



Avaya Fabric Orchestrator Solution Description

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Chapter 1: Introduction

Purpose

This document describes an Avaya solution from a holistic perspective focusing on the strategic, enterprise, and functional views of the architecture. This document also includes a high-level description of each verified reference configuration for the solution.

Related resources

Documentation

The following table lists the documents related to this product. Download the documents from the Avaya Support website at <http://support.avaya.com>.

Document title	Use this document for:	Audience
<i>Avaya Fabric Orchestrator Solution Description</i> , NN48100–100	Description of each verified reference configuration.	System administrator
<i>Deploying Avaya Fabric Orchestrator</i> , NN48100–101	Installing, configuring, initial administration, and basic maintenance checklist and procedures.	System administrator
<i>Getting Started and Locating the latest software and Release Notes for Avaya Fabric Orchestrator</i> , NN48100–102	Locating the latest software and product release notes.	System administrator
<i>Network Monitoring using Avaya Fabric Orchestrator</i> , NN48100–500	Monitoring the managed objects in AFO.	System administrator
<i>Network Configuration using Avaya Fabric Orchestrator</i> , NN48100–501	Configuring and managing Avaya Enterprise family of devices from discovered network.	System administrator

Table continues...

Document title	Use this document for:	Audience
<i>Bulk Device Configuration Management using Avaya Fabric Orchestrator</i> , NN48100–502	Performing a variety of management tasks across multiple device types using a web-based interface.	System administrator
<i>Virtualization Configuration using Avaya Fabric Orchestrator</i> , NN48100–503	Connecting the vCenter server to AFO, to help the data center administrator to configure the network changes that apply to the data center.	System administrator
<i>IP Flow Configuration using Avaya Fabric Orchestrator</i> , NN48100–504	Collecting and analyzing IP flows from IPFIX-, NetFlow v5-, and NetFlow v9- enabled devices.	System administrator
<i>Administration using Avaya Fabric Orchestrator</i> , NN48100–600	AFO System administration procedures.	System administrator
<i>Avaya Fabric Orchestrator Traps and Trends Reference</i> , NN48100–700	Viewing a list of supported traps and trends.	System administrator
<i>Avaya Fabric Orchestrator Supported Devices, Device MIBs, and Legacy Devices Reference</i> , NN48100–701	Confirming support for devices and MIBs.	System administrator

Training

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Procedure

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- To find the Avaya Mentor videos on YouTube, go to www.youtube.com/AvayaMentor and perform one of the following actions:
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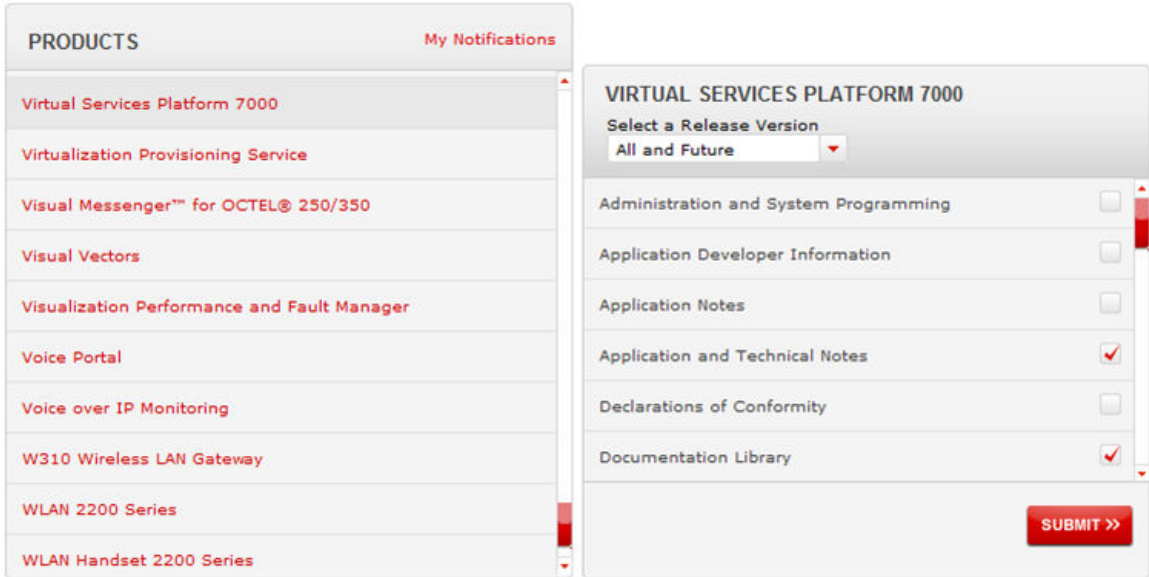
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Chapter 2: New in this document

Avaya Fabric Orchestrator Solution Description, NN48100–100 is a new document for Release 1.0 so all the features are new in this release. See *Avaya Fabric Orchestrator Release Notes* for a list of supported features.

Chapter 3: Introduction to Avaya Fabric Orchestrator (AFO)

Avaya Fabric Orchestrator (AFO) Overview

The Avaya Fabric Orchestrator (AFO) is the next generation Management and Orchestration solution from Avaya. AFO creates an open framework for managing networking gear at a higher level of abstraction using Avaya Fabric Networking technology. This solution separates the control and data management planes of the network. AFO architecture is comprised of new and existing products intended to ease onboarding of users and devices to the network.

AFO is a single, pre-installed, easily deployable appliance with a web-based multi-user solution. AFO integrates all its tools in a single device. AFO includes a set of management features that helps lower the TCO, delivers automation, and simplifies operational processes. The following is a list of AFO management features:

Table 1: AFO network management applications

Application	Description	Features
AFO Configuration	Provides an intuitive interface to configure and manage the Avaya Enterprise family of devices from a discovered network.	<ul style="list-style-type: none">• VLAN• MLT• Routing• VRF• Multicast• Fabric Connect• Fabric Extend• Multimedia• Trap/Log Registration• Security• Device Groups• File Inventory

Table continues...

Application	Description	Features
AFO Bulk Provisioning	Performs a variety of management tasks across multiple device types using a web-based interface.	<ul style="list-style-type: none"> • Configuration Backup and Restore • Configuration Update Generator • Device Password Manager • Inventory • Log Browser • Scheduler • Software Version Updater • TunnelGuard Distributor • Reports
AFO Monitoring	Monitors the managed objects in AFO, and reduces troubleshooting issues because of a more complete view of the network.	<ul style="list-style-type: none"> • Built-in monitoring for supported devices (Availability, KHI Bandwidth only) • Event-driven E-mail action • Event-driven scripting action • Built-in monitoring dashboard (view only) • Built-in reports (view only) • PDF and Excel export of reports and trends • Basic enumerated scopes • Trap and Syslog viewers • Basic virtualization support (Hypervisor and VM discovery) • Advanced discovery (multi-vendor, non-Avaya L4/L7 software and applications) • Advanced monitoring • Custom actions • Dashboards you can customize, and dashboard builder • Reports that you can customize, and reports builder • Advanced scopes • Network baselining
AFO IP Flow	Collects and analyzes IP flows from IPFIX-, NetFlow v5- and NetFlow v9-	<ul style="list-style-type: none"> • Flows collection

Table continues...

Application	Description	Features
	enabled devices. All management functions are provided through a Web-based user interface.	<ul style="list-style-type: none"> • Flows analysis by protocol and applications • PDF export to charts • Custom protocol monitoring • Custom application monitoring • PDF, Excel, and CSV export of charts and data
AFO Virtualization	Connects the vCenter server to AFO Configuration to help the data center administrator configure the network changes that apply to the data center.	<ul style="list-style-type: none"> • Monitoring virtual infrastructure and provision network

AFO delivers enterprise-class reliability, efficiency, and scaling to mission-critical networks around the globe. Thus, significantly reducing the cost of managing networks.

Management and orchestration

AFO offers management features to deliver automation and simplify operational processes.

Unified Management

Unified Management is an integrated set of functionality that offers best-in-class monitoring, provisioning, and troubleshooting for Avaya network devices. It helps reduce the administration, complexity, and related costs of managing the network through a single unified framework. This allows businesses to centralize and streamline their management workflows, while reducing installation, configuration, and maintenance time.

Discovery and visualization

AFO provides rich discovery and visualization capabilities of Avaya network devices. The application discovers all devices and nodes attached to the network such as servers, storage servers, switches, routers, IP phones, Avaya Aura® applications, and VM hosts. In addition, it identifies the relationships that exist among devices in the network including topology and links. If the security settings allow it, operating systems and applications on servers can also be part of the discovery process.

Highlights

- Network discovery
 - Support for standards, proprietary, application, and OS-based discovery
 - Device information can be used to provide a network inventory listing
 - Devices can be classified based on their function in the network such as core switches and Internet routers
- Network visualization
 - Hierarchy-based topology and service-based views
 - Device connectivity and their relationships to each other

Configuration and orchestration

Configuration and orchestration in AFO provides topology based network wide configuration and provisioning for the Avaya enterprise family of devices. AFO simplifies the configuration and provisioning process, so that IT resources can focus on managing the network.

Highlights

- Consolidates configuration, provisioning, and orchestration through topology-driven, Web-based, integrated network management
- Supports multiple concurrent users and includes powerful access controls such as role-based user control functionality
- GUI-driven, network-wide configuration and provisioning of new or existing network devices
- Device element management, inventory, updates, and device and user access control through centralized element management
- Simplified, intuitive wizards and easy-to-use templates that can be reused as required
- A common set of configuration commands can be run on multiple system devices
- Automate routine backups with regular device backups
- Automate the management of security updates
- User-based views allow administrators to create device groupings, which can be assigned to users and displayed on the topology map.
- Advanced event management allows administrators associate colors to trap types or severities. The topology map icons in the trap can be color-highlighted and sent through an email to users.
- Proactive change management compares device configurations with a previous baseline and generates a report or an email.
- IP phone discovery with centralized oversight of related Ethernet switch parameters.
- Scalability to manage large networks
- Automatically synchronize changes to the network. For example, VM configurations such as adding, moving, and changing are monitored and applied automatically to the network.

Monitoring and diagnostics management

Using information collected from the network and the devices, AFO performs status monitoring and sends the information required to perform event correlation and route cause analysis (RCA). AFO determines the most likely cause of the network outage by correlating all network events and determining the primary and secondary devices affected.

AFO also provides a set of event handling features. An action can be associated with an event so that the action runs automatically when the event appears on a specific device. For example, sending an email notification or paging the appropriate personnel.

Highlights

- SNMP Trap Receiver and Syslog Collector
- Event correlation
- Device status monitoring
- Event handling and scripting

- MIB compiler and browser
- Layer 2 and 3 diagnostics management, including tools such as ICMP ping, SNMP Gets, MIB Walker, and Browser.

Performance management

AFO provides basic performance management features to help two key activities in a customer environment: capacity planning and change monitoring.

AFO monitors thresholds on any instance and reports if thresholds reach or exceed. For example, if traffic on a particular link exceeds a pre-determined threshold, such as 30 percent, AFO records and reports the performance.

Highlights

- Instance-based performance monitoring (MIB-browser based)
- Long-term (trending) performance monitoring

Application performance management

AFO provides tools to monitor, analyze, and report application behaviors and their bandwidth utilization trends. AFO uses standard IP Flow technology combined with analysis using packet capture, trending, and alert notification capabilities.

Highlights

- IPFIX collector that supports IPFIX (Netflow v5 and v9) flows
- Real time analysis of the flow to provide trending and traffic pattern
- View of top 10 customers of network resources at various levels within network hierarchy

Virtualization provisioning

AFO provides VM agnostic lifecycle management and support for multiple vCenters in a large data center. With service profiling definition, you can create fabric connections per service. The AFO network follows VM and supports dynamic fabric provisioning.

Highlights

- Hypervisor VM agnostic lifecycle management
- Support for multiple vCenters in a large data center
- Service profiling definition allowing creation of fabric connections per service
- Supports dynamic fabric provisioning

Features

AFO provides the following benefits:

One appliance

AFO is a single, pre-installed appliance that is easy and quick to deploy, and provides tools that are integrated in a single device to reduce deployment time and complexity.

Unified management

AFO provides unified management of wired, wireless, physical, and virtual resources to provide a single point to monitor and manage all Avaya elements.

User interface

AFO has an integrated user interface for a common user experience, with data-driven menus, that simplifies management of all Avaya systems.

Two-click application access

You can access any application from the AFO web interface in two clicks. Click or move the mouse pointer over an application on the menu bar located at the top of the AFO window to access the primary level application page. The tools within the primary applications may require more clicks.

Fabric support and attach

AFO automates the Avaya experience with Fabric Connect and creates mapping between Avaya endpoints and infrastructure. AFO enables VMware-automated virtual machine orchestration, and automates the creation of end-to-end connectivity and uniform quality of experience. AFO is an appliance with auto-attach to Avaya fabric, known as Avaya OVS.

SDN-based

AFO is the core building block of the SDN controller. AFO is a consolidated management system that provides the necessary building blocks to enable an SDN controller through northbound REST interfaces, Open Stack drivers and plug-ins.

Increased scalability

AFO provides scaling of up to 5000 devices for configuration workflows.

Automatic one-click upgrade and patching

AFO provides the ability to upgrade and update the system with one-click. AFO automatically downloads the applicable updates and binary configuration files directly from the Avaya Product Licensing and Distribution System (PLDS) repository.

Fabric Extend

Fabric Extend provides the ability to extend Fabric Connect across non-SPB networks and devices. Using this feature you can merge multiple isolated SPB clouds into a single SPB network by creating VXLAN tunnels between Backbone Edge Bridges (BEBs). The configuration module in AFO supports enabling Fabric Extend using the Fabric Extend view.

Overview

The Fabric Extend view provides a graphical management interface for administrators to configure fabric extensions.

Every Fabric Extend network deployment involves creating numerous bidirectional tunnels. Fabric Extend view automates the provisioning of these tunnels by using Fabric Extend domains. When you add nodes to a Fabric Extend domain, Fabric Extend view automatically creates tunnels between the nodes belonging to the same domain. Fabric Extend view also ensures error-free bidirectional tunnel provisioning.

The Fabric Extend feature views the fabric extension as a bidirectional tunnel consisting of two compatible unidirectional tunnels one each configured on the two concerned devices. Thus Fabric Extend view manipulates the tunnels as bidirectional tunnels.

*** Note:**

The fabric can be extended using layer-2 Vlan or SPBoIP. Fabric Extend view in AFO 1.0 supports only SPBoIP tunnels.

Fabric Extend functions

Fabric Extend view provides the following functions:

- Identifies Fabric Extend capable switches.
- Provides an easy way to group and manage a set of Fabric Extend capable switches using domains characterized by the type of topology the group forms. For example: Mesh, Hub-and-Spoke.
- Provides an easy way to configure and manage point-to-point fabric extensions.

Fabric Extend domains

Fabric Extend Domains represent a topological arrangement or grouping of Fabric Extend capable devices. There are two types of Fabric Extend domains:

- **Mesh** – This type of domain creates full-mesh tunnels between all nodes (switches). If you add a switch to a mesh domain, Fabric Extend automatically builds Fabric Extend tunnels to all the other switches in the domain.
- **Hub-and-Spoke** – This type of domain identifies each node as either a hub or a spoke.
 - Hub nodes automatically establish bidirectional tunnels with all nodes in the domain.
 - Spoke nodes automatically establish bidirectional tunnels only with the hub nodes in the domain.

Point-to-Point tunnels

You can use Fabric Extend view to provision your own tunnels between Fabric Extend-capable nodes. You must specify the tunnel configuration for both ends of the tunnels.

For more information on Fabric Extend, see *Configuring Avaya Fabric Connect on VSP Operating System Software*, NN47227-510.

Chapter 4: Avaya Fabric Orchestrator specifications

Reference configurations

AFO is a hardware appliance that operates virtualized management modules on a RedHat Enterprise Linux (RHEL) Kernel-based Virtual Machine (KVM) Hypervisor.

Licensing

Licensing in AFO uses the System Manager WebLM as the license server to add or remove licenses.

Each AFO appliance requires a license. The licenses are node locked to the appliance and the WebLM server, hence they cannot be transferred from one appliance to the other. There are three types of licenses: 250-Node, 1500-Node, and 5000-Node. The type of license you purchase determines the device count and features available for each application. The Advanced Monitoring license includes all the applications and features.

License activations in PLDS require the HostID of the WebLM server and Monitoring VM HostID for inclusion in the license file. The HostID of the WebLM server is displayed on the Server Properties page of the WebLM.

License Type

There are three types of licenses. The following list outlines the types of AFO licenses:

- *250-Node*
- *1500-Node*
- *5000-Node*

The following table outlines the device count for each module.

Table 2: Device count for modules

Application	250-Node	1500-Node	5000-Node
AFO Configuration	250	1,500	5,000

Table continues...

Application	250-Node	1500-Node	5000-Node
AFO Monitoring	1,000	6,000	20,000
AFO Flow	10	10	10
AFO Virtualization	220	220	220

The following table outlines the device count for the AFO Monitoring module.

Table 3: Device counts for the AFO Monitoring

Managed Devices	250-Node	1500-Node	5000-Node
Networking Switches	250	1,500	5,000
UC, CC, phones, Avaya solution (EMC, HP), other Managed Objects	750	4,500	15,000
Total	1,000	6,000	20,000

Additional features

At the time of acquiring a license, you must select any additional features you wish to access along with the license type. These additional features include the Advanced Monitoring and Fabric Extend features.

The Advanced Monitoring feature is available for all three license types and can be enabled or disabled based on your requirement.

If you wish to purchase any additional features after you acquire a license, you can contact Avaya support to receive a new license for AFO from PLDS. You must replace the existing license with the new license on the WebLM server.

Trial version

AFO provides a trial version of 45 days which will be available soon after the configuration of AFO on the hardware appliance for the first time. You do not require any trial license file to run the trial version. The standard license will be active during the trial period.

Grace Period

A grace period of 30 days is available in case of any of the following scenarios :

- The absence of license after the trial period expires or at any given time.
- If after installing license there is any loss of connectivity to the license (WebLM) server.

For more information about licenses, see *Administration using Avaya Fabric Orchestrator*, NN48100–600.

PLDS support

Avaya Product Licensing and Distribution System (PLDS) enables you to perform licensing and entitlement management. Avaya Solution Software Director (SSD) uses PLDS's API to query for entitlement information and download required software bundles and other files automatically.

*** Note:**

Internet connectivity is required to use PLDS.

SSD checks for the entitled software based on PLDS login information provided in Management Server Console (MSC) preferences. To download files automatically, ensure that your system has connectivity to the Internet. Alternatively, you can use SSD to upgrade your system in Advanced mode when you do not have connectivity to the Internet.

For more information about how to generate a license file, see *Getting Started with Avaya PLDS for Avaya Networking Products*, NN46199-300. All licensing activities are performed through the Avaya PLDS Portal at <http://plds.avaya.com>.

Migration of installed Avaya management applications to AFO

If you are using the current Avaya network management applications, Avaya Configuration and Orchestration Manager (COM), Avaya Bulk Configuration Manager (BCM), Avaya Visualization Performance and Fault Manager (VPFM), Avaya IP Flow Manager (IPFM), and Avaya Virtualization Provisioning Service (VPS), you can migrate the application data, including add-ons, to AFO.

You can migrate data to AFO from the following applications.

- COM 3.1 and later
- VPS 1.1 and later
- IPFM 2.1 and later
- VPFM 3.0 and later

Application data includes:

- device credentials
- users
- roles
- certificates and security policies

For more information about migrating installed Avaya management applications to AFO, see *Deploying Avaya Fabric Orchestrator*, NN48100–101.

Software upgrade and patching

Overview

Upgrading is the process of updating the existing managed elements software version with a new version. In Avaya Fabric Orchestrator (AFO), the managed elements include; the virtual machine, applications for all the elements, and devices that are managed by AFO.

Software Patch (Update or Feature Pack) is an incremental change to the major release in terms of new features and bug fixes. The process of applying this patch is software patching.

The Solution Software Director (SSD) checks the compatibility of the available software with the AFO managed elements and recommends the required upgrades and updates based on your entitlements.

Solution Software Director (SSD)

You can perform software upgrade and patching using SSD through the AFO web interface. On the menu bar, click **Administration > Solution Software Director** to perform a software upgrade. You can upgrade AFO using any one of the following two methods depending on the scenarios as defined in the table below:

- Easy mode upgrade
- Advanced mode upgrade

The following table lists different scenarios and type of upgrades:

Table 4: Type of Upgrades

Scenario	Type of Upgrade
When Platform VM is up	You can perform either Easy mode upgrade or Advanced mode upgrade
When Platform VM is down	You can perform either Easy mode upgrade or Advanced mode upgrade
When PLDS is not accessible from server (offline)	You can only perform Advanced mode upgrade
When PLDS is accessible from server (online)	You can perform either Easy mode upgrade or Advanced mode upgrade
Using SSD for MSC self-upgrade in an AFO deployment	You can perform a self-upgrade of MSC from SSD. This means the service running the upgrade software upgrades itself.