

**Part No. 060504-10, Rev. B**  
**January 2018**

# **OmniSwitch AOS Release 8** **Specifications Guide**

## **8.4.1.R03**

Alcatel·Lucent   
Enterprise

**[www.al-enterprise.com](http://www.al-enterprise.com)**

**This user guide documents AOS Release 8.4.1.R03 for the  
OmniSwitch 9900, OmniSwitch 6900, OmniSwitch 6860, OmniSwitch 6865 and OmniSwitch 6560.  
The functionality described in this guide is subject to change without notice.**

**enterprise.alcatel-lucent.com** Alcatel-Lucent and the Alcatel-Lucent Enterprise logo are trademarks of Alcatel-Lucent. To view other trademarks used by affiliated companies of ALE Holding, visit: [enterprise.alcatel-lucent.com/trademarks](http://enterprise.alcatel-lucent.com/trademarks). All other trademarks are the property of their respective owners. The information presented is subject to change without notice. Neither ALE Holding nor any of its affiliates assumes any responsibility for inaccuracies contained herein. (2018)



26801 West Agoura Road  
Calabasas, CA 91301  
(818) 880-3500 FAX (818) 880-3505

**Service & Support Contact Information**

North America: 800-995-2696  
Latin America: 877-919-9526  
EMEA : +800 00200100 (Toll Free) or +1(650)385-2193  
Asia Pacific: +65 6240 8484  
Web: [support.esd.alcatel-lucent.com](http://support.esd.alcatel-lucent.com)  
Email: [ebg\\_global\\_supportcenter@al-enterprise.com](mailto:ebg_global_supportcenter@al-enterprise.com)

# Contents

|                  |   |      |
|------------------|---|------|
|                  | <b>About This Guide</b> .....                       | vii  |
|                  | Supported Platforms .....                           | vii  |
|                  | Who Should Read this Manual? .....                  | vii  |
|                  | When Should I Read this Manual? .....               | vii  |
|                  | What is Not in this Manual? .....                   | vii  |
|                  | How is the Information Organized? .....             | ix   |
|                  | Documentation Roadmap .....                         | ix   |
|                  | Related Documentation .....                         | xi   |
|                  | Technical Support .....                             | xii  |
| <b>Chapter 1</b> | <b>Switch Management Specifications</b> .....       | 1-1  |
|                  | In This Chapter .....                               | 1-2  |
|                  | Getting Started Specifications .....                | 1-3  |
|                  | Login Specifications .....                          | 1-3  |
|                  | File Management Specifications .....                | 1-4  |
|                  | CMM Specifications .....                            | 1-4  |
|                  | USB Flash Drive Specifications .....                | 1-5  |
|                  | CLI Specifications .....                            | 1-5  |
|                  | Configuration File Specifications .....             | 1-6  |
|                  | User Database Specifications .....                  | 1-6  |
|                  | WebView Specifications .....                        | 1-6  |
|                  | SNMP Specifications .....                           | 1-7  |
|                  | Web Services Specifications .....                   | 1-8  |
|                  | OpenFlow Specifications .....                       | 1-9  |
|                  | Virtual Chassis Specifications .....                | 1-10 |
|                  | Automatic Remote Configuration Specifications ..... | 1-11 |
|                  | Automatic Fabric Specifications .....               | 1-11 |
|                  | NTP Specifications .....                            | 1-11 |
| <b>Chapter 2</b> | <b>Network Configuration Specifications</b> .....   | 2-1  |
|                  | In This Chapter .....                               | 2-2  |

|   |      |
|---|------|
| Ethernet Specifications .....                   | 2-3  |
| UDLD Specifications .....                       | 2-3  |
| Source Learning Specifications .....            | 2-4  |
| VLAN Specifications .....                       | 2-4  |
| High Availability VLANs Specifications .....    | 2-5  |
| Spanning Tree Specifications .....              | 2-5  |
| Loopback Detection Specifications .....         | 2-6  |
| Static Link Aggregation Specifications .....    | 2-6  |
| Dynamic Link Aggregation Specifications .....   | 2-6  |
| Dual-Home Link Specifications .....             | 2-6  |
| ERP Specifications .....                        | 2-8  |
| MVRP Specifications .....                       | 2-8  |
| 802.1AB Specifications .....                    | 2-8  |
| SIP Snooping Specifications .....               | 2-9  |
| IP Specifications .....                         | 2-10 |
| VRF Specifications .....                        | 2-11 |
| IPv6 Specifications .....                       | 2-12 |
| IPsec Specifications .....                      | 2-14 |
| RIP Specifications .....                        | 2-15 |
| BFD Specifications .....                        | 2-15 |
| DHCP Relay Specifications .....                 | 2-16 |
| DHCP Server Specifications .....                | 2-17 |
| VRRP Specifications .....                       | 2-18 |
| Server Load Balancing Specifications .....      | 2-18 |
| IPMS Specifications .....                       | 2-19 |
| IPMSv6 Specifications .....                     | 2-20 |
| QoS Specifications .....                        | 2-21 |
| LDAP Policy Server Specifications .....         | 2-22 |
| Authentication Server Specifications .....      | 2-22 |
| UNP Specifications .....                        | 2-23 |
| Access Guardian Specifications .....            | 2-24 |
| AppMon Specifications .....                     | 2-25 |
| Application Fingerprinting Specifications ..... | 2-25 |
| Port Mapping Specifications .....               | 2-25 |
| Learned Port Security Specifications .....      | 2-25 |

|                   |  |            |
|-------------------|--|------------|
|                   | Port Mirroring Specifications .....                        | 2-27       |
|                   | Port Monitoring Specifications .....                       | 2-27       |
|                   | sFlow Specifications .....                                 | 2-28       |
|                   | RMON Specifications .....                                  | 2-29       |
|                   | Switch Health Specifications .....                         | 2-30       |
|                   | VLAN Stacking Specifications .....                         | 2-31       |
|                   | Switch Logging Specifications .....                        | 2-32       |
|                   | Ethernet OAM Specifications .....                          | 2-33       |
|                   | SAA Specifications .....                                   | 2-33       |
| <b>Chapter 3</b>  | <b>Advanced Routing Configuration Specifications .....</b> | <b>3-1</b> |
|                   | In This Chapter .....                                      | 3-1        |
|                   | OSPF Specifications .....                                  | 3-2        |
|                   | OSPFv3 Specifications .....                                | 3-3        |
|                   | IS-IS Specifications .....                                 | 3-4        |
|                   | BGP Specifications .....                                   | 3-5        |
|                   | Multicast Boundary Specifications .....                    | 3-6        |
|                   | DVMRP Specifications .....                                 | 3-6        |
|                   | PIM Specifications .....                                   | 3-7        |
|                   | MBR Specifications .....                                   | 3-8        |
| <b>Chapter 4</b>  | <b>Data Center Switching Specifications .....</b>          | <b>4-1</b> |
|                   | In This Chapter .....                                      | 4-2        |
|                   | Data Center Bridging Specifications .....                  | 4-3        |
|                   | Shortest Path Bridging Specifications .....                | 4-4        |
|                   | VXLAN Specifications .....                                 | 4-5        |
|                   | VXLAN Snooping Specifications .....                        | 4-5        |
|                   | FIP Snooping Specifications .....                          | 4-6        |
|                   | FCoE/FC Gateway Specifications .....                       | 4-7        |
|                   | Edge Virtual Bridging Specifications .....                 | 4-8        |
| <b>Appendix A</b> | <b>Software License and Copyright Statements .....</b>     | <b>A-1</b> |
|                   | ALE USA, Inc. License Agreement .....                      | A-1        |
|                   | ALE USA, Inc. SOFTWARE LICENSE AGREEMENT .....             | A-1        |
|                   | Third Party Licenses and Notices .....                     | A-4        |



# About This Guide

This *OmniSwitch AOS Release 8 Specifications Guide* provides Specification tables for all the OmniSwitch AOS Release 8 Products.

## Supported Platforms

The information in this guide applies only to the following products:

- OmniSwitch 9900 Series
- OmniSwitch 6900 Series
- OmniSwitch 6860 Series
- OmniSwitch 6865 Series
- OmniSwitch 6560 Series

## Who Should Read this Manual?

The audience for this user guide are network administrators and IT support personnel who need to configure, maintain, and monitor switches and routers in a live network.

## When Should I Read this Manual?

Read this guide as soon as you are ready to integrate your OmniSwitch into your network. You should already be familiar with the basics of managing a single OmniSwitch as described in the *OmniSwitch AOS Release 8 Switch Management Guide*.

The information provided in the Specification tables in this guide assume a basic understanding of OmniSwitch administration commands and procedures.

## What is Not in this Manual?

Procedures for switch management methods, such as CLI, web-based (WebView or OmniVista) or SNMP, are outside the scope of this guide.

For information on WebView and SNMP switch management methods consult the *OmniSwitch AOS Release 8 Switch Management Guide*. Information on using WebView and OmniVista can be found in the context-sensitive on-line help available with those network management applications.

This guide is designed to provide feature specification information only and is not intended as a reference for any CLI commands or configuration information. Refer to the Documentation Roadmap for a list of available user guides.



# How is the Information Organized?

Each chapter in this guide corresponds to an OmniSwitch software user manual:

- [Chapter 1, “Switch Management Specifications,”](#) applies to the features described in the *OmniSwitch AOS Release 8 Switch Management Guide*.
- [Chapter 2, “Network Configuration Specifications,”](#) applies to the features described in the *OmniSwitch AOS Release 8 Network Configuration Guide*.
- [Chapter 3, “Advanced Routing Configuration Specifications,”](#) applies to the features described in the *OmniSwitch AOS Release 8 Advanced Routing Configuration Guide*.
- [Chapter 4, “Data Center Switching Specifications,”](#) applies to the features described in the *OmniSwitch AOS Release 8 Data Center Switching Guide*.

## Documentation Roadmap

The OmniSwitch user documentation suite was designed to supply you with information at several critical junctures of the configuration process. The following section outlines a roadmap of the manuals that will help you at each stage of the configuration process. Under each stage, we point you to the manual or manuals that will be most helpful to you.

### Stage 1: Using the Switch for the First Time

**Pertinent Documentation:** *OmniSwitch Hardware Users Guide*  
*Release Notes*

This guide provides all the information you need to get your switch up and running the first time. It provides information on unpacking the switch, rack mounting the switch, installing NI modules, unlocking access control, setting the switch’s IP address, and setting up a password. It also includes succinct overview information on fundamental aspects of the switch, such as hardware LEDs, the software directory structure, CLI conventions, and web-based management.

At this time you should also familiarize yourself with the Release Notes that accompanied your switch. This document includes important information on feature limitations that are not included in other user guides.

### Stage 2: Gaining Familiarity with Basic Switch Functions

**Pertinent Documentation:** *OmniSwitch Hardware Users Guide*  
*OmniSwitch AOS Release 8 Switch Management Guide*

Once you have your switch up and running, you will want to begin investigating basic aspects of its hardware and software. Information about switch hardware is provided in the *Hardware Guide*. This guide provide specifications, illustrations, and descriptions of all hardware components, such as chassis, power supplies, Chassis Management Modules (CMMs), Network Interface (NI) modules, and cooling fans. It also includes steps for common procedures, such as removing and installing switch components.

The *OmniSwitch AOS Release 8 Switch Management Guide* is the primary users guide for the basic software features on a single switch. This guide contains information on the switch directory structure, basic file and directory utilities, switch access security, SNMP, and web-based management. It is recommended that you read this guide before connecting your switch to the network.

## Stage 3: Integrating the Switch Into a Network

**Pertinent Documentation:** *OmniSwitch AOS Release 8 Network Configuration Guide*  
*OmniSwitch AOS Release 8 Advanced Routing Configuration Guide*  
*OmniSwitch AOS Release 8 Data Center Switching Guide*

When you are ready to connect your switch to the network, you will need to learn how the OmniSwitch implements fundamental software features, such as 802.1Q, VLANs, Spanning Tree, and network routing protocols. The *OmniSwitch AOS Release 8 Network Configuration Guide* contains overview information, procedures, and examples on how standard networking technologies are configured on the OmniSwitch.

The *OmniSwitch AOS Release 8 Advanced Routing Configuration Guide* includes configuration information for networks using advanced routing technologies (OSPF and BGP) and multicast routing protocols (DVMRP and PIM-SM).

The *OmniSwitch AOS Release 8 Data Center Switching Guide* includes configuration information for data center networks using virtualization technologies (SPBM, VXLAN, UNP), Data Center Bridging protocols (PFC, ETC, and DCBX), and FCoE/FC gateway functionality.

### Anytime

The *OmniSwitch AOS Release 8 CLI Reference Guide* contains comprehensive information on all CLI commands supported by the switch. This guide includes syntax, default, usage, example, related CLI command, and CLI-to-MIB variable mapping information for all CLI commands supported by the switch. This guide can be consulted anytime during the configuration process to find detailed and specific information on each CLI command.

## Related Documentation

The following are the titles and descriptions of all the related OmniSwitch user manuals:

- *OmniSwitch 9900/6900/6860/6865/6560 Hardware Users Guides*

Describes the hardware and software procedures for getting an OmniSwitch up and running as well as complete technical specifications and procedures for all OmniSwitch chassis, power supplies, fans, and Network Interface (NI) modules.
- *OmniSwitch AOS Release 8 CLI Reference Guide*

Complete reference to all CLI commands supported on the OmniSwitch. Includes syntax definitions, default values, examples, usage guidelines and CLI-to-MIB variable mappings.
- *OmniSwitch AOS Release 8 Switch Management Guide*

Includes procedures for readying an individual switch for integration into a network. Topics include the software directory architecture, image rollback protections, authenticated switch access, managing switch files, system configuration, using SNMP, and using web management software (WebView).
- *OmniSwitch AOS Release 8 Network Configuration Guide*

Includes network configuration procedures and descriptive information on all the major software features and protocols included in the base software package. Chapters cover Layer 2 information (Ethernet and VLAN configuration), Layer 3 information (routing protocols, such as RIP and IPX), security options (authenticated VLANs), Quality of Service (QoS), link aggregation, and server load balancing.
- *OmniSwitch AOS Release 8 Advanced Routing Configuration Guide*

Includes network configuration procedures and descriptive information on all the software features and protocols included in the advanced routing software package. Chapters cover multicast routing (DVMRP and PIM-SM), Open Shortest Path First (OSPF), and Border Gateway Protocol (BGP).
- *OmniSwitch AOS Release 8 Data Center Switching Guide*

Includes an introduction to the OmniSwitch data center switching architecture as well as network configuration procedures and descriptive information on all the software features and protocols that support this architecture. Chapters cover Shortest Path Bridging MAC (SPBM), Data Center Bridging (DCB) protocols, Virtual Network Profile (vNP), and the Edge Virtual Bridging (EVB) protocol.
- *OmniSwitch AOS Release 8 Transceivers Guide*

Includes SFP and XFP transceiver specifications and product compatibility information.
- *OmniSwitch AOS Release 8 Specifications Guide*

Includes Specifications table information for the features documented in the Switch Management Guide, Network Configuration Guide, Advanced Routing Guide, and Data Center Switching Guide.
- **Technical Tips, Field Notices**

Includes information published by Alcatel-Lucent's Customer Support group.
- *Release Notes*

Includes critical Open Problem Reports, feature exceptions, and other important information on the features supported in the current release and any limitations to their support.

# Technical Support

An Alcatel-Lucent service agreement brings your company the assurance of 7x24 no-excuses technical support. You'll also receive regular software updates to maintain and maximize your Alcatel-Lucent product's features and functionality and on-site hardware replacement through our global network of highly qualified service delivery partners.

With 24-hour access to Alcatel-Lucent's Enterprise Service and Support web page, you'll be able to view and update any case (open or closed) that you have reported to Alcatel-Lucent Enterprise technical support, open a new case or access helpful release notes, technical bulletins, and manuals.

Access additional information on Alcatel-Lucent Enterprise Service Programs:

Web: [support.esd.alcatel-lucent.com](http://support.esd.alcatel-lucent.com)

Phone: 1-800-995-2696

Email: [ebg\\_global\\_supportcenter@al-enterprise.com](mailto:ebg_global_supportcenter@al-enterprise.com)

# 1 Switch Management Specifications

This chapter provides Specifications tables for the following switch management applications and procedures that are used for readying an individual OmniSwitch for integration into a network:

- The switch directory structure, basic file and directory utilities, switch access security, SNMP, and web-based management.
- The software directory architecture.
- Image rollback protections.
- Authenticated switch access.
- Managing switch files.
- System configuration.
- Using SNMP.
- Using web management software (WebView)..

---

**Note.** The maximum limit values provided in the Specifications tables included in this chapter are subject to available system resources.

---

For information about how to configure switch management applications, refer to the *OmniSwitch AOS Release 8 Switch Management Guide*.

## In This Chapter

This chapter contains the following switch management Specifications tables:

- [“Getting Started Specifications” on page 1-3.](#)
- [“Login Specifications” on page 1-3.](#)
- [“File Management Specifications” on page 1-4.](#)
- [“CMM Specifications” on page 1-4.](#)
- [“USB Flash Drive Specifications” on page 1-5.](#)
- [“CLI Specifications” on page 1-5.](#)
- [“Configuration File Specifications” on page 1-6.](#)
- [“User Database Specifications” on page 1-6.](#)
- [“WebView Specifications” on page 1-6.](#)
- [“WebView Specifications” on page 1-6.](#)
- [“SNMP Specifications” on page 1-7.](#)
- [“Web Services Specifications” on page 1-8.](#)
- [“Virtual Chassis Specifications” on page 1-10.](#)
- [“Automatic Remote Configuration Specifications” on page 1-11.](#)
- [“Automatic Fabric Specifications” on page 1-11.](#)
- [“NTP Specifications” on page 1-11.](#)

## Getting Started Specifications

|                                     | OS9900                           | OS6900                    | OS6860                    | OS6865                    | OS6560                    |
|-------------------------------------|----------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Standalone Configuration Files      | N/S                              | boot.cfg                  | N/S                       | N/S                       | N/S                       |
| Virtual Chassis Configuration Files | vcboot.cfg<br>vcsetup.cfg        | vcboot.cfg<br>vcsetup.cfg | vcboot.cfg<br>vcsetup.cfg | vcboot.cfg<br>vcsetup.cfg | vcboot.cfg<br>vcsetup.cfg |
| Image Files                         | Mhost.img<br>Mos.img<br>Meni.img | Tos.img                   | Uos.img                   | Uos.img                   | Nos.img                   |
| <b>Notes:</b>                       |                                  |                           |                           |                           |                           |
| N/A.                                |                                  |                           |                           |                           |                           |

## Login Specifications

|  | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|--|---|--------|--------|--------|--------|
| Login Methods                                | Telnet, SSH, HTTP, SNMP   |        |        |        |        |
| Number of concurrent Telnet sessions         | 6   |        |        |        |        |
| Number of concurrent SSH sessions            | 8   |        |        |        |        |
| Number of concurrent HTTP (WebView) sessions | 4   |        |        |        |        |
| Secure Shell public key authentication       | Password<br>DSA/RSA Public Key  |        |        |        |        |
| RFCs Supported for SSHv2                     | RFC 4253 - SSH Transport Layer Protocol<br>RFC 4418 - UMAC: Message Authentication Code using Universal Hashing |        |        |        |        |
| <b>Notes:</b>                                |   |        |        |        |        |
| N/A  |   |        |        |        |        |

## File Management Specifications

|   | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|---|--|--------|--------|--------|--------|
| File Transfer Methods                     | FTP (v4/v6), SFTP (v4/v6), SCP (v4/v6), TFTP   |        |        |        |        |
| Client/Server Support                     | FTP—Client (IPv4 Only) or Server<br>SFTP—Client or Server<br>SCP—Client or Server<br>TFTP—Client   |        |        |        |        |
| Number of concurrent FTP/SFTP sessions    | 4  |        |        |        |        |
| Configuration Recovery                    | The <b>flash/certified</b> directory holds configurations that are certified as the default start-up files for the switch. They will be used in the event of a non-specified reload. |        |        |        |        |
| Default Switch Directory - / <b>flash</b> | Contains the <b>certified, working, switch, network</b> , and user-defined directories.  |        |        |        |        |
| File/Directory Name Metrics               | 255 character maximum. File and directory names are case sensitive.  |        |        |        |        |
| File/Directory Name Characters            | Any valid ASCII character except '/'.  |        |        |        |        |
| Sub-Directories                           | Additional user-defined directories created in the <b>/flash</b> directory.  |        |        |        |        |
| Text Editing                              | Standard Vi editor   |        |        |        |        |
| System Clock                              | Set local date, time and time zone, Universal Time Coordinate (UTC), Daylight Savings (DST or summertime).   |        |        |        |        |
| <b>Notes:</b>                             |  |        |        |        |        |
| N/A                                       |  |        |        |        |        |

## CMM Specifications

|   | OS9900    | OS6900                                 | OS6860 | OS6865 | OS6560 |
|---|-----------|--|--------|--------|--------|
| Compact Flash Memory                              | 2 GB      | 2 GB<br>X72 - 4GB                      | 2 GB   | 2 GB   | 2 GB   |
| RAM Memory  | 16 GB     | 4 GB (X/T)<br>8 GB (Q32)<br>8 GB (X72) | 2 GB   | 2 GB   | 2 GB   |
| Maximum Length of File Names (in Characters)      | 255       |  |        |        |        |
| Maximum Length of Directory Names (in Characters) | 255       |  |        |        |        |
| Maximum Length of System Name (in Characters)     | 32        |  |        |        |        |
| Default Boot Directory                            | Certified |  |        |        |        |
| <b>Notes:</b>                                     |           |  |        |        |        |



N/A

## USB Flash Drive Specifications

|  | OS9900                                   | OS6900                              | OS6860                              | OS6865                              | OS6560                              |
|--|--|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| USB Flash Drive Support  | Alcatel-Lucent Certified USB Flash Drive |                                     |                                     |                                     |                                     |
| Automatic Software Upgrade   | Supported                                |                                     |                                     |                                     |                                     |
| Disaster Recovery  | <b>Mrescue.img</b><br>file required      | <b>Trescue.img</b><br>file required | <b>Urescue.img</b><br>file required | <b>Urescue.img</b><br>file required | <b>Nrescue.img</b><br>file required |
| <b>Notes:</b>  |  |                                     |                                     |                                     |                                     |
| The format of the Alcatel-Lucent certified USB Flash Drive must be FAT32. To avoid file corruption issues, the USB Drive should be stopped before removing from a PC. Directory names are case sensitive and must be lower case. |  |                                     |                                     |                                     |                                     |

## CLI Specifications

|                         | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|-------------------------|---|--------|--------|--------|--------|
| Configuration Methods   | <ul style="list-style-type: none"> <li>• Online configuration via real-time sessions using CLI commands.</li> <li>• Offline configuration using text file containing CLI commands.</li> </ul>   |        |        |        |        |
| Command Capture Feature | Snapshot feature captures switch configurations in a text file.   |        |        |        |        |
| User Service Features   | <ul style="list-style-type: none"> <li>• Command Line Editing</li> <li>• Command Prefix Recognition</li> <li>• CLI Prompt Option</li> <li>• Command Help</li> <li>• Keyword Completion</li> <li>• Command Abbreviation</li> <li>• Command History</li> <li>• Command Logging</li> <li>• Syntax Error Display</li> <li>• More Command</li> </ul> |        |        |        |        |
| <b>Notes:</b>           |   |        |        |        |        |
| N/A                     |   |        |        |        |        |

## Configuration File Specifications

|  | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--|--------|--------|--------|--------|
| Methods for Creating Configuration Files | <ul style="list-style-type: none"> <li>• Create a text file on a word processor and upload it to the switch.</li> <li>• Invoke the switch's snapshot feature to create a text file.</li> <li>• Create a text file using the switch's text editor.</li> </ul> |        |        |        |        |
| Timer Functions                          | Files can be applied immediately or by setting a timer on the switch.  |        |        |        |        |
| Command Capture Feature                  | Snapshot feature captures switch configurations in a text file.  |        |        |        |        |
| Error Reporting                          | Snapshot feature includes error reporting in the text file.  |        |        |        |        |
| Text Editing on the Switch               | Vi standard editor.  |        |        |        |        |
| Default Error File Limit                 | 1  |        |        |        |        |
| <b>Notes:</b>                            |  |        |        |        |        |
| N/A                                      |  |        |        |        |        |

## User Database Specifications

|  | OS9900 | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--------|--------|--------|--------|--------|
| Maximum number of alphanumeric characters in a username      | 63     |        |        |        |        |
| Maximum number of alphanumeric characters in a user password | 30     |        |        |        |        |
| Maximum number of local user accounts                        | 50     | 50     | 50     | 50     | 50     |
| <b>Notes:</b>  |        |        |        |        |        |
| N/A  |        |        |        |        |        |

## WebView Specifications

|                    | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--------------------|--|--------|--------|--------|--------|
| Supported Browsers | Internet Explorer for Windows<br>Firefox for Windows, Linux, and Solaris SunOS |        |        |        |        |
| <b>Notes:</b>      |  |        |        |        |        |
| N/A                |  |        |        |        |        |

# SNMP Specifications

|  | OS9900  | OS6900 | OS6860   | OS6865   | OS6560   |
|--|---|--------|----------|----------|----------|
| RFCs Supported for SNMPv2                                  | 1902 through 1907 - SNMPv2c Management Framework<br>1908 - Coexistence and transitions relating to SNMPv1 and SNMPv2c   |        |          |          |          |
| RFCs Supported for SNMPv3                                  | 2570—Version 3 of the Internet Standard Network Management Framework<br>2571—Architecture for Describing SNMP Management Frameworks<br>2572—Message Processing and Dispatching for SNMP<br>2573—SNMPv3 Applications<br>2574/3414—User-based Security Model (USM) for version 3 SNMP<br>2575—View-based Access Control Model (VACM) for SNMP<br>2576—Coexistence between SNMP versions<br>3586—The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model |        |          |          |          |
| SNMPv1, SNMPv2, SNMPv3                                     | The SNMPv3 protocol is ascending compatible with SNMPv1 and v2 and supports all the SNMPv1 and SNMPv2 PDUs  |        |          |          |          |
| SNMPv1 and SNMPv2 Authentication                           | Community Strings   |        |          |          |          |
| SNMPv1, SNMPv2 Encryption                                  | None  |        |          |          |          |
| SNMPv1 and SNMPv2 Security requests accepted by the switch | Sets and Gets   |        |          |          |          |
| SNMPv3 Authentication                                      | SHA, MD5  |        |          |          |          |
| SNMPv3 Encryption  | DES   | DES    | DES, AES | DES, AES | DES, AES |
| SNMPv3 Security requests accepted by the switch            | Non-authenticated Sets, Non-authenticated Gets and Get-Nexts, Authenticated Sets, Authenticated Gets and Get-Nexts, Encrypted Sets, Encrypted Gets and Get-Nexts  |        |          |          |          |
| SNMP traps   | For a list and description of system MIBs and Traps refer to Appendix B, “SNMP Trap Information,” in the <i>OmniSwitch AOS Release 8 Switch Management Guide</i> .  |        |          |          |          |
| <b>Notes:</b>  |   |        |          |          |          |
|  |   |        |          |          |          |

# Web Services Specifications

|  | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|--|---|--------|--------|--------|--------|
| Configuration Methods                      | <ul style="list-style-type: none"> <li>• HTTP/HTTPS</li> <li>• Python API</li> </ul>  |        |        |        |        |
| Response Formats                           | <ul style="list-style-type: none"> <li>• Extensible Markup language (XML)</li> <li>• JavaScript Object Notation (JSON)</li> </ul>   |        |        |        |        |
| Maximum Web Services Sessions              | 4   |        |        |        |        |
| Alcatel-Lucent Example Python Library      | <p>consumer.py (Python version 2.X/3.X compatible)</p> <p>This file is available on the Service &amp; Support Website. It is being provided as an example application to help with Web Services familiarization but is not an officially supported part of the Web Services solution.</p> |        |        |        |        |
| Embedded Python /Event based CLI Scripting | Python 3  |        |        |        |        |
| <b>Notes:</b>                              |   |        |        |        |        |
|  |   |        |        |        |        |

# OpenFlow Specifications

|   | OS9900 | OS6900                                   | OS6860                 | OS6865 | OS6560 |
|---|--------|--|------------------------|--------|--------|
| Modes Supported                                   | N/S    | Normal<br>Hybrid (API)                   | Normal<br>Hybrid (API) | N/S    | N/S    |
| Versions Supported                                | N/S    | 1.0/<br>1.3.1                            | 1.0/<br>1.3.1          | N/S    | N/S    |
| Maximum number of logical switches                | N/S    | 3  | 3                      | N/S    | N/S    |
| Maximum number of controllers per logical switch  | N/S    | 3  | 3                      | N/S    | N/S    |
| Maximum number of logical switches in Hybrid mode | N/S    | 1  | 1                      | N/S    | N/S    |
| Support for Virtual Chassis                       | N/S    | Supported                                | Supported              | N/S    | N/S    |
| OpenFlow 1.0/1.3.1 TCP port.                      | N/S    | 6633                                     | 6633                   | N/S    | N/S    |
| Flow Matching Table                               | N/S    | Q32 - 1279<br>X72 - 1279<br>other - 511  | 1535                   | N/S    | N/S    |
| MAC Table   | N/S    | Q32 - 224K<br>X72 - 224K<br>other - 128K | 48K                    | N/S    | N/S    |
| <b>Notes:</b>                                     |        |  |                        |        |        |
|   |        |  |                        |        |        |

# Virtual Chassis Specifications

|  | OS9900   | OS6900               | OS6860                                    | OS6865         | OS6560                                |
|--|--|----------------------|---|----------------|---------------------------------------|
| Maximum number of physical switches in a Virtual Chassis   | 2  | 6                    | 8   | 2              | 2                                     |
| Valid chassis identifier   | 1 or 2   | 1–6                  | 1–8                                       | 1 or 2         | 1 or 2                                |
| Valid chassis group identifier   | 0-255  | 0–255                | 0–255                                     | 0-255          | 0-255                                 |
| Valid chassis priority   | 0-255  | 0–255                | 0–255                                     | 0-255          | 0-255                                 |
| Maximum number of Virtual Fabric Link peers per chassis  | 1  | 5                    | 2   | 1              | 1                                     |
| Maximum number of member ports per Virtual Fabric Link   | 2  | 16                   | 8   | 2              | 2                                     |
| Valid Virtual Fabric Link identifier   | 0  | 0–4                  | 0 or 1                                    | 0              | 0                                     |
| VFL Supported Port Types   | 10G SFP+ or 40G QSFP or 100G QSFP28            | 10G SFP+ or 40G QSFP | Dedicated 20G VFL ports or 10G SFP+ ports | 10G SFP+ ports | Dedicated VFL ports or 10G SFP+ ports |
| Valid control VLAN   | 2–4094   |                      |   |                |                                       |
| Valid Virtual Chassis protocol hello interval  | 1–65535  |                      |   |                |                                       |
| OK LED   | Blinking Green = Master<br>Solid Green = Slave |                      |   |                |                                       |
| Remote Chassis Detection (RCD)   | Supported                                      | Supported            | N/S                                       | N/S            | N/S                                   |
| <b>Notes:</b>  |  |                      |   |                |                                       |
| <ul style="list-style-type: none"> <li>• Different OS6900 models can be mixed in a Virtual Chassis.</li> <li>• MAC Learning Mode is not supported on OS6900 Virtual Chassis</li> </ul> |  |                      |   |                |                                       |

## Automatic Remote Configuration Specifications

|  | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|--|---|--------|--------|--------|--------|
| DHCP Specifications                                  | DHCP Server required<br>DHCP Client on:<br>- VLAN 1<br>- Tagged VLAN 127<br>- LLDP Management VLAN<br>- Automatic LACP (tagged VLAN 127, untagged VLAN 1)   |        |        |        |        |
| File Servers   | TFTP<br>FTP/SFTP  |        |        |        |        |
| Clients supported                                    | TFTP<br>FTP/SFTP  |        |        |        |        |
| Instruction file                                     | Maximum length of:<br><ul style="list-style-type: none"> <li>• Pathname: 255 characters</li> <li>• Filename: 63 characters</li> </ul>                       |        |        |        |        |
| Maximum length of username for FTP/SFTP file server. | 15 characters   |        |        |        |        |
| Maximum DHCP lease tries                             | 6   |        |        |        |        |
| Unsupported Features                                 | <ul style="list-style-type: none"> <li>• ISSU and IPv6 are not supported.</li> <li>• Upgrade of uboot, miniboot, or FPGA files is not supported.</li> </ul> |        |        |        |        |
| OK LED   | Flashing amber during Automatic Remote Configuration process  |        |        |        |        |
| <b>Notes:</b>  |   |        |        |        |        |
| N/A  |   |        |        |        |        |

## Automatic Fabric Specifications

|   | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|---|---|--------|--------|--------|--------|
| Ports Supported   | Any switch port that is not already configured in such a way as to prevent the port from participating in the Automatic Fabric discovery and configuration process. |        |        |        |        |
| IP Protocols Supported for Automatic IP Configuration   | OSPFv2, OSPFv3, IS-IS IPv4, IS-IS IPv6  |        |        |        |        |
| <b>Notes:</b>   |   |        |        |        |        |
| Advanced routing protocols not supported on the OS6560. |   |        |        |        |        |

## NTP Specifications

|                | OS9900                     | OS6900 | OS6860 | OS6865 | OS6560 |
|----------------|----------------------------|--------|--------|--------|--------|
| RFCs supported | 1305–Network Time Protocol |        |        |        |        |

|  |                       |
|--|-----------------------|
| NTP Key File Location                    | <b>/flash/network</b> |
| Maximum number of NTP servers per client | 12                    |
| <b>Notes:</b>                            |                       |
| N/A                                      |                       |



# 2 Network Configuration Specifications

This chapter provides Specifications tables for the following OmniSwitch network configuration applications and procedures that are used for readying a switch for integration into a live network environment:

- Layer 2 features (Ethernet, source learning, and VLAN configuration).
- Layer 3 features (routing protocols, such as IP and RIP)
- Security options (MAC and 802.1x authentication)
- Quality of Service (QoS)
- Link aggregation
- Server load balancing.

---

**Note.** The maximum limit values provided in the Specifications tables included in this chapter are subject to available system resources.

---

For information about how to implement the fundamental software features and protocols for network configuration, refer to the *OmniSwitch AOS Release 8 Network Configuration Guide*.

## In This Chapter

This chapter contains the following network configuration Specifications tables:

- 
- “Ethernet Specifications” on page 2-3
  - “UDLD Specifications” on page 2-3
  - “Source Learning Specifications” on page 2-4
  - “VLAN Specifications” on page 2-4
  - “High Availability VLANs Specifications” on page 2-5
  - “Spanning Tree Specifications” on page 2-5
  - “Loopback Detection Specifications” on page 2-6
  - “Static Link Aggregation Specifications” on page 2-6
  - “Dynamic Link Aggregation Specifications” on page 2-6
  - “Dual-Home Link Specifications” on page 2-7
  - “ERP Specifications” on page 2-7.
  - “MVRP Specifications” on page 2-7.
  - “802.1AB Specifications” on page 2-8.
  - “SIP Snooping Specifications” on page 2-8.
  - “IP Specifications” on page 2-9.
  - “VRF Specifications” on page 2-10.
  - “IPv6 Specifications” on page 2-11.
  - “IPsec Specifications” on page 2-13.
  - “RIP Specifications” on page 2-14.
  - “BFD Specifications” on page 2-14.
  - “DHCP Relay Specifications” on page 2-15.
  - “DHCP Server Specifications” on page 2-16.
  - “VRRP Specifications” on page 2-17.
  - “Server Load Balancing Specifications” on page 2-17.
  - “IPMS Specifications” on page 2-18.
  - “IPMSv6 Specifications” on page 2-19.
  - “QoS Specifications” on page 2-20.
  - “LDAP Policy Server Specifications” on page 2-21.
  - “Authentication Server Specifications” on page 2-21.
  - “UNP Specifications” on page 2-22.
  - “Access Guardian Specifications” on page 2-23.
  - “AppMon Specifications” on page 2-24.
  - “Application Fingerprinting Specifications” on page 2-24.
  - “Port Mapping Specifications” on page 2-24.
  - “Learned Port Security Specifications” on page 2-24.
  - “Port Mirroring Specifications” on page 2-26.
  - “Port Monitoring Specifications” on page 2-26.
  - “sFlow Specifications” on page 2-27.
  - “RMON Specifications” on page 2-28.
  - “Switch Health Specifications” on page 2-29.
  - “VLAN Stacking Specifications” on page 2-30.
  - “Switch Logging Specifications” on page 2-31.
  - “Ethernet OAM Specifications” on page 2-32.
  - “SAA Specifications” on page 2-32.
-

## Ethernet Specifications

|  | OS9900  | OS6900 | OS6860       | OS6865 | OS6560 |
|--|---|--------|--------------|--------|--------|
| IEEE Standards Supported   | 802.3 Carrier Sense Multiple Access with Collision Detection (CSMA/CD)<br>802.3u (100BaseTX)<br>802.3ab (1000BaseT)<br>802.3z (1000Base-X)<br>802.3ae (10GBase-X)<br>802.3ba (40GBase-X)<br>802.3az (Energy Efficient Ethernet) |        |              |        |        |
| Ports Supported  | Ethernet (10 Mbps)<br>Fast Ethernet (100 Mbps)<br>Gigabit Ethernet (1 Gbps)<br>10 Gigabit Ethernet (10 Gbps)<br>40 Gigabit Ethernet (40 Gbps)   |        |              |        |        |
| 802.1Q Hardware Tagging  | Supported   |        |              |        |        |
| Jumbo Frame Configuration  | 1/10/40 Gigabit Ethernet ports  |        |              |        |        |
| Maximum Frame Size   | 1553 bytes (10/100 Mbps)<br>9216 bytes (1/10/40 Gbps)   |        |              |        |        |
| MACSec   | N/S   | N/S    | 1G/10G ports | N/S    | N/S    |
| <b>Notes:</b>  |   |        |              |        |        |
| <ul style="list-style-type: none"> <li>• Supported port types are chassis and module dependent.</li> <li>• OS6860/6865 does not support 10/100 half-duplex (CSMA/CD)</li> <li>• OS6860(E) - All models support MACSec on 10G ports</li> <li>• OS6860-P24 - MACSec supported on 1G/10G ports.</li> <li>• OS6860-P24Z8 - MACSec supported on 1G/10G ports (not supported on 2.5G ports)</li> </ul> |   |        |              |        |        |

## UDLD Specifications

|   | OS9900                                   | OS6900 | OS6860 | OS6865 | OS6560 |
|---|--|--------|--------|--------|--------|
| Maximum number of UDLD ports per system | Up to maximum physical ports per system. |        |        |        | N/S    |
| <b>Notes:</b>                           |  |        |        |        |        |
|   |  |        |        |        |        |

## Source Learning Specifications

|  | OS9900   | OS6900   | OS6860 | OS6865 | OS6560 |
|--|--|--|--------|--------|--------|
| RFCs Supported   | 2674—Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions |  |        |        |        |
| Maximum number of learned MAC addresses when centralized MAC source learning mode is enabled | 128K   | X20 - 128K<br>X40 - 128K<br>T20 - 128K<br>T40 - 128K<br>Q32 - 228K<br>X72 - 228K | 48K    | 48K    | 16K    |
| <b>Notes:</b>  |  |  |        |        |        |
| N/A  |  |  |        |        |        |

## VLAN Specifications

|  | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--|--------|--------|--------|--------|
| RFCs Supported   | 2674 - Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions |        |        |        |        |
| IEEE Standards Supported   | 802.1Q - Virtual Bridged Local Area Networks<br>802.1D - Media Access Control Bridges                                  |        |        |        |        |
| Maximum VLANs per switch   | 4092   | 4094   | 4094   | 4094   | 4094   |
| Maximum Tagged VLANs per Port  | 4091   | 4093   | 4093   | 4093   | 4093   |
| Maximum Untagged VLANs per Port  | One untagged VLAN (default VLAN) per port.   |        |        |        |        |
| Maximum number of ports or link aggregates per PVLAN supported                           | 1  |        |        |        |        |
| Maximum Number of Secondary VLANs paired with a Primary VLAN that can co-exist on a port | N/S  | 1      | 1      | 1      | N/S    |
| Maximum number of IPCL and EPCL rules per VLAN   | N/S  | 256    | 256    | 256    | N/S    |
| Maximum number of PVLAN per promiscuous port   | N/S  | 1      | 1      | 1      | N/S    |
| <b>Notes:</b>  |  |        |        |        |        |
|  |  |        |        |        |        |

## High Availability VLANs Specifications

|  | OS9900 | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--------|--------|--------|--------|--------|
| Maximum high availability VLANs per switch | N/S    | 16     | 16     | 32     | N/S    |
| <b>Notes:</b>                              |        |        |        |        |        |
| N/A  |        |        |        |        |        |

## Spanning Tree Specifications

|  | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--|--------|--------|--------|--------|
| IEEE Standards supported   | 802.1d—Media Access Control (MAC) Bridges<br>802.1s—Multiple Spanning Trees<br>802.1w—Rapid Spanning Tree Protocol |        |        |        |        |
| Spanning Tree operating modes supported  | Flat mode—one spanning tree instance per switch<br>Per-VLAN mode—one spanning tree instance per VLAN               |        |        |        |        |
| Spanning Tree port eligibility   | Fixed ports<br>802.1Q tagged ports<br>Link aggregate of ports  |        |        |        |        |
| Maximum VLAN Spanning Tree instances per switch.                               | 128  | 128    | 100    | 100    | 100    |
| Maximum flat mode Multiple Spanning Tree Instances (MSTI) per switch           | 16 MSTI, in addition to the Common and Internal Spanning Tree instance (also referred to as MSTI 0).               |        |        |        |        |
| <b>Notes:</b>  |  |        |        |        |        |
| Maximum VLAN Spanning Tree instances per switch—values based on per-VLAN mode. |  |        |        |        |        |

## Loopback Detection Specifications

|                     | OS9900           | OS6900    | OS6860    | OS6865    | OS6560 |
|---------------------|------------------|-----------|-----------|-----------|--------|
| Edge (Bridge)       | Supported        | N/S       | Supported | Supported | N/S    |
| SAP (Access)        | N/S              | Supported | Supported | Supported | N/S    |
| Transmission Timer  | 5–600 seconds    |           |           |           |        |
| Auto-recovery Timer | 30–86400 seconds |           |           |           |        |
| <b>Notes:</b>       |                  |           |           |           |        |
| N/A                 |                  |           |           |           |        |

## Static Link Aggregation Specifications

|   | OS9900 | OS6900 | OS6860 | OS6865 | OS6560 |
|---|--------|--------|--------|--------|--------|
| Maximum number of link aggregation groups             | 253    | 256    | 128    | 128    | 32     |
| Maximum number of ports per link aggregate group      | 16     | 16     | 16     | 16     | -      |
| <b>Notes:</b>   |        |        |        |        |        |
| On an OS9900 linkagg IDs 0, 126, and 127 are reserved |        |        |        |        |        |

## Dynamic Link Aggregation Specifications

|  | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|--|---|--------|--------|--------|--------|
| IEEE Specifications Supported                          | 802.1ax/802.3ad—Aggregation of Multiple Link Segments |        |        |        |        |
| Maximum number of link aggregation groups              | 253   | 256    | 128    | 128    | 32     |
| Maximum number of ports per link aggregate group       | 16  | 16     | 16     | 16     | -      |
| <b>Notes:</b>  |   |        |        |        |        |
| On an OS9900 linkagg IDs 0, 126, and 127 are reserved. |   |        |        |        |        |

## Dual-Home Link Specifications

|                        | OS9900 | OS6900 | OS6860 | OS6865 | OS6560 |
|------------------------|--------|--------|--------|--------|--------|
| DHL sessions supported | N/S    | N/S    | 1      | 1      | 1      |
| <b>Notes:</b>          |        |        |        |        |        |
| N/A                    |        |        |        |        |        |

## ERP Specifications

|   | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|---|---|--------|--------|--------|--------|
| ITU-T G.8032 03/2010                          | Ethernet Ring Protection version 2<br>(Multi Rings and Ladder networks supported)<br>(Hold off timer, Lockout, Signal degrade SD, RPL Replacement, Forced Switch, Manual Switch, Clear for Manual/Forced Switch, Dual end blocking not supported) |        |        |        |        |
| ITU-T Y.1731/IEEE 802.1ag                     | ERP packet compliant with OAM PDU format for CCM  |        |        |        |        |
| Maximum number of rings per node              | 64  |        |        |        |        |
| Maximum number of nodes per ring              | 16 (recommended)  |        |        |        |        |
| Maximum number of VLANs per port              | 4094  |        |        |        |        |
| Range for ring ID                             | 1–2147483647  |        |        |        |        |
| Range for remote MEPID                        | 1–8191  |        |        |        |        |
| Range for wait-to-restore timer               | 1–12 minutes  |        |        |        |        |
| Range for guard timer                         | 1–200 centi-seconds   |        |        |        |        |
| <b>Notes:</b>                                 |   |        |        |        |        |
| ERP is not supported on the OS9900 or OS6560. |   |        |        |        |        |

## MVRP Specifications

|                          | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--------------------------|--|--------|--------|--------|--------|
| IEEE Standards Supported | IEEE 802.1ak-2007 Amendment 7: Multiple Registration Protocol<br>IEEE 802.1Q-2005 Corrigendum 2008 |        |        |        |        |
| Maximum MVRP VLANs       | 512  | 512    | 512    | 512    | 512    |
| <b>Notes:</b>            |  |        |        |        |        |
|                          |  |        |        |        |        |

## 802.1AB Specifications

|   | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|---|---|--------|--------|--------|--------|
| IEEE Specification  | IEEE 802.1AB-2005 Station and Media Access Control Connectivity Discovery |        |        |        |        |
| Maximum number of network policies that can be associated with a port   | 8   | 8      | 8      | 8      | 8      |
| Maximum number of network policies that can be configured on the switch | 32  | 32     | 32     | 32     | 32     |
| Nearest Edge MAC Address  | 01:20:da:02:01:73   |        |        |        |        |
| Nearest Bridge MAC Address  | 01:80:c2:00:00:0e   |        |        |        |        |
| Nearest Customer MAC Address  | 01:80:C2:00:00:00   |        |        |        |        |
| Non-TPMR Address  | 01:80:C2:00:00:03   |        |        |        |        |
| <b>Notes:</b>   |   |        |        |        |        |
| N/A   |   |        |        |        |        |

## SIP Snooping Specifications

|                | OS9900 | OS6900 | OS6860   | OS6865 | OS6560 |
|----------------|--------|--------|--|--------|--------|
| RFCs Supported | N/S    | N/S    | 3261–SIP session initiation protocol<br>6337–SIP USAGE of offer/answer model<br>4566–SDP session description Protocol<br>3551–RTP profile for audio and video conferences with minimal control<br>3311–The Session Initiation Protocol (SIP) UPDATE Method<br>3262–Reliability of Provisional Responses in SIP | N/S    | N/S    |
| <b>Notes:</b>  |        |        |  |        |        |
| N/A            |        |        |  |        |        |



# IP Specifications

|   | OS9900   | OS6900   | OS6860 | OS6865 | OS6560 |
|---|--|--|--------|--------|--------|
| RFCs Supported  | 791–Internet Protocol<br>792–Internet Control Message Protocol<br>826–An Ethernet Address Resolution Protocol<br>2784–Generic Routing Encapsulation (GRE)<br>2890–Key and Sequence Number Extensions to GRE (extensions defined are not supported)<br>1701–Generic Routing Encapsulation (GRE)<br>1702–Generic Routing Encapsulation over IPV4 Networks<br>2003-IP Encapsulation within IP |  |        |        |        |
| Maximum router interfaces per system                                  | 4K   | 4K   | 4K     | 4K     | -      |
| Maximum router interfaces per VLAN                                    | 16   |  |        |        |        |
| Maximum HW routes   | 128K   | X20 - 16K<br>X40 - 16K<br>T20 - 16K<br>T40 - 16K<br>Q32 - 12K<br>X72 - 12K | 12K    | 12K    | -      |
| Maximum HW ARP entries per module                                     | 8K   | X20 - 8K<br>X40 - 8K<br>T20 - 16K<br>T40 - 16K<br>Q32 - 48K<br>X72 - 48K   | 16K    | 16K    | 256    |
| Maximum HW ARP entries in VC of OS6900s (Distributed ARP not enabled) | N/A  | Equal to capacity of module with lowest number of supported ARPs.          | N/A    | N/A    | -      |
| Maximum HW ARP entries in VC of OS6900s (Distributed ARP enabled)     | N/A  | VC of 4 or more (Q32 or X72) - 192K.                                       | N/A    | N/A    | -      |
| Maximum number of GRE tunnel interfaces per switch                    | N/S  | 127  | 127    | 127    | -      |
| Maximum number of IPIP tunnel interfaces per switch                   | N/S  | 127  | 127    | 127    | -      |
| Maximum next hops per ECMP entry (static or RIP routes)               | 16   | 16   | 16     | 16     | -      |
| <b>Notes:</b>   |  |  |        |        |        |

- The OmniSwitch can support a higher number of routes than what is documented in the hardware routing limits. This is done by moving older unused routes into software and more recent active routes into hardware. The total number of routes supported is dependent upon the switch configuration and the total amount of memory available. Exceeding the maximum hardware routes will result in some traffic being routed in software.

## VRF Specifications

|  | OS9900                                   | OS6900 | OS6860 | OS6865                            | OS6560 |
|--|--|--------|--------|-----------------------------------|--------|
| Routing Protocols Supported  | Static, IPv4, RIPv2, OSPFv2, BGP4, IS-IS |        |        | Static, IPv4, RIPv2, OSPFv2, BGP4 |        |
| Maximum number of MAX profile VRF instances per switch (no LOW profiles) | 64                                       | 64     | 64     | 64                                | N/S    |
| Maximum number of LOW profile VRF instances per switch (no MAX profiles) | 300                                      | 128    | 128    | 128                               | N/S    |
| Maximum VRF instances per VLAN   | 1  |        |        |                                   |        |
| Maximum OSPFv2 VRF routing instances per switch                          | 16                                       |        |        |                                   |        |
| Maximum RIPv2 VRF routing instances per switch                           | 16                                       |        |        |                                   |        |
| Maximum BGP VRF routing instances per switch                             | 32                                       |        |        |                                   |        |
| <b>Notes:</b>  |  |        |        |                                   |        |
|  |  |        |        |                                   |        |

# IPv6 Specifications

|  | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--|--------|--------|--------|--------|
| RFCs Supported   | 1981—Path MTU Discovery for IP version 6<br>2375—IPv6 Multicast Address Assignments<br>2460—Internet Protocol, Version 6 (IPv6) Specification<br>2464—Transmission of IPv6 Packets over Ethernet Networks<br>2465—Management Information Base for IP Version 6: Textual Conventions and General Group<br>2466—Management Information Base for IP Version 6: ICMPv6 Group<br>2711—IPv6 Router Alert Option<br>3056—Connection of IPv6 Domains via IPv4 Clouds<br>3484—Default Address Selection for Internet Protocol version 6 (IPv6)<br>3493—Basic Socket Interface Extensions for IPv6<br>3542—Advanced Sockets Application Program Interface (API) for IPv6<br>3587—IPv6 Global Unicast Address Format<br>3595—Textual Conventions for IPv6 Flow Label<br>3596—DNS Extensions to Support IP Version 6<br>4007—IPv6 Scoped Address Architecture<br>4022—Management Information Base for the Transmission Control Protocol (TCP)<br>4113—Management Information Base for the User Datagram Protocol (UDP)<br>4193—Unique Local IPv6 Unicast Addresses<br>4213—Basic Transition Mechanisms for IPv6 Hosts and Routers<br>4291—IP Version 6 Addressing Architecture<br>4294—IPv6 Node Requirements<br>4443—Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification<br>4861—Neighbor Discovery for IP version 6 (IPv6)<br>4862—IPv6 Stateless Address Autoconfiguration<br>5095—Deprecation of Type 0 Routing Headers in IPv6<br>5453—Reserved IPv6 Interface Identifiers<br>5722—Handling of Overlapping IPv6 Fragments<br>3315—Dynamic Host Configuration Protocol for IPv6 (DHCPv6) |        |        |        |        |
| Maximum IPv6 interfaces                                  | VLANs- 4096<br>Configured Tunnels - 255<br>6to4 Tunnels - 1  |        |        |        |        |
| Maximum IPv6 global unicast or anycast addresses         | 10K  | 10K    | 10K    | 10K    | N/S    |
| Maximum IPv6 global unicast addresses per IPv6 interface | 50   | 50     | 50     | 50     | N/S    |

|   |           |   |  |  |     |
|---|-----------|---|--|--|-----|
| Maximum IPv6 hardware routes when there are no IPv4 routes present (includes dynamic and static routes)   | -         | 256<br>(prefix >= 65)<br>X20/<br>X40 -<br>8K<br>(prefix <= 64)<br>T20/<br>T40 -<br>8K<br>(prefix <= 64)<br>Q32/<br>X72 -<br>6K<br>(prefix <=64) | 1K<br>(prefix >= 65)<br>6K<br>(prefix <= 64) | 1K<br>(prefix >= 65)<br>6K<br>(prefix <= 64) | N/S |
| Maximum IPv6 static route prefixes per switch   | 500       | 500   | 500  | 500  | N/S |
| Maximum number of RIPng Peers   | 20        | 20  | 20   | 20   | N/S |
| Maximum number of RIPng Interfaces  | 20        | 20  | 20   | 20   | N/S |
| Maximum number of RIPng Routes  | 5K        | 5K  | 5K   | 5K   | N/S |
| Maximum next hops per ECMP entry (static or RIPng routes)   | 16        | 16  | 16   | 16   | N/S |
| DHCPv6 implementation   | multi-VRF | N/S   | multi-VRF                                    |  | N/S |
| Maximum IPv6 relay destinations supported for each interface  | -         | N/S   | 5  | 5  | N/S |
| Maximum number of relay hops for each relay   | -         | N/S   | 32   | 32   | N/S |
| <b>Notes:</b>   |           |   |  |  |     |
| <ul style="list-style-type: none"> <li>• RFC 3315 is not supported on the OS6900 switches.</li> <li>• Exceeding the maximum IPv6 hardware routes or having IPv4 routes will result in some traffic being routed in software.</li> </ul> |           |   |  |  |     |

# IPsec Specifications

|  | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--|--------|--------|--------|--------|
| IP Version Supported   | IPv6   |        |        |        |        |
| RFCs Supported   | 4301—Security Architecture for the Internet Protocol<br>4302—IP Authentication Header (AH)<br>4303—IP Encapsulating Security Payload (ESP)<br>4305—Cryptographic Algorithm Implementation Requirements for ESP and AH<br>4308—Cryptographic Suites for IPsec |        |        |        |        |
| Encryption Algorithms Supported for ESP  | NULL, 3DES-CBC, and AES-CBC  |        |        |        |        |
| Key lengths supported for Encryption Algorithms                                    | 3DES-CBC - 192 bits<br>AES-CBC - 128, 192, or 256 bits   |        |        |        |        |
| Authentication Algorithms Supported for AH   | HMAC-SHA1-96, HMAC-MD5-96, and AES-XCBC-MAC-96   |        |        |        |        |
| Key lengths supported for Authentication Algorithms                                | HMAC-MD5 - 128 bits<br>HMAC-SHA1 - 160 bits<br>AES-XCBC-MAC - 128 bits   |        |        |        |        |
| Master Security Key formats  | Hexadecimal (16 bytes) or String (16 characters)   |        |        |        |        |
| Priority value range for IPsec Policy  | 1–1000 (1=highest priority, 1000=lowest priority)  |        |        |        |        |
| Index value range for IPsec Policy Rule  | 1–10   |        |        |        |        |
| SPI Range  | 256–999999999  |        |        |        |        |
| Modes Supported  | Transport  |        |        |        |        |
| <b>Notes:</b>  |  |        |        |        |        |
| <ul style="list-style-type: none"> <li>• IPsec not supported on OS6560.</li> </ul> |  |        |        |        |        |

## RIP Specifications

|   | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|---|---|--------|--------|--------|--------|
| RFCs Supported                          | RFC 1058–RIP v1<br>RFC 2453–RIP v2<br>RFC 1722–RIP v2 Protocol Applicability Statement<br>RFC 1724–RIP v2 MIB Extension |        |        |        |        |
| Maximum Number of Interfaces            | 16  | 10     | 10     | 10     | -      |
| Maximum Number of Peers                 | 16  | 100    | 100    | 100    | -      |
| Maximum Number of Routes                | 10K   | 10K    | 10K    | 10K    | 256    |
| Maximum number of ECMP next hop entries | 512   | 16     | 16     | 16     | -      |
| <b>Notes:</b>                           |   |        |        |        |        |
|   |   |        |        |        |        |

## BFD Specifications

|   | OS9900  | OS6900                   | OS6860                   | OS6865                     | OS6560 |
|---|---|--------------------------|--------------------------|----------------------------|--------|
| RFCs Supported  | 5880—Bidirectional Forwarding Detection<br>5881—Bidirectional Forwarding Detection for IPv4 and IPv6 (Single Hop)<br>5882—Generic Application of Bidirectional Forwarding Detection |                          |                          |                            |        |
| Maximum Number of BFD Sessions  | -   | Chassis - 32<br>VC - 100 | Chassis - 32<br>VC - 100 | Chassis - 32<br>VC - 100 - | N/S    |
| Protocols Supported   | BGP, OSPF, VRRP Remote Address Tracking only, and Static Routes.<br>IPv6 protocols not supported.   |                          |                          |                            |        |
| Modes Supported   | Asynchronous<br>Echo<br>(Demand Mode not supported)   |                          |                          |                            |        |
| <b>Notes:</b>   |   |                          |                          |                            |        |
| <ul style="list-style-type: none"> <li>• BFD is not supported on the OS6560.</li> </ul> |   |                          |                          |                            |        |

## DHCP Relay Specifications

|  | OS9900  | OS6900 | OS6860 | OS6865 | OS6560                         |
|--|---|--------|--------|--------|--------------------------------|
| RFCs Supported   | 0951–Bootstrap Protocol<br>1534–Interoperation between DHCP and BOOTP<br>1541–Dynamic Host Configuration Protocol<br>1542–Clarifications and Extensions for the Bootstrap Protocol<br>2132–DHCP Options and BOOTP Vendor Extensions<br>3046–DHCP Relay Agent Information Option, 2001 |        |        |        |                                |
| DHCP Relay Implementation  | Global DHCP<br>Per-VLAN DHCP  |        |        |        |                                |
| DHCP Relay Service   | BOOTP/DHCP (Bootstrap Protocol/Dynamic Host Configuration Protocol)   |        |        |        |                                |
| UDP Port Numbers   | 67 for Request<br>68 for Response   |        |        |        |                                |
| IP addresses supported for each Relay Service                                  | 1536  |        |        |        | 256                            |
| IP addresses supported for the Per-VLAN service                                | 1536  |        |        |        | 256                            |
| Maximum number of UDP relay services allowed per switch                        | 30  |        |        |        |                                |
| Maximum number of VLANs to which forwarded UDP service port traffic is allowed | 256   |        |        |        |                                |
| Maximum DHCP Snooping IP source filtering entries per NI                       | 256   | 256    | 256    | 256    | 128 (48-port)<br>256 (24-port) |
| <b>Notes:</b>  |   |        |        |        |                                |
| Maximum of 32 VLANs can be enabled with the ISF.                               |   |        |        |        |                                |

# DHCP Server Specifications

|   | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|---|--|--------|--------|--------|--------|
| RFCs Supported                          | RFC 2131—Dynamic Host Configuration Protocol<br>RFC 3315—Dynamic Host Configuration Protocol for IPv6<br>RFC 950—Internet Standard Subnetting Procedure<br>RFC 868—Time Protocol<br>RFC 1035—Domain Implementation and Specification<br>RFC 1191—Path MTU Discovery  |        |        |        |        |
| DHCP Server Implementation              | BOOTP/DHCP   |        |        |        |        |
| UDP Port Numbers                        | 67 for Request and Response (IPv4)<br>547 for Request (IPv6)<br>546 for Response (IPv6)  |        |        |        |        |
| IP address lease allocation mechanisms: |  |        |        |        |        |
| <b>BootP</b>                            | <b>Static BootP:</b><br>IP address is allocated using the BootP configuration when the MAC address of the client is defined.   |        |        |        |        |
| <b>DHCP</b>                             | <b>Static DHCP:</b><br>The network administrator assigns an IP address to the client. DHCP conveys the address assigned by the DHCP server to the client.<br><br><b>Dynamic DHCP:</b><br>The DHCP server assigns an IP address to a client for a limited period of time or until the client explicitly releases the address. |        |        |        |        |
| OmniSwitch IPv4 Configuration Files     | <b>dhcpd.conf</b><br><b>dhcpd.pcy</b><br><b>dhcpsrv.db</b>   |        |        |        |        |
| OmniSwitch IPv6 Configuration Files     | <b>dhcpdv6.conf</b><br><b>dhcpdv6.pcy</b><br><b>dhcpv6srv.db</b>   |        |        |        |        |
| Maximum number of leases                | 8000   |        |        |        |        |
| Maximum lease information file size     | 375K   |        |        |        |        |
| <b>Notes:</b>                           |  |        |        |        |        |
|   |  |        |        |        |        |



## VRRP Specifications

|   | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|---|---|--------|--------|--------|--------|
| RFCs Supported                                      | RFC 3768—Virtual Router Redundancy Protocol<br>RFC 2787—Definitions of Managed Objects for the Virtual Router Redundancy Protocol |        |        |        |        |
| Maximum number of VRRPv2 and VRRPv3 virtual routers | 134   | 255    | 255    | 255    | 255    |
| Maximum number of IP addresses per instance         | -   | 16     | 16     | 16     | 16     |
| <b>Notes:</b>                                       |   |        |        |        |        |
|   |   |        |        |        |        |

## Server Load Balancing Specifications

|   | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|---|---|--------|--------|--------|--------|
| Maximum number of clusters  | 32  |        |        |        |        |
| Maximum number of physical servers per cluster  | 32  |        |        |        |        |
| Layer-3 classification  | Destination IP address<br>QoS policy condition                            |        |        |        |        |
| Layer-2 classification  | QoS policy condition  |        |        |        |        |
| Server health checking  | Ping, link checks   |        |        |        |        |
| High availability support   | Hardware-based failover, VRRP, Chassis Management Module (CMM) redundancy |        |        |        |        |
| Networking protocols supported  | Virtual IP (VIP) addresses  |        |        |        |        |
| <b>Notes:</b>   |   |        |        |        |        |
| <ul style="list-style-type: none"> <li>• SLB is not supported on the OS9900 or OS6560.</li> </ul> |   |        |        |        |        |

# IPMS Specifications

|   | OS9900   | OS6900   | OS6860 | OS6865 | OS6560 |
|---|--|--|--------|--------|--------|
| RFCs Supported  | RFC 1112—Host Extensions for IP Multicasting<br>RFC 2236—Internet Group Management Protocol, Version 2<br>RFC 2710—Multicast Listener Discovery (MLD) for IPv6<br>RFC 2933—Internet Group Management Protocol MIB<br>RFC 3019—IP Version 6 Management Information Base for The Multicast Listener Discovery Protocol<br>RFC 3376—Internet Group Management Protocol, Version 3<br>RFC 3810—Multicast Listener Discovery Version 2 (MLDv2) for IPv6<br>RFC 4541—Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches<br>RFC 4604—Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast |  |        |        |        |
| IGMP Versions Supported   | IGMPv1, IGMPv2, IGMPv3   |  |        |        |        |
| Maximum number of IPv4 multicast flows  | 2K   | X20 - 2K<br>X40 - 2K<br>T20 - 2K<br>T40 - 2K<br>Q32 - 20K<br>X72 - 20K | 12K    | 12K    | 1024   |
| Maximum number of IPv4 multicast forwarding entries   | 3K   | 40K  | 36K    | 8K     | -      |
| <b>Notes:</b>   |  |  |        |        |        |
| Mixing an XNI-U32S with other modules in the same chassis reduces the maximum number of IPv4 multicast flows to 2K. |  |  |        |        |        |

# IPMSv6 Specifications

|   | OS9900   | OS6900   | OS6860 | OS6865 | OS650 |
|---|--|--|--------|--------|-------|
| RFCs Supported  | RFC 2710—Multicast Listener Discovery for IPv6<br>RFC 3019—IPv6 MIB for Multicast Listener Discovery Protocol<br>RFC 3306—Unicast-Prefix-based IPv6 Multicast Addresses<br>RFC 3810—Multicast Listener Discovery Version 2 for IPv6<br>RFC 4541—Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches<br>RFC 4604—Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicas |  |        |        |       |
| MLD Versions Supported  | MLDv1, MLDv2   |  |        |        |       |
| MLD Query Interval  | 1–65535 in seconds   |  |        |        |       |
| MLD Router Timeout  | 1–65535 in seconds   |  |        |        |       |
| MLD Source Timeout  | 1–65535 in seconds   |  |        |        |       |
| MLD Query Response Interval   | 1–65535 in milliseconds  |  |        |        |       |
| MLD Last Member Query Interval  | 1–65535 in milliseconds  |  |        |        |       |
| Maximum number of IPv6 multicast flows  | -  | X20 - 2K<br>X40 - 2K<br>T20 - 2K<br>T40 - 2K<br>Q32 - 20K<br>X72 - 20K | 12K    | 12K    |       |
| <b>Notes:</b>   |  |  |        |        |       |
| <ul style="list-style-type: none"> <li>• IPMSv6 is not supported on the OS9900 or OS6560.</li> <li>• Mixing an XNI-U32S with other modules in the same chassis reduces the maximum number of IPv4 multicast flows to 2K.</li> </ul> |  |  |        |        |       |

## QoS Specifications

|  | OS9900                                 | OS6900                                    | OS6860 | OS6865 | OS6560 |
|--|--|---|--------|--------|--------|
| Maximum number of policy rules   | 1024                                   | 8192                                      | 3072   | 3072   | 1024   |
| Maximum number of policy conditions                                    | 1024                                   | 8192                                      | 3072   | 3072   | 1024   |
| Maximum number of policy actions                                       | 1024                                   | 8192                                      | 3072   | 3072   | 1024   |
| Maximum number of policy rules per slot                                | 1024                                   | 1024<br>Q32 - 2560<br>X72 - 2560          | 3072   | 3072   | 1024   |
| Maximum number of validity periods                                     | 64                                     |   |        |        |        |
| Maximum number of policy services                                      | 256                                    |   |        |        |        |
| Maximum number of groups (network, MAC, service, port)                 | 1023                                   | 2047                                      | 1024   | 1023   | 1023   |
| Maximum number of group entries  | 1024 per group (256 per service group) |   |        |        |        |
| Maximum number of Class of Service (CoS) queues per port.              | 8                                      |   |        |        |        |
| Queue Set Profiles (QSP)   | 4                                      |   |        |        |        |
| Weighted Random Early Detection profiles (WRED)                        | -                                      | TCP traffic only<br>Q32- N/S<br>X72 - N/S | N/S    | N/S    | -      |
| Maximum number of QoS policy lists per switch                          | 32 (includes the default list)         |   |        |        |        |
| Maximum number of QoS policy lists per Universal Network Profile (UNP) | 1                                      |   |        |        |        |
| <b>Notes:</b>  |  |   |        |        |        |
| N/A  |  |   |        |        |        |

## LDAP Policy Server Specifications

|  | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|--|---|--------|--------|--------|--------|
| RFCs Supported   | RFC 2251–Lightweight Directory Access Protocol (v3)<br>RFC 3060–Policy Core Information Model—Version 1 Specification |        |        |        |        |
| Maximum number of policy servers (supported on the switch) | 5   |        |        |        |        |
| Maximum number of policy servers (supported by PolicyView) | 1   |        |        |        |        |
| <b>Notes:</b>  |   |        |        |        |        |
| N/A  |   |        |        |        |        |

## Authentication Server Specifications

|                        | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|------------------------|--|--------|--------|--------|--------|
| RADIUS RFCs Supported  | RFC 2865–Remote Authentication Dial In User Service (RADIUS)<br>RFC 2866–RADIUS Accounting<br>RFC 2867–RADIUS Accounting Modifications for Tunnel Protocol Support<br>RFC 2868–RADIUS Attributes for Tunnel Protocol Support<br>RFC 2809–Implementation of L2TP Compulsory Tunneling through RADIUS<br>RFC 2869–RADIUS Extensions<br>RFC 2548–Microsoft Vendor-specific RADIUS Attributes<br>RFC 2882–Network Access Servers Requirements: Extended RADIUS Practices   |        |        |        |        |
| TACACS+ RFCs Supported | RFC 1492–An Access Control Protocol  |        |        |        |        |
| LDAP RFCs Supported    | RFC 1789–Connectionless Lightweight X.500 Directory Access Protocol<br>RFC 2247–Using Domains in LDAP/X.500 Distinguished Names<br>RFC 2251–Lightweight Directory Access Protocol (v3)<br>RFC 2252–Lightweight Directory Access Protocol (v3): Attribute Syntax Definitions<br>RFC 2253–Lightweight Directory Access Protocol (v3): UTF-8 String Representation of Distinguished Names<br>RFC 2254–The String Representation of LDAP Search Filters<br>RFC 2256–A Summary of the X.500(96) User Schema for Use with LDAPv3 |        |        |        |        |
| Other RFCs             | RFC 2574–User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)<br>RFC 2924–Accounting Attributes and Record Formats<br>RFC 2975–Introduction to Accounting Management<br>RFC 2989–Criteria for Evaluating AAA Protocols for Network Access  |        |        |        |        |

|   |   |
|---|---|
| Maximum number of authentication servers in single authority mode   | 8 |
| Maximum number of authentication servers in multiple authority mode | 8 |
| Maximum number of servers per Authenticated Switch Access type      | 8 |
| <b>Notes:</b>   |   |
| N/A   |   |

## UNP Specifications

|   | OS9900  | OS6900 | OS6860   | OS6865 |
|---|---|--------|--|--------|
| Number of UNPs per switch                                       | 1K  | 4K     | 1K   | 1K     |
| Number of UNP users per switch                                  | 1K  | 2K     | 256  | 256    |
| Authentication type   | MAC and 802.1x authentication   |        |  |        |
| Profile type  | VLAN, SPB service, and VXLAN service  |        | Edge, VLAN, and SPB service  |        |
| UNP port type   | Bridge (VLAN-based classification) or access (service-based classification) |        | Edge, bridge, and SPB access   |        |
| UNP classification rules  | MAC address, MAC address range, IP address, and VLAN tag                    |        | MAC address, MAC OUI, MAC address range, IP address, VLAN tag, Port, Group ID, authentication type, and LLDP (IP Phones TLV) |        |
| Number of QoS policy lists per switch                           | 32 (includes the default list)  |        |  |        |
| Number of QoS policy lists per UNP                              | 1   |        |  |        |
| <b>Notes:</b>   |   |        |  |        |
| Number of UNPs per switch includes static and dynamic profiles. |   |        |  |        |

# Access Guardian Specifications

|  | OS9900  | OS6900 | OS6860  | OS6865 | OS6560 |
|--|---|--------|---|--------|--------|
| RFCs Supported   | RFC 2284–PPP Extensible Authentication Protocol (EAP)<br>RFC 2865–Remote Authentication Dial In User Service (RADIUS)<br>RFC 2866–RADIUS Accounting<br>RFC 2867–RADIUS Accounting Modifications for Tunnel Protocol Support<br>RFC 2868–RADIUS Attributes for Tunnel Protocol Support<br>RFC 2869–RADIUS Extensions<br>RFC 3576--Change of Authorization-Request (COA) and Disconnect request (DM) for BYOD. RFC support is limited to ClearPass solution.<br>RFC 3579–RADIUS Support for EAP |        |   |        |        |
| IEEE Standards Supported   | IEEE 802.1X-2001–Standard for Port-based Network Access Control<br>802.1X RADIUS Usage Guidelines   |        |   |        |        |
| Authentication methods supported   | -   | -      | 802.1X, MAC address, Captive Portal                     |        | -      |
| Maximum number of Access Guardian users  | -   | -      | 1K (includes quarantined and Captive Portal users)      |        | -      |
| Maximum number of users quarantined by QMR   | -   | -      | 1K  | 1K     | -      |
| Average number of users allowed to login to Captive portal Web pages at any given time   | -   | -      | 40  | 40     | -      |
| Maximum number of Captive Portal profiles  | -   | -      | 8   | 8      | -      |
| Maximum number of AAA profiles   | -   | -      | 8   | 8      | -      |
| Maximum number of authentication servers   | -   | -      | 4 per authentication type (MAC, 802.1X, Captive Portal) |        | -      |
| Maximum number of accounting servers   | -   | -      | 4 per authentication type (MAC, 802.1X, Captive Portal) |        | -      |
| BYOD Solution Server   | -   | -      | ClearPass Policy Manager (CPPM)                         |        | -      |
| mDNS GRE Tunnel Supported Protocol   | -   | -      | IPv4  | IPv4   | -      |
| SSDP GRE Tunnel Supported Protocol   | -   | --     | IPv4  | IPv4   | -      |
| <b>Notes:</b>  |   |        |   |        |        |
| <ul style="list-style-type: none"> <li>Access Guardian BYOD related features are only supported on the OS6860/6865.</li> </ul> |   |        |   |        |        |

## AppMon Specifications

|  | OS9900 | OS6900 | OS6860      | OS6865 | OS6560 |
|--|--------|--------|-------------|--------|--------|
| Packet types sampled   | N/S    | N/S    | TCP and UDP |        | N/S    |
| <b>Notes:</b>  |        |        |             |        |        |
| <ul style="list-style-type: none"> <li>AppMon is supported in a virtual chassis of OmniSwitch 6860 and OmniSwitch 6860E platforms where at least one OmniSwitch 6860E is mandatory for the feature to work.</li> </ul> |        |        |             |        |        |

## Application Fingerprinting Specifications

|  | OS9900   | OS6900 | OS6860 | OS6865 |
|--|--|--------|--------|--------|
| Packet sampling rate   | 50K packets-per-second on each module.   |        | N/S    |        |
| Packet types sampled   | IPv4 and IPv6 (no fragmented, encrypted, control, or protocol packets. For example, ICMP, LLDP, BPDU packets not scanned). |        | N/S.   |        |
| <b>Notes:</b>  |  |        |        |        |
| <ul style="list-style-type: none"> <li>AFP is supported on the OS6900 only.</li> </ul> |  |        |        |        |

## Port Mapping Specifications

|                       | OS9900 | OS6900 | OS6860 | OS6865 | OS6560 |
|-----------------------|--------|--------|--------|--------|--------|
| Port Mapping Sessions | 8      |        |        |        |        |
| <b>Notes:</b>         |        |        |        |        |        |
|                       |        |        |        |        |        |

## Learned Port Security Specifications

|  | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|--|---|--------|--------|--------|--------|
| Ports eligible for Learned Port Security                     | Fixed and 802.1Q tagged   |        |        |        |        |
| Ports not eligible for Learned Port Security                 | Link aggregate ports.<br>802.1Q (trunked) link aggregate ports. |        |        |        |        |
| Minimum number of learned MAC addresses allowed per LPS port | 1   |        |        |        |        |



|  |      |
|--|------|
| Maximum number of learned MAC addresses allowed per LPS port   | 1000 |
| Maximum number of filtered MAC addresses allowed per LPS port  | 100  |
| Maximum number of configurable MAC address ranges per LPS port | 1    |
| <b>Notes:</b>  |      |
|  |      |

## Port Mirroring Specifications

|   | OS9900   | OS6900   | OS6860   | OS6865   | OS6560   |
|---|----------|----------|----------|----------|----------|
| Mirroring Sessions Supported                              | 2        | 2        | 2        | 2        | 2        |
| Combined Mirroring/<br>Monitoring Sessions per<br>Chassis | 3        | 2        | 2        | 3        | 2        |
| N-to-1 Mirroring Supported                                | 128 to 1 | 128 to 1 | 128 to 1 | 128 to 1 | 128 to 1 |
| Number of RPMIR VLANs<br>per session                      | N/S      | 1        | 1        | 1        | 1        |
| <b>Notes:</b>   |          |          |          |          |          |
| N/A   |          |          |          |          |          |

## Port Monitoring Specifications

|   | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|---|---|--------|--------|--------|--------|
| Monitoring Sessions<br>Supported                          | 1   | 1      | 1      | 1      | 1      |
| Combined Mirroring/<br>Monitoring Sessions per<br>Chassis | 3   | 2      | 2      | 2      | 1      |
| File Type Supported                                       | ENC file format (Network General Sniffer Network Analyzer Format) |        |        |        |        |
| <b>Notes:</b>   |   |        |        |        |        |
| N/A   |   |        |        |        |        |

# sFlow Specifications

|  | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--|--------|--------|--------|--------|
| RFCs Supported                             | 3176—sFlow Management Information Base   |        |        |        |        |
| Receiver/Sampler/Polling Instances         | 2  |        |        |        |        |
| Sampling                                   | length of packet<br>type of frame<br>source and destination MACs<br>source and destination VLANs<br>source and destination priorities<br>source and destination IP addresses<br>source and destination ports<br>tcp flags and tos                          |        |        |        |        |
| Polling                                    | In octets<br>Out octets<br>Number of Rx Unicast packets<br>Number of Tx Unicast packets<br>Number of Rx Multicast packets<br>Number of Tx Multicast packets<br>Number of Rx Broadcast packets<br>Number of Tx Broadcast packets<br>In Errors<br>Out Errors |        |        |        |        |
| <b>Notes:</b>                              |  |        |        |        |        |
| - Sflow not supported on OS9900 or OS6560. |  |        |        |        |        |

# RMON Specifications

|                                    | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|------------------------------------|---|--------|--------|--------|--------|
| RFCs Supported                     | 2819 - Remote Network Monitoring Management Information Base  |        |        |        |        |
| RMON Functionality Supported       | Basic RMON 4 group implementation<br>–Ethernet Statistics group<br>–History (Control and Statistics) group<br>–Alarms group<br>–Events group  |        |        |        |        |
| RMON Functionality Not Supported   | RMON 10 group*<br>RMON2*<br>–Host group<br>–HostTopN group<br>–Matrix group<br>–Filter group<br>–Packet Capture group<br>(*An external RMON probe that includes RMON 10 group and RMON2 be used where full RMON probe functionality is required.) |        |        |        |        |
| Flavor (Probe Type)                | Ethernet/History/Alarm  |        |        |        |        |
| Status                             | Active/Creating/Inactive  |        |        |        |        |
| History Control Interval (seconds) | 1–3600  |        |        |        |        |
| History Sample Index Range         | 1–65535   |        |        |        |        |
| Alarm Interval (seconds)           | 1–2147483647  |        |        |        |        |
| Alarm Startup Alarm                | Rising Alarm/Falling Alarm/<br>RisingOrFalling Alarm  |        |        |        |        |
| Alarm Sample Type                  | Delta Value/Absolute  |        |        |        |        |
| RMON Traps Supported               | RisingAlarm/FallingAlarm<br>These traps are generated whenever an Alarm entry crosses either its Rising Threshold or its Falling Threshold and generates an event configured for sending SNMP traps.  |        |        |        |        |
| <b>Notes:</b>                      |   |        |        |        |        |
| N/A                                |   |        |        |        |        |

# Switch Health Specifications

|  | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--|--------|--------|--------|--------|
| Health Functionality Supported                 | <ul style="list-style-type: none"> <li>–Switch level CPU Utilization Statistics (percentage);</li> <li>–Switch/module/port level Input Utilization Statistics (percentage);</li> <li>–Switch/module/port level Input/Output Utilization Statistics (percentage);</li> <li>–Switch level Memory Utilization Statistics (percentage);</li> <li>–Device level (for example, Chassis/CMM) Temperature Statistics (Celsius).</li> </ul> |        |        |        |        |
| Monitored Resource Utilization Levels          | <ul style="list-style-type: none"> <li>–Most recent utilization level;</li> <li>–Average utilization level during last minute;</li> <li>–Average utilization level during last hour;</li> <li>–Maximum utilization level during last hour.</li> </ul>  |        |        |        |        |
| Resource Utilization Raw Sample Values         | Saved for previous 60 seconds.   |        |        |        |        |
| Resource Utilization Current Sample Values     | Stored.  |        |        |        |        |
| Resource Utilization Maximum Utilization Value | Calculated for previous 60 seconds and stored.   |        |        |        |        |
| Utilization Value = 0                          | Indicates that none of the resources were measured for the period.   |        |        |        |        |
| Utilization Value = 1                          | Indicates that a non-zero amount of the resource (less than 2%) was measured for the period.   |        |        |        |        |
| Percentage Utilization Values                  | Calculated based on Resource Measured During Period/Total Capacity.  |        |        |        |        |
| Resource Threshold Levels                      | Apply automatically across all levels of switch (switch/module/port).  |        |        |        |        |
| Rising Threshold Crossing                      | A Resource Threshold was exceeded by its corresponding utilization value in the current cycle.   |        |        |        |        |
| Falling Threshold Crossing                     | A Resource Threshold was exceeded by its corresponding utilization value in the previous cycle, but is not exceeded in the current cycle.  |        |        |        |        |
| Threshold Crossing Traps Supported             | Device, module, port-level threshold crossings.  |        |        |        |        |
| <b>Notes:</b>                                  |  |        |        |        |        |
| N/A  |  |        |        |        |        |

## VLAN Stacking Specifications

|  | OS9900   | OS6900 | OS6860 | OS6865 |
|--|--|--------|--------|--------|
| IEEE Standards supported   | IEEE 802.1Q, 2003 Edition, IEEE Standards for Local and Metropolitan Area Networks—Virtual Bridged Local Area Networks<br>P802.1ad/D6.0 (C/LM) Standard for Local and Metropolitan Area Networks—Virtual Bridged Local Area Networks—Amendment 4: Provider Bridges |        |        |        |
| Maximum number of services   | 4  |        |        |        |
| Maximum number of SVLANs   | 4K   |        |        |        |
| Maximum number of SAPs   | 8K   |        |        |        |
| Maximum number of SAP profiles   | 8K (1K if profiles assign priority or bandwidth)   |        | 8K     | 8K     |
| Maximum number of SAP profile VLAN translation or double tagging rules | 8K   |        | -      | -      |
| Maximum number of customer VLANs (CVLANs) associated with a SAP        | 4K   |        |        |        |
| Maximum number of service-to-SAP associations                          | -  | -      | -      | 1K     |
| <b>Notes:</b>  |  |        |        |        |
| VLAN Stacking is not supported on the OS9900 or OS6560.                |  |        |        |        |

## Switch Logging Specifications

|                                    | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|------------------------------------|---|--------|--------|--------|--------|
| RFCs Supported                     | RFC-5424 Syslog Protocol  |        |        |        |        |
| Functionality Supported            | High-level event logging mechanism that forwards requests from applications to enabled logging devices.                                     |        |        |        |        |
| Number of Syslog Servers Supported | 12  |        |        |        |        |
| Logging Devices                    | Flash Memory/Console/IP Address   |        |        |        |        |
| Severity Levels/Types Supported    | 2 (Alarm - highest severity), 3 (Error), 4 (Alert), 5 (Warning) 6 (Info - default), 7 (Debug 1), 8 (Debug 2), 9 (Debug 3 - lowest severity) |        |        |        |        |
| <b>Notes:</b>                      |   |        |        |        |        |
| N/A                                |   |        |        |        |        |

## Ethernet OAM Specifications

|  | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--|--------|--------|--------|--------|
| Standards Supported                                    | IEEE 802.1ag Version 8.1– <i>Connectivity Fault Management</i><br>IEEE 802.1D– <i>Media Access Control (MAC) Bridges</i><br>IEEE 802.1Q– <i>Virtual Bridged Local Area Networks</i><br>ITU-T Y.1731– <i>OAM Functions and Mechanisms for Ethernet-Based Networks</i> |        |        |        |        |
| Maximum Maintenance Domains (MD) per Bridge            | 8  |        |        |        |        |
| Maximum Maintenance Associations (MA) per Bridge       | 128  |        |        |        |        |
| Maximum Maintenance End Points (MEP) per Bridge        | 256  |        |        |        |        |
| Maximum MEP CMM Database Size                          | 1K   |        |        |        |        |
| Minimum CCM interval                                   | 100ms  |        |        |        |        |
| <b>Notes:</b>  |  |        |        |        |        |
| Ethernet OAM is not supported on the OS9900 or OS6560. |  |        |        |        |        |

## SAA Specifications

|                     | OS9900 | OS6900    | OS6860    | OS6865    |  |
|---------------------|--------|-----------|-----------|-----------|--|
| Platforms Supported | N/S    | Supported | Supported | Supported |  |
| <b>Notes:</b>       |        |           |           |           |  |
| N/A                 |        |           |           |           |  |



# 3 Advanced Routing Configuration Specifications

This chapter provides Specifications tables for the following OmniSwitch features that are used to set up and monitor advanced routing protocols for operation in a live network environment:

- Routing technologies.
  - Open Shortest Path First (OSPF), version 2 and version 3.
  - Intermediate System-to-Intermediate System (IS-IS).
  - Border Gateway Protocol (BGP).
- Multicast routing protocols.
  - Multicast boundaries that are used to confine scoped multicast addresses to a specific domain.
  - Distance Vector Multicast Routing Protocol (DVMRP)
  - Protocol-Independent Multicast (PIM)
  - Multicast Border Router (MBR) functionality as defined in the PIM-SM specification (RFC 4601)

**Note:** The OmniSwitch can support a higher number of routes than what is documented in the protocol routing tables. The values documented are based on typical scenarios and validated during the AOS test phase. The total number of routes supported is dependent upon the switch configuration and the total amount of memory available.

For information about how to configure advanced routing protocols, refer to the *OmniSwitch AOS Release 8 Advanced Routing Configuration Guide*.

## In This Chapter

This chapter contains the following Advanced Routing Specifications tables:

- [“OSPF Specifications” on page 3-2.](#)
- [“OSPFv3 Specifications” on page 3-3.](#)
- [“IS-IS Specifications” on page 3-4.](#)
- [“BGP Specifications” on page 3-5.](#)
- [“Multicast Boundary Specifications” on page 3-6.](#)
- [“DVMRP Specifications” on page 3-6.](#)
- [“PIM Specifications” on page 3-7.](#)
- [“MBR Specifications” on page 3-8.](#)

# OSPF Specifications

The following Specifications table contains information for the OmniSwitch implementation of Open Shortest Path First (OSPF) routing protocol. Note that any maximum limits provided in the table are subject to available system resources.

|  | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|--|--|--------|--------|--------|--------|
| RFCs supported   | 1370—Applicability Statement for OSPF<br>4750—OSPF Version 2 Management Information Base<br>2328—OSPF Version 2<br>5250—The OSPF Opaque LSA Option<br>3101—The OSPF Not-So-Stubby Area (NSSA) Option<br>3623—Graceful OSPF Restart |        |        |        |        |
| Maximum number of areas  | 10   | 10     | 4      | 4      | N/S    |
| Maximum number of interfaces   | 128  | 128    | 128    | 128    | N/S    |
| Maximum number of passive interfaces   | 200  | 200    | 200    | 200    | N/S    |
| Maximum number of Link State Database entries  | -  | 100K   | 20K    | 20K    | N/S    |
| Maximum number of neighbors per router   | 254  | 254    | 128    | 128    | N/S    |
| Maximum number of routes   | 14K  | 32K    | 32K    | 32K    | N/S    |
| Maximum number of ECMP next hop entries  | 2  | 16     | 16     | 16     | N/S    |
| <b>Notes:</b>  |  |        |        |        |        |
| - The maximum number of routes value may vary depending on the number of interfaces/neighbors. |  |        |        |        |        |

## OSPFv3 Specifications

The following Specifications table contains information for the OmniSwitch implementation of Open Shortest Path First version 3 (OSPFv3) routing protocol. Note that any maximum limits provided in the table are subject to available system resources.

|   | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|---|--|--------|--------|--------|--------|
| RFCs supported  | RFC 1826—IP Authentication Header<br>RFC 1827—IP Encapsulating Security Payload<br>RFC 2553—Basic Socket Interface Extensions for IPv6<br>RFC 2373—IPv6 Addressing Architecture<br>RFC 2374—An IPv6 Aggregatable Global Unicast Address Format<br>RFC 2460—IPv6 base specification<br>RFC 2740—OSPF for IPv6 |        |        |        |        |
| Maximum number of areas   | 5  | 5      | 4      | 4      | N/S    |
| Maximum number of interfaces  | 20   | 20     | 128    | 128    | N/S    |
| Maximum number of Link State Database entries   | 20K  | 20K    | 20K    | 20K    | N/S    |
| Maximum number of neighbors   | 128  | 128    | 128    | 128    | N/S    |
| Maximum number of routes  | 10K  | 10K    | 32K    | 32K    | N/S    |
| Maximum number of ECMP next hop entries   | 16   | 16     | 16     | 16     | N/S    |
| <b>Notes:</b>   |  |        |        |        |        |
| - The maximum number of routes per router value may vary depending on the number of interfaces/neighbors. |  |        |        |        |        |

## IS-IS Specifications

The following Specifications table contains information for the OmniSwitch implementation of the Intermediate System-to-Intermediate System (IS-IS) routing protocol. Note that any maximum limits provided in the table are subject to available system resources.

|   | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|---|---|--------|--------|--------|--------|
| RFCs Supported  | 1142-OSI IS-IS Intra-domain Routing Protocol<br>1195-OSI IS-IS for Routing in TCP/IP and Dual Environments<br>3373-Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point- to-Point Adjacencies<br>3567-Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication<br>2966-Prefix Distribution with two-level IS-IS (Route Leaking) support<br>2763-Dynamic Host name exchange support<br>3719-Recommendations for Interoperable Networks using IS-IS<br>3787-Recommendations for Interoperable IP Networks using IS-IS<br>5308-IS-IS support for IPv6 (Routing IPv6 with IS-IS) |        |        |        |        |
| IETF Internet-Drafts Supported                              | draft-ietf-isis-igp-p2p-over-lan-05.txt-Point-to-point operation over LAN in link-state routing protocols   |        |        |        |        |
| Maximum number of areas (per router)                        | -   | 3      | 3      | 3      | N/S    |
| Maximum number of L1 adjacencies per interface (per router) | -   | 70     | 70     | 70     | N/S    |
| Maximum number of L2 adjacencies per interface (per router) | -   | 70     | 70     | 70     | N/S    |
| Maximum number of IS-IS interfaces (per router)             | -   | 70     | 70     | 70     | N/S    |
| Maximum number of Link State Packet entries (per adjacency) | -   | 255    | 255    | 255    | N/S    |
| Maximum number of IS-IS routes                              | -   | 24000  | 24000  | 24000  | N/S    |
| Maximum number of IS-IS L1 routes                           | -   | 12000  | 12000  | 12000  | N/S    |
| Maximum number of IS-IS L2 routes                           | -   | 12000  | 12000  | 12000  | N/S    |
| <b>Notes:</b>   |   |        |        |        |        |
|   |   |        |        |        |        |

# BGP Specifications

The following Specifications table contains information for the OmniSwitch implementation of the Border Gateway Protocol (BGP) routing protocol. Note that any maximum limits provided in the table are subject to available system resources.

|   | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|---|---|--------|--------|--------|--------|
| RFCs Supported  | 1771/4271–A Border Gateway Protocol 4 (BGP-4)<br>2439–BGP Route Flap Damping<br>3392/5492–Capabilities Advertisement with BGP-4<br>2385–Protection of BGP Sessions via the TCP MD5 Signature Option<br>1997–BGP Communities Attribute<br>4456–BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP)<br>3065–Autonomous System Confederations for BGP<br>4273–Definitions of Managed Objects for BGP-4<br>4486–Subcodes for BGP Cease Notification<br>4760–Multiprotocol Extensions for BGP-4<br>2545–Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing<br>2918 - Route Refresh Capability for BGP-4<br>4724 - Graceful Restart Mechanism for BGP<br>6793 - BGP 4-octet ASN<br>5668 - 4-Octet AS Specific BGP Extended Community<br>2042 - Registering New BGP Attribute Types<br>5396 -Textual Representation of Autonomous System (AS) Numbers |        |        |        |        |
| BGP Attributes Supported                              | Origin, AS Path, Next Hop (IPv4), MED, Local Preference, Atomic Aggregate, Aggregator (IPv4), Community, Originator ID, Cluster List, Multiprotocol Reachable NLRI (IPv6), Multiprotocol Unreachable NLRI (IPv6), AS4 Path, AS4 Aggregator (IPv4), and AS Specific Extended Community.  |        |        |        |        |
| Maximum number of peers per switch (32 peers per VRF) | 30  | 512    | 512    | 512    | N/S    |
| Maximum number of networks                            | -   | 4K     | 4K     | 4K     | N/S    |
| Maximum number of aggregation addresses               | -   | 2K     | 2K     | 2K     | N/S    |
| Maximum number of routes                              | 20K   | 128K   | 64K    | 64K    | N/S    |
| Maximum number of policies                            | -   | 1K     | 1K     | 1K     | N/S    |
| <b>Notes:</b>   |   |        |        |        |        |
|   |   |        |        |        |        |

## Multicast Boundary Specifications

The following Specifications table contains information for the OmniSwitch implementation of multicast address boundary functionality. Note that any maximum limits provided in the table are subject to available system resources.

|   | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|---|--|--------|--------|--------|--------|
| RFCs Supported  | 2365—Administratively Scoped IP Multicast<br>5132 - IP Multicast MIB |        |        |        |        |
| Valid Scoped Address Range  | 239.0.0.0 to 239.255.255.255   |        |        |        |        |
| Valid extended Multicast route boundary Address Range   | 224.0.0.0 to 239.255.255.255   |        |        |        |        |
| <b>Notes:</b>   |  |        |        |        |        |
| - If software routing is used, the number of total flows supported is variable, depending on the number of flows and the number of routes per flow. |  |        |        |        |        |
| - Multicast boundary is not supported on the OS6560.  |  |        |        |        |        |

## DVMRP Specifications

The following Specifications table contains information for the OmniSwitch implementation of the Distance Vector Multicast Routing Protocol (DVMRP). Note that any maximum limits provided in the table are subject to available system resources.

|   | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|---|---|--------|--------|--------|--------|
| RFCs Supported                                  | 1075—Distance Vector Multicast Routing Protocol, Version 1<br>4087—IP Tunnel MIB<br>2715—Interoperability Rules for Multicast Routing Protocols   |        |        |        |        |
| IETF Internet-Drafts Supported                  | draft-ietf-idmr-dvmrp-v3-09.txt - Distance Vector Multicast Routing Protocol, Version 3   |        |        |        |        |
| DVMRP version supported                         | DVMRPv3.255   |        |        |        |        |
| DVMRP attributes supported                      | Reverse Path Multicasting, Neighbor Discovery, Multicast Source Location, Route Report Messages, Distance metrics, Dependent Downstream Routers, Poison Reverse, Pruning, Grafting, DVMRP Tunnels |        |        |        |        |
| DVMRP timers supported                          | Flash update interval, Graft retransmissions, Neighbor probe interval, Neighbor timeout, Prune lifetime, Prune retransmission, Route report interval, Route hold-down, Route expiration timeout   |        |        |        |        |
| Maximum number of interfaces                    | 384 (Maximum 384 combined Multicast Interfaces between PIMv4, PIMv6 and DVMRP.)   |        |        |        |        |
| Multicast protocols per interface               | 1 (PIM and DVMRP cannot be enabled on the same interface.)  |        |        |        |        |
| <b>Notes:</b>                                   |   |        |        |        |        |
| DVMRP is not supported on the OS9900 or OS6560. |   |        |        |        |        |

# PIM Specifications

The following Specifications table contains information for the OmniSwitch implementation of the Protocol-Independent Multicast (PIM) routing protocol. Note that any maximum limits provided in the table are subject to available system resources.

|                                     | OS9900   | OS6900 | OS6860 | OS6865 | OS6560 |
|-------------------------------------|--|--------|--------|--------|--------|
| RFCs Supported                      | 2365—Administratively Scoped IP Multicast<br>4601—Protocol Independent Multicast-Sparse Mode (PIM-SM) Protocol Specification<br>4007—IPv6 Scoped IP Multicast<br>5060—Protocol Independent Multicast MIB<br>5132—IP Multicast MIB<br>3569—An Overview of Source-Specific Multicast (SSM)<br>3973—Protocol Independent Multicast-Dense Mode (PIM-DM)<br>5015 - Bidirectional Protocol Independent Multicast (BIDIR-PIM)<br>5059—Bootstrap Router (BSR) Mechanism for PIM<br>5240—Protocol Independent Multicast (PIM) Bootstrap Router MIB<br>2715—Interoperability Rules for Multicast Routing Protocols |        |        |        |        |
| PIM-SM version supported            | PIM-SMv2   |        |        |        |        |
| PIM attributes supported            | Shared trees (also referred to as RP trees)<br>Designated Routers (DRs)<br>Designated Forwarders (DFs)<br>Bootstrap Routers (BSRs)<br>Candidate Bootstrap Routers (C-BSRs)<br>Rendezvous Points (RPs) (applicable only for PIM-SM)<br>Candidate Rendezvous Points (C-RPs)  |        |        |        |        |
| PIM timers supported                | C-RP expiry, C-RP holdtime, C-RP advertisement, Join/Prune, Probe, Register suppression, Hello, Expiry, Assert, Neighbor liveness, DF Election Timer   |        |        |        |        |
| Maximum PIM interfaces              | 384 (Maximum 384 combined Multicast Interfaces between PIMv4, PIMv6 and DVMRP.)<br>100 (OS9900)  |        |        |        |        |
| Maximum Rendezvous Point (RP)       | 100  |        |        |        |        |
| Maximum Bootstrap Routers (BSRs)    | 1  |        |        |        |        |
| Multicast Protocols per Interface   | 1 (PIM and DVMRP cannot be enabled on the same IP interface)   |        |        |        |        |
| Reserved SSM IPv4 Address Ranges    | 232.0.0.0 to 232.255.255.255   |        |        |        |        |
| Reserved SSM IPv6 Address Ranges    | FF3x::/32  |        |        |        |        |
| <b>Notes:</b>                       |  |        |        |        |        |
| PIM is not supported on the OS6560. |  |        |        |        |        |

## MBR Specifications

The following Specifications table contains information for the OmniSwitch implementation of the multicast border router (MBR) functionality defined in the PIM-SM specification (RFC 4601). Note that any maximum limits provided in the table are subject to available system resources.

|                                     | OS9900  | OS6900 | OS6860 | OS6865 | OS6560 |
|-------------------------------------|---|--------|--------|--------|--------|
| RFCs Supported                      | 4601—Protocol Independent Multicast-Sparse Mode (PIM-SM) Protocol Specification<br>3973—Protocol Independent Multicast-Dense Mode (PIM-DM)<br>2715—Interoperability Rules for Multicast Routing Protocols |        |        |        |        |
| IETF Internet-Drafts Supported      | draft-ietf-idmr-dvmrp-v3-09.txt - Distance Vector Multicast Routing Protocol, Version 3   |        |        |        |        |
| MBR Interoperability                | DVMRP interoperability with IPv4 PIM (PIM-SM and PIM-DM only).  |        |        |        |        |
| <b>Notes:</b>                       |   |        |        |        |        |
| MBR is not supported on the OS6560. |   |        |        |        |        |



# 4 Data Center Switching Specifications

The OmniSwitch implementation of data center switching capabilities helps enterprises address the challenges and ongoing transformation of data center networks. This chapter provides Specifications tables for the following OmniSwitch data center switching applications:

- Data Center Bridging (DCB) protocols to convert Ethernet into a lossless transport to support a reliable storage area network fabric within the data center mesh.
- Shortest Path Bridging MAC (SPBM), including SPBM support of Provider Backbone Bridging (PBB) encapsulation and services.
- Virtual eXtensible Local Area Network (VXLAN) to transparently extend Layer 2 networks over a Layer 3 infrastructure.
- VXLAN Snooping to detect and identify VXLAN traffic on the network.
- Fibre Channel over Ethernet (FCoE) Initialization Protocol (FIP) snooping to ensure the security of an FCoE network.
- FCoE/FC gateway functionality to converge FC over Ethernet and FC-to-FC over Ethernet through an OmniSwitch gateway.
- Edge Virtual Bridging (EVB) for managing virtual machines created and managed on servers also running the EVB protocol..

---

**Note.** The maximum limit values provided in the Specifications tables included in this chapter are subject to available system resources.

---

For information about how to configure data center switching applications, refer to the *OmniSwitch AOS Release 8 Data Center Switching Guide*.

## In This Chapter

This chapter contains the following data center Specifications tables:

- “Data Center Bridging Specifications” on page 4-3.
- “Shortest Path Bridging Specifications” on page 4-4.
- “VXLAN Specifications” on page 4-5.
- “VXLAN Snooping Specifications” on page 4-5.
- “FIP Snooping Specifications” on page 4-6.
- “FCoE/FC Gateway Specifications” on page 4-7.
- “Edge Virtual Bridging Specifications” on page 4-8.

## Data Center Bridging Specifications

The following Specifications table contains information for the OmniSwitch implementation of Data Center Bridging (DCB). Note that any maximum limits provided in the table are subject to available system resources.

|  | <b>OS6900</b>  |
|--|--|
| OmniSwitch Software License                    | Data Center  |
| IEEE Standards Supported                       | 802.1Qbb— <i>Priority-based Flow Control</i><br>802.1Qaz D2.5— <i>Enhanced Transmission Selection</i><br>802.1Qaz D2.5— <i>Data Center Bridging Exchange Converged Enhanced Ethernet DCBX v.1.01</i><br>802.1Q-REV/D1.5— <i>Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks</i> |
| Maximum number of DCB profiles                 | 128 profiles: <ul style="list-style-type: none"> <li>• Profiles 1–11 are predefined, with profile 8 serving as the default profile for all ports.</li> <li>• Profiles 12–128 are reserved for user-defined (custom) profiles.</li> </ul>   |
| Maximum number of lossless queues (priorities) | 110  |
| DCB TLVs supported                             | ETS Configuration<br>ETS Recommendation<br>PFC Configuration<br>Application Priority   |
| Notes:   |  |
| - DCB is only supported on the OS6900.         |  |

# Shortest Path Bridging Specifications

The following Specifications table contains information for the OmniSwitch implementation of Shortest Path Bridging (SPB). Note that any maximum limits provided in the table are subject to available system resources.

|  | OS9900   | OS6900   | OS6860 | OS6865 |
|--|--|--|--------|--------|
| IEEE Standards Supported   | 802.1aq/D3.6: Draft February 10, 2011— <i>Virtual Bridged Local Area Networks-Amendment 9: Shortest Path Bridging</i><br>802.1ah/D4.2: DRAFT March 26, 2008— <i>Virtual Bridged Local Area Networks-Amendment 6: Provider Backbone Bridging</i>      |  |        |        |
| IETF Internet-Drafts Supported   | draft-ietf-isis-ieee-aq-05.txt— <i>ISIS Extensions Supporting IEEE 802.1aq Shortest Path Bridging</i><br>IETF draft— <i>IP/IPVPN services with IEEE 802.1aq SPBB networks</i><br>IETF draft— <i>IP/IPVPN services with IEEE 802.1aq SPB networks</i> |  |        |        |
| SPB mode supported   | SPBM (MAC-in-MAC)  |  |        |        |
| IP over SPBM   | IPv4 (VPN-Lite and L3 VPN)<br>VRF-to-ISID mapping (one-to-one, one-to-many)  |  |        |        |
| Maximum number of ISIS-SPB instances per switch.   | 1  |  |        |        |
| Maximum number of BVLANS per switch  | 16   |  |        |        |
| Number of equal cost tree (ECT) algorithm IDs supported.   | 16 (Can select any ID between 1 and 16 to assign to a BVLAN)   |  |        |        |
| Maximum number of service instance identifiers (I-SIDs) per switch   | 1K   | 1K<br>Q32 - 8K<br>X72 - 8K   | 2K     | 2K     |
| Maximum number of VLANs or SVLANs per I-SID  | 4K   | 4K   | 2K     | 2K     |
| Maximum number of SAPs   | 8K   | X20 - 4K<br>X40 - 4K<br>T20 - 8K<br>T40 - 8K<br>Q32 - 8K<br>X72 - 8K | 2K     | 2K     |
| Maximum Transmission Unit (MTU) size for SPB services.   | 9K (not configurable at this time)   |  |        |        |
| Maximum number of Remote Fault Propagation (RFP) domains.  | 8 (or less if there are other Ethernet OAM domains already configured on the switch)   |  | N/S    | N/S    |
| <b>Notes:</b>  |  |  |        |        |
| - SPB is not supported on the OS6560.<br>- In a VC with OS6900-X models, the maximum number of SAPs is 4K. |  |  |        |        |

## VXLAN Specifications

The following Specifications table contains information for the OmniSwitch implementation of the Virtual eXtensible LAN (VXLAN) feature. Note that any maximum limits provided in the table are subject to available system resources.

|   | <b>OS6900</b>  |
|---|--|
| RFCs Supported  | 7348— <i>VXLAN: A Framework for Overlaying Layer 2 Virtualized Networks over Layer 3 Networks.</i> |
| VXLAN segments (L2 overlay networks)  | 16 million   |
| VXLAN service instances   | 8K   |
| VXLAN Tunnel End Points in a VXLAN network.                                 | 500  |
| VXLAN UDP destination ports   | 8 (including the default UDP port number, which is 4789).  |
| VXLAN Service Access Points (SAPs)  | 8K (per device or per Virtual Chassis)   |
| VXLAN SAPs with a VLAN ID range   | 8 SAPs per service access port   |
| Service access ports with SAPs that contain a VLAN ID range                 | 255  |
| VXLAN Network IDs (VNIs)  | 4K   |
| Multicast Groups  | 500  |
| Multicast protocol supported  | Bidirectional PIM (BIDIR-PIM)  |
| <b>Notes:</b>   |  |
| VXLAN is only supported on the OmniSwitch 6900-Q32 and OmniSwitch 6900-X72. |  |

## VXLAN Snooping Specifications

The following Specifications table contains information for the OmniSwitch implementation of VXLAN Snooping. Note that any maximum limits provided in the table are subject to available system resources.

|   | <b>OS6900</b>  |
|---|--|
| RFCs Supported                                    | 7348— <i>VXLAN: A Framework for Overlaying Layer 2 Virtualized Networks over Layer 3 Networks.</i> |
| Packet sampling rate                              | 1K packets-per-second on each module.  |
| <b>Notes:</b>                                     |  |
| - VXLAN Snooping is only supported on the OS6900. |  |

## FIP Snooping Specifications

The following Specifications table contains information for the OmniSwitch implementation of FIP Snooping and FCoE. Note that any maximum limits provided in the table are subject to available system resources.

|   | <b>OS6900</b>   |
|---|---|
| OmniSwitch Software License                     | Data Center   |
| INCITS Standards Supported                      | <ul style="list-style-type: none"> <li>• T11 Fibre Channel Backbone - 5 (FC-BB-5) Rev 2.00 June 4, 2009</li> <li>• FC-BB-5 Annex C: Increasing FC-BB_E Robustness Using Access Control Lists</li> <li>• T11 Switch Fabric - 5 (FC-SW-5) Rev 8.5 June 3, 2009</li> </ul> |
| Maximum number of FIP Snooping Sessions         | 128<br>Maximum number of FIP Snooping Sessions  |
| Required port types                             | 10G or faster Ethernet with DCB profile and DCBx enabled with PFC/ETS active (ports and link aggregates)  |
| <b>Notes:</b>                                   |   |
| - FIP Snooping is only supported on the OS6900. |   |

# FCoE/FC Gateway Specifications

The following Specifications table contains information for the OmniSwitch FCoE/FC Gateway. Note that any maximum limits provided in the table are subject to available system resources.

|   | <b>OS6900</b>   |
|---|---|
| OmniSwitch Software License   | Data Center   |
| INCITS Standards Supported  | <ul style="list-style-type: none"> <li>• FC-PI-4 Fibre Channel T11/08-138v1</li> <li>• FC-PI-5 Fibre Channel T11 2118-D/Rev 6.10</li> <li>• FC-BB-5 Backbone 5 T11/1871-D</li> <li>• FC-BB-6 Backbone 6 T11/2159-D (CNA switching only)</li> </ul>  |
| Fibre Channel functionality supported   | <ul style="list-style-type: none"> <li>• FCoE transit bridge               <ul style="list-style-type: none"> <li>- FCoE tunneling of encapsulated FC frames</li> <li>- FCoE initialization protocol (FIP) snooping</li> </ul> </li> <li>• FCoE/FC gateway switch               <ul style="list-style-type: none"> <li>- N_Port proxy (NPIV)</li> <li>- F_Port proxy (Reverse-NPIV)</li> <li>- E_Port proxy (E2E-tunnel)</li> </ul> </li> </ul> |
| Supported port types  | <ul style="list-style-type: none"> <li>• Fibre Channel for FCoE/FC gateway—OS-XNI-U12E module with SFP-FC-SR transceiver</li> <li>• Ethernet for FCoE/FIP snooping—10G or faster with DCB profile, DCBx enabled with PFC/ETS active (ports and link aggregates)</li> </ul>  |
| OmniSwitch 64-bit World Wide Node Name (WWNN)   | 10:00:xx:xx:xx:xx:xx:xx (where xx = next available increment of the switch base MAC address)  |
| OmniSwitch 64-bit World Wide Port Name (WWPN) for each Fibre Channel port                     | 10:00:xx:xx:xx:xx:xx:xx (where xx = port MAC address)   |
| VSAN–FC port associations   | Multiple FC port assignments per VSAN allowed. Only one VSAN assignment per FC port allowed.  |
| VSAN–FCoE VLAN mapping  | One-to-one  |
| VSAN scalability per switch   | Based on the number of FC ports (for example, if switch has 12 FC ports, then 12 VSANs; one for each FC port). Note that an FC port configured as an E2E tunnel endpoint does not use up a VSAN assignment.   |
| Maximum number of VSANs per network   | 4094  |
| E2E tunnel scalability  | One tunnel termination per FC port up to the number of available FC ports on the switch or virtual chassis.   |
| Maximum frame size supported  | 2180  |
| Load Balancing  | NP_Port load balancing only: <ul style="list-style-type: none"> <li>• Dynamic</li> <li>• Dynamic-reorder</li> <li>• ENode-based</li> <li>• Static</li> </ul>  |
| <b>Notes:</b>   |   |
| Only an OmniSwitch 6900 with the supported port types can serve as an FCoE/FC Gateway switch. |   |

## Edge Virtual Bridging Specifications

The following Specifications table contains information for the OmniSwitch implementation of Edge Virtual Bridging (EVB). Note that any maximum limits provided in the table are subject to available system resources.

|  | <b>OS6900</b>  |
|--|--|
| OmniSwitch Software License            | Data Center  |
| IEEE Standards Supported               | P802.1Qbg Standard Draft, Revision D2.2. February 18, 2012— <i>Virtual Bridged Local Area Networks—Amendment 21: Edge Virtual Bridging</i> |
| EVB mode                               | Bridging (virtual machines request the required CVLAN ID tag)  |
| Edge Relay (ER) support                | Single ER per switch port. The ER can operate as a Virtual Ethernet Port Aggregator (VEPA) or as a Virtual Ethernet Bridge (VEB).          |
| <b>Notes:</b>                          |  |
| - EVB is only supported on the OS6900. |  |



# A Software License and Copyright Statements

This appendix contains ALE USA, Inc. and third-party software vendor license and copyright statements.

## ALE USA, Inc. License Agreement

### ALE USA, Inc. SOFTWARE LICENSE AGREEMENT

---

**IMPORTANT.** Please read the terms and conditions of this license agreement carefully before opening this package.

---

**By opening this package, you accept and agree to the terms of this license agreement. If you are not willing to be bound by the terms of this license agreement, do not open this package. Please promptly return the product and any materials in unopened form to the place where you obtained it for a full refund.**

1. **License Grant.** This is a license, not a sales agreement, between you (the “Licensee”) and ALE USA, Inc.. ALE USA, Inc. hereby grants to Licensee, and Licensee accepts, a non-exclusive license to use program media and computer software contained therein (the “Licensed Files”) and the accompanying user documentation (collectively the “Licensed Materials”), only as authorized in this License Agreement. Licensee, subject to the terms of this License Agreement, may use one copy of the Licensed Files on the Licensee’s system. Licensee agrees not to assign, sublicense, transfer, pledge, lease, rent, or share their rights under this License Agreement. Licensee may retain the program media for backup purposes with retention of the copyright and other proprietary notices. Except as authorized under this paragraph, no copies of the Licensed Materials or any portions thereof may be made by Licensee and Licensee shall not modify, decompile, disassemble, reverse engineer, or otherwise attempt to derive the Source Code. Licensee is also advised that ALE USA, Inc. products contain embedded software known as firmware which resides in silicon. Licensee may not copy the firmware or transfer the firmware to another medium.

2. **ALE USA, Inc.’s Rights.** Licensee acknowledges and agrees that the Licensed Materials are the sole property of ALE USA, Inc. and its licensors (herein “its licensors”), protected by U.S. copyright law, trademark law, and are licensed on a right to use basis. Licensee further acknowledges and agrees that all rights, title, and interest in and to the Licensed Materials are and shall remain with ALE USA, Inc. and its licensors and that no such right, license, or interest shall be asserted with respect to such copyrights and trademarks. This License Agreement does not convey to Licensee an interest in or to the Licensed Materials, but only a limited right to use revocable in accordance with the terms of this License Agreement.

3. **Confidentiality.** ALE USA, Inc. considers the Licensed Files to contain valuable trade secrets of ALE USA, Inc., the unauthorized disclosure of which could cause irreparable harm to ALE USA, Inc.. Except as expressly set forth herein, Licensee agrees to use reasonable efforts not to disclose the Licensed Files to any third party and not to use the Licensed Files other than for the purpose authorized by this License Agreement. This confidentiality obligation shall continue after any termination of this License Agreement.

4. **Indemnity.** Licensee agrees to indemnify, defend and hold ALE USA, Inc. harmless from any claim, lawsuit, legal proceeding, settlement or judgment (including without limitation ALE USA, Inc.'s reasonable United States and local attorneys' and expert witnesses' fees and costs) arising out of or in connection with the unauthorized copying, marketing, performance or distribution of the Licensed Files.

5. **Limited Warranty.** ALE USA, Inc. warrants, for Licensee's benefit alone, that the program media shall, for a period of ninety (90) days from the date of commencement of this License Agreement (referred to as the Warranty Period), be free from defects in material and workmanship. ALE USA, Inc. further warrants, for Licensee benefit alone, that during the Warranty Period the Licensed Files shall operate substantially in accordance with the functional specifications in the User Guide. If during the Warranty Period, a defect in the Licensed Files appears, Licensee may return the Licensed Files to ALE USA, Inc. for either replacement or, if so elected by ALE USA, Inc., refund of amounts paid by Licensee under this License Agreement. EXCEPT FOR THE WARRANTIES SET FORTH ABOVE, THE LICENSED MATERIALS ARE LICENSED "AS IS" AND ALE USA, Inc. AND ITS LICENSORS DISCLAIM ANY AND ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING (WITHOUT LIMITATION) ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES SO THE ABOVE EXCLUSIONS MAY NOT APPLY TO LICENSEE. THIS WARRANTY GIVES THE LICENSEE SPECIFIC LEGAL RIGHTS. LICENSEE MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

6. **Limitation of Liability.** ALE USA, Inc.'s cumulative liability to Licensee or any other party for any loss or damages resulting from any claims, demands, or actions arising out of or relating to this License Agreement shall not exceed the license fee paid to ALE USA, Inc. for the Licensed Materials. IN NO EVENT SHALL ALE USA, Inc. BE LIABLE FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL, SPECIAL, OR EXEMPLARY DAMAGES OR LOST PROFITS, EVEN IF ALE USA, Inc. HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. SOME STATES DO NOT ALLOW THE LIMITATION OR EXCLUSION OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION TO INCIDENTAL OR CONSEQUENTIAL DAMAGES MAY NOT APPLY TO LICENSEE.

7. **Export Control.** This product is subject to the jurisdiction of the United States. Licensee may not export or reexport the Licensed Files, without complying with all United States export laws and regulations, including but not limited to (i) obtaining prior authorization from the U.S. Department of Commerce if a validated export license is required, and (ii) obtaining "written assurances" from licensees, if required.

8. **Support and Maintenance.** Except as may be provided in a separate agreement between ALE USA, Inc. and Licensee, if any, ALE USA, Inc. is under no obligation to maintain or support the copies of the Licensed Files made and hereunder and ALE USA, Inc. has no obligation to furnish Licensee with any further assistance, documentation or information of any nature or kind.

9. **Term.** This License Agreement is effective upon Licensee opening this package and shall continue until terminated. Licensee may terminate this License Agreement at any time by returning the Licensed Materials and all copies thereof and extracts therefrom to ALE USA, Inc. and certifying to ALE USA, Inc. in writing that all Licensed Materials and all copies thereof and extracts therefrom have been returned or erased by the memory of Licensee's computer or made non-readable. ALE USA, Inc. may terminate this License Agreement upon the breach by Licensee of any term hereof. Upon such termination by ALE USA,

Inc., Licensee agrees to return to ALE USA, Inc. or destroy the Licensed Materials and all copies and portions thereof.

**10. Governing Law.** This License Agreement shall be construed and governed in accordance with the laws of the State of California.

**11. Severability.** Should any term of this License Agreement be declared void or unenforceable by any court of competent jurisdiction, such declaration shall have no effect on the remaining terms herein.

**12. No Waiver.** The failure of either party to enforce any rights granted hereunder or to take action against the other party in the event of any breach hereunder shall not be deemed a waiver by that party as to subsequent enforcement of rights or subsequent actions in the event of future breaches.

**13. Notes to United States Government Users.** Software and documentation are provided with restricted rights. Use, duplication or disclosure by the government is subject to (i) restrictions set forth in GSA ADP Schedule Contract with ALE USA, Inc.'s reseller(s), or (ii) restrictions set forth in subparagraph (c) (1) and (2) of 48 CFR 52.227-19, as applicable.

**14. Third Party Materials.** Licensee is notified that the Licensed Files contain third party software and materials licensed to ALE USA, Inc. by certain third party licensors. Some third party licensors are third part beneficiaries to this License Agreement with full rights of enforcement. Please refer to the section entitled "[Third Party Licenses and Notices](#)" on page -4 for the third party license and notice terms.

## Third Party Licenses and Notices

Legal Notices applicable to any software alone or in connection with the product to which this document pertains, are contained in files within the software itself located at: **/flash/foss**.

Also, if needed, we provide all FOSS (Free and Open Source Software) source code used into this release at the following URL: <https://support.esd.alcatel-lucent.com>.