Overview

HPE FlexFabric 5950 Switch Series

The HPE FlexFabric 5950 Switch Series is a family of high-density, ultra-low-latency, top-of-rack (ToR) switches that is part of the Hewlett Packard Enterprise (HPE) FlexNetwork architecture's HPE FlexFabric solution.

Ideally suited for deployment at the aggregation or server access layer of large enterprise data centers, the HPE 5950 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 now require spine and ToR switch innovations that will meet their needs for higher-performance server connectivity, convergence of Ethernet and storage traffic, the capability to handle virtual environments, and ultra-low-latency all in a single device- the HPE FlexFabric 5950 Switch Series.



HPE FlexFabric 5950 Switch Series

Models

HPE FlexFabric 5950 32QSFP28 Switch	JH321A

Key features

- Cut-through with ultra-low-latency and wire speed
- VXLAN VTEP OVSDB support for virtualized environments
- High-density 100GbE/40GbE/25GbE/10GbE spine/ToR connectivity
- IPv6 support with full L2 and L3 features
- HPE FlexFabric Network Analytics solution capability for real time microburst detection

Standard Features

Data center optimized

- **Flexible high port density**
  the HPE FlexFabric 5950 Switch Series enables scaling of the server edge with 100GbE, 40GbE, 25GbE and 10GbE spine and ToR deployments to new heights with flexible form factor options.
- **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 wire-speed packet forwarding
- **Higher scalability**
  Hewlett Packard Enterprise (HPE) Intelligent Resilient Fabric (IRF) technology simplifies the architecture of server access networks; up to ten HPE 5950 switches can be combined to deliver

unmatched scalability of virtualized access layer switches and flatter two-tier networks using 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 like hitless software upgrades with IRF-based 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**
  provide 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 Enhanced Transmission Selection (ETS), Explicit Congestion Notification (ECN) for converged FCoE, iSCSI and RoCE environments.
- **Jumbo frames**
  with frame sizes of up to 9,416 bytes on 100GbE ports, allows high-performance remote backup and disaster-recovery services to be enabled
- **VXLAN hardware support**
  VXLAN Layer 2 gateway support for up to 4k tunnels
- **Dynamic VXLAN configuration**
  OVSDB support for dynamic VXLAN configuration

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

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Convergence

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

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Quality of Service (QoS)

Powerful QoS features

- **Flexible queue scheduling**

including Strict Priority (SP), WRR, WDRR, WFQ, SP+WRR, SP+WDRR, SP+WFQ, Configurable Buffer, Time range, Queue Shaping, CAR with 8kbps granularity.

- **Packet filtering and remarking:**

packet filtering at L2 (Layer 2) through L4 (Layer 4); flow classification based on source MAC address, destination MAC address, source IP (IPv4/IPv6) address, destination IP (IPv4/IPv6) address, port, protocol, and VLAN.

Layer 3 routing

- **Virtual Router Redundancy Protocol (VRRP) and VRRP Extended**
  allow 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

- **Layer 3 IPv4 routing**
  provides routing of IPv4 at media speed; supports static routes, RIP and RIPv2, OSPF, BGP, and IS-IS
- **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
- **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
- **Intermediate system to intermediate system (IS-IS)**
  uses a path vector Interior Gateway Protocol (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, 6to4, 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

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 provides a fast, resilient environment that is ideal for the data center
- **Spanning Tree Protocol (STP)**
  supports STP (IEEE 802.1D), Rapid STP (RSTP, IEEE 802.1w), and Multiple STP (MSTP, IEEE 802.1s)
- **VLAN support**
  provides support for 4,096 VLANs based on port
- **IGMP support**

provides support for IGMP Snooping, Fast-Leave, and Group-Policy; IPv6 IGMP Snooping provides Layer 2 optimization of multicast traffic
- **DHCP support at Layer 2**
  provides full DHCP Snooping support for DHCP Snooping Option 82, DHCP Relay Option 82, DHCP Snooping Trust, and DHCP Snooping Item Backup

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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
- **Dynamic Host Configuration Protocol (DHCP)**
  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

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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**
  facilitate 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 command-line interface (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 (CLI)**
  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 secure shell (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 Intelligent Management Center (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

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Security

- **Access control lists (ACLs)**
  provide IP Layer 3 filtering based on source/destination IP address/subnet and source/destination TCP/UDP port number
- **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

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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**

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
- **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 wire-speed traffic accounting and monitoring
- **SNMP v1, v2c and v3**
  facilitate 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 command-line interface (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 In Services Software Upgrade (ISSU) and hitless patching of the modular operating system
- **NTP Support**
  synchronize timekeeping among distributed time servers and clients; Support for Network Time Protocol (NTP).

Resiliency and high availability

- **Hewlett Packard Enterprise (HPE) Intelligent Resilient Fabric (IRF) technology**
  enables an HPE FlexFabric to deliver resilient, scalable, and secured data center networks for physical and virtualized environments; groups up to ten HPE 5950 switches in an 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
- **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 dynamically back each other up 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
- **Ultrafast protocol convergence (< 50 ms) 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

Configuration Information

BTO Models

Standard Switch Enclosures

Rule #	Description	SKU
1, 2, 3, 5, 6, 7, 8, 9, 10,	HPE FlexFabric 5950 32QSFP28 Switch • 32 40G\100G QSFP+\QSFP28 ports (min=0 \ max=32) • 2 1\10G SFP+ ports (min=0 \ max=2) • 1 100M\1G SFP management ports (min=0 \ max 1) • Must select min 1 Power Supply • Must select min 6 Fan Trays • 1U - Height	JH321A

Configuration Rules

1	The following 40G Transceivers install into this switch:

	HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A
	HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver	JL251A
	HPE X140 40G QSFP+ MPO SR4 Transceiver	JG325B
	HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
	HPE X140 40G QSFP+ LC LR4L 2km SM Transceiver	JL286A
	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
	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
2	The following 10G Transceivers install into this Switch:	
	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
3	The following QSFP28 Transceivers install into this switch:	
	HPE X150 100G QSFP28 MPO SR4 100m MM Transceiver	JL274A
	HPE X150 100G QSFP28 LC LR4 10km SM Transceiver	JL275A
	HPE X150 100G QSFP28 MPO PSM4 500m SM Transceiver	JH420A
	HPE X150 100G QSFP28 CWDM4 2km SM Transceiver	JH673A
	HPE X150 100G QSFP28 LC SWDM4 100m MM Transceiver	JH419A
	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 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 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
5	The following Transceivers install into this switch's SFP+ Ports: (Use BTO only when adding to switch)	
	HPE X130 10G SFP+ LC SR Transceiver	JD092B
	HPE X130 10G SFP+ LC LR Transceiver	JD094B
	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
6	The following Transceivers install into this switch's Management (SFP) Ports: (Use BTO only when adding to switch)	
	HPE X120 1G SFP LC SX Transceiver	JD118B
	HPE X120 1G SFP LC LX Transceiver	JD119B
	HPE X120 1G SFP RJ45 T Transceiver	JD089B
	HPE X120 1G SFP LC LH100 Transceiver	JD103A
7	The following Transceivers install into this switch's Management (SFP) Ports: (Use BTO only when adding to switch)	

	HPE X115 100M SFP LC FX Transceiver	JD102B
	HPE X110 100M SFP LC LX Transceiver	JD120B
8	The following 40G Transceiver installs into this switch's QSFP+ Ports with PHY: (Use BTO only when adding to switch)	
	HPE X140 40G QSFP+ LC ER4 40km SM Transceiver	JL306A
9	The following 10G Transceiver installs into this switch's SFP+ Ports: (Use BTO only when adding to switch)	
	HPE X130 10G SFP+ LC ER 40km Transceiver	JG234A
10	The following Transceivers install into this switch's SFP+ Ports: (Use BTO only when adding to switch)	
	HPE X130 10G SFP+ LC LH 80km Transceiver	JG915A

Notes: OCA Only Model Selection Form -
HPE Offering > DataCenter Networking > FlexFabric Switches - Access:
5950 Switch Series

Rack Level Integration CTO Models

CTO Switch Chassis

Rule #	Description	SKU
1, 2, 3, 5, 6, 7, 8, 9, 12	HPE FlexFabric 5950 32QSFP28 Switch • 32 40G\100G QSFP+\QSFP28 ports (min=0 \ max=32) • 2 1\10G SFP+ ports (min=0 \ max=2) • 1 100M\1G SFP management ports (min=0 \ max 1) • Must select min 1 Power Supply • Must select min 6 Fan Trays • 1U - Height	JH321A
	Configuration Rules	
1	The following 40G Transceivers install into this switch:	
	HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A
	HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver	JL251A
	HPE X140 40G QSFP+ MPO SR4 Transceiver	JG325B
	HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
	HPE X140 40G QSFP+ LC LR4L 2km SM Transceiver	JL286A
	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
	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
2	The following 10G Transceivers install into this Switch:	
	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
3	The following QSFP28 Transceivers install into this switch:	
	HPE X150 100G QSFP28 MPO SR4 100m MM Transceiver	JL274A
	HPE X150 100G QSFP28 LC LR4 10km SM Transceiver	JL275A

	HPE X150 100G QSFP28 MPO PSM4 500m SM Transceiver	JH420A
	HPE X150 100G QSFP28 CWDM4 2km SM Transceiver	JH673A
	HPE X150 100G QSFP28 LC SWDM4 100m MM Transceiver	JH419A
	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 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 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
5	The following Transceivers install into this switch's SFP+ Ports: (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 X130 10G SFP+ LC ER 40km Transceiver	JG234A
	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
6	The following are supported in fiber mgmt ports (if applicable) and front facing SFP+/SFP28 interfaces: Transceivers install into this switch's (SFP+) Ports: (Use BTO only when adding to switch)	
	HPE X120 1G SFP LC SX Transceiver	JD118B
	HPE X120 1G SFP LC LX Transceiver	JD119B
	HPE X120 1G SFP RJ45 T Transceiver	JD089B
	HPE X120 1G SFP LC LH100 Transceiver	JD103A
7	The following Transceivers install into this switch's Management (SFP) Ports: (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
8	The following 40G Transceiver installs into this switch's QSFP+ Ports with PHY: (Use #0D1 or #B01 if switch is CTO) - if applicable	
	HPE X140 40G QSFP+ LC ER4 40km SM Transceiver	JL306A
9	The following 10G Transceiver installs into this switch's SFP+ Ports: (Use #0D1 or #B01 if switch is CTO) - if applicable	
	HPE X130 10G SFP+ LC ER 40km Transceiver	JG234A
12	The following Transceivers install into this switch's SFP+ Ports: Use #0D1 or #B01 if switch is CTO) - if applicable	
	HPE X130 10G SFP+ LC LH 80km Transceiver	JG915A
Notes:	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

Rule #	Description	SKU
3, 8, 11	HPE 5950 16-port QSFP+ Module • 16 40G QSFP+ ports (min=0 \ max=16)	JH405A
2, 8, 9, 11,	HPE 5950 8-port QSFP28 Module	JH406A

	• 8 40G/100G QSFP+/QSFP28 ports (min=0 \ max=8)	:
1, 2, 7, 8, 9, 10, 11, 12, 15	HPE FlexFabric 5950 24-port SFP28 and 2-port QSFP28 Module	JH450A
	• 24 1G/10G/25G SFP/SFP+/SFP28 ports (min=0 \ max=24) • 2 40G/100G QSFP+/QSFP28 ports (min=0 \ max=2)	
1, 2, 7, 8, 11, 12, 15	HPE 5930 24-port SFP+ and 2-port QSFP+ Module	JH180A
	• 24 1G/10G SFP/SFP+ ports (min=0 \ max=24) • 2 40G QSFP+ ports (min=0 \ max=2)	
2, 9, 11	HPE FlexFabric 5950 8-port QSFP28 MACsec Module	JH957A
	• 8 40G/100G QSFP+/QSFP28 ports (min=0 \ max=8)	
1, 2, 7, 8, 11, 12, 15	HPE 5930 24-port SFP+ and 2-port QSFP+ with MACsec Module	JH181A
	• 24 1G/10G SFP/SFP+ ports (min=0 \ max=24) • 2 40G QSFP+ ports (min=0 \ max=2)	
2, 8, 11	HPE 5930 24-port 10GBASE-T and 2-port QSFP+ with MACsec Module	JH182A
	• 24 1/10GBase-T ports • 2 40G QSFP+ ports (min=0 \ max=2)	
2, 8, 11	HPE 5930 8-port QSFP+ Module	JH183A
	• 8 40G QSFP+ ports (min=0 \ max=8)	
1, 2, 7, 8, 11, 12, 15, 17	HPE 5930 24-port Converged Port and 2-port QSFP+ Module	JH184A
	• 24 Converged 1G/10G SFP/SFP+ 8G FC ports (min=0 \ max=24) • 2 40G QSFP+ ports (min=0 \ max=2)	

Configuration Rules

Rule #	Description	SKU
1	The following Transceivers install into this Module's SFP+ Ports: (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 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
2	The following 40G Transceivers install into this Module's QSFP+ Ports: (Use #0D1 or #B01 if switch is CTO) - if applicable	
	HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A
	HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver	JL251A
	HPE X140 40G QSFP+ MPO SR4 Transceiver	JG325B
	HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
	HPE X140 40G QSFP+ LC LR4L 2km SM Transceiver	JL286A
	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

3	The following 40G Transceivers install into this Module's QSFP+ Ports: (Use #0D1 or #B01 if switch is CTO) - if applicable	
	HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A
	HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver	JL251A
	HPE X140 40G QSFP+ MPO SR4 Transceiver	JG325B
	HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
	HPE X140 40G QSFP+ LC LR4L 2km SM Transceiver	JL286A
	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

Rule #	Description	SKU
7	The following 10G Transceivers install into this Module's SFP+ Ports: (Use #0D1 or #B01 if switch is CTO) - if applicable	
	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
8	The following 40G Transceivers install into this Module's QSFP+ Ports: (Use #0D1 or #B01 if switch is CTO) - if applicable	
	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
9	The following 100G Transceivers install into this Module's QSFP28 Ports: (Use #0D1 or #B01 if switch is CTO) - if applicable	
	HPE X150 100G QSFP28 MPO SR4 100m MM Transceiver	JL274A
	HPE X150 100G QSFP28 LC LR4 10km SM Transceiver	JL275A
	HPE X150 100G QSFP28 MPO PSM4 500m SM Transceiver	JH420A
	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
10	The following SFP28 Transceivers install into this Module's SFP28 Ports: (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
	HPE X2A0 25G SFP28 to SFP28 3m Active Optical Cable	JH955A
	HPE X2A0 25G SFP28 to SFP28 5m Active Optical Cable	JH956A
	HPE X2A0 25G SFP28 to SFP28 7m Active Optical Cable	JL297A
	HPE X2A0 25G SFP28 to SFP28 10m Active Optical Cable	JL298A
	HPE X2A0 25G SFP28 to SFP28 20m Active Optical Cable	JL299A
11	The following 40G Transceiver installs into this switch's QSFP+ Ports with PHY: (Use #0D1 or #B01 if switch is CTO) - if applicable	
	HPE X140 40G QSFP+ LC ER4 40km SM Transceiver	JL306A
12	The following 10G Transceiver installs into this Module's SFP+ Ports: (Use #0D1 or #B01 if switch is CTO) - if applicable	

	HPE X130 10G SFP+ LC LH 80km Transceiver	JG915A
	HPE X130 10G SFP+ LC ER 40km Transceiver	JG234A
15	The following Transceivers install into this Module's (SFP28) Ports: (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 X120 1G SFP RJ45 T Transceiver	JD089B
	HPE X120 1G SFP LC LH100 Transceiver	JD103A
17	The following FC Transceivers install into this Module's SFP+/FC Ports: (Use #0D1 or BTO if switch is CTO) - if applicable	
	HPE H-series 8Gb Short Wave Fibre Channel SFP+ 1 Pack Transceiver	AJ718A

Transceivers

Remarks	Description	SKU
	SFP Transceivers	
	HPE X115 100M SFP LC FX Transceiver	JD102B
	HPE X110 100M SFP LC LX Transceiver	JD120B
	HPE X120 1G SFP LC SX Transceiver	JD118B
	HPE X120 1G SFP LC LX Transceiver	JD119B
	HPE X120 1G SFP RJ45 T Transceiver	JD089B
	HPE X120 1G SFP LC LH100 Transceiver	JD103A
	SFP+ Transceivers	
	HPE X130 10G SFP+ LC SR Transceiver	JD092B
	HPE X130 10G SFP+ LC LR Transceiver	JD094B
	HPE X130 10G SFP+ LC ER 40km Transceiver	JG234A
	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
	FC SFP+ Transceivers	
	HPE H-series 8Gb Short Wave Fibre Channel SFP+ 1 Pack Transceiver	AJ718A
	SFP28 Transceivers	
	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
	HPE X2A0 25G SFP28 to SFP28 3m Active Optical Cable	JH955A
	HPE X2A0 25G SFP28 to SFP28 5m Active Optical Cable	JH956A
	HPE X2A0 25G SFP28 to SFP28 7m Active Optical Cable	JL297A
	HPE X2A0 25G SFP28 to SFP28 10m Active Optical Cable	JL298A
	HPE X2A0 25G SFP28 to SFP28 20m Active Optical Cable	JL299A
	QSFP+ Transceivers	
	HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A
	HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver	JL251A
	HPE X140 40G QSFP+ MPO SR4 Transceiver	JG325B
	HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
	HPE X140 40G QSFP+ LC LR4L 2km SM Transceiver	JL286A
	HPE X140 40G QSFP+ LC ER4 40km SM Transceiver	JL306A

Notes:	Supported on PHY switch 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
	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
	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
	QSFP28 Transceivers	
	HPE X150 100G QSFP28 MPO SR4 100m MM Transceiver	JL274A
	HPE X150 100G QSFP28 LC LR4 10km SM Transceiver	JL275A
	HPE X150 100G QSFP28 MPO PSM4 500m SM Transceiver	JH420A
	HPE X150 100G QSFP28 CWDM4 2km SM Transceiver	JH673A
	HPE X150 100G QSFP28 LC SWDM4 100m MM Transceiver	JH419A
	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 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 QSFP28 4xSFP28 1m Direct Attach Copper Cable	JL282A
	HPE X240 QSFP28 4xSFP28 3m Direct Attach Copper Cable	JL283A

Cables

Rule #	Description	SKU
	Multi-Mode Cables	
	HPE LC to LC Multi-mode OM3 2-Fiber 0.5m 1-Pack Fiber Optic Cable	AJ833A
	HPE LC to LC Multi-mode OM3 2-Fiber 1.0m 1-Pack Fiber Optic Cable	AJ834A
	HPE LC to LC Multi-mode OM3 2-Fiber 2.0m 1-Pack Fiber Optic Cable	AJ835A
	HPE LC to LC Multi-mode OM3 2-Fiber 5.0m 1-Pack Fiber Optic Cable	AJ836A
	HPE LC to LC Multi-mode OM3 2-Fiber 15.0m 1-Pack Fiber Optic Cable	AJ837A
	HPE LC to LC Multi-mode OM3 2-Fiber 30.0m 1-Pack Fiber Optic Cable	AJ838A
	HPE LC to LC Multi-mode OM3 2-Fiber 50.0m 1-Pack Fiber Optic Cable	AJ839A
	HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 1m Cable	QK732A
	HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 2m Cable	QK733A
	HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable	QK734A
	HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable	QK735A
	HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable	QK736A
	HPE Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable	QK737A
	MPO Cables	
	HPE Multi Fiber Push On to 4 x Lucent Connector 5m Cable	K2Q46A
	HPE Multi Fiber Push On to 4 x Lucent Connector 15m Cable	K2Q47A
	HPE Premier Flex MPO/MPO Multi-mode OM4 12 fiber 10m Cable	QK729A
	HPE Premier Flex MPO/MPO Multi-mode OM4 8 fiber 50m Cable	QK731A
	HPE Premier Flex MPO/MPO OM4 100m (12ft) Cable	H6Z30A
	Internal Power Supplies	
	For JH321A System (std 0 // max 2) User Selection (min 1 // max 2) per switch	

1, 2	HPE 58x0AF 650W AC Power Supply • includes 1 x c13, 300w	JC680A
	HPE 58x0AF 650W AC Power Supply PDU Cable NA/JP/TW • C15 PDU Jumper Cord (NA/MX/TW/JP)	JC680A#B2B
	HPE 58x0AF 650W AC Power Supply PDU Cable ROW • C15 PDU Jumper Cord (ROW)	JC680A#B2C
	HPE 58x0AF 650W AC Power Supply US220v • HPE 2.3M C13 to NEMA L6-20P Power Cord(J9936A)	JC680A#B2E
	HPE A58x0AF 650W AC Power Supply • No Localized Power Cord Selected	JC680A#AC3
1	HPE FlexFabric Switch 650W 48V Hot Plug NEBS-compliant DC Power Supply • includes 1 x c13, 300w	JH336A
	Configuration Rules	
1	If 2 power supplies are selected they must be the same SKU number.	
2	Localization (Wall Power Cord) required on orders without #B2B, #B2C (PDU Power Cord) . (See Localization Menu) **Notes:** When Switches/Routers are Factory Racked, Then #B2B, or #B2C should be the Defaulted Power Cable option on the Switches/Routers.	
Notes:	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) High Volt Switch/Router/Power Supply to Wall Power Cord - #B2E Option. (Offered only in North America, Mexico, Taiwan, and Japan) No Localized Power Cord Selected - #AC3 Option	

Switch Options

Rule #	Description	SKU
	Fan Trays For JH321A System (std 0 // max 6) User Selection (min 6 // max 6) per switch	
1, 2	HPE X711 Front (Port Side) to Back (Power Side) Airflow High Volume 2 Fan Tray	JH388A
1, 2	HPE X712 Back (Power Side) to Front (Port Side) Airflow High Volume 2 Fan Tray	JH389A
1	HPE 5930 4-slot Back (Power Side) to Front (Port Side) Airflow Fan Tray	JH185A
1	HPE 5930 4-slot Front (Port Side) to Back (Power Side) Airflow Fan Tray	JH186A
	Configuration Rules	
1	Fan Trays cannot be mixed in the same switch enclosure	
2	This fan tray is only supported on JH321A	
Notes:	If there is any empty space below the switch in a rack when using Back to Front Fan Trays, JG389A and JH185A, the rack will receive an Air Plenum kit that takes up 1U of additional space in the rack. The Air Plenum kit is not required on fully configured racks. This only applies for CTO Rack Level Integration. The Air Plenum Kit is a non-saleable SKU, and is brought in automatically for CTO Factory Rack Level Integration.	

Related Options

HPE FlexFabric 5950 32QSFP28 Switch (JH321A) accessories

Remarks	Description	SKU
	Transceivers	
	HPE X115 100M SFP LC FX Transceiver	JD102B
	HPE X110 100M SFP LC LX Transceiver	JD120B
	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 X120 1G SFP RJ45 T Transceiver	JD089B
	HPE X120 1G SFP LC SX Transceiver	JD118B
	HPE X120 1G SFP LC LX Transceiver	JD119B
	HPE X130 10G SFP+ LC SR Transceiver	JD092B
	HPE X130 10G SFP+ LC LR Transceiver	JD094B
	HPE X130 10G SFP+ LC ER 40km Transceiver	JG234A
	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
	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 X140 40G QSFP+ MPO SR4 Transceiver	JG325B
	HPE X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
	HPE X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A
	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
	HPE X140 40G QSFP+ LC BiDi 100m MM Transceiver	JL251A
	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 X140 40G QSFP+ LC ER4 40km SM Transceiver	JL306A
	HPE X150 100G QSFP28 MPO SR4 100m MM Transceiver	JL274A
	HPE X150 100G QSFP28 LC LR4 10km SM Transceiver	JL275A
	HPE X150 100G QSFP28 LC SWDM4 100m MM Transceiver	JH419A
	HPE X150 100G QSFP28 MPO PSM4 500m SM Transceiver	JH420A
	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 X150 100G QSFP28 CWDM4 2km SM Transceiver	JH673A

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

Technical Specifications

HPE FlexFabric 5950 32QSFP28 Switch (JH321A)		
I/O ports and slots	32 QSFP28 100GbE ports	
	2 SFP+ 1/10GbE ports	
Additional ports and slots	1 RJ-45 serial console port	
	1 RJ-45 out-of-band management port	
	1 USB 2.0	
Power supplies	2 power supply slots 1 minimum power supply required (ordered separately)	
Fan tray	6 fan tray slots The customer must order fan trays, as fan trays 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**	17.32(w) x 25.98(d) x 1.72(h) in (44.00 x 54.00 x 4.36 cm)
	Weight	37.48 lb (17 kg) shipping weight
	Full configuration weight	33.07 lb (15 kg)
Memory and processor	1 GB flash; Packet buffer size: 16 MB, 4 GB SDRAM	
Performance	**10 Gbps Latency**	< 1 µs (64-byte packets)
	Throughput	up to 3169 Mpps
	Routing/Switching capacity	3200 Gbps
	Routing table size	128000 entries (IPv4), 64000 entries (IPv6)
	MAC address table size	136000 entries
Environment	**Operating temperature**	32°F to 113°F (0°C to 45°C)
	Operating relative humidity	10% to 95%, noncondensing
	Acoustic	Low-speed fan: 62.8 dB, High-speed fan: 78.2 dB
Electrical characteristics	**Frequency**	50/60 Hz
	Maximum heat dissipation	955/1689 BTU/hr (1007.53/1781.9 kJ/hr)
	Voltage	90 - 264 VAC, rated -40 to -75 VDC, rated (depending on power supply chosen)
	Maximum power rating	495 W
	Idle power	280 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; EN 60825-1 Safety of Laser Products-Part 1; EN 60825-2 Safety of Laser Products-Part 2; IEC 60950-1; CAN/CSA-C22.2 No. 60950-1; Anatel; ULAR; GOST; EN 60950-1/A11; FDA 21 CFR Subchapter J; NOM; ROHS Compliance	
Emissions	VCCI Class A; EN 55022 Class A; ICES-003 Class A; ANSI C63.4 2003; AS/NZS CISPR 22 Class A; EN 61000-3-2:2006; EN 61000-3-3:1995 +A1:2001+A2:2005; EMC Directive 2004/108/EC; FCC (CFR 47, Part 15) Class A; ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED)	

Immunity	**Generic**	ETSI EN 300 386 V1.3.3
	EN	EN 55024:1998+ A1:2001 + A2:2003
	ESD	EN 61000-4-2; IEC 61000-4-2
	Radiated	EN 61000-4-3; IEC 61000-4-3
	EFT/Burst	EN 61000-4-4; IEC 61000-4-4
	Surge	EN 61000-4-5; IEC 61000-4-5
	Conducted	EN 61000-4-6; IEC 61000-4-6
	Power frequency magnetic field	IEC 61000-4-8; EN 61000-4-8
	Voltage dips and interruptions	EN 61000-4-11; IEC 61000-4-11
	Harmonics	EN 61000-3-2, IEC 61000-3-2
	Flicker	EN 61000-3-3, IEC 61000-3-3
Management	IMC - Intelligent Management Center; command-line interface; out-of-band management; SNMP Manager; Telnet; FTP The HPE FlexFabric Network Analytics solution requires the HPE Intelligent Management Center Enterprise or Standard Platform, and IMC Virtual Application Networking Fabric Manager Software	
Notes:	The customer must order a power supply, as the device does not come with one. At least one JC680A is required.	
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 Border Gateway Protocol (BGP)
- RFC 1771 BGPv4
- RFC 1997 BGP Communities Attribute
- RFC 2918 Route Refresh Capability
- RFC 3392 Capabilities Advertisement with BGP-4
- RFC 4271 A Border Gateway Protocol 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

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
- 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

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 internets
- RFC 1253 (OSPF v2)
- RFC 1531 Dynamic Host Configuration Protocol
- 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 Remote Authentication Dial In User Service (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
- RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
- RFC 3413 Simple Network Management Protocol (SNMP) Applications
- RFC 3416 Protocol Operations for SNMP
- RFC 3417 Transport Mappings for the Simple Network Management Protocol (SNMP)
- RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)
- RFC 3768 Virtual Router Redundancy Protocol (VRRP)
- RFC 4250 The Secure Shell (SSH) Protocol Assigned Numbers
- RFC 4251 The Secure Shell (SSH) Protocol Architecture
- RFC 4252 The Secure Shell (SSH) Authentication Protocol
- RFC 4253 The Secure Shell (SSH) Transport Layer Protocol
- RFC 4254 The Secure Shell (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 Secure Shell (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 Network Time Protocol Version 4: Protocol and Algorithms Specification
- RFC2929 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

Network management

- RFC 2580 Conformance Statements for SMIv2
- RFC 3164 BSD syslog Protocol

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)
- RFC 2576 (Coexistence between SNMP V1, V2, V3)
- RFC 2819 RMON
- Multiple Configuration Files
- Multiple Software Images
- SSHv1/SSHv2 Secure Shell
- TACACS/TACACS+

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

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

Security

- RFC 1321 The MD5 Message-Digest Algorithm
- RFC 2818 HTTP Over TLS
- RFC 6192 Partial Support - Protecting the Router Control Plane
- Access Control Lists (ACLs)
- SSHv2 Secure Shell

Summary of Changes

Date	Version History	Action	Description of Change
03-Aug-2020	Version 22	Changed	SKU descriptions were updated.
09-Dec-2019	Version 21	Changed	Configuration Information and Related Options were updated. Obsolete SKUs were removed. New SKUs were added.
03-Sep-2019	Version 20	Changed	Configuration Information and Related Options were updated. Obsolete SKUs were removed. New SKUs were added.
06-May-2019	Version 19	Changed	SKU JL250A was removed. Obsolete SKUs were removed.
04-Feb-2019	Version 18	Changed	Removed Box Level CTO SSP Section and logic from menu and configurators
16-Nov-2018	Version 17	Changed	Technical Specifications updated
01-Oct-2018	Version 16	Changed	Recommended and Extended markings removed from the document.
04-Sep-2018	Version 15	Changed	Configuration section updated
06-Aug-2018	Version 14	Changed	Configuration section updated
07-May-2018	Version 13	Added	SKU added: JH419A
02-Apr-2018	Version 12	Changed	Configuration section updated
05-Feb-2018	Version 11	Changed	Changes made on Features and benefits, Configuration and Technical Specifications
03-Jul-2017	Version 10	Changed	Configuration section updated
05-Jun-2017	Version 9	Changed	SKU added: JH673A Features and benefits updated
08-May-2017	Version 8	Changed	Edits made on Configuration section
06-Mar-2017	Version 7	Changed	SKUs added: JL437A; JL438A; JL439A Configuration section updated
09-Jan-2017	Version 6	Added	SKUs added: JL293A, JH420A
05-Dec-2016	Version 5	Added	Models added: JH402A; JH404ASKUs added: JH405A; JH406A; JH450A; JL294A; JL295A
05-Sep-2016	Version 4	Changed	SKUs added: JL273A Configuration section updated
01-Aug-2016	Version 3	Added	SKUs added: JL271A, JL272A, JL274A, JL275A, JL276A, JL277A, JL278A, JL287A, JL288A, JL289A, JL290A, JL291A, JL292A, JL250A, JL286A
10-Jun-2016	Version 2	Changed	Minor edits on Technical Specifications
06-Jun-2016	Version 1	New	New QuickSpecs

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