EM            VNFM
ID  SLA  SCM  PROXY  VERSION
------------------------------
3   UP   UP   UP     5.7.0
6   UP   UP   UP     5.7.0

show ncs-state ha
ncs-state ha mode slave
ncs-state ha node-id 3-1506093933
ncs-state ha master-node-id 6-1506093930

exit

cd /var/lib/zookeeper/data/
ls
myid  version-2  version-2_old  zookeeper_server.pid

cat /var/log/em/zookeeper/zookeeper.log
<---SNIP--->
2017-09-22 15:25:35,192 [myid:3] - INFO
[QuorumPeer[myid=3]/0:0:0:0:0:0:0:0:2181:Follower@61] - FOLLOWING - LEADER ELECTION
```

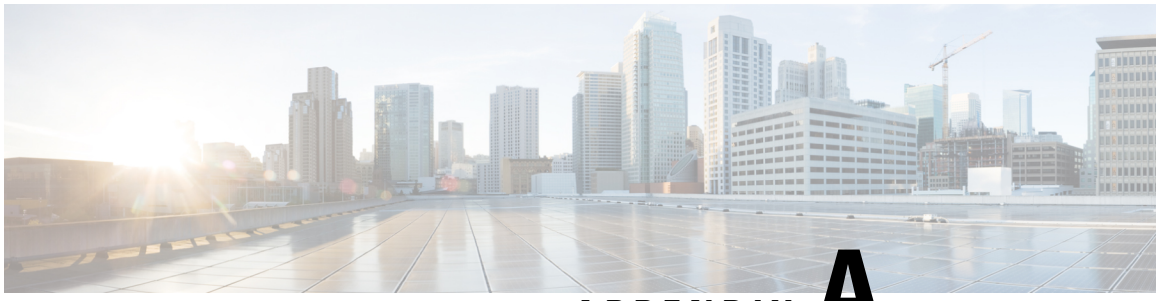
```
 TOOK - 236
2017-09-22 15:25:35,194 [myid:3] - INFO
[QuorumPeer[myid=3]/0:0:0:0:0:0:0:0:2181:QuorumPeer$QuorumServer@149] - Resolved
hostname: 30.30.62.6 to address: /30.30.62.6
2017-09-22 15:25:35,211 [myid:3] - INFO
[QuorumPeer[myid=3]/0:0:0:0:0:0:0:0:2181:Learner@329] - Getting a snapshot from leader
2017-09-22 15:25:35,224 [myid:3] - INFO
[QuorumPeer[myid=3]/0:0:0:0:0:0:0:0:2181:FileTxnSnapLog@240] - Snapshotting:
0x200000050 to /var/lib/zookeeper/data/version-2/snapshot.200000050
2017-09-22 15:25:37,561 [myid:3] - INFO
[NIOServerCxn.Factory:0.0.0.0/0.0.0.0:2181:NIOServerCnxnFactory@192] - Accepted socket
 connection from /30.30.62.15:58011
2017-09-22 15:25:37,650 [myid:3] - WARN
[NIOServerCxn.Factory:0.0.0.0/0.0.0.0:2181:ZooKeeperServer@882] - Connection request
 from old client /30.30.62.15:58011; will be dropped if server is in r-o mode
2017-09-22 15:25:37,652 [myid:3] - INFO
[NIOServerCxn.Factory:0.0.0.0/0.0.0.0:2181:ZooKeeperServer@928] - Client attempting
 to establish new session at /30.30.62.15:58011
<---SNIP--->
```

i. Disable the UEM debug mode on the VM on which the Zookeeper database was rebuilt.

```
/opt/cisco/em-scripts/disable_debug_mode.sh
Disable debug mode
```

Next Steps

Open a support case providing all the log information that was collected.



APPENDIX A

boot_uas.py Help

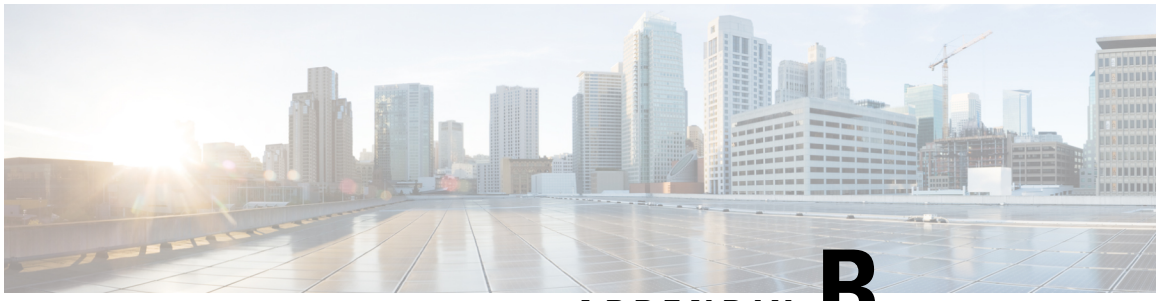
```
./boot_uas.py --help
usage: boot_uas.py [-h] [--version] [--hostname HOSTNAME]
[--delete DELETE [DELETE ...]] [--recover RECOVER]
[--delete-uas] [--json] [--openstack] [--kvm]
[--autodeploy] [--autoit] [--autovnf]
[--os_auth_url OS_AUTH_URL]
[--os_tenant_name OS_TENANT_NAME]
[--os_tenant_id OS_TENANT_ID]
[--os_project_name OS_PROJECT_NAME]
[--os_project_id OS_PROJECT_ID]
[--os_project_domain_name OS_PROJECT_DOMAIN_NAME]
[--os_project_domain_id OS_PROJECT_DOMAIN_ID]
[--os_username OS_USERNAME] [--os_user_id OS_USER_ID]
[--os_password OS_PASSWORD]
[--os_user_domain_name OS_USER_DOMAIN_NAME]
[--os_user_domain_id OS_USER_DOMAIN_ID]
[--os_identity_api_version OS_IDENTITY_API_VERSION]
[--net NET [NET ...]] [--ip [IPADDR [IPADDR ...]]]
[--orch-interface ORCH_INTF] [--gateway DEFAULT_GW]
[--gateway_if DEFAULT_GW_IDX] [--ha] [--ha-vip HA_VIP]
[--ha-net HA_VIP_NET] [--ha-secret HA_SECRET]
[--floating-ip [FLOATING_IP]]
[--external-network PUBLICNET] [--flavor FLAVOR]
[--avail_zone AVAIL_ZONE] [--image IMAGE]
[--ssh_key_file SSH_KEY_FILE] [--password PASSWORD]
[--admin ADMIN] [--oper OPER] [--security SECURITY]
optional arguments:
-h, --help show this help message and exit
--version show program's version number and exit
--hostname HOSTNAME Hostname prefix
--delete DELETE [DELETE ...]
Delete UAS deployment. Applicable only for OpenStack
--recover RECOVER Recover UAS deployment.
--delete-uas Deletes the UAS deployment. Applicable only for KVM
--json Output Data in JSON
Specify the infrastructure to be used for the UAS VM:
--openstack Use Openstack Infrastructure
--kvm Use KVM Infrastructure
Specify the type of UAS VM to be instantiated:
--autodeploy Boot AutoDeploy UAS type
--autoit Boot AutoIT UAS type
--autovnf Boot AutoVNF UAS type
OpenStack configuration to instantiate AutoVNF cluster.
You can either source RC file or provide them on command line:
--os_auth_url OS_AUTH_URL
OS Auth-URL, defaults to env[OS_AUTH_URL].
--os_tenant_name OS_TENANT_NAME
```

boot_uas.py Help

```
OS Tenant Name, defaults to env[OS_TENANT_NAME].
--os_tenant_id OS_TENANT_ID
OS Tenant ID, defaults to env[OS_TENANT_ID].
--os_project_name OS_PROJECT_NAME
OS Project Name, defaults to env[OS_PROJECT_NAME].
--os_project_id OS_PROJECT_ID
OS Project ID, defaults to env[OS_PROJECT_ID].
--os_project_domain_name OS_PROJECT_DOMAIN_NAME
OS Project Domain Name, defaults to
env[OS_PROJECT_DOMAIN_NAME].
--os_project_domain_id OS_PROJECT_DOMAIN_ID
OS Project Domain ID, defaults to
env[OS_PROJECT_DOMAIN_ID].
--os_username OS_USERNAME
OS Username, defaults to env[OS_USERNAME].
--os_user_id OS_USER_ID
OS User ID, defaults to env[OS_USER_ID].
--os_password OS_PASSWORD
OS Password, defaults to env[OS_PASSWORD].
--os_user_domain_name OS_USER_DOMAIN_NAME
OS User Domain Name, defaults to
env[OS_USER_DOMAIN_NAME].
--os_user_domain_id OS_USER_DOMAIN_ID
OS User Domain ID, defaults to env[OS_USER_DOMAIN_ID].
--os_identity_api_version OS_IDENTITY_API_VERSION
OS Identity API Version, defaults to
env[OS_IDENTITY_API_VERSION].
Networks to be used, first network is used as orchestration:
--net NET [NET ...] Ordered list of networks (name or uuid) to attach to
AutoVNF Cluster.
--ip [IPADDR [IPADDR ...]]
Static IP, default is DHCP
--orch-interface ORCH_INTF
Orchestration Interface
Default gateway parameters.:
--gateway DEFAULT_GW Default Gateway IP Address, needed only in case of
static IP
--gateway_if DEFAULT_GW_IDX
Interface index to associate default route, default is
first interface.
High-Availability parameters:
--ha Enable High-Availability
--ha-vip HA_VIP Virtual IP Address (VIP) for cluster
--ha-net HA_VIP_NET Network used to assign the VIP address
--ha-secret HA_SECRET
HA Secret for the cluster
Floating IP Parameters:
--floating-ip [FLOATING_IP]
Enable floating IP association to VIP port
--external-network PUBLICNET
External Network to allocate floating IP.
VM specific parameters:
--flavor FLAVOR VM Flavor (name or uuid), default is 'm1.medium'
--avail_zone AVAIL_ZONE
The availability zone for AutoVNF placement.
--image IMAGE Image name or UUID from VIM
AutoVNF VM Login Parameters, if not provided, user will be prompted:
--ssh_key_file SSH_KEY_FILE
Path to SSH key file to be used as authorised key for
login as 'ubuntu'
--password PASSWORD Password for login as 'ubuntu', this is required if
SSH key is not provided
AutoVNF API Access parameters, if not provided, user will be prompted:
--admin ADMIN Password for AutoVNF admin user.
```

```
--oper OPER Password for AutoVNF oper user
--security SECURITY Password for AutoVNF security user
```

boot_uas.py Help



APPENDIX B

Sample VIM Orchestrator and VIM Configuration File

This configuration file dictates the deployment of the VIM Orchestrator (Undercloud) and the VIM (Overcloud). For information on the parameters, see the *Cisco Ultra Services Platform NETCONF API Guide*.

The file below is an example of a combined VIM Orchestrator and VIM configuration file. The configuration in this file brings up a single OSP-D VM on the Ultra M Manager Node within Ultra M deployments based on OSP 10 and that leverage the Hyper-Converged architecture. It also deploys the VIM and related parameters on the Controller, OSP Compute, and Compute nodes.

Caution This is only a sample configuration file provided solely for your reference. You must create and modify your own configuration file according to the specific needs of your deployment such as:

- Secure-tokens
- NFVI PoP details
- VIM orchestrator details
- Networking details
- Server flavors and information
- Satellite or CDN server information
- VIM role and node information

```
uas-mode generic
uas-instance vim-vimorch
 external-connection-point 172.21.203.118
 scm                       scm
!
nsd vim-vimorch
 vim-orch     underc
 vim          overc
!
secure-token cimc
 user     admin
 password ********
!
secure-token stack
```

Sample VIM Orchestrator and VIM Configuration File

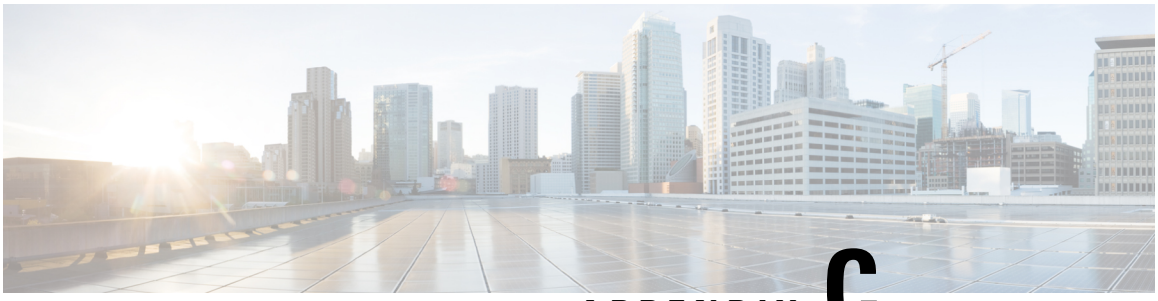
```
 user     stack
 password ********
!
secure-token ssh-baremetal
 user     nfvi
 password ********
!
secure-token os-login
 user     admin
 password ********
!
vimd overc
 vim-orch-id underc
 nfvi-pop-id sjc-pop
 nfvi-nodes node_1
  role vim-compute
 !
 nfvi-nodes node_2
  role vim-controller
 !
 nfvi-nodes node_3
  role vim-controller
 !
 nfvi-nodes node_4
  role vim-osd-compute
 !
 nfvi-nodes node_5
  role vim-osd-compute
 !
 nfvi-nodes node_6
  role vim-osd-compute
 !
 networking dns [ 171.70.168.183 ]
 networking ntp 172.24.167.109
 networking vlan-pool start 1001
 networking vlan-pool end 2000
 networking network-types internal-api
  ip-prefix 11.120.0.0/24
  vlan-id   20
  allocation-pool start 11.120.0.10
  allocation-pool end 11.120.0.200
 !
 networking network-types tenant
  ip-prefix 11.117.0.0/24
  vlan-id   17
  allocation-pool start 11.117.0.10
  allocation-pool end 11.117.0.200
 !
 networking network-types storage
  ip-prefix 11.118.0.0/24
  vlan-id   18
  allocation-pool start 11.118.0.10
  allocation-pool end 11.118.0.200
 !
 networking network-types storage-mgmt
  ip-prefix 11.119.0.0/24
  vlan-id   19
  allocation-pool start 11.119.0.10
  allocation-pool end 11.119.0.200
 !
 networking network-types external
  ip-prefix     172.21.203.0/24
  vlan-id       101
  allocation-pool start 172.21.203.125
```

```
  allocation-pool end 172.21.203.150
  default-route 172.21.203.1
 !
!
nfvi-popd sjc-pop
 deployment-flavor ucs-1-vnf
 nfvi-node node_0
  physical-server-manager ip-address 192.100.1.1
  physical-server-manager login-credential cimc
 !
 nfvi-node node_1
  physical-server-manager ip-address 192.100.1.2
  physical-server-manager login-credential cimc
 !
 nfvi-node node_2
  physical-server-manager ip-address 192.100.1.3
  physical-server-manager login-credential cimc
 !
 nfvi-node node_3
  physical-server-manager ip-address 192.100.1.4
  physical-server-manager login-credential cimc
 !
 nfvi-node node_4
  physical-server-manager ip-address 192.100.1.5
  physical-server-manager login-credential cimc
 !
 nfvi-node node_5
  physical-server-manager ip-address 192.100.1.6
  physical-server-manager login-credential cimc
 !
 nfvi-node node_6
  physical-server-manager ip-address 192.100.1.7
  physical-server-manager login-credential cimc
 !
!
vim-orchd underc
 hostname           tb3-undercloud
 domain-name        cisco.com
 dns                [ 171.70.168.183 ]
 login-credential   stack
 satellite-server ip-address 10.23.252.119
 satellite-server hostname rh-satellite
 satellite-server domain-name cisco.com
 satellite-server organization ultram
 satellite-server activation-key "openstack 10"
 satellite-server pool-id 8a977cf75c0ca9df015d2ce1cb4d06ab

 external-network ip-address 172.21.203.119
 external-network netmask 255.255.255.0
 provisioning-network ip-address 192.200.0.1
 provisioning-network netmask 255.0.0.0
 provisioning-network public-vip 192.200.0.2
 provisioning-network admin-vip 192.200.0.3
 provisioning-network dhcp-ip-range start 192.200.0.101
 provisioning-network dhcp-ip-range end 192.200.0.150
 provisioning-network inspection-ip-range start 192.200.0.201
 provisioning-network inspection-ip-range end 192.200.0.250
 network-cidr       192.0.0.0/8
 masquerade-network 192.0.0.0/8
 nfvi-node pop-id sjc-pop
 nfvi-node id     node_0
 nfvi-node ip-address 172.21.203.116
 nfvi-node login-credential ssh-baremetal
 image              /var/cisco/isos/rhel-server-7.3-x86_64-dvd.iso
```

Sample VIM Orchestrator and VIM Configuration File

```
 flavor vcpus   4
 flavor ram     16384
 flavor root-disk 100
 flavor ephemeral-disk 0
 flavor swap-disk 0
!
```



APPENDIX C

Sample Tenant Configuration File

Sample Configuration File for Single Tenant

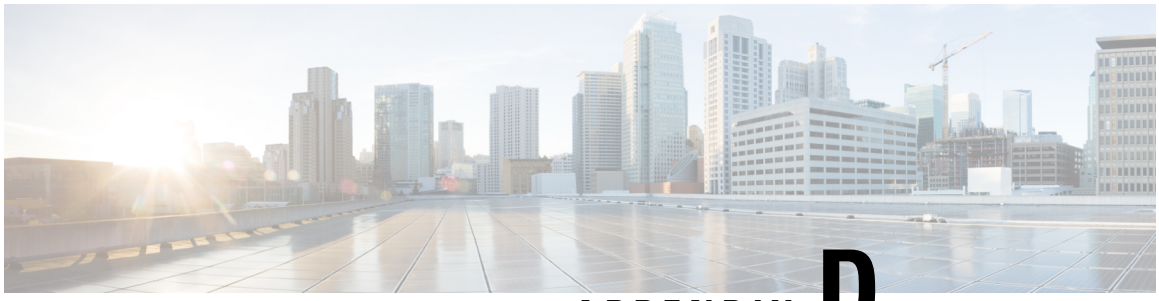
As described in Configure VIM Tenants, on page 55, tenant configuration parameters are contained in the VIM Artifact Descriptor (vim-artifact).

Caution This is only a sample configuration file provided solely for your reference. You must create and modify your own configuration file according to the specific needs of your deployment.

```
nsd nsd1
vim-identity vim_one
vim-artifact vim_one_artifact
!
secure-token cimc
user $8$6FMSIVcieTXcXeCV4V37zQlwnoHIA/xNgQFKLmygL0Y=
password $8$y1KOa2J9Qt487Ew8iUxkKbpzzUL3/0Wr0wqxe/KQXdA=
!
secure-token stack
user $8$oeUvS7KN3eThSmvj4S7e9/NT+cxSlfwm2BcRsQKoIcs=
password $8$Ry5Grth2Bc5Vaojx+HgMUVcBPEX69khyC5V8CnkX4LY=
!
secure-token ssh-baremetal
user $8$jwA0KuwOA6a7z9iFoBFGw6Pd+Np6sKhtw/IKX0iFXzc=
password $8$TO5mcj4yPSIpCoQCSG1tcgwq9rZ14WGBavsUnuJ3/5Q=
!
secure-token vim-admin-creds
user $8$WU2Q6jMIKA/C5tozjt/+M3L29heHstM0x68E80RQ6ME=
password $8$prN66xSTFb+5CU4fM2Cej5BcZnOhxJUibj8/gMxuBMM=
!
secure-token sjc-core
user $8$FwHBmHTaIBE3TZ1cZHb2bizvT0Plelj6awh0A2i7yHA=
password $8$OoEWoe7/hJjhjox1SDdJnf81eIO4i+9ZeGIeHlMYNpE=
!
vim vim_one
api-version v2
auth-url http://172.21.203.31:5000/v2.0
user vim-admin-creds
tenant admin
!
tenantd sjccore
login-credential sjc-core
tenant-role admin
tenant-quota no-of-instances-allowed 10000
tenant-quota no-of-cores-allowed 200000
tenant-quota no-of-injected-files 300000
```

Sample Tenant Configuration File

```
tenant-quota no-of-injected-files-content-in-bytes 400000
tenant-quota megabytes-of-ram-allowed 500000000
tenant-quota no-of-floating-ips 600
tenant-quota max-no-of-subnets-allowed 700
tenant-quota max-no-of-ports-allowed 8000
tenant-quota no-of-volumes-allowed 900
tenant-quota volumes-allowed-gb 10000
tenant-quota volumes-backup-size-allowed 20000
!
vim-artifactd vim_one_artifact
tenant sjccore
!
```



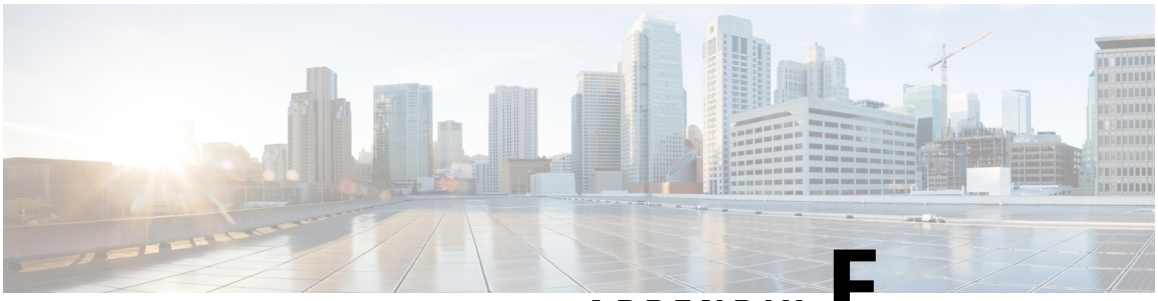
APPENDIX D

Sample VNF Rack and VNF Descriptor Configuration File

As described in Configure the VNF Rack and the VNF Descriptors, on page 58, VNF rack configuration parameters are contained in the VIM Artifact Descriptor (VIM-ArtifactD) while VNF configuration parameters are contained in the VNF descriptor (VNFD).

Caution This is only a sample configuration file provided solely for your reference. You must create and modify your own configuration file according to the specific needs of your deployment.

Sample VNF Rack and VNF Descriptor Configuration File

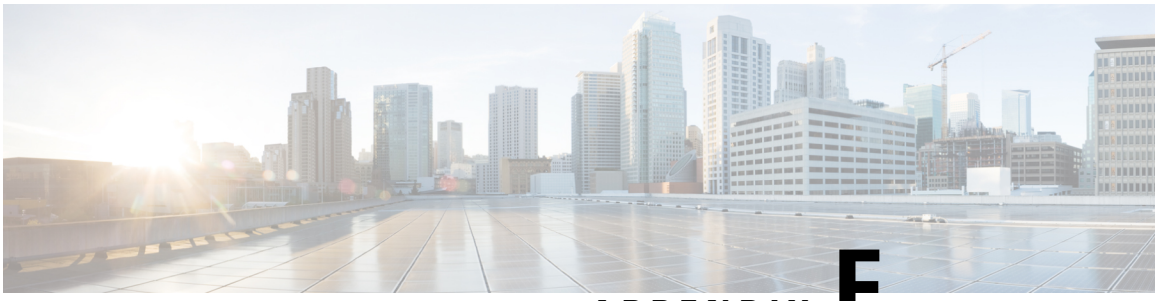


APPENDIX E

Sample system.cfg File

```
config
        system hostname ugp-saegw
        ssh key-gen wait-time 0
        cli hidden
        tech-support test-commands encrypted password ***
        logging filter runtime facility confdmgr level debug critical-info
        logging filter runtime facility vnfma level debug critical-info
        context local
                administrator $CF_LOGIN_USER password $CF_LOGIN_PASSWORD ftp
                        interface LOCAL1
                                ip address $CF_VIP_ADDR 255.255.255.0
                #exit
                ip route 0.0.0.0 0.0.0.0 $NICID_1_GATEWAY LOCAL1
                ssh generate key
                server sshd
                        subsystem sftp
                #exit
                server confd
                        confd-user admin
                #exit
        #exit
        port ethernet 1/1
            bind interface LOCAL1 local
            no shutdown
        #exit
        snmp community public read-only
end
```

Sample system.cfg File



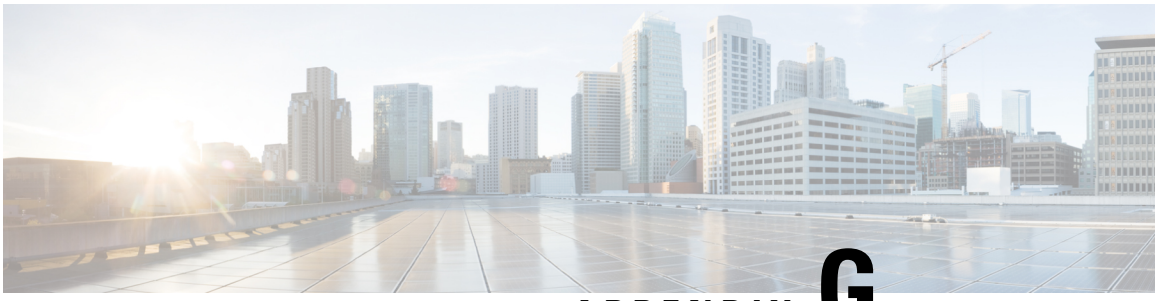
APPENDIX F

Sample ESC VIM Connector Configuration

```
<esc_system_config xmlns="http://www.cisco.com/esc/esc">
  <vim_connectors>
    <!--represents a vim-->
    <vim_connector>
      <!--unique id for each vim-->
      <id>vim1</id>
      <!--vim type [OPENSTACK|VMWARE_VSPHERE|LIBVIRT|AWS|CSP]-->
      <type>OPENSTACK</type>
      <properties>
        <property>
          <name>os_auth_url</name>
          <value>http://10.84.16.185:5000/v3</value>
        </property>
        <!-- The project name for openstack authentication and authorization -->
        <property>
          <name>os_project_name</name>
          <value>saegw</value>
        </property>
        <!-- The project domain name is only needed for openstack v3 identity api -->
        <property>
          <name>os_project_domain_name</name>
          <value>default</value>
        </property>
        <property>
          <name>os_identity_api_version</name>
          <value>3</value>
        </property>
        <property>
          <name>os_identity_overwrite_endpoint</name>
          <value>http://10.84.16.185:5000/v3</value>
        </property>
      </properties>
      <users>
        <user>
          <id>saegw</id>
          <credentials>
            <properties>
              <property>
                <name>os_password</name>
                <value>******</value>
              </property>
              <!-- The user domain name is only needed for openstack v3 identity api -->
              <property>
                <name>os_user_domain_name</name>
                <value>default</value>
              </property>
            </properties>
```

Sample ESC VIM Connector Configuration

```
            </credentials>
          </user>
        </users>
      </vim_connector>
    </vim_connectors>
  </esc_system_config>
```



APPENDIX G

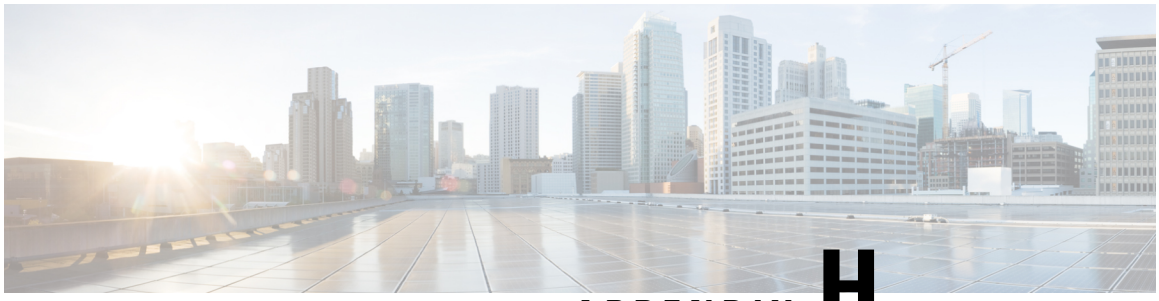
Sample AutoVNF VNFM Configuration File

This configuration file provides AutoVNF with the necessary information for communicating with a pre-existing VNFM installation. This is used when deploying VNFs through a stand-alone AutoVNF instance. Refer to Deploying VNFs Using AutoVNF, on page 63.

Caution This is only a sample configuration file provided solely for your reference. You must create and modify your own configuration file according to the specific needs of your deployment.

```
nsd vpc
 vnfd pgw
  vnfm vnf-instance esc
  vnfm vim     default_openstack_vim
  !
 !
!
 vnf-instance esc
  vnf-type                  esc
  external-connection-point 31.31.31.105
  netconf-credential        esc_nc
 !
!
secure-token esc_nc
 user     $8$rGbuPzNgqZwdibSmAZ2pWDkIZT3WxL9sRy7ux4A9BSM=
 password $8$4xqtIS1MMn+pptMDQhBdUHdxxZwaLtzJOCubIdPbnbQ=
!
vim default_openstack_vim
 api-version v2
 auth-url    http://172.21.201.218:5000/v2.0
 user        openstack
 tenant      tenant1
!
```

Sample AutoVNF VNFM Configuration File



APPENDIX H

Sample AutoVNF VNF Configuration File

The AutoVNF file includes all the configuration information required to deploy all the VNF components. The AutnuoVNF configuration file dictates the deployment of the AutoVNF. For information on the parameters, see the *Cisco Ultra Services Platform NETCONF API Guide*.

The file below is an example of AutoVNF configuration file to bring up the AutoVNF within Ultra M deployments based on OSP 10 and that leverage the Hyper-Converged architecture.

Caution This is only a sample configuration file provided solely for your reference. You must create and modify your own configuration file according to the specific needs of your deployment.

```
-snip-
uas-mode standalone
nsd vpc
 vld mgmt
  vl-type          management
  network-instance mgmt
 !
 vld orch
  vl-type          orchestration
  network-instance orch
 !
 vld svc
  vl-type          service
  network-instance service1
 !
 vnfd pgw
  vnf-type          ugp
  version           6.0
  high-availability true
  configuration internal-network-mtu 1500
  configuration boot-time 1800
  configuration domain-name cisco.com
  configuration set-vim-instance-name true
  configuration dns-server 1.1.1.1
  !
  vld di-internal
   network-instance di-internal2
  !
  external-connection-point cf
   connection-point eth1
   ip-address       32.32.32.201
  !
  external-connection-point em
```

Sample AutoVNF VNF Configuration File

```
 connection-point eth0
 ip-address       31.31.31.110
!
vnfc em
 health-check enabled
 health-check probe-frequency 10
 health-check probe-max-miss 6
 health-check retry-count 3
 health-check recovery-type restart-then-redeploy
 health-check boot-time 300
 vdu vdu-id em
 vdu image em_image
 vdu flavor em_flvor
 number-of-instances 3
 connection-point eth0
  virtual-link service-vl orch
  virtual-link fixed-ip 31.31.31.111
  !
  virtual-link fixed-ip 31.31.31.112
  !
  virtual-link fixed-ip 31.31.31.113
  !
 !
!
vnfc cf
 health-check enabled
 health-check probe-frequency 10
 health-check probe-max-miss 6
 health-check retry-count 3
 health-check recovery-type restart-then-redeploy
 health-check boot-time 300
 vdu vdu-id cf
 vdu image cf_image
 vdu flavor cf_flavor
 number-of-instances 1
 volume boot cf-boot-volumes
 volume storage cf-cdr-volumes
 !
 connection-point eth0
  virtual-link internal-vl di-internal
 !
 connection-point eth1
  virtual-link service-vl mgmt
 !
 connection-point eth2
  virtual-link service-vl orch
 !
!
vnfc sf
 health-check enabled
 health-check probe-frequency 10
 health-check probe-max-miss 6
 health-check retry-count 3
 health-check recovery-type restart-then-redeploy
 health-check boot-time 300
 vdu vdu-id sf
 vdu image sf_image
 vdu flavor sf_flavor
 number-of-instances 2
 connection-point eth0
  virtual-link internal-vl di-internal
 !
 connection-point eth1
  virtual-link service-vl orch
```

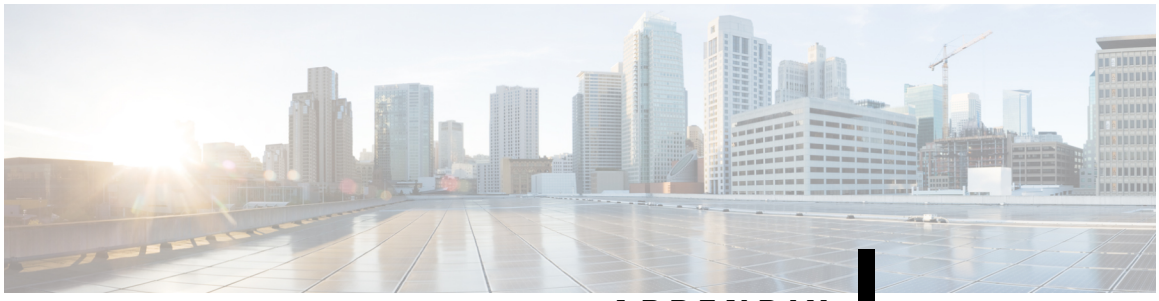
```
   !
   connection-point eth2
    virtual-link service-vl svc
   !
  !
 !
secure-token em_login
 user     $8$h2p6wBGvyLyG6PJ+1sLcCblNdYZ0G2Ak/PELpAliuNA=
 password $8$DQpFSWRlPGXCsyY6z23JETYo2eCvpoP4I3htPfcI14Q=
!
secure-token cf_login
 user     $8$cZSBwQoEP/iFTjZ8npYtUXiwIrRLoWbnPtDq/2lzFvY=
 password $8$WOnJ0Ug0tdfxsV61G59QBax2YTmqE7NZi/ATR757QgU=
!
secure-token scm-admin
 user     $8$P35TDpFReR+aQZGoq11B7d9CCy7taqenoveYdEoaOjc=
 password $8$rD3O0S75m+G3AYds9o86xoV921Y8/OFSIM8aQ06w9+Q=
!
secure-token scm-oper
 user     $8$V2KoPEOcwgECEkv8P/UeXtG6P8r4LVWScJZlc1sBQVs=
 password $8$osruKvpKho28t+InZL8fKXVgql3eMKmufLFl4MOcdC8=
!
secure-token scm-security
 user     $8$ab6FCW9tewTeRTAuobg62MHLMysv4+WJ+acPOYhkIOI=
 password $8$g8QqV0KkdLH09K6A7rLDfF16g6Drrc7FFXe8LKzJo8c=
!
secure-token openstack
 user     $8$IV7e6WN+92ByeHjUsNUzavctpqYwfJi8w7iphYUkhT4=
 password $8$9WRej/z1HeBDmJbsoUQEHQnP6K2f0w9q/TVz5RAvoD4=
!
scm scm
 admin    scm-admin
 oper     scm-oper
 security scm-security
!
vdu esc
 vdu-type           cisco-esc
 login-credential   esc_nc
 netconf-credential esc_nc
 image url none
 flavor vcpus   2
 flavor ram     4096
 flavor root-disk 40
 flavor ephemeral-disk 0
 flavor swap-disk 0
 configuration bootvm
  apply-at   day-zero
  source-url file:///opt/cisco/usp/bundles/vnfm-bundle/bootvm-3_1_0_116.py
 !
!
vdu em
 vdu-type         element-manager
 login-credential em_login
 scm              scm
 image url none
 flavor vcpus   2
 flavor ram     4096
 flavor root-disk 40
 flavor ephemeral-disk 0
 flavor swap-disk 0
!
vdu cf
 vdu-type         control-function
 login-credential cf_login
```

Sample AutoVNF VNF Configuration File

```
 image url none
 flavor vcpus   8
 flavor ram     16384
 flavor root-disk 40
 flavor ephemeral-disk 0
 flavor swap-disk 0
 ned netconf
  ned-id         cisco-staros-nc
  port-number    830
  authentication cf_login
 !
 configuration staros_config.txt
  apply-at   day-zero
  source-url file:///home/ubuntu/system.cfg
 !
!
vdu sf
 vdu-type session-function
 image url none
 flavor vcpus   8
 flavor ram     16384
 flavor root-disk 16
 flavor ephemeral-disk 0
 flavor swap-disk 0
 upp cores     30
 upp crypto-cores 0
 upp service-mode vpc
 upp disable-mcdma false
 upp disable-numa false
!
network orch
 ip-prefix 11.11.11.0/24
 type      vlan
 dhcp      true
!
volume-instance-group cf-boot-volumes
 volume CF1-VOLUME-BOOT
  type     LUKS
  bootable true
 !
 volume CF2-VOLUME-BOOT
  type     LUKS
  bootable true
 !
!
volume-instance-group cf-cdr-volumes
 volume CF1-VOLUME-CDR
  type     LUKS
  bootable false
 !
 volume CF2-VOLUME-CDR
  type     LUKS
  bootable false
 !
!
network-instance mgmt
 ip-prefix 32.32.32.0/24
 type      vlan
 dhcp      false
 ip-allocation-pool 32.32.32.200 32.32.32.210
 !
!
network-instance orch
 ip-prefix 31.31.31.0/24
```

```
 type      vlan
 dhcp      false
 ip-allocation-pool 31.31.31.200 31.31.31.210
 !
!
network-instance di-internal2
 ip-prefix 192.168.2.0/24
 type      sriov-flat
 dhcp      true
 gateway   192.168.2.1
 vlan-tag  true
 vlan      2111
!
network-instance di_internal_bh
 ip-prefix 36.36.36.0/24
 type      vlan
 dhcp      true
!
network-instance service1
 ip-prefix 192.168.3.0/24
 type      sriov-flat
 dhcp      true
 vlan-tag  true
 vlan      2111
!
network-instance service_bh
 ip-prefix 37.37.37.0/24
 type      vlan
 dhcp      true
!
-snip-
```

Sample AutoVNF VNF Configuration File



APPENDIX

USP KPI Descriptions

- USP KPI Descriptions, on page 191

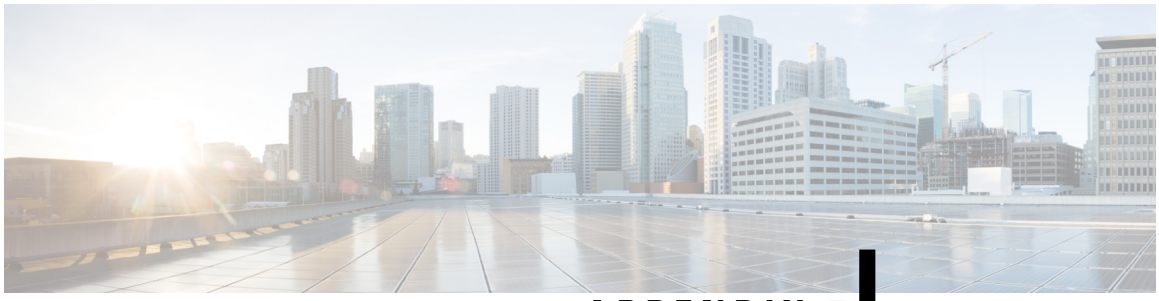
USP KPI Descriptions

Table 18: Supported KPIs, on page 191 lists and describes the key performance indicators supported in this release of the USP.

Table 18: Supported KPIs

KPI name	Description	Data type
leaf tx-throughput-bps	Transmit Throughput bit per second	usp:counter64
leaf rx-throughput-bps	Receive Throughput in bits per second	usp:counter64
leaf tx-throughput-pps	Transmit Throughput in Packets per second	usp:counter64
leaf rx-throughput-pps	Receive Throughput in Packets per second	usp:counter64
leaf tx-pkts	Total Number of Transmitted Packets	usp:counter64
leaf rx-pkts 4	Total Number of Received packets	usp:counter64
leaf tx-bytes	Total Number of Transmitted Bytes	usp:counter64
leaf rx-bytes	Total Number of Received Bytes	usp:counter64
leaf tx-pkt-drops	Total Number of transmit packets drop	usp:counter64
leaf tx-byte-drops	Total Number of transmit bytes drops	usp:counter64
leaf rx-pkt-drops	Total Number of receive packets drop	usp:counter64
leaf rx-byte-drops	Total Number of receive bytes drop	usp:counter64
leaf num-of-subscribers	Total number of active subscribers	usp:counter64
leaf num-pcc-rules	Total number of Policy Charging Rules	usp:counter64
leaf num-of-service-functions	Total number of Ultra Service Components (USCs)	type uint16;

KPI name	Description	Data type
leaf flows-per-second	Flow creation rate	type uint16;
leaf cpu-utils	CPU Usage in %	uint16
leaf memory-utils-bytes	Memory usage in bytes	usp:counter64
leaf storage-usage-bytes	Storage usage in bytes	usp:counter64
leaf flow-created	Number of flows created	usp:counter64
leaf flow-terminated	Number of flows terminated	usp:counter64
leaf flow-aged	Number of flows aged out	usp:counter64
leaf flow-hits	FLow cache hits	usp:counter64
leaf flow-miss	Flow cache misses	usp:counter64



APPENDIX J

Backing Up Deployment Information

This chapter provides information on the following topics:

- Overview, on page 193
- Identify Component IP Addresses, on page 193
- Backup Configuration Files, on page 196
- Backup UAS ConfD Databases, on page 197
- Collect Logs, on page 198
- Collect Charging Detail Records, on page 198

Overview

Prior to performing a deployment deactivation (e.g. as part of an upgrade or downgrade process), it is highly recommended that you make backup copies of key information.

To backup this information:

1. Identify Component IP Addresses, on page 193.
2. Backup Configuration Files, on page 196.
3. Backup UAS ConfD Databases, on page 197.
4. Collect Logs, on page 198
5. Collect Charging Detail Records, on page 198.

Identify Component IP Addresses

To collect the HA-VIP, and floating IP addresses for UAS, ESC, UEM, and CF:

1. Log on to the server on which OSP-D is running.
2. Source the “stack_namerc-core” file.

   source ~/<*stack_name*>**rc-core**
3. Obtain the floating IP for CF and UEM VMs.

   neutron floatingip-list

Example command output:

```
+--------------------------------------+--------------+-----------------+--------------------------------------+
| id                                   | fixed_ip_address | floating_ip_address |
port_id                              |
+--------------------------------------+--------------+-----------------+--------------------------------------+
| 22936d62-d086-4658-acfc-51b3d8952df6 | 172.168.20.13    | 10.169.126.155      |
a9489513-9bec-449b-a1f8-02487b9fb175 |
| 2fc42615-5254-44ec-af5a-a14440a36812 | 172.168.20.5     | 10.169.126.145      |
6a170e76-bb05-4cb9-b09e-e94b8e1ae99c |
| 38a53400-346e-4e12-96b6-989fcad75ab3 |                  | 10.169.126.149      |
                                     |
| 70be87df-97db-4d53-b603-2efb7cfd4a6c |                  | 10.169.126.154      |
                                     |
| 72205ae8-c905-4705-a67f-a99cf9078246 | 172.168.20.101   | 10.169.126.144      |
a088cc88-3e95-4751-a092-e2f6063d3886 |
| 780e652c-3ee7-47c3-ad25-f1cf17d0c9f6 | 172.16.182.6     | 10.169.126.140      |
f186730b-be55-4404-9a5a-84741a8d8032 |
| 871825f2-5d30-4a34-baec-3ba09cf93559 | 172.168.10.11    | 10.169.126.143      |
c416552e-5f41-4dbe-bbd1-6a9ef0a39e94 |
| 89c1784d-a8a5-4e91-835c-d4dbff47172e | 172.168.10.13    | 10.169.126.147      |
78afdd69-5f86-48c7-84c0-a10dbf25ea57 |
| 89d6c6ac-bf12-45b9-ae52-7fd2a20a2838 |                  | 10.169.126.146      |
                                     |
| a501bec3-d87f-47de-8e11-f5ce903ea1fe |                  | 10.169.126.157      |
                                     |
| f6ff9566-1514-4d55-b09d-800c19906d9e | 172.168.10.7     | 10.169.126.142      |
dde1fe31-e278-443f-bd5e-f434edefe14e |
| f8c131b5-a5d6-400e-8936-c407504208da | 172.16.182.11    | 10.169.126.139      |
aff0efca-cef0-4852-bdb4-9b1fa5ca373f |
| f963b405-3586-4ab2-8815-b76332832e64 | 172.168.10.101   | 10.169.126.141      |
2a3ab817-9939-45a9-8774-e062ea74387f |
+--------------------------------------+--------------+-----------------+--------------------------------------+
```

4. Obtain the AutoDeploy address.

   nova list | grep auto-deploy

5. Log on to the AutoDeploy VM as the default user, *ubuntu*.

   ssh ubuntu*@<ad_vm_address>*

6. Switch to the *root* user.

   sudo su

7. Enter the ConfD CLI.

   confd_cli -C -u admin

8. Find the deployment details from AutoDeploy:

   show service-deployment *<deployment_name>* **siter autovnfr**

   Example command output:

```
siter LBUCS002
 autovnfr LBPCF100-UAS
  endpoint-info ip-address 10.169.126.141
  endpoint-info port 2022
  status alive
  vnfmr LBPCF100-ESC
   endpoint-info ip-address 172.168.10.7
   endpoint-info port 830
```

```
   status alive
  vnfr LBPCF100-VNF
   status alive
   vnf-deploymentr LBPCF100-DEPLOYMENT
    em-endpoint-info ip-address 172.168.10.11
    em-endpoint-info port 2022
 autovnfr LBPGW100-UAS
  endpoint-info ip-address 10.169.126.144
  endpoint-info port 2022
  status alive
  vnfmr LBPGW100-ESC
   endpoint-info ip-address 172.168.20.5
   endpoint-info port 830
   status alive
  vnfr LBPGW100-VNF
   status alive
   vnf-deploymentr LBPGW100-DEPLOYMENT
    em-endpoint-info ip-address 172.168.20.12
```

Record the UAS IP address for each VNF as highlighted in the command output example.

9. Log on to the master AutoVNF VM as the default user, *ubuntu*.

   ssh ubuntu*@<ad_vm_address>*

10. Switch to the *root* user.

    sudo su

11. Enter the ConfD CLI.

    confd_cli -C -u admin

12. Collect the VIP address for ESC.

    In releases prior to 6.0:

    show autovnf-oper:vnfm

    Example output:

```
autovnf-oper:vnfm vnfmd
state alive
version 3.1.0.94
transaction-id 1507961257-916914
ha-vip 30.30.62.7
vnfc-instance vnfmd-ESC
compute-host tb1ano-compute-7.localdomain
interfaces autovnfd-uas-management
ip-address 30.30.61.17
mac-address fa:16:3e:3d:be:31
interfaces autovnfd-uas-orchestration
ip-address 30.30.62.7
mac-address fa:16:3e:68:8e:15
```

    In 6.0 and later releases:

    show vnfr

    For an example output, see the Example show vnfr Command Output, on page 142.

13. Collect the VIP address for the UEM and CF.

    show autovnf-oper:vip-port

    Example output:

```
vip-port vnfd-deployment vnf-deployment
transaction-id 1508009048-329005
port autovnfd-uas-management-30.30.61.103
network autovnfd-uas-management
ha-vip 30.30.61.103
vdu-ref element-manager
port autovnfd-uas-management-30.30.61.104
network autovnfd-uas-management
ha-vip 30.30.61.104
vdu-ref control-function
vip-port vnfmd vnfm-deployment
transaction-id 1507961257-916914
port vnfmd-ESC-vip
network autovnfd-uas-management
ha-vip 30.30.62.7
vdu-ref esc
```

In 6.0 and later releases:

show vnfr

For an example output, see the Example show vnfr Command Output, on page 142.

14. Repeat 13, on page 195 for each VNF-UAS.

Backup Configuration Files

Backing up configuration files involves using SFTP to download copies of these files to a backup directory on a remote server.

Important If SFTP to any of the VMs fails, then remove the respective entry from the *known_hosts* file under .ssh directory and retry.

To backup the configuration files:

1. Create a backup directory, if one does not already exist.
2. SFTP the Day 0 configuration called *system.cfg* from each UGP-based VNF to the backup directory.
3. SFTP the latest Day N configuration file from each UGP-based VNF to the backup directory.

   The Day N configuration file specifies the configuration of the various gateway and services deployed on the UGP.

Important UGP-based VNF Day N configuration can also be obtained by logging in to the CF and logging the output of the **show configuration** command. In addition, password information saved in this file is encrypted. Prior to re-applying this configuration to the upgraded/redeployed VNF, you'll need to manually reconfigure the unencrypted passwords in the configuration file.

4. Collect the output of the **show support details** command for each VNF.
5. SFTP the latest AutoDeploy configuration file from the AutoDeploy VM to the backup directory.

Important You'll need to log in to the AutoDeploy VM using the credentials for the user *unbuntu*.

6. SFTP the latest AutoVNF configuration file from the master AutoVNF VM to the backup directory.

Important You'll need to log in to the AutoVNF VM using the credentials for the user *unbuntu*.

7. SFTP the latest VIM Orchestrator configuration file from the AutoDeploy VM to the backup directory.
8. SFTP the latest VIM configuration file from the AutoDeploy VM to the backup directory.

Backup UAS ConfD Databases

Backing up ConfD databases (CDBs) is done on the UAS software role VMs and involves copying the databased files to a secure location.

AutoDeploy CDB:

Copy the contents of the */opt/cisco/usp/uas/confd-6.3.1/var/confd/cdb* directory.

Example directory contents:

```
total 1100
drwxr-xr-x 2 root root    4096 Sep 27 22:27 ./
drwxr-xr-x 8 root root    4096 Sep 27 18:48 ../
-rw-r--r-- 1 root root   10332 Sep 27 22:10 aaa_init.xml
-rw-r--r-- 1 root root   10261 Oct  2 20:20 A.cdb
-rw-r--r-- 1 root root 1086629 Sep 27 22:10 C.cdb
-rw-r--r-- 1 root root     804 Sep 27 22:27 O.cdb
```

AutoIT CDB

Copy the contents of the */opt/cisco/usp/uas/confd-6.3.1/var/confd/cdb* directory.

Example directory contents:

```
total 884
drwxr-xr-x 2 root root 4096 Sep 14 18:55 ./
drwxr-xr-x 8 root root 4096 Sep 11 21:56 ../
-rw-r--r-- 1 root root 10234 Sep 12 18:34 aaa_init.xml
-rw-r--r-- 1 root root 7092 Sep 14 18:56 A.cdb
-rw-r--r-- 1 root root 857637 Sep 12 18:34 C.cdb
-rw-r--r-- 1 root root 16363 Sep 14 18:56 O.cdb
```

AutoVNF

Copy the contents of the */opt/cisco/usp/uas/confd-6.3.1/var/confd/cdb* directory.

Example directory contents:

```
total 1232
drwxr-xr-x 2 root root    4096 Oct  4 05:39 ./
drwxr-xr-x 8 root root    4096 Sep 27 18:48 ../
-rw-r--r-- 1 root root   10218 Sep 27 22:22 aaa_init.xml
```

```
-rw-r--r-- 1 root root    3789 Sep 27 22:22 A.cdb
-rw-r--r-- 1 root root 1223594 Sep 27 22:22 C.cdb
-rw-r--r-- 1 root root     277 Sep 27 18:48 gilan.xml
-rw-r--r-- 1 root root    2216 Oct  4 05:39 O.cdb
-rw-r--r-- 1 root root     271 Sep 27 18:48 vpc.xml
```

Collect Logs

Prior to deactivating any part of the deployment, it is recommended that you collect logs from the different components that comprise the USP-based VNF and transfer them to a remote backup server.

- **AutoDeploy Logs:** Refer to Viewing AutoDeploy Logs, on page 122 for information on the logs to collect and their locations.

  It is recommended that you copy autodeploy.log to autodeply_beforedeactivation.log and then collect logs during de-activation.

- **AutoIT Logs:** Refer to Viewing AutoIT Logs, on page 127 for information on the logs to collect and their locations.

  It is recommended that you copy autoit.log to autoit_beforedeactivation.log and then collect logs during de-activation.

- **AutoVNF Logs:** Refer to Viewing AutoVNF Logs, on page 132 for information on the logs to collect and their locations.

  It is recommended that you copy autovnf.log to autovnf_beforedeactivation.log and then collect logs during de-activation.

- **VNFM (ESC) Logs:** Refer to Viewing ESC Logs, on page 149 for information on the logs to collect and their locations.

- **UEM Logs:** Refer to Viewing UEM Logs, on page 152 for information on the logs to collect and their locations.

Collect Charging Detail Records

Prior to performing an upgrade or redeployment, it is strongly recommended that you collect or backup copies of all charging detail records (CDRs).

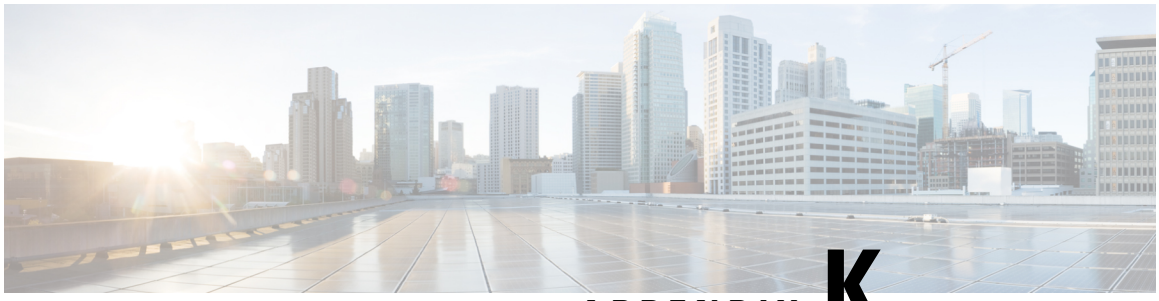
The UGP-based VNF supports the ability to push locally-stored CDRs to a configured collection server based on user-defined intervals or criteria. Refer to the “Configuring CDR Push” section within the “HDD Storage” chapter of the GTPP Interface Administration and Reference. Select the document pertaining to your software version from those available here: https://www.cisco.com/c/en/us/support/wireless/asr-5000-series/products-installation-and-configuration-guides-list.html

Prior to initiating the VNF upgrade or redeployment, collect or backup copies of all CDRs using one of these two methods:

- Initiate a manual push of specified CDR files to the configured collection server, OR
- Retrieve CDRs via SFTP

Instructions for using these methods is provided in the GTPP Interface Administration and Reference. Note that additional configuration may be required in order to use these methods.

Backing Up Deployment Information



APPENDIX K

Example RedHat Network Interface and Bridge Configuration Files

- /etc/sysconfig/network-scripts/ifcfg-eno2, on page 201
- /etc/sysconfig/network-scripts/ifcfg-eno1, on page 201
- /etc/sysconfig/network-scripts/ifcfg-br-ex, on page 202
- /etc/sysconfig/network-scripts/ifcfg-br-ctlplane, on page 202

/etc/sysconfig/network-scripts/ifcfg-eno2

```
TYPE=Ethernet
BOOTPROTO=dhcp
DEFROUTE=yes
PEERDNS=yes
PEERROUTES=yes
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_PEERDNS=yes
IPV6_PEERROUTES=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=stable-privacy
NAME=eno2
UUID=ba5aa1e1-c3c9-47ea-8858-e0103f3b9b07
DEVICE=eno2
ONBOOT=yes
BRIDGE=br-ex
NM_CONTROLLED=no
NETMASK=255.255.255.0
GATEWAY=172.25.22.1
```

/etc/sysconfig/network-scripts/ifcfg-eno1

```
TYPE=Ethernet
BOOTPROTO=dhcp
DEFROUTE=yes
PEERDNS=yes
PEERROUTES=yes
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
```

```
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_PEERDNS=yes
IPV6_PEERROUTES=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=stable-privacy
NAME=eno1
UUID=c8a52d43-2ce7-4a4d-81bd-ca7fce6cebe8
DEVICE=eno1
ONBOOT=yes
BRIDGE=br-ctlplane
NM_CONTROLLED=no
```

/etc/sysconfig/network-scripts/ifcfg-br-ex

```
DEVICE=br-ex
DEFROUTE=yes
TYPE=Bridge
ONBOOT=yes
BOOTPROTO=static
NM_CONTROLLED=no
DELAY=0
IPADDR=172.25.22.59
NETMASK=255.255.255.0
GATEWAY=172.25.22.1
PREFIX="24"
DNS1="171.70.168.183"
DOMAIN="cisco.com"
IPV4_FAILURE_FATAL="yes"
```

/etc/sysconfig/network-scripts/ifcfg-br-ctlplane

```
DEFROUTE=yes
TYPE=Bridge
ONBOOT=yes
BOOTPROTO=static
NM_CONTROLLED=no
DELAY=0
DEVICE=br-ctlplane
```