Overview

Models

HP FlexFabric 5930-32QSFP+ Switch	JG726A

Key features

- Cut-through with ultra-low-latency and wire speed
- VXLAN and NVGRE hardware support for virtualized environments
- High-denisty 40GbE spine/ToR connectivity
- IPv6 support with full L2 and L3 features
- Convergence-ready with DCB, FCoE, and TRILL

Product overview

The HP FlexFabric 5930 Switch Series is a family of high-density, ultra-low-latency, top-of-rack (ToR) switches that is part of the HP FlexNetwork architecture's HP FlexFabric solution.

Ideally suited for deployment at the aggregation or server access layer of large enterprise data centers, the HP 5930 Switch Series is also powerful enough for deployment at the data center 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 HP FlexFabric 5930 Switch Series.

Features and benefits

Quality of Service (QoS)

- **Powerful QoS features**
  - **Flexible classification**
    creates traffic classes based on access control lists (ACLs), IEEE 802.1p precedence, IP, and DSCP or Type of Service (ToS) precedence; supports filter, redirect, mirror, remark, and logging
  - **Feature support**
    provides support for Strict Priority Queuing (SP), Weighted Fair Queuing (WFQ), Weighted Deficit Round Robin (WDRR), SP+WDRR together, configurable buffers, Explicit Congestion Notification (ECN), and Weighted Random Early Detection (WRED)

Data center optimized

- **Flexible high port density**
  the HP FlexFabric 5930 Switch Series enables scaling of the server edge with 40GbE spine and ToR deployments to new heights with high-density 32-port solutions delivered in a 1RU design. Each 40 GbE QSFP+ port can also be configured as four 10GbE ports by using a 40-GbE-to-10GbE splitter cable.
- **High-performance switching**
  cut-through and nonblocking architecture delivers low latency (~1 microsecond for 10GbE) for very demanding enterprise applications; the switch delivers high-performance switching capacity and wire-speed packet forwarding
- **Higher scalability**
  HP Intelligent Resilient Framework (IRF) technology simplifies the architecture of server access networks; up to four HP 5930

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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 single-chassis ISSU
- **TRILL and EVB/VEPA**
  TRansparent Interconnection of Lots of Links (TRILL) is supported to increase the scale of enterprise data centers; Edge Virtual Bridging with Virtual Ethernet Port Aggregator (EVB/VEPA) provides connectivity into the virtual environment for a data center-ready environment
- **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**
  1+1 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), and IEEE 802.1Qaz Enhanced Transmission Selection (ETS) for converged applications
- **FCoE support**
  provides support for Fibre Channel over Ethernet (FCoE), including expansion, fabric, trunk VF and N ports, and aggregation of E-port and N-port virtualization; fabric services such as name server, registered state change notification, and login services; per-VSAN fabric services, FSPF, soft and hard zoning, Fibre Channel traceroute, ping, debugging, and FIP snooping
- **Jumbo frames**
  with frame sizes of up to 10,000 bytes on Gigabit Ethernet and 10-Gigabit ports, allows high-performance remote backup and disaster-recovery services to be enabled
- **VXLAN and NVGRE hardware support**
  supports, in hardware, VXLAN and NVGRE overlay technologies

Manageability

- **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

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visibility is provided with sFlow and SNMP v1/v2/v3, and is fully supported in HP Intelligent Management Center (IMC)

- **ISSU and hot patching**
  provides hitless software upgrades with single-unit In Services Software Upgrade (ISSU) and hitless patching of the modular operating system
- **Autoconfiguration**
  provides automatic configuration via DHCP autoconfiguration
- **Network Time Protocol (NTP) and Secure Network Time Protocol (SNTP)**
  synchronize timekeeping among distributed time servers and clients; keep consistent timekeeping among all clock-dependent devices within the network so that the devices can provide diverse applications based on the consistent time

Resiliency and high availability

- **HP Intelligent Resilient Framework (IRF) technology**
  enables an HP FlexFabric to deliver resilient, scalable, and secured data center networks for physical and virtualized environments; groups up to four HP 5930 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

Layer 2 switching

- **MAC-based VLAN**
  provides granular control and security; uses RADIUS to map a MAC address/user to specific VLANs
- **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 128 groups of 16 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, MAC address, IPv4 subnet, protocol, and guest VLAN; supports VLAN mapping

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- **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

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

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

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- **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

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
- **Low maximum power consumption**
  uses just 409W of AC or 399W of DC power

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
- **Network Time Protocol (NTP)**
  synchronizes timekeeping among distributed time servers and clients; keeps timekeeping consistent among all clock-dependent devices within the network so that the devices can provide diverse applications based on the consistent time
- **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

Overview

- **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 isibility
- **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**
  HP 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

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

Convergence

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

Warranty and support

- **1-year warranty**
  advance hardware replacement with 10-calendar-day delivery (available in most countries)

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- **Electronic and telephone support**
  limited electronic and business-hours telephone support is available from HP for the entire warranty period; to reach our support centers, refer to **www.hp.com/networking/contact-support**; for details on the duration of support provided with your product purchase, refer to **www.hp.com/networking/warrantysummary**
- **Software releases**
  to find software for your product, refer to **www.hp.com/networking/support**; for details on the software releases available with your product purchase, refer to **www.hp.com/networking/warranty**

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

HP FF 5930-32QSFP+ Switch — JG726A
- 32 QSFP+ ports (min=0 \ max=32) — See Configuration Note:1
- Must select min 1 Power Supply
- Must select min 2 Fan Tray
- 1U - Height

Configuration Rules

Note 1 — The following 40G Transceivers install into this switch:

HP X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A
HP X140 40G QSFP+ MPO SR4 Transceiver	JG325A
HP X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
HP X240 40G QSFP+ QSFP+ 1m Direct Attach Copper Cable	JG326A
HP X240 40G QSFP+ QSFP+ 3m Direct Attach Copper Cable	JG327A
HP X240 40G QSFP+ QSFP+ 5m Direct Attach Copper Cable	JG328A
HP X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable	JG329A
HP X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable	JG330A
HP X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable	JG331A

Box Level Integration CTO Models

CTO Solution Sku

HP 59xx CTO Switch Solution — JG505A
- SSP trigger sku

CTO Switch Chassis

HP FF 5930-32QSFP+ Switch — JG726A
- 32 QSFP+ ports (min=0 \ max=32) — See Configuration Note:1, 5
- Must select min 1 Power Supply
- Must select min 2 Fan Tray
- 1U - Height

Configuration Rules

Note 1 — The following 40G Transceivers install into this switch: (Use #0D1 or #B01 quoted to switch if switch is CTO) - if applicable

HP X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A

Configuration

	HP X140 40G QSFP+ MPO SR4 Transceiver	JG325A
	HP X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
	HP X240 40G QSFP+ QSFP+ 1m Direct Attach Copper Cable	JG326A
	HP X240 40G QSFP+ QSFP+ 3m Direct Attach Copper Cable	JG327A
	HP X240 40G QSFP+ QSFP+ 5m Direct Attach Copper Cable	JG328A
	HP X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable	JG329A
	HP X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable	JG330A
	HP X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable	JG331A
Note 5	If the Switch Chassis is to be Box Level Factory Integrated (CTO), Then the #0D1 is required on the Switch Chassis and integrated to the JG505A - HP 59xx CTO Switch Solution. (Min 1/Max 1 Router per SSP)	

Rack Level Integration CTO Models

CTO Switch Chassis

HP FF 5930-32QSFP+ Switch — JG726A

- 32 QSFP+ ports (min=0 \ max=32)
- Must select min 1 Power Supply
- Must select min 2 Fan Tray
- 1U - Height

See Configuration Note:1, 11

Configuration Rules

Note 1	The following 40G Transceivers install into this switch: (Use #0D1 or #B01 quoted to switch if switch is CTO) - if applicable	
	HP X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver	JG661A
	HP X140 40G QSFP+ MPO SR4 Transceiver	JG325A
	HP X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	JG709A
	HP X240 40G QSFP+ QSFP+ 1m Direct Attach Copper Cable	JG326A
	HP X240 40G QSFP+ QSFP+ 3m Direct Attach Copper Cable	JG327A
	HP X240 40G QSFP+ QSFP+ 5m Direct Attach Copper Cable	JG328A
	HP X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable	JG329A
	HP X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable	JG330A
	HP X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable	JG331A
Note 11	If HP CTO Switch Chassis is selected for Rack Level Integration, Then the Switch needs to integrate (with #0D1) to the Rack.	

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

Transceivers

QSFP+ Transceivers

Configuration

HP X140 40G QSFP+ LC LR4 SM XCVR	JG661A
HP X140 40G QSFP+ MPO SR4 XCVR	JG325B
HP X140 40G QSFP+ CSR4 300m XCVR	JG709A
HP X240 40G QSFP+ QSFP+ 1m DAC Cable	JG326A#B01
HP X240 40G QSFP+ QSFP+ 3m DAC Cable	JG327A#B01
HP X240 40G QSFP+ QSFP+ 5m DAC Cable	JG328A#B01
HP X240 QSFP+ 4x10G SFP+ 1m DAC Cable	JG329A#B01
HP X240 QSFP+ 4x10G SFP+ 3m DAC Cable	JG330A#B01
HP X240 QSFP+ 4x10G SFP+ 5m DAC Cable	JG331A#B01

Internal Power Supplies

System (std 0 // max 2) User Selection (min 1 // max 2) per switch

HP 58x0AF 650W AC Power Supply • includes 1 x c13, 300w	JC680A See Configuration Note:1, 2
PDU Cable NA/MX/TW/JP • C15 PDU Jumper Cord (NA/MX/TW/JP)	JC680A#B2B
PDU Cable ROW • C15 PDU Jumper Cord (ROW)	JC680A#B2C
HP 58x0AF 650W DC Power Supply	JC681A See Configuration Note:1

Configuration Rules:

Note 1	If 2 power supplies are selected they must be the same Sku number.
Note 2	Localization (Wall Power Cord) required on orders without #B2B, #B2C (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.
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)

Switch Enclosure Options

Fan Trays

Configuration

System (std 0 // max 2) User Selection (min 2 // max 2) per switch

HP X711 Frt(prt)-Bck(pwr) HV Fan TrayHP A58x0AF Bck(pwr)-Frt(ports) Fan Tray	JG552A See Configuration Note:1, 2
HP X712 Bck(pwr)-Frt(prt) HV Fan TrayHP A58x0AF Frt(ports)-Bck(pwr) Fan Tray	JG553A See Configuration Note:1, 2

Configuration Rules

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

Remarks: Watson Blue Text:
If there is any empty space below the switch in a rack when using Back to Front Fan Trays, JG553A, 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.

Technical Specifications

HP FlexFabric 5930-32QSFP+ Switch (JG726A)

Ports	32 QSFP+ 40GbE ports 1 RJ-45 serial console po 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	2 fan tray slots The customer must order fan trays, as fan trays 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**	17.32(w) x 25.98(d) x 1.72(h) in (44.00 x 66.0 x 4.37 cm)
	Weight	28.66 lb (13 kg) shipping weight
Memory and processor	512 MB flash, 4 GB SDRAM; packet buffer size: 12.2 MB	
Performance	**10 Gb/s Latency**	< 1µs (64-byte packets)
	Throughput	1905 Mpps
	Routing/Switching capacity	2560 Gb/s
	Routing table size	16000 entries (IPv4), 8000 entries (IPv6)
	MAC address table size	288000 entries
Environment	**Operating temperature**	32°F to 113°F (0°C to 45°C)
	Operating relative humidity	10% to 90%, noncondensing
	Acoustic	Low-speed fan: 65.7 dB, High-speed fan: 70.6 dB
Electrical characteristics	**Maximum heat dissipation**	1396 BTU/hr (1472.78 kJ/hr)
	AC voltage	100 - 240 VAC
	DC voltage	-36 to -72 VDC
	Maximum power rating	409 W
	Idle power	175 W
	Frequency	50/60 Hz
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	
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

Technical Specifications

	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	
Notes	The customer must order a power supply, as the device does not come with one. At least one JC680A or JC681A is required.	
Services	Refer to the HP website at: **www.hp.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 HP 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

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)
Multiple Configuration Files
Multiple Software Images
SSHv1/SSHv2 Secure Shell
TACACS/TACACS+

General protocols
IEEE 802.1D MAC Bridges
IEEE 802.1p Priority
IEEE 802.1Q VLANs
IEEE 802.1s Multiple Spanning Trees

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 4291 IP Version 6 Addressing Architecture
RFC 4862 IPv6 Stateless Address Auto-configuration
RFC 5095 Deprecation of Type 0 Routing Headers in IPv6

MIBs
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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

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
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RFC 783 TFTP Protocol (revision 2)
RFC 791 IP
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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 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
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RFC 2453 RIPv2
RFC 2581 TCP Congestion Control
RFC 2644 Directed Broadcast Control
RFC 2767 Dual Stacks IPv4 & IPv6
RFC 3046 DHCP Relay Agent Information Option
RFC 3768 Virtual Router Redundancy Protocol (VRRP)
RFC 4250 The Secure Shell (SSH) Protocol Assigned Numbers
RFC 3415 SNMP-View based-ACM MIB
LLDP-EXT-DOT1-MIB
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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
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IEEE 802.1P (CoS)
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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
Access Control Lists (ACLs)
SSHv2 Secure Shell

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 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 4941 Privacy Extensions for Stateless Address Autoconfiguration in IPv6

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