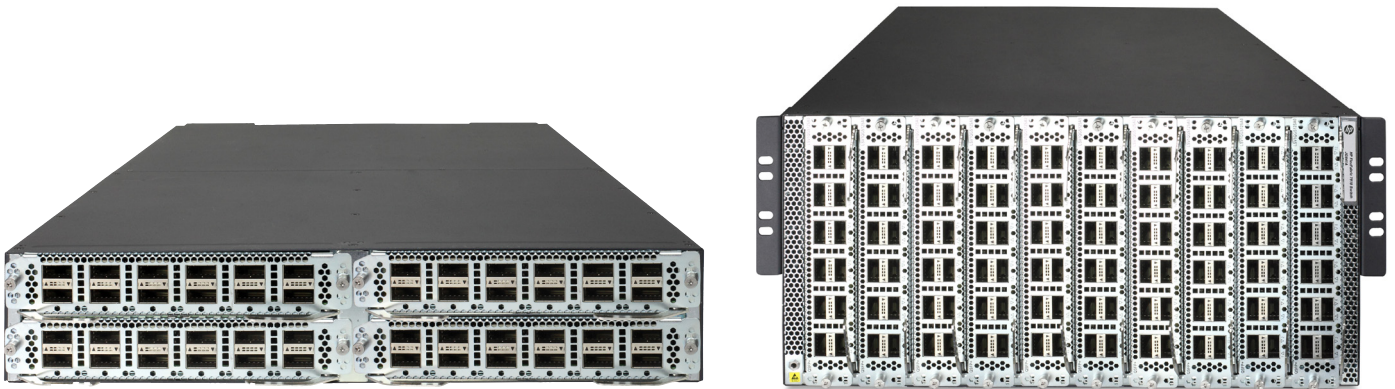




# HPE FlexFabric 7900 Switch Series



## Key features

- Nonblocking and lossless Clos architecture
- Large Layer 2 scaling with TRILL and IRF
- VXLAN support for virtualized and cloud deployments
- SDN-enabled with OpenFlow 1.3 support
- High 10GbE, 40GbE, and 100GbE density across 9.6 Tbps switch fabric

## Product overview

The HPE FlexFabric 7900 Switch Series is the next generation compact modular data center core switch designed to support virtualized data centers and evolutionary needs of private and public clouds deployments.

The 7900 delivers unprecedented levels of performance, buffering, scale, and availability with high-density 10GbE, 40GbE, and 100GbE interfaces using only a fraction of the footprint used by traditional chassis. The switch supports full Layer 2 and 3 features along with advanced data center features including TRILL, IRF, VXLAN, and open standards-based programmability with OpenFlow support.

## Features and benefits

### Product architecture

- Modern scalable system architecture

Provides nonblocking, lossless Clos architecture with VOQs and large buffers with the flexibility and scalability for future growth
- Distributed architecture with separation of data and control planes

Delivers enhanced fault tolerance and facilitates continuous operation and zero service disruption during planned or unplanned control-plane events
- Advanced Comware modular operating system

Brings native high stability, independent process monitoring, and restart through the modular design and multiple processes of Hewlett Packard Enterprise Comware v7 software; supports enhanced serviceability functions
- In-Service Software Upgrade (ISSU)

Provides IRF based upgrade of the entire fabric for seamless and non-disruptive maintenance

### Performance

- High-performance fully distributed architecture

Delivers up to 9.6 Tbps switching capacity and 5.94 Bpps throughput with nonblocking wirespeed performance
- High-density 1/10GbE, 40GbE, and 100GbE interface connectivity

Offers up to 10 interface module slots to scale up to 120 40GbE or 20 100GbE or 480 10GbE or 240 1/10GbE interface or a combination
- Distributed scalable fabric architecture

Integrated fabric and management modules to deliver more than 1 Tb per slot bandwidth

### Data center optimized

- Virtual Extensible LAN (VXLAN)

VXLAN Routing/Bridging to provide wire-rate support to build overlay networks enabling virtual machine mobility and cloud deployments
- Scalable Layer 2 fabric functionality

Builds flexible, resilient, and scalable Layer 2 fabrics with TRILL and IRF
- Ethernet Virtual Interconnect (EVI)

Is an Hewlett Packard Enterprise Virtual Application Network innovation that provides a Layer 2 extension across the data center to simplify the interconnectivity of geographically disperse data centers
- Front-to-back airflow design

Accommodates deployment in data centers utilizing hot-cold aisles

**Resiliency and high availability**

- Intelligent Resilient Fabric (IRF)

Creates virtual resilient switching fabrics, where two switches perform as a single L2 switch and L3 router; servers or switches can be attached using standard LACP for automatic load balancing and high availability there by eliminating the need for complex protocols and simplifying network operations

- Redundant/load-sharing fabrics, management, fan assemblies, and power supplies Increase total performance and power availability while providing hitless, stateful failover

- Hot-swappable modules

Allows replacement of modules without any impact on other modules

- Graceful restart

Allows routers to indicate to others their capability to maintain a routing table during a temporary shutdown, which significantly reduces convergence times upon recovery; supports OSPF, BGP, and IS-IS

- Virtual Router Redundancy Protocol (VRRP)

Allows groups of two routers to dynamically back each other up to create highly available routed environments

- Device Link Detection Protocol (DLDP)

Monitors link connectivity and shuts down ports at both ends if unidirectional traffic is detected, preventing loops in STP-based networks

- IEEE 802.3ad Link Aggregation Control Protocol (LACP)

Supports up to 1024 trunk groups and up to 16 members per trunk; supports static or dynamic groups and a user-selectable hashing algorithm

- Mid-plane free chassis design

Delivers increased system reliability and optimal airflow as the chassis has no mid-plane and line cards connect directly to the onboard fabric card

- Bidirectional Forwarding Detection (BFD)

Ultrafast sub second protocol convergence with standards based failure detection which enables link connectivity monitoring and reduces network convergence time for RIP, OSPF, BGP, IS-IS, and VRRP

**Layer 2 switching**

- VLAN

Supports up to 4,094 port-based or IEEE 802.1Q-based VLANs

- Port mirroring

Duplicates port traffic (ingress and egress) to a local or remote monitoring port; supports four mirroring groups, with an unlimited number of ports per group

- Port isolation

Increases security by isolating ports within a VLAN while still allowing them to communicate with other VLANs

- Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) protocol snooping

Controls and manages the flooding of multicast packets in a Layer 2 network

- Spanning Tree Protocol (STP)

Supports standard IEEE 802.1D STP, IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)

### **Layer 3 routing**

- Open shortest path first (OSPF)

Delivers faster convergence; uses this link-state routing Interior Gateway Protocol (IGP), which supports ECMP, NSSA, and MD5 authentication for increased security and graceful restart for faster failure recovery

- Intermediate system to intermediate system (IS-IS)

Uses a path vector IGP, which is defined by the ISO organization for IS-IS routing and extended by IETF RFC 1195 to operate in both TCP/IP and the OSI reference model (Integrated IS-IS)

- Border Gateway Protocol 4 (BGP-4)

Delivers an implementation of the Exterior Gateway Protocol (EGP) utilizing path vectors; uses TCP for enhanced reliability for the route discovery process; reduces bandwidth consumption by advertising only incremental updates; supports extensive policies for increased flexibility; scales to very large networks

- Equal-Cost Multipath (ECMP)

Enables multiple equal-cost links in a routing environment to increase link redundancy and scale bandwidth

- Static IPv4 routing

Provides simple manually configured IPv4 routing

- Routing Information Protocol (RIP)

Uses a distance vector algorithm with UDP packets for route determination; supports RIPv1 and RIPv2 routing; includes loop protection

- IP performance optimization

Provides a set of tools to improve the performance of IPv4 networks; includes directed broadcasts, customization of TCP parameters, support of ICMP error packets, and extensive display capabilities

- Unicast Reverse Path Forwarding (uRPF)

Limits erroneous or malicious traffic in accordance with RFC 3074

**Quality of Service (QoS)**

- IEEE 802.1p prioritization

Delivers data to devices based on the priority and type of traffic

- Flexible classification

Creates traffic classes based on access control lists (ACLs), IEEE 802.1p precedence, IP, and DSCP or Type of Service (ToS) precedence; supports filter, redirect, mirror, remark, and logging

- Bandwidth shaping

– Port-based rate limiting

Provides per-port ingress-/egress-enforced increased bandwidth

– Classifier-based rate limiting

Uses an access control list (ACL) to enforce increased bandwidth for ingress traffic on each port

– Reduced bandwidth

Provides per-port, per-queue egress-based reduced bandwidth

- Broad QoS feature set

Provides support for Strict Priority Queuing (SP), Weighted Fair Queuing (WFQ), Weighted Deficit Round Robin (WDRR), SP+WDRR together, configurable buffers, Explicit Congestion Notification (ECN), and Weighted Random Early Detection (WRED)

- Traffic policing

Supports Committed Access Rate (CAR) and line rate

**Layer 3 services**

- Address Resolution Protocol (ARP)

Determines the MAC address of another IP host in the same subnet; supports static ARPs; gratuitous ARP allows detection of duplicate IP addresses; proxy ARP allows normal ARP operation between subnets or when subnets are separated by a Layer 2 network

- User Datagram Protocol (UDP) helper

Redirects UDP broadcasts to specific IP subnets to prevent server spoofing

- Dynamic Host Configuration Protocol (DHCP)

Simplifies the management of large IP networks and supports client and server; DHCP Relay enables DHCP operation across subnets

**Management**

- Management interface control

Enables or disables each of the following interfaces depending on security preferences: console port, telnet port, or reset button

- Industry-standard CLI with a hierarchical structure

Reduces training time and expenses, and increases productivity in multivendor installations

- SNMPv1, v2, and v3

Provide complete support of SNMP; provide full support of industry-standard Management Information Base (MIB) plus private extensions; SNMPv3 supports increased security using encryption

- sFlow® (RFC 3176)

Provides scalable ASIC-based wirespeed network monitoring and accounting with no impact on network performance; this allows network operators to gather a variety of sophisticated network statistics and information for capacity planning and real-time network monitoring purposes

- Remote monitoring (RMON)

Uses standard SNMP to monitor essential network functions; supports events, alarm, history, and statistics group plus a private alarm extension group

- Debug and sampler utility

Supports ping and traceroute

- Network Time Protocol (NTP)

Synchronizes timekeeping among distributed time servers and clients; keeps timekeeping consistent among all clock-dependent devices within the network so that the devices can provide diverse applications based on the consistent time

- Network Quality Analyzer (NQA)

Analyzes network performance and service quality by sending test packets, and provides network performance and service quality parameters such as jitter, TCP, or FTP connection delays and file transfer rates; allows a network manager to determine overall network performance and to diagnose and locate network congestion points or failures

- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)

Advertises and receives management information from adjacent devices on a network, facilitating easy mapping by network management applications

### **Connectivity**

- Jumbo frames

Allows high-performance backups and disaster-recovery systems with a maximum frame size of 12288 bytes

- Loopback

Supports internal loopback testing for maintenance purposes and an increase in availability; loopback detection protects against incorrect cabling or network configurations and can be enabled on a per-port or per-VLAN basis for added flexibility

- Monitor link

Collects statistics on performance and errors on physical links, increasing system availability

- Packet storm protection

Protects against unknown broadcast, unknown multicast, or unicast storms with user-defined thresholds

- Flow control

Provides back pressure using standard IEEE 802.3x, reducing congestion in heavy traffic situations

**Security**

- Access control list (ACL)

Used for filtering traffic to prevent unauthorized users from accessing the network, or for controlling network traffic to save resources; rules can either deny or permit traffic to be forwarded; rules can be based on a Layer 2 header or a Layer 3 protocol header; rules can be set to operate on specific dates or times

- Remote Authentication Dial-In User Service (RADIUS)

Eases switch security access administration by using a password authentication server

- Secure shell (SSHv2)

Uses external servers to securely log in to a remote device; with authentication and encryption, it protects against IP spoofing and plain-text password interception; increases the security of Secure FTP (SFTP) transfers

- DHCP snooping

Helps ensure that DHCP clients receive IP addresses from authorized DHCP servers and maintain a list of DHCP entries for trusted ports; prevents reception of fake IP addresses and reduces ARP attacks, improving security

- IP Source Guard

Filters packets on a per-port basis, which prevents illegal packets from being forwarded

- ARP attack protection

Protects against attacks that use a large number of ARP requests, using a host-specific, user-selectable threshold

**Multicast support**

- Internet Group Management Protocol (IGMP)

Utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks; supports IGMPv1, v2, and v3

- Protocol Independent Multicast (PIM)

Defines modes of multicasting to allow one-to-many and many-to-many transmission of information; PIM Dense Mode (DM), Sparse Mode (SM), and Source-Specific Mode (SSM) are supported

**Warranty and support**

- 1-year Warranty:

See [\*\*hpe.com/networking/warrantysummary\*\*](http://hpe.com/networking/warrantysummary) for warranty and support information included with your product purchase

- Software releases:

To find software for your product, refer to [\*\*hpe.com/networking/support\*\*](http://hpe.com/networking/support); for details on the software releases available with your product purchase, refer to [\*\*hpe.com/networking/warrantysummary\*\*](http://hpe.com/networking/warrantysummary)

## HPE FlexFabric 7900 Switch Series

### Specifications



**HPE FlexFabric 7904 Switch Chassis (JG682A)**



**HPE FlexFabric 7910 Switch Chassis (JG841A)**

|                                        | HPE FlexFabric 7904 Switch Chassis (JG682A)                                                                                            | HPE FlexFabric 7910 Switch Chassis (JG841A)                                                                                                |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>I/O ports and slots</b>             | 4 I/O module slots<br>Supports a maximum of 48 40GbE ports or 192 10GbE ports or 96 1/10GbE ports, or 8 100GbE ports, or a combination | 10 I/O module slots<br>Supports a maximum of 120 40GbE ports or 480 10GbE ports or 240 1/10GbE ports, or 20 100GbE ports, or a combination |
| <b>Power supplies</b>                  | 2 power supply slots<br>1 minimum power supply required (ordered separately)                                                           | 4 power supply slots<br>1 minimum power supply required (ordered separately)                                                               |
| <b>Fan tray</b>                        | 2 fan tray slots<br>JG684A for Front to Back airflow                                                                                   | 2 fan tray slots<br>JG843A for Front to Back airflow                                                                                       |
| <b>Physical characteristics</b>        |                                                                                                                                        |                                                                                                                                            |
| Dimensions                             | 17.32(w) x 28.35(d) x 3.47(h) in. (44 x 72 x 8.81 cm)<br>(2U height)                                                                   | 17.32(w) x 29.92(d) x 8.66(h) in. (43.99 x 76 x 22 cm)<br>(5U height)                                                                      |
| Weight                                 | 39.46 lb (17.9 kg) chassis only (no fan tray or power supplies)                                                                        | 63.49 lb (28.8 kg) chassis only (no fan tray or power supplies)                                                                            |
| Full configuration weight              | 87.7 lb (39.78 kg)                                                                                                                     | 156.97 lb (71.2 kg)                                                                                                                        |
| <b>Memory and processor</b>            |                                                                                                                                        |                                                                                                                                            |
| Management module                      | Dual Core MIPS64 @ 1.2 GHz, 512 MB flash, 4 GB DDR2 SDRAM                                                                              | Dual Core MIPS64 @ 1.0 GHz, 1 GB flash, 8 GB DDR2 SDRAM                                                                                    |
| <b>Mounting and enclosure</b>          |                                                                                                                                        |                                                                                                                                            |
|                                        | Mounts in an EIA standard 19-inch rack or other equipment cabinet<br>(hardware included); horizontal surface mounting only             | Mounts in an EIA standard 19-inch rack or other equipment cabinet<br>(hardware included); horizontal surface mounting only                 |
| <b>Performance</b>                     |                                                                                                                                        |                                                                                                                                            |
| Throughput                             | Up to 2.3 Bpps (64-byte packets)                                                                                                       | Up to 5.8 Bpps (64-byte packets)                                                                                                           |
| Switching capacity                     | 3.8 Tbps                                                                                                                               | 9.6 Tbps                                                                                                                                   |
| Routing table size                     | 32768 entries (IPv4)                                                                                                                   | 32768 entries (IPv4)                                                                                                                       |
| MAC address table size                 | 131072 entries.                                                                                                                        | 131072 entries                                                                                                                             |
| <b>Reliability</b>                     |                                                                                                                                        |                                                                                                                                            |
| Availability                           | 99.999%                                                                                                                                | 99.999%                                                                                                                                    |
| <b>Environment</b>                     |                                                                                                                                        |                                                                                                                                            |
| Operating temperature                  | 32°F to 104°F (0°C to 40°C)                                                                                                            | 32°F to 104°F (0°C to 40°C)                                                                                                                |
| Operating relative humidity            | 10% to 95%, noncondensing                                                                                                              | 10% to 95%, noncondensing                                                                                                                  |
| Nonoperating/Storage temperature       | -40°F to 158°F (-40°C to 70°C)                                                                                                         | -40°F to 158°F (-40°C to 70°C)                                                                                                             |
| Nonoperating/Storage relative humidity | 5% to 95%, noncondensing                                                                                                               | 5% to 95%, noncondensing                                                                                                                   |
| Altitude                               | Up to 13,123 ft (4 km)                                                                                                                 | Up to 13,123 ft (4 km)                                                                                                                     |
| Acoustic                               | Low-speed fan: 57.6 dB, High-speed fan: 73.3 dB                                                                                        | Low-speed fan: 47.9 dB, High-speed fan: 77.9 dB                                                                                            |

## Specifications (continued)

|                                   | HPE FlexFabric 7904 Switch Chassis (JG682A)                                                                                                                                                                                                                                                                                        | HPE FlexFabric 7910 Switch Chassis (JG841A)                                                                                                                                                                                                                                                                                        |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Electrical characteristics</b> |                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                    |
| AC voltage                        | 100–120/200–240 VAC                                                                                                                                                                                                                                                                                                                | 100–240 VAC                                                                                                                                                                                                                                                                                                                        |
| Current                           | 16/60 A                                                                                                                                                                                                                                                                                                                            | 13 A                                                                                                                                                                                                                                                                                                                               |
| Power output                      | 1800 W                                                                                                                                                                                                                                                                                                                             | 1800 W                                                                                                                                                                                                                                                                                                                             |
| Frequency                         | 50/60 Hz                                                                                                                                                                                                                                                                                                                           | 50/60 Hz                                                                                                                                                                                                                                                                                                                           |
| Notes                             | Based on a common power supply of 1800 W (AC)                                                                                                                                                                                                                                                                                      | Based on a common power supply of 1800 W (AC)                                                                                                                                                                                                                                                                                      |
| <b>Safety</b>                     | UL 60950-1; CAN/CSA 22.2 No. 60950-1; IEC 60950-1; EN 60950-1; FDA 21 CFR Subchapter J; AS/NZS 60950-1; RoHS Compliance<br>EN 50581                                                                                                                                                                                                | UL 60950-1; CAN/CSA 22.2 No. 60950-1; IEC 60950-1; EN 60950-1; FDA 21 CFR Subchapter J; AS/NZS 60950-1; RoHS Compliance<br>EN 50581                                                                                                                                                                                                |
| <b>Emissions</b>                  | VCCI Class A; EN 55022 Class A; CISPR 22 Class A; IEC/EN 61000-3-2; IEC/EN 61000-3-3; ICES-003 Class A; AS/NZS CISPR 22 Class A; FCC (CFR 47, Part 15) Class A; ETSI EN 300 386                                                                                                                                                    | VCCI Class A; EN 55022 Class A; CISPR 22 Class A; IEC/EN 61000-3-2; IEC/EN 61000-3-3; ICES-003 Class A; AS/NZS CISPR 22 Class A; FCC (CFR 47, Part 15) Class A; ETSI EN 300 386                                                                                                                                                    |
| <b>Immunity</b>                   |                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                    |
| Generic                           | EN 55024                                                                                                                                                                                                                                                                                                                           | EN 55024                                                                                                                                                                                                                                                                                                                           |
| <b>Management</b>                 | IMC—Intelligent Management Center; command-line interface; out-of-band management (serial RS-232C); SNMP Manager; Telnet; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB                                                                                                    | IMC—Intelligent Management Center; command-line interface; out-of-band management (serial RS-232C); SNMP Manager; Telnet; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB                                                                                                    |
| <b>Services</b>                   | Refer to the Hewlett Packard Enterprise website at <a href="https://hpe.com/networking/services">hpe.com/networking/services</a> for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local Hewlett Packard Enterprise sales office. | Refer to the Hewlett Packard Enterprise website at <a href="https://hpe.com/networking/services">hpe.com/networking/services</a> for details on the service-level descriptions and product numbers. For details about services and response times in your area, please contact your local Hewlett Packard Enterprise sales office. |

**Standards and protocols**

(APPLIES TO ALL PRODUCTS IN SERIES)

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BGP</b>                          | RFC 1771 BGPv4<br>RFC 1772 Application of the BGP<br>RFC 1997 BGP Communities Attribute<br>RFC 1998 PPP Gandalf FZA Compression Protocol<br>RFC 2385 BGP Session Protection via TCP MD5<br>RFC 2439 BGP Route Flap Damping<br>RFC 2796 BGP Route Reflection<br>RFC 2858 BGP-4 Multi-Protocol Extensions<br>RFC 2918 Route Refresh Capability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RFC 3065 Autonomous System Confederations for BGP<br>RFC 3392 Capabilities Advertisement with BGP-4<br>RFC 4271 A Border Gateway Protocol 4 (BGP-4)<br>RFC 4272 BGP Security Vulnerabilities Analysis<br>RFC 4273 Definitions of Managed Objects for BGP-4<br>RFC 4274 BGP-4 Protocol Analysis<br>RFC 4275 BGP-4 MIB Implementation Survey                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | RFC 4276 BGP-4 Implementation Report<br>RFC 4277 Experience with the BGP-4 Protocol<br>RFC 4360 BGP Extended Communities Attribute<br>RFC 4456 BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP)<br>RFC 5291 Outbound Route Filtering Capability for BGP-4<br>RFC 5292 Address-Prefix-Based Outbound Route Filter for BGP-4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Denial of service protection</b> | Automatic filtering of well-known denial-of-service packets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | CPU DoS Protection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Rate Limiting by ACLs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Device management</b>            | RFC 1157 SNMPv1/v2c<br>RFC 1305 NTPv3<br>RFC 1902 (SNMPv2)<br>RFC 2579 (SMIv2 Text Conventions)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | RFC 2580 (SMIv2 Conformance)<br>RFC 2819 (RMON groups Alarm, Event, History, and Statistics only)<br>HTTP, SSHv1, and Telnet<br>Multiple Configuration Files                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Multiple Software Images<br>SSHv1/SSHv2 Secure Shell                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>General protocols</b>            | IEEE 802.1ad Q-in-Q<br>IEEE 802.1p Priority<br>IEEE 802.1Q VLANs<br>IEEE 802.1s Multiple Spanning Trees<br>IEEE 802.1w Rapid Reconfiguration of Spanning Tree<br>IEEE 802.1x PAE<br>IEEE 802.3ab 1000BASE-T<br>IEEE 802.3ac (VLAN Tagging Extension)<br>IEEE 802.3ad Link Aggregation Control Protocol (LACP)<br>IEEE 802.3ae 10-Gigabit Ethernet<br>IEEE 802.3ah Ethernet in the First Mile over Point-to-Point Fiber (EFMF)<br>IEEE 802.3ba 40 and 100 Gigabit Ethernet Architecture<br>IEEE 802.3x Flow Control<br>IEEE 802.3z 1000BASE-X<br>RFC 768 UDP<br>RFC 783 TFTP Protocol (revision 2)<br>RFC 791 IP<br>RFC 792 ICMP<br>RFC 793 TCP<br>RFC 826 ARP<br>RFC 854 TELNET<br>RFC 894 IP over Ethernet<br>RFC 925 Multi-LAN Address Resolution<br>RFC 950 Internet Standard Subnetting Procedure<br>RFC 959 File Transfer Protocol (FTP)<br>RFC 1027 Proxy ARP<br>RFC 1035 Domain Implementation and Specification<br>RFC 1042 IP Datagrams | RFC 1058 RIPv1<br>RFC 1142 OSI IS-IS Intra-domain Routing Protocol<br>RFC 1195 OSI ISIS for IP and Dual Environments<br>RFC 1213 Management Information Base for Network Management of TCP/IP-based internets<br>RFC 1293 Inverse Address Resolution Protocol<br>RFC 1305 NTPv3<br>RFC 1350 TFTP Protocol (revision 2)<br>RFC 1393 Traceroute Using an IP Option<br>RFC 1519 CIDR<br>RFC 1531 Dynamic Host Configuration Protocol<br>RFC 1533 DHCP Options and BOOTP Vendor Extensions<br>RFC 1591 DNS (client only)<br>RFC 1624 Incremental Internet Checksum<br>RFC 1701 Generic Routing Encapsulation<br>RFC 1721 RIP-2 Analysis<br>RFC 1723 RIPv2<br>RFC 1812 IPv4 Routing<br>RFC 2082 RIP-2 MD5 Authentication<br>RFC 2091 Trigger RIP<br>RFC 2131 DHCP<br>RFC 2138 Remote Authentication Dial In User Service (RADIUS)<br>RFC 2236 IGMP Snooping<br>RFC 2338 VRRP<br>RFC 2453 RIPv2<br>RFC 2644 Directed Broadcast Control<br>RFC 2763 Dynamic Name-to-System ID mapping support | RFC 2784 Generic Routing Encapsulation (GRE)<br>RFC 2865 Remote Authentication Dial In User Service (RADIUS)<br>RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS<br>RFC 2973 IS-IS Mesh Groups<br>RFC 3022 Traditional IP Network Address Translator (Traditional NAT)<br>RFC 3277 IS-IS Transient Blackhole Avoidance<br>RFC 3567 Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication<br>RFC 3719 Recommendations for Interoperable Networks using Intermediate System to Intermediate System (IS-IS)<br>RFC 3784 ISIS TE support<br>RFC 3786 Extending the Number of IS-IS LSP Fragments Beyond the 256 Limit<br>RFC 3787 Recommendations for Interoperable IP Networks using Intermediate System to Intermediate System (IS-IS)<br>RFC 3847 Restart signaling for IS-IS<br>RFC 4251 The Secure Shell (SSH) Protocol Architecture<br>RFC 4486 Subcodes for BGP Cease Notification Message<br>RFC 4884 Extended ICMP to Support Multi-Part Messages<br>RFC 4941 Privacy Extensions for Stateless<br>RFC 5130 A Policy Control Mechanism in IS-IS Using Administrative Tags |

**Standards and protocols (continued)**

(APPLIES TO ALL PRODUCTS IN SERIES)

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IP multicast</b>       | RFC 2236 IGMPv2<br>RFC 2283 Multiprotocol Extensions for BGP-4<br>RFC 2362 PIM Sparse Mode<br>RFC 3376 IGMPv3<br>RFC 3973 PIM Dense Mode<br>RFC 4541 Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches                                                                                                                                                                                                                                                   | RFC 4601 PIM Sparse Mode<br>RFC 4604 Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast<br>RFC 4605 IGMP/MLD Proxying                                                                                                                                                                                                                                                                            | RFC 4607 Source-Specific Multicast for IP<br>RFC 5059 Bootstrap Router (BSR) Mechanism for Protocol Independent Multicast (PIM)                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>MIBs</b>               | RFC 1156 (TCP/IP MIB)<br>RFC 1157 A Simple Network Management Protocol (SNMP)<br>RFC 1215 A Convention for Defining Traps for use with the SNMP<br>RFC 1229 Interface MIB Extensions<br>RFC 1493 Bridge MIB<br>RFC 1573 SNMP MIB II<br>RFC 1643 Ethernet MIB<br>RFC 1657 BGP-4 MIB<br>RFC 1907 SNMPv2 MIB<br>RFC 2011 SNMPv2 MIB for IP<br>RFC 2012 SNMPv2 MIB for TCP<br>RFC 2013 SNMPv2 MIB for UDP<br>RFC 2096 IP Forwarding Table MIB<br>RFC 2127 ISDN Management Information Base using SMIv2<br>RFC 2233 Interface MIB | RFC 2571 SNMP Framework MIB<br>RFC 2572 SNMP-MPD MIB<br>RFC 2573 SNMP-Notification MIB<br>RFC 2573 SNMP-Target MIB<br>RFC 2578 Structure of Management Information Version 2 (SMIv2)<br>RFC 2580 Conformance Statements for SMIv2<br>RFC 2620 RADIUS Accounting MIB<br>RFC 2665 Ethernet-Like-MIB<br>RFC 2668 802.3 MAU MIB<br>RFC 2674 802.1p and IEEE 802.1Q Bridge MIB<br>RFC 2787 VRRP MIB<br>RFC 2819 RMON MIB<br>RFC 2925 Ping MIB<br>RFC 2932IP (Multicast Routing MIB)<br>RFC 2933 IGMP MIB | RFC 2934 Protocol Independent Multicast MIB for IPv4<br>RFC 3414 SNMP-User based-SM MIB<br>RFC 3415 SNMP-View based-ACM MIB<br>RFC 3417 Simple Network Management Protocol (SNMP) over IEEE 802 Networks<br>RFC 3418 MIB for SNMPv3<br>RFC 3621 Power Ethernet MIB<br>RFC 2618 RADIUS Client MIB<br>RFC 3813 MPLS LSR MIB<br>RFC 3814 MPLS FTN MIB<br>RFC 3815 MPLS LDP MIB<br>RFC 3826 AES for SNMP's USM MIB<br>RFC 4133 Entity MIB (Version 3)<br>RFC 4444 Management Information Base for Intermediate System to Intermediate System (IS-IS) |
| <b>Network management</b> | IEEE 802.1AB Link Layer Discovery Protocol (LLDP)<br>RFC 1155 Structure of Management Information<br>RFC 1157 SNMPv1<br>RFC 1448 Protocol Operations for version 2 of the Simple Network Management Protocol (SNMPv2)                                                                                                                                                                                                                                                                                                        | RFC 2211 Controlled-Load Network<br>RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm), and 9 (events)<br>RFC 3176 sFlow<br>RFC 3411 SNMP Management Frameworks                                                                                                                                                                                                                                                                                                                   | RFC 3412 SNMPv3 Message Processing<br>RFC 3414 SNMPv3 User-based Security Model (USM)<br>RFC 3415 SNMPv3 View-based Access Control Model (VACM)<br>ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED)                                                                                                                                                                                                                                                                                                                                        |
| <b>OSPF</b>               | RFC 1245 OSPF protocol analysis<br>RFC 1246 Experience with OSPF<br>RFC 1765 OSPF Database Overflow<br>RFC 1850 OSPFv2 Management Information Base (MIB), traps<br>RFC 2154 OSPF w/Digital Signatures (Password, MD-5)<br>RFC 2328 OSPFv2<br>RFC 2370 OSPF Opaque LSA Option<br>RFC 3101 OSPF NSSA                                                                                                                                                                                                                           | RFC 3137 OSPF Stub Router Advertisement<br>RFC 3623 Graceful OSPF Restart<br>RFC 3630 Traffic Engineering Extensions to OSPFv2<br>RFC 4061 Benchmarking Basic<br>OSPF Single Router Control Plane Convergence<br>RFC 4062 OSPF Benchmarking Terminology and Concepts<br>RFC 4063 Considerations When Using Basic OSPF Convergence Benchmarks                                                                                                                                                        | RFC 4222 Prioritized Treatment of Specific OSPF Version 2 Packets and Congestion Avoidance<br>RFC 4577 OSPF as the Provider/Customer Edge Protocol for BGP/MPLS IP Virtual Private Networks (VPNs)<br>RFC 4811 OSPF Out-of-Band LSDB Resynchronization<br>RFC 4812 OSPF Restart Signaling<br>RFC 4813 OSPF Link-Local Signaling<br>RFC 4940 IANA Considerations for OSPF                                                                                                                                                                         |
| <b>QoS/CoS</b>            | IEEE 802.1P (CoS)<br>RFC 1349 Type of Service in the Internet Protocol Suite                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RFC 2211 Specification of the Controlled-Load Network Element Service<br>RFC 2212 Guaranteed Quality of Service                                                                                                                                                                                                                                                                                                                                                                                     | RFC 2474 DSCP DiffServ<br>RFC 2475 DiffServ Architecture<br>RFC 2597 DiffServ Assured Forwarding (AF)<br>RFC 2598 DiffServ Expedited Forwarding (EF)                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Security</b>           | IEEE 802.1x Port Based Network Access Control<br>RFC 1321 The MD5 Message-Digest Algorithm<br>RFC 1334 PPP Authentication Protocols (PAP)<br>RFC 1994 PPP Challenge Handshake Authentication Protocol (CHAP)<br>RFC 2082 RIP-2 MD5 Authentication                                                                                                                                                                                                                                                                            | RFC 2104 Keyed-Hashing for Message Authentication<br>RFC 2408 Internet Security Association and Key Management Protocol (ISAKMP)<br>RFC 2409 The Internet Key Exchange (IKE)<br>RFC 2716 PPP EAP TLS Authentication Protocol<br>RFC 2865 RADIUS Authentication<br>RFC 2866 RADIUS Accounting                                                                                                                                                                                                        | RFC 2868 RADIUS Attributes for Tunnel Protocol Support<br>RFC 2869 RADIUS Extensions<br>Access Control Lists (ACLs)<br>Guest VLAN for 802.1x<br>MAC Authentication<br>SSHv1/SSHv2 Secure Shell                                                                                                                                                                                                                                                                                                                                                   |

HPE FlexFabric 7900 Switch Series accessories

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| Modules                                     | HPE FlexFabric 7900 12-port 40GbE QSFP+ FX Module (JG683B)<br>HPE FlexFabric 7900 24-port 1/10GbE SFP+ FX Module (JG845A)<br>HPE FlexFabric 7900 2-port 100GbE CXP/6-port 40GbE QSFP+/4-port 10GbE SFP+ FX Module (JH002A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Transceivers                                | HPE X140 40G QSFP+ MPO SR4 Transceiver (JG325B)<br>HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver (JG709A)<br>HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver (JG661A)<br>HPE X240 40G QSFP+ to QSFP+ 1m Direct Attach Copper Cable (JG326A)<br>HPE X240 40G QSFP+ to QSFP+ 3m Direct Attach Copper Cable (JG327A)<br>HPE X240 40G QSFP+ to QSFP+ 5m Direct Attach Copper Cable (JG328A)<br>HPE X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable (JG329A)<br>HPE X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable (JG330A)<br>HPE X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable (JG331A)<br>HPE X150 100G CXP MPO SR 100m Multimode Transceiver (JG881A)<br>HPE X2A0 100G CXP To CXP 10m Active Optical Cable (JG882A)<br>HPE X2A0 100G CXP To CXP 30m Active Optical Cable (JG883A)<br>HPE X130 10G SFP+ LC SR Transceiver (JD092B)<br>HPE X130 10G SFP+ LC LR Transceiver (JD094B)<br>HPE X130 10G SFP+ LC ER 40km Transceiver (JG234A)<br>HPE X130 10G SFP+ LC LH 80km Transceiver (JG915A)<br>HPE X240 10G SFP+ to SFP+ 0.65m Direct Attach Copper Cable (JD095C)<br>HPE X240 10G SFP+ to SFP+ 1.2m Direct Attach Copper Cable (JD096C)<br>HPE X240 10G SFP+ to SFP+ 3m Direct Attach Copper Cable (JD097C)<br>HPE X240 10G SFP+ to SFP+ 5m Direct Attach Copper Cable (JG081C)<br>HPE X240 10G SFP+ SFP+ 7m Direct Attach Copper Cable (JC784C)<br>HPE X120 1G SFP LC SX Transceiver (JD118B)<br>HPE X120 1G SFP LC LX Transceiver (JD119B)<br>HPE X120 1G SFP LC BX 10-U Transceiver (JD098B)<br>HPE X120 1G SFP LC BX 10-D Transceiver (JD099B)<br>HPE X125 1G SFP LC LH40 1310nm Transceiver (JD061A)<br>HPE X120 1G SFP LC LH40 1550nm Transceiver (JD062A)<br>HPE X125 1G SFP LC LH70 Transceiver (JD063B)<br>HPE X170 1G SFP LC LH70 1510 Transceiver (JD115A)<br>HPE X170 1G SFP LC LH70 1550 Transceiver (JD109A)<br>HPE X170 1G SFP LC LH70 1570 Transceiver (JD110A)<br>HPE X170 1G SFP LC LH70 1590 Transceiver (JD111A)<br>HPE X170 1G SFP LC LH70 1610 Transceiver (JD112A)<br>HPE X120 1G SFP LC LH100 Transceiver (JD103A) |
| Power supply                                | HPE FlexFabric 7900 1800w AC Power Supply Unit (JG840A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Mounting kit                                | HPE X421 Chassis Universal 4-post Rack Mounting Kit (JC665A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| HPE FlexFabric 7904 Switch Chassis (JG682A) | HPE FlexFabric 7904 front (Port side) to back (Power side) airflow Fan Tray (JG684A)<br>HPE FlexFabric 7904 Back (Power Side) to Front (Port Side) Airflow Fan Tray (JG839A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| HPE FlexFabric 7910 Switch Chassis (JG841A) | HPE FlexFabric 7910 7.2Tbps Fabric/Main Processing Unit (JG842A)<br>HPE FlexFabric 7910 2.4Tbps Fabric/Main Processing Unit (JH001A)<br>HPE FlexFabric 7910 Front (Port side) to Back (Power side) Airflow Fan Tray (JG843A)<br>HPE FlexFabric 7910 Cable Management Frame (JH041A)<br>HPE FlexFabric 7910 Bottom-Support Rails (JH042A)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |



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