QuickSpecs

Overview

HPE FlexFabric 5945 Switch Series

HPE FlexFabric 5945 48SFP28 8QSFP28 Switch (JQ074A)

HPE FlexFabric 5945 4-slot Switch (JQ076A)

Models

HPE FlexFabric 5945 48SFP28 8QSFP28 Switch	JQ074A
HPE FlexFabric 5945 4-slot Switch	JQ076A

Key features

- Cut-through with ultra low latency and wirespeed
- VXLAN, VTEP, and OVSDB support for virtualized environments
- High-density 100GbE/40GbE/25GbE/10GbE spine/top-of-rack (ToR) connectivity
- IPv6 support with full L2 and L3 features

Hewlett Packard Enterprise

Overview

- HPE FlexFabric Network Analytics solution support for real-time microburst detection

Product overview

HPE FlexFabric 5945 Switch Series is a family of high-density, ultra-low-latency, and ToR switches that is part of HPE FlexFabric solution (from the HPE Cloud-First Reference Architecture).

Ideally suited for deployment at the aggregation or server access layer of large enterprise data centers, the HPE FlexFabric 5945 Switch Series is also powerful enough for deployment at the core layer of medium-sized enterprises.

With the increase in virtualized applications and server-to-server traffic, customers require spine and ToR switches that can meet their throughput requirements. With the HPE FlexFabric 5945, data centers can now support up to 100 Gb per ports, allowing high-performance server connectivity and the capabilities to handle virtual environments. This is available in the low-latency HPE FlexFabric 5945 Switch Series..

Features and benefits

Quality of Service (QoS)

- **Powerful QoS features**
  - **Flexible queue scheduling:** Including Strict Priority (SP), WRR, WFQ, SP+WRR, SP+WDRR, SP+WFQ, configurable buffer, time range, queue shaping, and CAR with 8 kbps granularity.
  - **Packet filtering and remarking:** Packet filtering based on packet header fields from Layer 2 through Layer 4, including source MAC, destination MAC, source IP (IPv4/IPv6), destination IP (IPv4/IPv6), port number, protocol type, and VLAN.

Data center optimized

- **Flexible high port density**
  HPE FlexFabric 5945 Switch Series enables scaling of the server edge, with 100GbE, 40GbE. 25GbE, and 10GbE spine and leaf deployment. The HPE FlexFabric 5945 Switch Series solution includes a 48-port of 25 Gb with 8-port of 100G and a 2RU 4-slot modular form factor
- **High-performance switching**
  Cut-through and nonblocking architecture delivers low latency (~ 1 microsecond for 100GbE) for very demanding enterprise applications; the switch delivers high-performance switching capacity and wirespeed packet forwarding
- **Higher scalability**
  HPE Intelligent Resilient Fabric (IRF) technology simplifies the architecture of server access networks; up to 10 HPE FlexFabric 5945 switches can be combined to deliver unmatched scalability of virtualized access layer switches and flatter 2-tier networks using HPE IRF, which reduces cost and complexity
- **Advanced modular operating system**
  Comware v7 software's modular design and multiple processes bring native high stability, independent process monitoring, and restart; the OS also allows individual software modules to be upgraded for higher availability and supports enhanced serviceability functions such as hitless software upgrades with HPE IRF based in-service software upgrade (ISSU)
- **Reversible airflow**
  Enhanced for data center hot-cold aisle deployment with reversible airflow—for either front-to-back or back-to-front airflow
- **Redundant fans and power supplies**
  Internal redundant and hot-pluggable power supplies and dual fan trays enhance reliability and availability
- **Lower OPEX and greener data center**
  Provides reversible airflow and advanced chassis power management
- **Data Center Bridging (DCB) protocols**
  Provides support for IEEE 802.1Qbb Priority Flow Control (PFC), Data Center Bridging Exchange (DCBX), IEEE 802.1Qaz

Overview

Enhanced Transmission Selection (ETS), Explicit Congestion Notification (ECN) for converged FCoE, iSCSI, and RoCE environments

- **Jumbo frames**
  With frame sizes of up to 9416 bytes on 100GbE ports, high-performance remote backup and disaster recovery services are enabled
- **VXLAN hardware support**
  VXLAN L2/L3 gateway support for up to 4K tunnels
- **Dynamic VXLAN configuration**
  OVSDB support for dynamic VXLAN configuration

Manageability

- **The HPE FlexFabric Network Analytics solution with real-time telemetry analysis provides insight into data center network operation**
  - Tracks all the accounting associated with the admission and allocation process of all the buffers and queues across the ingress and egress ports
  - Microburst congestion detection
  - Rich congestion analytics
  - Buffer congestion state and statistics
  - For more information, see the **HPE FlexFabric Network Analytics data sheet** and **HPE FlexFabric Network Analytics technical white paper**.
- **Full-featured console**
  Provides complete control of the switch with a familiar CLI
- **Troubleshooting**
  - **Ingress and egress port monitoring:** enable network problem solving
  - **Traceroute and ping:** enable testing of network connectivity
- **Multiple configuration files**
  allow multiple configuration files to be stored to a flash image
- **sFlow® (RFC 3176)**
  Provides wirespeed traffic accounting and monitoring
- **SNMP v1, v2c, and v3**
  Facilitates centralized discovery, monitoring, and secure management of networking devices
- **Out-of-band interface**
  Isolates management traffic from user data plane traffic for complete isolation and total reachability, no matter what happens in the data plane
- **Remote configuration and management**
  Delivered through a secure CLI over Telnet and SSH; role-based access control (RBAC) provides multiple levels of access; configuration rollback and multiple configurations on the flash provide ease of operation; remote visibility is provided with sFlow and SNMP v1/v2/v3, and is fully supported in **HPE Intelligent Management Center (IMC)**
- **ISSU and hot patching**
  Provides hitless software upgrades with IRF-based ISSU and hitless patching of the modular operating system
- **PTP and NTP support**
  Synchronizes timekeeping among distributed time servers and clients; support for Network Time Protocol (NTP)
- **NTP, SNTP**
  synchronizes timekeeping among distributed time servers and clients; support for network time protocol (NTP), secure network time protocol (SNTP)

Resiliency and high availability

- **IRF technology**
  Enables an HPE FlexFabric switch to deliver resilient, scalable, and secured data center networks for physical and virtualized environments; groups up to 10 HPE FlexFabric 5945 switches in an HPE IRF configuration, allowing them to be configured and managed as a single switch with a single IP address; simplifies ToR deployment and management, reducing data center deployment and operating expenses

Overview

- **IEEE 802.1w Rapid Convergence Spanning Tree Protocol**
  Increases network uptime through faster recovery from failed links
- **IEEE 802.1s Multiple Spanning Tree**
  Provides high-link availability in multiple VLAN environments by allowing Multiple Spanning Trees
- **Virtual Router Redundancy Protocol (VRRP)**
  Allows groups of two routers to back each other up dynamically to create highly available routed environments
- **Hitless patch upgrades**
  Allows patches and new service features to be installed without restarting the equipment, increasing network uptime, and facilitating maintenance
- **Fast protocol convergence with standard-based failure detection-Bidirectional Forwarding Detection (BFD)**
  Enables link connectivity monitoring and reduces network convergence time for RIP, OSPF, BGP, IS-IS, VRRP, MPLS, and IRF
- **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
- **Graceful restart**
  Allows routers to indicate to others their capability to maintain a routing table during a temporary shutdown and significantly reduces convergence times upon recovery; supports OSPF, BGP, and IS-IS

Layer 2 switching

- **Address Resolution Protocol (ARP)**
  Supports static, dynamic, and reverse ARP and ARP proxy
- **IEEE 802.3x Flow Control**
  Provides intelligent congestion management via PAUSE frames
- **Ethernet Link Aggregation**
  Provides IEEE 802.3ad Link Aggregation of up to 256 groups of 32 ports; support for LACP, LACP Local Forwarding First, and LACP Short-time provide a fast, resilient environment that is ideal for the data center
- **Spanning Tree Protocol**
  Supports STP (IEEE 802.1D), Rapid STP (RSTP, IEEE 802.1w), and Multiple STP (MSTP, IEEE 802.1s)
- **VLAN support**
  Provides support for 4096 VLANs based on port
- **IGMP support**
  Provides support for IGMP Snooping, fast-leave, and group policy; IPv6 IGMP Snooping provides L2 optimization of multicast traffic
- **DHCP support at L2**
  Provides full DHCP Snooping support for DHCP Snooping Option 82, DHCP Relay Option 82, DHCP Snooping Trust, and DHCP Snooping Item Backup

Layer 3 services

- **Address Resolution Protocol**
  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 L2 network
- **Dynamic Host Configuration Protocol**
  Simplifies the management of large IP networks and supports client and server; DHCP Relay enables DHCP operation across subnets
- **Operations, administration, and maintenance (OAM) support**
  Provides support for Connectivity Fault Management (IEEE 802.1AG) and Ethernet in the First Mile (IEEE 802.3AH); provides additional monitoring that can be used for fast fault detection and recovery

Layer 3 routing

Overview

- **EVPN and EVPN-DCI**
  Can act as a VTEP, EVPN Gateway, or Border Gateway enabling virtual multipoint bridged connectivity between different Layer 2 domains over an IP network
- **VRRP and VRRP Extended**
  Allows quick failover of router ports
- **Policy-based routing**
  Makes routing decisions based on policies set by the network administrator
- **Equal-Cost Multipath (ECMP)**
  Enables multiple equal-cost links in a routing environment to increase link redundancy and scale bandwidth
- **L3 IPv4 routing**
  Provides routing of IPv4 at media speed; supports static routes, RIP and RIPv2, OSPF, BGP, and IS-IS
- **Open shortest path first**
  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
- **Border Gateway Protocol 4 (BGP-4)**
  Delivers an implementation of the BGP utilizing path vectors; uses TCP for enhanced reliability for the route discovery process; reduces bandwidth consumption by advertising only incremental updates; supports extensive
- **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)
- **Static IPv6 routing**
  Provides simple manually configured IPv6 routing
- **Dual IP stack**
  Maintains separate stacks for IPv4 and IPv6 to ease the transition from an IPv4-only network to an IPv6-only network design
- **Routing Information Protocol next generation (RIPng)**
  Extends RIPv2 to support IPv6 addressing
- **OSPFv3**
  Provides OSPF support for IPv6
- **BGP+**
  Extends BGP-4 to support Multiprotocol BGP (MBGP), including support for IPv6 addressing
- **IS-IS for IPv6**
  Extends IS-IS to support IPv6 addressing
- **IPv6 tunneling**
  Allows IPv6 packets to traverse IPv4-only networks by encapsulating the IPv6 packet into a standard IPv4 packet; supports manually configured, 6 to 4, and intra-site automatic tunnel addressing protocol (ISATAP) tunnels; is an important element for the transition from IPv4 to IPv6
- **Policy routing**
  Allows custom filters for increased performance and security; supports ACLs, IP prefix, AS paths, community lists, and aggregate policies
- **Bidirectional Forwarding Detection (BFD)**
  Enables link connectivity monitoring and reduces network convergence time for RIP, OSPF, BGP, IS-IS, VRRP, MPLS, and IRF
- **Multicast Routing PIM dense and sparse modes**
  Provides robust support of multicast protocols
- **Layer 3 IPv6 routing**
  Provides routing of IPv6 at media speed; supports static routing, RIPng, OSPFv3, BGP4+ for IPv6, and IS-ISv6

Additional information

- **Green IT and power**
  Improves energy efficiency through the use of the latest advances in silicon development; shuts off unused ports and utilizes variable-speed fans, reducing energy costs

Overview

Management

- **USB support**
  - **File copy:** allows users to copy switch files to and from a USB flash drive
- **Multiple configuration files**
  Stores easily to the flash image
- **SNMPv1, v2c, and v3**
  Facilitates centralized discovery, monitoring, and secure management of networking devices
- **Out-of-band interface**
  Isolates management traffic from user data plane traffic for complete isolation and total reachability, no matter what happens in the data plane
- **Port mirroring**
  Enables traffic on a port to be simultaneously sent to a network analyzer for monitoring
- **Remote configuration and management**
  Is available through a CLI
- **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
- **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
- **Command authorization**
  Leverages RADIUS to link a custom list of CLI commands to an individual network administrator's login; an audit trail documents activity
- **Dual flash images**
  Provides independent primary and secondary operating system files for backup while upgrading
- **Command-line interface**
  Provides a secure, easy-to-use CLI for configuring the module via SSH or a switch console; provides direct real-time session visibility
- **Logging**
  Provides local and remote logging of events via SNMP (v2c and v3) and syslog; provides log throttling and log filtering to reduce the number of log events generated
- **Management interface control**
  Provides management access through a modem port and terminal interface, as well as in-band and out-of-band Ethernet ports; provides access through terminal interface, Telnet, or SSH
- **Industry-standard CLI with a hierarchical structure**
  Reduces training time and expenses, and increases productivity in multivendor installations
- **Management security**
  Restricts access to critical configuration commands; offers multiple privilege levels with password protection; ACLs provide Telnet and SNMP access; local and remote syslog capabilities allow logging of all access
- **Information center**
  Provides a central repository for system and network information; aggregates all logs, traps, and debugging information generated by the system and maintains them in order of severity; outputs the network information to multiple channels based on user-defined rules
- **Network management**
  HPE IMC centrally configures, updates, monitors, and troubleshoots
- **Remote intelligent mirroring**
  Mirrors ingress/egress ACL-selected traffic from a switch port or VLAN to a local or remote switch port anywhere on the network

Security

- **Access control lists**
  Provides IP L3 filtering based on source/destination IP, address/subnet, and source/destination TCP/UDP port number

Overview

- **RADIUS/TACACS+**
  Eases switch management security administration by using a password authentication server
- **Secure shell**
  Encrypts all transmitted data for secure remote CLI access over IP networks
- **IEEE 802.1X and RADIUS network logins**
  Controls port-based access for authentication and accountability
- **Port security**
- Allows access only to specified MAC addresses, which can be learned or specified by the administrator

Convergence

- **LLDP-MED (Media Endpoint Discovery)**
  Defines a standard extension of LLDP that stores values for parameters such as QoS and VLAN to configure network devices such as IP phones automatically

Warranty and support

- **1-year warranty**
  See **http://www.hpe.com/networking/warrantysummary** for warranty and support information included with your product purchase.
- **Software releases**
  to find software for your product, refer to **http://www.hpe.com/networking/support**; for details on the software releases available with your product purchase, refer to **http://www.hpe.com/networking/warrantysummary**

Configuration

Build To Order: BTO is a standalone unit with no integration. BTO products ship standalone are not part of a CTO or Rack-Shippable solution.

Standard Switch Enclosures

HPE FlexFabric 5945 48SFP28 8QSFP28 Switch
- 48 SFP/SFP+/SFP28 ports (min=0 \ max=48)
- 8 QSFP+/QSFP28 ports (min=0 \ max=8)
- 1 SFP Management Port (min=0 \ max=1)
- 2 Power Supply Slots (Min 1 required)
- 5 Fan Tray Slots (Min 5 required)
- 1U - Height

JQ074A
See Configuration
NOTE: 1, 2, 3, 4, 5, 6

HPE FlexFabric 5945 4-slot Switch
- 4 port expansion module slots
- 1 SFP Management Port (min=0 \ max=1)
- 4 Power Supply Slots (Min 2 required)
- 2 Fan Tray Slots (Min 2 required)
- 2U - Height

JQ076A
See Configuration
NOTE: 1

Configuration Rules

Note 1   The following SFP/SFP+ Transceivers install into this Switch's Management Port:

HPE X115 100M SFP LC FX Transceiver	JD102B
HPE X110 100M SFP LC LX Transceiver	JD120B
HPE X110 100M SFP LC LH40 Transceiver	JD090A
HPE X120 1G SFP RJ45 T Transceiver	JD089B

Note 2   The following SFP Transceivers install into this switch:

HPE X120 1G SFP LC SX Transceiver	JD118B
HPE X120 1G SFP LC LX Transceiver	JD119B
HPE X125 1G SFP LC LH40 1310nm Transceiver	JD061A
HPE X120 1G SFP LC LH40 1550nm Transceiver	JD062A
HPE X125 1G SFP LC LH70 Transceiver	JD063B

Note 3   The following SFP+ Transceivers install into this Switch:

HPE X130 10G SFP+ LC SR Transceiver	JD092B
HPE X130 10G SFP+ LC LR Transceiver	JD094B
HPE X2A0 10G SFP+ to SFP+ 7m Active Optical Cable	JL290A
HPE X2A0 10G SFP+ to SFP+ 10m Active Optical Cable	JL291A
HPE X2A0 10G SFP+ to SFP+ 20m Active Optical Cable	JL292A
HPE FlexNetwork X240 10G SFP+ to SFP+ 0.65m Direct Attach Copper Cable	JD095C
HPE FlexNetwork X240 10G SFP+ to SFP+ 1.2m Direct Attach Copper Cable	JD096C
HPE FlexNetwork X240 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	JD097C
HPE FlexNetwork X240 10G SFP+ to SFP+ 5m Direct Attach Copper Cable	JG081C

Note 4   The following SFP28 Transceivers install into this Switch:

HPE X190 25G SFP28 LC SR 100m MM Transceiver	JL293A
HPE X240 25G SFP28 to SFP28 1m Direct Attach Copper Cable	JL294A
HPE X240 25G SFP28 to SFP28 3m Direct Attach Copper Cable	JL295A

Configuration

HPE X240 25G SFP28 to SFP28 5m Direct Attach Copper Cable	JL296A

Note 5   The following QSFP+ Transceivers install into this Switch:

HPE X140 40G QSFP+ MPO SR4 Transceiver	JG325B
HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver	JL251A
HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A
HPE X140 40G QSFP+ LC LR4L 2km SM Transceiver	JL286A
HPE X2A0 40G QSFP+ to QSFP+ 7m Active Optical Cable	JL287A
HPE X2A0 40G QSFP+ to QSFP+ 10m Active Optical Cable	JL288A
HPE X2A0 40G QSFP+ to QSFP+ 20m Active Optical Cable	JL289A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 1m Direct Attach Copper Cable	JG326A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 3m Direct Attach Copper Cable	JG327A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 5m Direct Attach Copper Cable	JG328A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable	JG329A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable	JG330A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable	JG331A

Note 6   The following QSFP28 Transceivers install into this Switch:

HPE X150 100G QSFP28 MPO SR4 100m MM Transceiver	JL274A
HPE X150 100G QSFP28 MPO PSM4 500m SM Transceiver	JH420A
HPE X150 100G QSFP28 LC LR4 10km SM Transceiver	JL275A
HPE X150 100G QSFP28 CWDM4 2km SM Transceiver	JH673A
HPE X2A0 100G QSFP28 to QSFP28 7m Active Optical Cable	JL276A
HPE X2A0 100G QSFP28 to QSFP28 10m Active Optical Cable	JL277A
HPE X2A0 100G QSFP28 to QSFP28 20m Active Optical Cable	JL278A
HPE X240 100G QSFP28 to QSFP28 1m Direct Attach Copper Cable	JL271A
HPE X240 100G QSFP28 to QSFP28 3m Direct Attach Copper Cable	JL272A
HPE X240 100G QSFP28 to QSFP28 5m Direct Attach Copper Cable	JL273A
HPE X240 QSFP28 4xSFP28 1m Direct Attach Copper Cable	JL282A
HPE X240 QSFP28 4xSFP28 3m Direct Attach Copper Cable	JL283A
HPE X240 QSFP28 4xSFP28 5m Direct Attach Copper Cable	JL284A

Remarks:

OCA Only Model Selection Form -
HPE Offering > DataCenter Networking > FlexFabric Switches - Access:
HPE FlexFabric 5945 Switch Series

Rack Level Integration CTO Models

CTO Switch Chassis

HPE FlexFabric 5945 48SFP28 8QSFP28 Switch
- 48 SFP/SFP+/SFP28 ports (min=0 \ max=48)
- 8 QSFP+/QSFP28 ports (min=0 \ max=8)
- 1 SFP Management Port (min=0 \ max=1)
- 2 Power Supply Slots (Min 1 required)
- 5 Fan Tray Slots (Min 5 required)
- 1U - Height

JQ074A
See Configuration
NOTE: 1, 2, 3, 4, 5,
6, 7

Configuration

HPE FlexFabric 5945 4-slot Switch   JQ076A

- 4 port expansion module slots
- 1 SFP Management Port (min=0 \ max=1)
- 4 Power Supply Slots (Min 2 required)
- 2 Fan Tray Slots (Min 2 required)
- 2U - Height

See Configuration
NOTE: 1, 7

Configuration Rules

Note 1   The following SFP/SFP+ Transceivers install into this Switch's Management Port: (Use #0D1 or #B01 if switch is CTO) - if applicable

HPE X115 100M SFP LC FX Transceiver	JD102B
HPE X110 100M SFP LC LX Transceiver	JD120B
HPE X110 100M SFP LC LH40 Transceiver	JD090A
HPE X120 1G SFP RJ45 T Transceiver	JD089B

Note 2   The following SFP Transceivers install into this switch: (Use #0D1 or #B01 if switch is CTO) - if applicable

HPE X120 1G SFP LC SX Transceiver	JD118B
HPE X120 1G SFP LC LX Transceiver	JD119B
HPE X125 1G SFP LC LH40 1310nm Transceiver	JD061A
HPE X120 1G SFP LC LH40 1550nm Transceiver	JD062A
HPE X125 1G SFP LC LH70 Transceiver	JD063B

Note 3   The following SFP+ Transceivers install into this Switch: (Use #0D1 or #B01 if switch is CTO) - if applicable

HPE X130 10G SFP+ LC SR Transceiver	JD092B
HPE X130 10G SFP+ LC LR Transceiver	JD094B
HPE X2A0 10G SFP+ to SFP+ 7m Active Optical Cable	JL290A
HPE X2A0 10G SFP+ to SFP+ 10m Active Optical Cable	JL291A
HPE X2A0 10G SFP+ to SFP+ 20m Active Optical Cable	JL292A
HPE FlexNetwork X240 10G SFP+ to SFP+ 0.65m Direct Attach Copper Cable	JD095C
HPE FlexNetwork X240 10G SFP+ to SFP+ 1.2m Direct Attach Copper Cable	JD096C
HPE FlexNetwork X240 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	JD097C
HPE FlexNetwork X240 10G SFP+ to SFP+ 5m Direct Attach Copper Cable	JG081C

Note 4   The following SFP28 Transceivers install into this Switch: (Use #0D1 or #B01 if switch is CTO) - if applicable

HPE X190 25G SFP28 LC SR 100m MM Transceiver	JL293A
HPE X240 25G SFP28 to SFP28 1m Direct Attach Copper Cable	JL294A
HPE X240 25G SFP28 to SFP28 3m Direct Attach Copper Cable	JL295A
HPE X240 25G SFP28 to SFP28 5m Direct Attach Copper Cable	JL296A

Note 5   The following QSFP+ Transceivers install into this Switch: (Use #0D1 or #B01 if switch is CTO) - if applicable

HPE X140 40G QSFP+ MPO SR4 Transceiver	JG325B
HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver	JL251A
HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A
HPE X140 40G QSFP+ LC LR4L 2km SM Transceiver	JL286A
HPE X2A0 40G QSFP+ to QSFP+ 7m Active Optical Cable	JL287A
HPE X2A0 40G QSFP+ to QSFP+ 10m Active Optical Cable	JL288A
HPE X2A0 40G QSFP+ to QSFP+ 20m Active Optical Cable	JL289A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 1m Direct Attach Copper Cable	JG326A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 3m Direct Attach Copper Cable	JG327A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 5m Direct Attach Copper Cable	JG328A

Configuration

HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable	JG329A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable	JG330A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable	JG331A

Note 6   The following QSFP28 Transceivers install into this Switch: (Use #0D1 or #B01 if switch is CTO) - if applicable

HPE X150 100G QSFP28 MPO SR4 100m MM Transceiver	JL274A
HPE X150 100G QSFP28 MPO PSM4 500m SM Transceiver	JH420A
HPE X150 100G QSFP28 LC LR4 10km SM Transceiver	JL275A
HPE X150 100G QSFP28 CWDM4 2km SM Transceiver	JH673A
HPE X2A0 100G QSFP28 to QSFP28 7m Active Optical Cable	JL276A
HPE X2A0 100G QSFP28 to QSFP28 10m Active Optical Cable	JL277A
HPE X2A0 100G QSFP28 to QSFP28 20m Active Optical Cable	JL278A
HPE X240 100G QSFP28 to QSFP28 1m Direct Attach Copper Cable	JL271A
HPE X240 100G QSFP28 to QSFP28 3m Direct Attach Copper Cable	JL272A
HPE X240 100G QSFP28 to QSFP28 5m Direct Attach Copper Cable	JL273A
HPE X240 QSFP28 4xSFP28 1m Direct Attach Copper Cable	JL282A
HPE X240 QSFP28 4xSFP28 3m Direct Attach Copper Cable	JL283A
HPE X240 QSFP28 4xSFP28 5m Direct Attach Copper Cable	JL284A

Note 7   If HPE CTO Switch Chassis is selected for Rack Level Integration, Then the Switch needs to integrate (with #0D1) to the Rack.

Remarks:

Clic UNB - If an option is ordered with #0D1/#B01, then the switch must have #0D1 option.

Enter the following menu selections as integrated to the CTO Model X server above if order is factory built.

Switch Options

Modules

HPE 5950 8-port QSFP28 Mod	JH406A
• 8 40G/100G QSFP+/QSFP28 ports (min=0 \ max=8)	See Configuration **NOTE:** 3, 4, 5

HPE 5950 24p SFP28 and 2p QSFP28 Mod	JH450A
• 24 10G/25G SFP+/SFP28 ports (min=0 \ max=24) (Default)	See Configuration
• 2 40G/100G QSFP+/QSFP28 ports (min=0 \ max=2)	**NOTE:** 1, 2, 3, 4, 5

Configuration Rules

Note 1   The following SFP+ Transceivers install into this Switch: (Use #0D1 or #B01 if switch is CTO) - if applicable

HPE X130 10G SFP+ LC SR Transceiver	JD092B
HPE X130 10G SFP+ LC LR Transceiver	JD094B
HPE X2A0 10G SFP+ to SFP+ 7m Active Optical Cable	JL290A
HPE X2A0 10G SFP+ to SFP+ 10m Active Optical Cable	JL291A
HPE X2A0 10G SFP+ to SFP+ 20m Active Optical Cable	JL292A
HPE FlexNetwork X240 10G SFP+ to SFP+ 0.65m Direct Attach Copper Cable	JD095C
HPE FlexNetwork X240 10G SFP+ to SFP+ 1.2m Direct Attach Copper Cable	JD096C
HPE FlexNetwork X240 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	JD097C

Configuration

HPE FlexNetwork X240 10G SFP+ to SFP+ 5m Direct Attach Copper Cable   JG081C

Note 2   The following SFP28 Transceivers install into this Switch: (Use #0D1 or #B01 if switch is CTO) - if applicable
HPE X190 25G SFP28 LC SR 100m MM Transceiver   JL293A
HPE X240 25G SFP28 to SFP28 1m Direct Attach Copper Cable   JL294A
HPE X240 25G SFP28 to SFP28 3m Direct Attach Copper Cable   JL295A
HPE X240 25G SFP28 to SFP28 5m Direct Attach Copper Cable   JL296A

Note 3   The following QSFP+ Transceivers install into this Switch: (Use #0D1 or #B01 if switch is CTO) - if applicable
HPE X140 40G QSFP+ MPO SR4 Transceiver   JG325B
HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver   JG709A
HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver   JL251A
HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver   JG661A
HPE X140 40G QSFP+ LC LR4L 2km SM Transceiver   JL286A
HPE X2A0 40G QSFP+ to QSFP+ 7m Active Optical Cable   JL287A
HPE X2A0 40G QSFP+ to QSFP+ 10m Active Optical Cable   JL288A
HPE X2A0 40G QSFP+ to QSFP+ 20m Active Optical Cable   JL289A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 1m Direct Attach Copper Cable   JG326A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 3m Direct Attach Copper Cable   JG327A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 5m Direct Attach Copper Cable   JG328A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable   JG329A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable   JG330A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable   JG331A

Note 4   The following QSFP28 Transceivers install into this Switch: (Use #0D1 or #B01 if switch is CTO) - if applicable
HPE X150 100G QSFP28 MPO SR4 100m MM Transceiver   JL274A
HPE X150 100G QSFP28 MPO PSM4 500m SM Transceiver   JH420A
HPE X150 100G QSFP28 LC LR4 10km SM Transceiver   JL275A
HPE X150 100G QSFP28 CWDM4 2km SM Transceiver   JH673A
HPE X2A0 100G QSFP28 to QSFP28 7m Active Optical Cable   JL276A
HPE X2A0 100G QSFP28 to QSFP28 10m Active Optical Cable   JL277A
HPE X2A0 100G QSFP28 to QSFP28 20m Active Optical Cable   JL278A
HPE X240 100G QSFP28 to QSFP28 1m Direct Attach Copper Cable   JL271A
HPE X240 100G QSFP28 to QSFP28 3m Direct Attach Copper Cable   JL272A
HPE X240 100G QSFP28 to QSFP28 5m Direct Attach Copper Cable   JL273A
HPE X240 QSFP28 4xSFP28 1m Direct Attach Copper Cable   JL282A
HPE X240 QSFP28 4xSFP28 3m Direct Attach Copper Cable   JL283A
HPE X240 QSFP28 4xSFP28 5m Direct Attach Copper Cable   JL284A

Note 5   This Module can install into the following Switches: (Use #0D1 or #B01 if switch is CTO) - if applicable
HPE FlexFabric 5945 4-slot Switch   JQ076A

Transceivers

SFP Transceivers

HPE X115 100M SFP LC FX Transceiver   JD102B
HPE X110 100M SFP LC LX Transceiver   JD120B
HPE X110 100M SFP LC LH40 Transceiver   JD090A
HPE X120 1G SFP RJ45 T Transceiver   JD089B

Configuration

HPE X120 1G SFP LC SX Transceiver   JD118B
HPE X120 1G SFP LC LX Transceiver   JD119B
HPE X125 1G SFP LC LH40 1310nm Transceiver   JD061A
HPE X120 1G SFP LC LH40 1550nm Transceiver   JD062A
HPE X125 1G SFP LC LH80 Transceiver   JD063B

SFP+ Transceivers

HPE X130 10G SFP+ LC SR Transceiver   JD092B
HPE X130 10G SFP+ LC LR Transceiver   JD094B
HPE X2A0 10G SFP+ to SFP+ 7m Active Optical Cable   JL290A
HPE X2A0 10G SFP+ to SFP+ 10m Active Optical Cable   JL291A
HPE X2A0 10G SFP+ to SFP+ 20m Active Optical Cable   JL292A
HPE X240 10G SFP+ SFP+ 0.65m DA Cable   JD095C
HPE X240 10G SFP+ SFP+ 1.2m DA Cable   JD096C
HPE X240 10G SFP+ SFP+ 3m DA Cable   JD097C
HPE X240 10G SFP+ SFP+ 5m DA Cable   JG081C

SFP28 Transceivers

HPE X190 25G SFP28 LC SR 100m MM XCVR   JL293A
HPE X240 25G SFP28 to SFP28 1m Direct Attach Copper Cable   JL294A
HPE X240 25G SFP28 to SFP28 3m Direct Attach Copper Cable   JL295A
HPE X240 25G SFP28 to SFP28 5m Direct Attach Copper Cable   JL296A

QSFP+ Transceivers

HPE X140 40G QSFP+ MPO SR4 Transceiver   JG325B
HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver   JG709A
HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver   JL251A
HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver   JG661A
HPE X140 40G QSFP+ LC LR4L 2km SM Transceiver   JL286A
HPE X2A0 40G QSFP+ to QSFP+ 7m Active Optical Cable   JL287A
HPE X2A0 40G QSFP+ to QSFP+ 10m Active Optical Cable   JL288A
HPE X2A0 40G QSFP+ to QSFP+ 20m Active Optical Cable   JL289A
HPE X240 40G QSFP+ QSFP+ 1m Direct Attach Copper Cable   JG326A
HPE X240 40G QSFP+ QSFP+ 3m Direct Attach Copper Cable   JG327A
HPE X240 40G QSFP+ QSFP+ 5m Direct Attach Copper Cable   JG328A
HPE X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable   JG329A
HPE X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable   JG330A
HPE X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable   JG331A

QSFP28 Transceivers

HPE X150 100G QSFP28 MPO SR4 100m MM Transceiver   JL274A
HPE X150 100G QSFP28 MPO PSM4 500m SM Transceiver   JH420A
HPE X150 100G QSFP28 LC LR4 10km SM Transceiver   JL275A
HPE X150 100G QSFP28 CWDM4 2km SM Transceiver   JH673A
HPE X2A0 100G QSFP28 to QSFP28 7m Active Optical Cable   JL276A
HPE X2A0 100G QSFP28 to QSFP28 10m Active Optical Cable   JL277A

Configuration

HPE X2A0 100G QSFP28 to QSFP28 20m Active Optical Cable	JL278A
HPE X240 100G QSFP28 to QSFP28 1m Direct Attach Copper Cable	JL271A
HPE X240 100G QSFP28 to QSFP28 3m Direct Attach Copper Cable	JL272A
HPE X240 100G QSFP28 to QSFP28 5m Direct Attach Copper Cable	JL273A
HPE X240 QSFP28 4xSFP28 1m DAC Cable	JL282A
HPE X240 QSFP28 4xSFP28 3m DAC Cable	JL283A
HPE X240 QSFP28 4xSFP28 5m Direct Attach Copper Cable	JL284A

Internal Power Supplies

(JQ074A) System (std 0 // max 2) User Selection (min 1 // max 2)
(JQ076A) System (std 0 // max 4) User Selection (min 2 // max 4)

HPE 58x0AF 650W AC Power Supply   JC680A
- includes 1 x c13, 650w   See Configuration
                                                                                                   NOTE: 1, 2, 3

PDU Cable NA/MEX/TW/JP   JC680A#B2B
- C15 PDU Jumper Cord (NA/MX/TW/JP)

PDU Cable ROW   JC680A#B2C
- C15 PDU Jumper Cord (ROW)

No Power Cord   JC680A#AC3
- No Localized Power Cord Selected

HPE SW 650W 48V NEBS DC PSU   JH336A
- includes 1 x c13, 650w   See Configuration
                                                                                                   NOTE: 1, 3

Configuration Rules

Note 1   PSU's cannot be mixed in the same switch enclosure

Note 2   Localization (Wall Power Cord) required on orders without #B2B, #B2C, and #AC3 (PDU Power Cord) . (See
           Localization Menu)
           REMARK: When Switches/Routers are Factory Racked, Then #B2B, or #B2C should be the Defaulted Power Cable
           option on the Switches/Routers.

Note 3   Must be ordered in multiples of 2 if configuring with JQ076A

Remarks:
           Drop down under power supply should offer the following options and results:
           Switch/Router to PDU Power Cord - #B2B in NA, Mexico, Taiwan, and Japan or #B2C ROW. (Watson Default B2B
           or B2C for Rack Level CTO)
           Switch/Router/Power Supply to Wall Power Cord - Localized Option (Watson Default for BTO and Box Level CTO)
           No Power Cord - #AC3 Option

Fan Trays

(JQ074A) System (std 0 // max 5) User Selection (min 5 // max 5)

Configuration

(JQ076A) System (std 0 // max 2) User Selection (min 2 // max 2)

HPE X712 Bck(pwr)-Frt(prt) HV2 Fan Tray   JH389A
                                                                                        See Configuration
                                                                                        NOTE: 1, 2

HPE X711 Frt(prt)-Bck(pwr) HV2 Fan Tray   JH388A
   • Default   See Configuration
                                                                                        NOTE: 1, 2

HPE 5930 4-slot B(pwr) F(prt) Fan Tray   JH185A
                                                                                        See Configuration
                                                                                        NOTE: 1, 3

HPE 5930-4Slt Front-to-Back Fan Tray   JH186A
   • Default   See Configuration
                                                                                        NOTE: 1, 3

Configuration Rules

Note 1   Fan Trays cannot be mixed in the same switch enclosure

Note 2   This fan tray is supported on: JQ074A

Note 3   This fan tray is supported on: JQ076A

Technical Specifications

HPE FlexFabric 5945 48SFP28 8QSFP28 Switch (JQ074A)

I/O ports and slots	48 x 25G SFP28 ports
	8 x 100G QSFP28 ports
	2 x 1G SFP ports (IEEE 802.3ae Type 10GBASE-ER)
	IEEE 802.3ae Type 10GBASE-LR, IEEE 802.3ae Type 10GBASE-SR,
	IEEE 802.3z Type 1000BASE-SX, IEEE 802.3z Type 1000BASE-LX
	Supports 48 x 10/25GbE and 8 x 100GbE fixed ports, or up to 80 x 10GbE ports when using splitter cables
Additional ports and slots	1 x console port
	1 x mini USB port
	1 x USB port
	2 x out-of-band management ports (one fiber port and one copper port)
Power supplies	2 power supply slots
	1 minimum power supply required (ordered separately)
Fan tray	5 fan tray slots
	The customer must order fan trays, as they are not included with the switch. This system requires same-direction airflow fan trays to function properly. The system should not be operated with only five fan trays for more than 24 hours. The system should not be operated without a fan tray for more than two minutes. The system should not be operated outside of the temperature range of 32°F (0°C) to 113°F (45°C). Failure to comply with these operating requirements may void the product warranty.

Physical characteristics	**Dimensions**	43.6 x 440 x 460 mm (1.72 x 17.32 x 18.11 in)
	Weight	10.10 kg (22.27 lb) shipping weight
	Full configuration weight	15 kg (33.07 lb)
Memory and processor	1 GB flash; packet buffer size: 16 MB, 4 GB SDRAM	
Performance	**Latency**	< 1 μs (64-byte packets) up to 2003 Mpps
	Throughput	2 Tbps
	Routing/Switching capacity	2024 Mpps
	Routing table size	128K entries (IPv4), 84K entries (IPv6)
	MAC address table size	288K entries
Environment	**Operating temperature**	32°F to 113°F (0°C to 45°C)
	Operating relative humidity	5% to 95%, noncondensing
	Acoustic	Low-speed fan: 62.1 dB, high-speed fan: 77.9 dB
Electrical characteristics	**Frequency**	50/60 Hz
	Maximum heat dissipation	1381 BTU/hr (1458 kJ/hr)
	Voltage	100 VAC to 240 VAC V rated
		90 VAC to 264 VAC max
		−40 VDC to −60 VDC rated
		−40 VDC to −72 VDC max
	Maximum power rating	650 W
	Idle power	179 W

Technical Specifications

Notes		Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated
Safety		UL 60950-1, CAN/CSA C22.2 No 60950-1, IEC 60950-1, EN 60950-1, AS/NZS 60950-1, FDA 21 CFR Subchapter J
Emissions		FCC Part 15 (CFR 47) CLASS A, ICES-003 CLASS A, VCCI CLASS A, CISPR 32 CLASS A , EN 55032 CLASS A, AS/NZS CISPR32 CLASS A, EN 61000-3-2, EN 61000-3-3, ETSI EN 300 386
Immunity		CISPR 24, EN 55024, ETSI EN 300 386
Management		IMC; CLI; out-of-band management; SNMP Manager; Telnet; FTP
Notes		The customer must install a minimum of one power supply, as the device does not come with one. The customer must install 5 fan kits, as the device does not come with one.
Services		Refer to the Hewlett Packard Enterprise website at: **http://www.hpe.com/networking/services** 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.

HPE FlexFabric 5945 4-slot Switch (JQ076A)

I/O ports and slots		4 module slots
		2 x 1G SFP ports (IEEE 802.3ae Type 10GBASE-ER)
		IEEE 802.3ae Type 10GBASE-LR, IEEE 802.3ae Type 10GBASE-SR
		IEEE 802.3z Type 1000BASE-SX, IEEE 802.3z
		Type 1000BASE-LX
		Supports up to a maximum of 96 x 10/25GbE and 8 x 100GbE ports, or up to 32 x 100GbE ports
Additional ports and slots		1 x console port
		1 x mini USB port
		1 x USB port
		2 x out-of-band management ports (one fiber port and one copper port)
Power supplies		4 power supply slots 2 minimum power supplies required (ordered separately)
Fan tray		2 fan tray slots The customer must order fan trays, as they are not included with the switch. This system requires two same-direction airflow fan trays to function properly. The system should not be operated with only one fan tray for more than 24 hours. The system should not be operated without a fan tray for more than two minutes. The system should not be operated outside of the temperature range of 32°F (0°C) to 113°F (45°C). Failure to comply with these operating requirements may void the product warranty.
Physical characteristics	**Dimensions**	88.1 x 440 x 660 mm (3.47 x 17.32 x 25.98 in) (2U height)
	Weight	18.10 kg (39.90 lb) shipping weight
	Full configuration weight	27 kg (59.52 lb)
Memory and processor		1 GB flash; packet buffer size: 16 MB, 4 GB SDRAM
Performance	**Latency**	< 1 μs (64-byte packets) up to 2003 Mpps
	Throughput	3.2 Tbps
	Routing/Switching capacity	2024 Mbpps
	Routing table size	128K entries (IPv4), 84K entries (IPv6)
	MAC address table size	288K entries

Technical Specifications

Environment	**Operating temperature**	32°F to 113°F (0°C to 45°C)
	Operating relative humidity	5% to 95%, noncondensing
	Acoustic	Low-speed fan: 70.8 dB, high-speed fan: 83.2dB
Electrical characteristics	**Frequency**	50/60 Hz
	Maximum heat dissipation	2348 BTU/hr (2478 kJ/hr)
	Voltage	100 VAC to 240 VAC V rated, 90 VAC to 264 VAC max.., −40 VDC to −60 VDC rated −40 VDC to −72 VDC max.
	Maximum power rating	650 W
	Idle power	185 W
	Notes	Idle power is the actual power consumption of the device with no ports connected. Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated
Safety		UL 60950-1, CAN/CSA C22.2 No 60950-1, IEC 60950-1, EN 60950-1, AS/NZS 60950-1, FDA 21 CFR Subchapter J
Emissions		FCC Part 15 (CFR 47) CLASS A, ICES-003 CLASS A, VCCI CLASS A, CISPR 32 CLASS A , EN 55032 CLASS A, AS/NZS CISPR32 CLASS A, EN 61000-3-2, EN 61000-3-3, ETSI EN 300 386
Immunity		CISPR 24, EN 55024, ETSI EN 300 386
Management		IMC; CLI; out-of-band management; SNMP Manager; Telnet; FTP
Notes		The customer must install a minimum of two power supplies, as the device does not come with one. The customer must install 2 fan kits, as the device does not come with one.
Services		Refer to the Hewlett Packard Enterprise website at: **http://www.hpe.com/networking/services** 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)

BGP	RFC 1163 BGP RFC 1771 BGPv4 RFC 1997 BGP Communities Attribute RFC 2918 Route Refresh Capability RFC 3392 Capabilities Advertisement with BGP-4 RFC 4271 A BGP 4 (BGP-4) RFC 4360 BGP Extended Communities Attribute RFC 4456 BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP) RFC 4760 Multiprotocol Extensions for BGP-4 RFC 7432 BGP MPLS-Based Ethernet VPN
Device Management	RFC 1157 SNMPv1/v2c RFC 1305 NTPv3 RFC 1591 DNS (client) RFC 1902 (SNMPv2) RFC 1908 (SNMP v1/2 Coexistence) RFC 2573 (SNMPv3 Applications)

Technical Specifications

RFC 2576 (coexistence between SNMP V1, V2, V3)
RFC 2819 RMON
Multiple configuration files
Multiple software images
SSHv1/SSHv2 Secure Shell
TACACS/TACACS+

General Protocols
IEEE 802.1ad Q-in-Q
IEEE 802.1AX-2008 Link Aggregation
IEEE 802.1D MAC Bridges
IEEE 802.1p Priority
IEEE 802.1Q VLANs
IEEE 802.1s Multiple Spanning Trees
IEEE 802.1w Rapid Reconfiguration of Spanning Tree
IEEE 802.3ad Link Aggregation Control Protocol (LACP)
IEEE 802.3ae 10-Gigabit Ethernet
IEEE 802.3ag Ethernet OAM
IEEE 802.3ah Ethernet in First Mile over Point to Point Fiber—EFMF
IEEE 802.3x Flow Control RFC 768 UDP
RFC 783 TFTP Protocol (revision 2)
RFC 791 IP
RFC 792 ICMP
RFC 793 TCP
RFC 826 ARP
RFC 854 Telnet
RFC 856 Telnet
RFC 868 Time Protocol
RFC 896 Congestion Control in IP/TCP Internetworks
RFC 950 Internet Standard Subnetting Procedure RFC 1027 Proxy ARP
RFC 1058 RIPv1
RFC 1091 Telnet Terminal-Type Option
RFC 1141 Incremental updating of the internet checksum
RFC 1142 OSI IS-IS Intra-domain Routing Protocol
RFC 1191 Path MTU discovery
RFC 1213 Management Information Base for Network Management of TCP/IP-based internet RFC 1253 (OSPF v2)
RFC 1531 DHCP
RFC 1533 DHCP Options and BOOTP Vendor Extensions
RFC 1534 DHCP/BOOTP Interoperation RFC 1541 DHCP
RFC 1542 Clarifications and Extensions for the Bootstrap Protocol
RFC 1591 DNS (client only)
RFC 1624 Incremental internet Checksum RFC 1723 RIP v2
RFC 1812 IPv4 Routing
RFC 2030 Simple Network Time Protocol (SNTP) v4 RFC 2131 DHCP
RFC 2236 IGMP Snooping RFC 2338 VRRP
RFC 2453 RIPv2
RFC 2581 TCP Congestion Control RFC 2644 Directed Broadcast Control RFC 2767 Dual Stacks IPv4 & IPv6
RFC 2865 RADIUS
RFC 2868 RADIUS Attributes for Tunnel Protocol Support
RFC 2890 Key and Sequence Number Extensions to GRE
RFC 3046 DHCP Relay Agent Information Option
RFC 3411 An Architecture for Describing
Simple Network Management Protocol (SNMP)
Management Frameworks

Technical Specifications

RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
RFC 3413 SNMP Applications
RFC 3416 Protocol Operations for SNMP
RFC 3417 Transport Mappings for the SNMP
RFC 3418 Management Information Base (MIB) for the SNMP
RFC 3768 VRRP
RFC 4250 The SSH) Protocol Assigned Numbers
RFC 4251 The SSH Protocol Architecture
RFC 4252 The SSH Authentication Protocol
RFC 4253 The SSH Transport Layer Protocol
RFC 4254 The SSH Connection Protocol
RFC 4292 IP Forwarding Table MIB
RFC 4293 Management Information Base for the Internet Protocol (IP)
RFC 4364 BGP/MPLS IP Virtual Private Networks (VPNs)
RFC 4419 Diffie-Hellman Group Exchange for the SSH Transport Layer Protocol
RFC 4594 Configuration Guidelines for DiffServ Service Classes
RFC 4601 Protocol Independent Multicast— Sparse Mode (PIM-SM): Protocol Specification (Revised)
RFC 4604 Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast
RFC 4607 Source-Specific Multicast for IP RFC 4941 Privacy Extensions for Stateless Address Autoconfiguration in IPv6
RFC 5340 OSPF for IPv6
RFC 5905 NTP Version 4: Protocol and Algorithms Specification
RFC 2929 RADIUS Support DS for RADIUS

IPv6

RFC 2080 RIPng for IPv6
RFC 2460 IPv6 Specification
RFC 2461 IPv6 Neighbor Discovery
RFC 2462 IPv6 Stateless Address Auto-configuration
RFC 2463 ICMPv6
RFC 2464 Transmission of IPv6 over Ethernet Networks
RFC 2473 Generic Packet Tunneling in IPv6
RFC 2545 Use of MP-BGP-4 for IPv6
RFC 2563 ICMPv6
RFC 2711 IPv6 Router Alert Option
RFC 2740 OSPFv3 for IPv6
RFC 2767 Dual stacks IPv46 & IPv6
RFC 3315 DHCPv6 (client and relay)
RFC 3484 Default Address Selection for IPv6
RFC 3810 Multicast Listener Discovery Version 2 (MLDv2) for IPv6
RFC 4213 Basic Transition Mechanisms for IPv6 Hosts and Routers
RFC 4291 IP Version 6 Addressing Architecture
RFC 4443 ICMPv6
RFC 4552 Authentication/Confidentiality for OSPFv3
RFC 4862 IPv6 Stateless Address Auto-configuration
RFC 5095 Deprecation of Type 0 Routing Headers in IPv6

MIBs

RFC 1213 MIB II
RFC 1907 SNMPv2 MIB
RFC 2571 SNMP Framework MIB
RFC 2572 SNMP-MPD MIB
RFC 2573 SNMP-Notification MIB
RFC 2573 SNMP-Target MIB
RFC 2574 SNMP USM MIB

Technical Specifications

	RFC 2737 Entity MIB (version 2) RFC 3414 SNMP-User based-SM MIB RFC 3415 SNMP-View based-ACM MIB LLDP-EXT-DOT1-MIB LLDP-EXT-DOT3-MIB LLDP-MIB
Network Management	RFC 2580 Conformance Statements for SMIv2 RFC 3164 BSD syslog Protocol
OSPF	RFC 1587 OSPF NSSA RFC 2328 OSPFv2 RFC 3101 OSPF NSSA RFC 3137 OSPF Stub Router Advertisement RFC 3623 Graceful OSPF Restart RFC 4577 OSPF as the Provider/Customer Edge Protocol for BGP/MPLS IP Virtual Private Networks (VPNs) RFC 4811 OSPF Out-of-Band LSDB Resynchronization RFC 4812 OSPF Restart Signaling RFC 4813 OSPF Link-Local Signaling
QoS/CoS	IEEE 802.1p (CoS) RFC 2475 DiffServ Architecture RFC 2597 DiffServ Assured Forwarding (AF) RFC 3247 Supplemental Information for the New Definition of the EF PHB (Expedited Forwarding Per-Hop Behavior) RFC 3260 New Terminology and Clarifications for DiffServ
Security	RFC 1321 The MD5 Message-Digest Algorithm RFC 2818 HTTP Over TLS RFC 6192 Partial Support-Protecting the router control plane ACLs SSHv2

Accessories

HPE FlexFabric 5945 Switch Series accessories

HPE FlexFabric 5945 48SFP28 8QSFP28 Switch (JQ074A) accessories

HPE 58x0AF 650W AC Power Supply	JC680A
HPE FlexFabric Switch 650W 48V Hot Plug NEBS-compliant DC Power Supply	JH336A
HPE X712 Back (Power Side) to Front (Port Side) Airflow High Volume 2 Fan Tray	JH389A
HPE X711 Front (Port Side) to Back (Power Side) Airflow High Volume 2 Fan Tray	JH388A

HPE FlexFabric 5945 4-slot Switch (JQ076A) accessories

HPE FlexFabric 5950 24-port SFP28 and 2-port QSFP28 Module	JH450A
HPE 5950 8-port QSFP28 Module	JH406A
HPE 58x0AF 650W AC Power Supply	JC680A
HPE FlexFabric Switch 650W 48V Hot Plug NEBS-compliant DC Power Supply	JH336A
HPE 5930 4-slot Back (Power Side) to Front (Port Side) Airflow Fan Tray	JH185A
HPE 5930 4-slot Front (Port Side) to Back (Power Side) Airflow Fan Tray	JH186A

HPE 5945 48SFP28 8QSFP28 Switch (JQ074A) and HPE 5945 4-slot Switch (JQ076A) Optics

Gigabit SFP transceiver modules

HPE X120 1G SFP RJ45 T Transceiver	JD089B
HPE X120 1G SFP LC SX Transceiver	JD118B
HPE X120 1G SFP LC LX Transceiver	JD119B
HPE X125 1G SFP LC LH40 1310nm Transceiver	JD061A
HPE X120 1G SFP LC LH40 1550nm Transceiver	JD062A
HPE X125 1G SFP LC LH70 Transceiver	JD063B

NOTE: 1G transceivers are supported on the SFP+ ports, but not SFP28 ports. Only management Ethernet ports support the HPE X120 1G SFP RJ45 T Transceiver module (JD089B).

100-Megabit SFP transceiver modules

HPE X115 100M SFP LC FX Transceiver	JD102B
HPE X110 100M SFP LC LX Transceiver	JD120B
HPE X110 100M SFP LC LH40 Transceiver	JD090A
HPE X130 10G SFP+ LC LR Transceiver	JD094B

NOTE: These are only supported on the management SFP ports

10-Gigabit SFP+ modules and cables

10-Gigabit SFP+ transceiver modules available for the SFP+ ports and SFP28 ports

HPE X130 10G SFP+ LC SR Transceiver	JD092B
HPE X130 10G SFP+ LC LR Transceiver	JD094B

10-Gigabit SFP+ fiber cables available for the SFP+ ports and SFP28 ports

HPE X2A0 10G SFP+ to SFP+ 7m Active Optical Cable	JL290A
HPE X2A0 10G SFP+ to SFP+ 10m Active Optical Cable	JL291A
HPE X2A0 10G SFP+ to SFP+ 20m Active Optical Cable	JL292A

10-Gigabit SFP+ copper cables available for the SFP+ ports and SFP28 ports

Accessories

HPE FlexNetwork X240 10G SFP+ to SFP+ 0.65m Direct Attach Copper Cable   JD095C
HPE FlexNetwork X240 10G SFP+ to SFP+ 1.2m Direct Attach Copper Cable   JD096C
HPE FlexNetwork X240 10G SFP+ to SFP+ 3m Direct Attach Copper Cable   JD097C
HPE FlexNetwork X240 10G SFP+ to SFP+ 5m Direct Attach Copper Cable   JG081C

25-Gigabit SFP28 modules and cables

SFP28 transceiver modules available for the SFP28 ports
HPE X190 25G SFP28 LC SR 100m MM Transceiver   JL293A

SFP28 copper cables available for the SFP28 ports
HPE X240 25G SFP28 to SFP28 1m Direct Attach Copper Cable   JL294A
HPE X240 25G SFP28 to SFP28 3m Direct Attach Copper Cable   JL295A
HPE X240 25G SFP28 to SFP28 5m Direct Attach Copper Cable   JL296A

40-Gigabit QSFP+ modules and cables

QSFP+ transceiver modules available for the QSFP+ and QSFP28 ports
HPE X140 40G QSFP+ MPO SR4 Transceiver   JG325B
HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver   JG709A
HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver   JL251A
HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver   JG661A
HPE X140 40G QSFP+ LC LR4L 2km SM Transceiver   JL286A

QSFP+ fiber cables available for the QSFP+ and QSFP28 ports
HPE X2A0 40G QSFP+ to QSFP+ 7m Active Optical Cable   JL287A
HPE X2A0 40G QSFP+ to QSFP+ 10m Active Optical Cable   JL288A
HPE X2A0 40G QSFP+ to QSFP+ 20m Active Optical Cable   JL289A

QSFP+ copper cables available for the QSFP+ and QSFP28 ports
HPE FlexNetwork X240 40G QSFP+ QSFP+ 1m Direct Attach Copper Cable   JG326A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 3m Direct Attach Copper Cable   JG327A
HPE FlexNetwork X240 40G QSFP+ QSFP+ 5m Direct Attach Copper Cable   JG328A

QSFP+ to 4 x SFP+ copper cables available for the QSFP+ and QSFP28 ports
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable   JG329A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable   JG330A
HPE FlexNetwork X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable   JG331A

100-Gigabit QSFP28 modules and cables

QSFP28 transceiver modules available for the QSFP28 ports
HPE X150 100G QSFP28 MPO SR4 100m MM Transceiver   JL274A
HPE X150 100G QSFP28 MPO PSM4 500m SM Transceiver   JH420A
HPE X150 100G QSFP28 LC LR4 10km SM Transceiver   JL275A
HPE X150 100G QSFP28 CWDM4 2km SM Transceiver   JH673A

QSFP28 fiber cables available for the QSFP28 ports
HPE X2A0 100G QSFP28 to QSFP28 7m Active Optical Cable   JL276A
HPE X2A0 100G QSFP28 to QSFP28 10m Active Optical Cable   JL277A
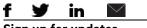
Accessories

HPE X2A0 100G QSFP28 to QSFP28 20m Active Optical Cable   JL278A

QSFP28 copper cables available for the QSFP28 ports
HPE X240 100G QSFP28 to QSFP28 1m Direct Attach Copper Cable   JL271A
HPE X240 100G QSFP28 to QSFP28 3m Direct Attach Copper Cable   JL272A
HPE X240 100G QSFP28 to QSFP28 5m Direct Attach Copper Cable   JL273A

QSFP28 to SFP28 copper cables available for the QSFP28 ports
HPE X240 QSFP28 4xSFP28 1m Direct Attach Copper Cable   JL282A
HPE X240 QSFP28 4xSFP28 3m Direct Attach Copper Cable   JL283A
HPE X240 QSFP28 4xSFP28 5m Direct Attach Copper Cable   JL284A

Summary of Changes

Date	Version History	Action	Description of Change
06-Aug-2018	Version 1	Creation	Document creation

Summary of Changes

To learn more, visit**: http://www.hpe/networking**

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