HPE MSR2000 Router Series

Key features

• Up to 1 Mpps forwarding; converged high-performance routing, switching, security, voice, and mobility
• Embedded security features with hardware-based encryption, firewall, Network Address Translation (NAT), and Virtual Private Networks (VPNs)
• Industry-leading breadth of LAN and WAN connectivity, up to 24/48 GE switching ports integrated
• No additional licensing complexity; no cost for advanced features
• Zero-touch solution, with single-pane-of-glass management

Product overview

The HPE MSR2000 Router Series, the next generation of router from Hewlett Packard Enterprise (HPE), is a component of the HPE FlexBranch solution, which is a part of the comprehensive HPE FlexNetwork architecture. These routers feature a modular design that delivers unmatched application services for small- to medium-sized branch offices. This gives your IT personnel the benefit of reduced complexity, and simplified configuration, deployment, and management.

The MSR2000 series provides an agile, flexible network infrastructure that enables you to quickly adapt to your changing business requirements while delivering integrated concurrent services on a single, easy-to-manage platform.
Features and benefits

Performance
• Excellent forwarding performance
  Provides forwarding performance up to 1 Mpps (672 Mb/s); meets the bandwidth-intensive application demands of enterprise businesses
• Powerful security capacity
  The MSR2000 series is available with standard or high encryption, an embedded hardware encryption accelerator to improve encryption performance; IPSec encryption throughput can be up to 400 Mb/s with a maximum of 1,000 IPSec VPN tunnels

Product architecture
• SDN/OpenFlow
  OpenFlow is the communications interface defined between the control and forwarding layers of a Software-Defined Networking (SDN) architecture. OpenFlow separates the data forwarding and routing decision functions. It keeps the flow-based forwarding function and employs a separate controller to make routing decisions. OpenFlow matches packets against one or more flow tables. MSR support OpenFlow 1.3.1
• Ideal multiservice platform
  Provides WAN router, Ethernet switch, 3G and 4G WAN, stateful firewall, VPN, and SIP or voice gateway on MSRs
• Advanced hardware architecture
  Supports multicore processors, Gigabit switching, and PCIe bus. Dual internal power supplies (AC or DC) supported on MSR2004-48 for higher reliability and flexibility
• New operating system version
  Ships with new Comware v7 Operating System delivering the latest in virtualization and routing

Connectivity
• Virtual eXtensible LAN (VXLAN)
  VXLAN is an IP-based network, using the “MAC in UDP” package of Layer VPN technology. VXLAN can be based on an existing ISP or enterprise IP networks for decentralized physical site provides Layer 2 communication, and can provide service isolation for different tenants
• Virtual Private LAN Service (VPLS)
  VPLS delivers a point-to-multipoint L2VPN service over an MPLS or IP backbone. The backbone is transparent to the customer sites, which can communicate with each other as if they were on the same LAN. The following protocols support on MSRs, RFC4447, RFC4761, and RFC4762, BFD detection in VPLS, Support hierarchical HOPE (H-VPLS), MAC address recovery in H-VPLS to speed up convergence
• Network Mobility (NEMO)
  NEMO enables a node to retain the same IP address and maintain application connectivity when the node travels across networks. It allows location-independent routing of IP datagrams on the Internet
• High-density port connectivity
  Provides 24 or 48 Giga LAN switching ports on board (all switching ports can be configured as routed ports), up to four interface module slots, and up to 30 module options
• Multiple WAN interfaces
  Provides a traditional link with E1, T1, Serial, ADSL over POTs, ADSL over ISDN, G.SHDSL, Asynchronous Transfer Mode (ATM), and ISDN links; high-density Fast or Giga Ethernet access modules; mobility access with 3G (WCDMA/HSPA)/4G LTE SIC module, and 3G/4G USB modems
• Packet storm protection
  Protects against broadcast, multicast, or unicast storms with user-defined thresholds

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

• 3G/4G LTE access support
  Provides 3G/4G LTE wireless access for primary or backup connectivity via a 3G/4G LTE SIC modules certified on various cellular networks; optional carrier 3G/4G LTE USB modems are available

• USB interface
  Uses USB memory disk to download and upload configuration and OS image files; supports an external USB 3G/4G modem for a 3G/4G WAN uplink

• Flexible port selection
  Provides a combination of fiber and copper interface modules, 100/1000BASE-X support, and 10/100/1000BASE-T auto-speed detection plus auto duplex and MDI/MDI-X

Layer 2 switching
• Spanning Tree Protocol (STP)
  Supports standard IEEE 802.1D STP, IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)

• Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) protocol snooping
  Control and manage the flooding of multicast packets in a Layer 2 network

• Port mirroring
  Duplicates port traffic (ingress and egress) to a local or remote monitoring port

• VLANs
  Supports IEEE 802.1Q-based VLANs

• sFlow®
  Allows traffic sampling

• Define port as switched or routed
  Supports command switch to easily change switched ports to routed (maximum four Fast Ethernet ports)

Layer 3 routing
• Static IPv4 routing
  Provides simple manually configured IPv4 routing

• Routing Information Protocol (RIP)
  Uses a distance vector algorithm with User Datagram Protocol (UDP) packets for route determination; supports RIPv1 and RIPv2 routing; includes loop protection

• 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, 6 to 4, and Intra-Site Automatic Tunnel Addressing Protocol (ISATAP) tunnels; is an important element for the transition from IPv4 to IPv6

• Multiprotocol Label Switching (MPLS)
Uses BGP to advertise routes across Label Switched Paths (LSPs), but uses simple labels to forward packets from any Layer 2 or Layer 3 protocol, which reduces complexity and increases performance; supports graceful restart for reduced failure impact; supports LSP tunneling and multilevel stacks

• Multiprotocol Label Switching (MPLS) Layer 3 VPN
Allows Layer 3 VPNs across a provider network; uses Multiprotocol BGP (MBGP) to establish private routes for increased security; supports RFC 2547bis multiple autonomous system VPNs for added flexibility; supports IPv6 MPLS VPN

• Multiprotocol Label Switching (MPLS) Layer 2 VPN
Establishes simple Layer 2 point-to-point VPNs across a provider network using only MPLS Label Distribution Protocol (LDP), requires no routing and therefore decreases complexity, increases performance, and allows VPNs of non-routable protocols; uses no routing information for increased security; supports Circuit Cross Connect (CCC), Static Virtual Circuits (SVCs), Martini draft, and Kompella draft technologies

• Routing policy
Allows custom filters for increased performance and security; supports access control lists (ACLs), IP prefix, AS paths, community lists, and aggregate policies
Layer 3 services

- **NAT-PT**
  Network Address Translation-Protocol Translation (NAT-PT) enables communication between IPv4 and IPv6 nodes by translating between IPv4 and IPv6 packets. It performs IP address translation, and according to different protocols, performs semantic translation for packets. This technology is only suitable for communication between a pure IPv4 node and a pure IPv6 node.

- **WAN Optimization**
  MSR performs optimization using TFO and a combination of DRE, Lempel-Ziv (LZ) compression to provide the bandwidth optimization for file service and web applications. The policy engine module determines which traffic can be optimized and which optimization action should be taken. A pair of WAN optimization equipment can discover each other automatically and complete the negotiation to establish a TCP optimization session.

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

- **User Datagram Protocol (UDP) helper**
  Redirects UDP broadcasts to specific IP subnets to prevent server spoofing.

- **Dynamic Host Configuration Protocol (DHCP)**
  Simplifies the management of large IP networks and supports client and server; DHCP Relay enables DHCP operation across subnets.

Quality of service (QoS)

- **Nested QoS**
  Provides a built-in QoS engine that supports nested QoS (same as hierarchical QoS) and can implement a hierarchical scheduling mechanism based on ports, user groups, users, and user services.

- **Traffic policing**
  Supports Committed Access Rate (CAR) and line rate.

- **Congestion management**
  Supports FIFO, PQ, CQ, WFQ, CBQ, and RTPQ.

- **Weighted random early detection (WRED)/random early detection (RED)**
  Delivers congestion avoidance capabilities through the use of queue management algorithms.

- **Other QoS technologies**
**Security**

- **IPS**
  Built-in Intrusion Prevention System (IPS) detects and protects the branch office from security threats. Optional HPE integration filters for client-side, branch protection from exploits and vulnerabilities

- **Enhanced stateful firewall**
  Application layer protocol inspection, Transport layer protocol inspection, ICMP error message check, and TCP SYN check. Support more L4 and L7 protocols like TCP, UDP, UDP-Lite, ICMPv4/ICMPv6, SCTP, DCCP, RAWIP, HTTP, FTP, SMTP, DNS, SIP, H.323, SCCP

- **Zone based firewall**
  Zone based policy firewall changes the firewall configuration from the older interface-based model to a more flexible, more easily understood zone-based model. Interfaces are assigned to zones, and inspection policy is applied to traffic moving between the zones. Inter-zone policies offer considerable flexibility and granularity, so different inspection policies can be applied to multiple host groups connected to the same router interface

- **Auto Discover VPN (ADVPN)**
  Collects, maintains, and distributes dynamic public addresses through the VPN Address Management (VAM) protocol, making VPN establishment available between enterprise branches that use dynamic addresses to access the public network; compared to traditional VPN technologies, ADVPN technology is more flexible and has richer features, such as NAT traversal of ADVPN packets, AAA identity authentication, IPSec protection of data packets, and multiple VPN domains

- **IPSec VPN**
  Supports DES, Triple DES (3DES), and Advanced Encryption Standard (AES) 128/192/256 encryption, and MD5 and SHA-1 authentication

- **Access control list (ACL)**
  Supports powerful ACLs for both IPv4 and IPv6: ACLs are used for filtering traffic to prevent unauthorized users from accessing the network, or for controlling network traffic to save resources; rules can either deny or permit traffic to be forwarded; rules can be based on a Layer 2 header or a Layer 3 protocol header; rules can be set to operate on specific dates or times

- **Terminal Access Controller Access-Control System (TACACS+)**
  Delivers an authentication tool using TCP with encryption of the full authentication request, providing additional security

- **Unicast Reverse Path Forwarding (URPF)**
  Allows normal packets to be forwarded correctly, but discards the attaching packet due to lack of reverse path route or incorrect inbound interface; prevents source spoofing and distributed attacks

- **Network login**
  Allows authentication of multiple users per port

- **RADIUS**
  Eases security access administration by utilizing a user and password authentication server

- **Network address translation (NAT)**
  Supports one-to-one NAT, many-to-many NAT, and NAT control, enabling NAPT to support multiple connections; supports blacklist in NAT, a limit on the number of connections, session logs, and multi-instances
• Secure shell (SSHv2)
  Uses external servers to securely login to a remote device, with authentication and encryption, it protects against IP spoofing and plain text password interception, increases the security of Secure File Transfer Protocol (SFTP) transfers

• Attack detection and protection
  Responding to network attacks and threats by MSR Comware, support max connection limitation, single-packet attacks protection, scanning attack protection, flood attack protection, TCP and ICMP Attack Protection and so on

Convergence
• Internet Group Management Protocol (IGMP)
  Utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks; supports IGMPv1, v2, and v3

• Protocol Independent Multicast (PIM)
  Defines modes of Internet IPv4 and IPv6 multicasting to allow one-to-many and many-to-many transmission of information; supports PIM Dense Mode (DM), Sparse Mode (SM), and Source-Specific Mode (SSM)

• Multicast Source Discovery Protocol (MSDP)
  Allows multiple PIM-SM domains to interoperate, is used for inter-domain multicast applications

• Multicast Border Gateway Protocol (MBGP)
  Allows multicast traffic to be forwarded across BGP networks and kept separate from unicast traffic

Integration
• Embedded Netstream
  Improves traffic distribution using powerful scheduling algorithms, including Layer 4 to 7 services; monitors the health status of servers and firewalls

• Embedded VPN and stateful firewall
  Provides enhanced stateful packet inspection and filtering; delivers advanced VPN services with Triple DES (3DES) and Advanced Encryption Standard (AES) encryption at high performance and low latency; URL filtering, and application prioritization and enhancement

• SIP trunking
  Delivers multiple concurrent calls on one link; the carrier authenticates only the link, rather than carrying each SIP call on the link

Resiliency and high availability
• Intelligent Resilient Framework (IRF)
  IRF allows the customer build an IRF stack, namely a logical device, by interconnecting multiple devices through stack ports. The customer can manage all the devices in the IRF stack by managing the logical device, which is cost-effective like a box-type device, and scalable and highly reliable like a chassis-type distributed device

• Backup center
  Acts as a part of the management and backup function to provide backup for device interfaces; delivers reliability by switching traffic over to a backup interface when the primary one fails
• Virtual Router Redundancy Protocol (VRRP)
  Allows groups of two routers to dynamically back each other up to create highly available routed environments; supports VRRP load balancing

• Embedded Automation Architecture (EAA)
  Monitors the internal event and status of system hardware and software, identifying potential problems as early as possible; collects field information and attempts to automatically repair the issues; based on the user configuration, onsite information will be sent to technical support

• Bidirectional Forwarding Detection (BFD)
  Detects quickly the failures of the bidirectional forwarding paths between two devices for upper-layer protocols such as routing protocols and MPLS

**Management**

• HPE Intelligent Management Center (IMC)
  Integrates fault management, element configuration, and network monitoring from a central vantage point; built-in support for third-party devices enables network administrators to centrally manage all network elements with a variety of automated tasks, including discovery, categorization, baseline configurations, and software images; the software also provides configuration comparison tools, version tracking, change alerts, and more

• 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 Simple Network Management Protocol (SNMP) access; local and remote syslog capabilities allow logging of all access

• SNMPv1, v2, and v3
  Provide complete support of SNMP; provide full support of industry-standard Management Information Base (MIB) plus private extensions; SNMPv3 supports increased security using encryption

• Remote monitoring (RMON)
  Uses standard SNMP to monitor essential network functions; supports events, alarm, history, and statistics group plus a private alarm extension group

• FTP, TFTP, and SFTP support
  Offer different mechanisms for configuration updates; FTP allows bidirectional transfers over a TCP/IP network; trivial FTP (TFTP) is a simpler method using User Datagram Protocol (UDP); Secure File Transfer Protocol (SFTP) runs over an SSH tunnel to provide additional security

• Debug and sampler utility
  Supports ping and traceroute for both IPv4 and IPv6

• 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
• 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

• Management interface control
  Provides management access through modem port and terminal interface; provides access through terminal interface, Telnet, or SSH

• Network Quality Analyzer (NQA)
  Analyzes network performance and service quality by sending test packets, and provides network performance and service quality parameters such as jitter, TCP, or FTP connection delays; allows network manager to determine overall network performance and diagnose and locate network congestion points or failures

• Role-based security
  Delivers role-based access control (RBAC); supports 16 user levels (0-15)

• Standards-based authentication support for LDAP
  Integrates seamlessly into existing authentication services

Ease of deployment
• Zero-touch deployment
  Supports TR-069, USB disk auto deployment, and 3G SMS auto deployment

Additional information
• OPEX savings
  Simplifies and streamlines deployment, management, and training through the use of a common operating system, thereby cutting costs as well as reducing the risk of human errors associated with having to manage multiple operating systems across different platforms and network layers

• Faster time to market
  Allows new and custom features to be brought rapidly to market through engineering efficiencies, delivering better initial and ongoing stability

• Green initiative support
  Provides support for RoHS and WEEE regulations

Investment protection
• Reuse of existing SIC modules
  Supports existing SIC modules, transceivers, and cables for investment protection

Warranty and support
• 1-year Warranty
  See hpe.com/networking/warrantysummary for warranty and support information included with your product purchase.

• Software releases
  To find software for your product, refer to hpe.com/networking/support for details on the software releases available with your product purchase, refer to hpe.com/networking/warrantysummary
# HPE MSR2000 Router Series

<table>
<thead>
<tr>
<th>Specifications</th>
<th>HPE MSR20003 AC Router (JG411A)</th>
<th>HPE MSR2004-24 AC Router (JG734A)</th>
<th>HPE MSR2004-48 Router (JG735A)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I/O ports and slots</strong></td>
<td>3 SIC slots, or 1 DSIC slot, and 1 SIC slot</td>
<td>4 SIC slots</td>
<td>4 SIC slots</td>
</tr>
<tr>
<td></td>
<td>2 RJ-45 1000BASE-T ports (IEEE 802.3ab Type 1000BASE-T)</td>
<td>3 RJ-45 1000BASE-T ports (IEEE 802.3ab Type 1000BASE-T)</td>
<td>3 RJ-45 1000BASE-T ports (IEEE 802.3ab Type 1000BASE-T)</td>
</tr>
<tr>
<td></td>
<td>1 SFP fixed Gigabit Ethernet SFP port</td>
<td>24 RJ-45 autosensing 10/100/1000 LAN ports</td>
<td>48 RJ-45 autosensing 10/100/1000 LAN ports</td>
</tr>
</tbody>
</table>

| **AP characteristics** | | |
| Radios (via optional modules) | 3G, 4G LTE | 3G, 4G LTE | 3G, 4G LTE |

| **Physical characteristics** | | |
| Dimensions | | |
| Weight | | |
| 14.17(w) x 11.81(d) x 1.74(h) in (36 x 30 x 4.42 cm) (1U height) | 17.32(w) x 14.17(d) x 1.74(h) in (43.99 x 35.99 x 4.42 cm) (1U height) | 17.32(w) x 15.75(d) x 1.74(h) in (43.99 x 40.01 x 4.42 cm) (1U height) |
| 7.61 lb (3.45 kg) | 15.1 lb (6.85 kg) | 17.2 lb (7.8 kg) |

| Memory and processor | RISC @ 800 MHz, 1 GB DDR3 SDRAM, 256 MB flash | RISC @ 800 MHz, 1 GB DDR3 SDRAM, 256 MB flash | RISC @ 800 MHz, 1 GB DDR3 SDRAM, 256 MB flash |

| Mounting and enclosure | Desktop or can be mounted in a EIA standard 19-inch telco rack when used with the rack-mount kit in the package. | Desktop or can be mounted in a EIA standard 19-inch telco rack when used with the rack-mount kit in the package. | Desktop or can be mounted in a EIA standard 19-inch telco rack when used with the rack-mount kit in the package. |

| **Performance** | | |
| Throughput | | |
| Routing table size | 300000 entries (IPv4), 200000 entries (IPv6) | 200000 entries (IPv4), 200000 entries (IPv6) | 200000 entries (IPv4), 200000 entries (IPv6) |
| Forwarding table size | 300000 entries (IPv4), 200000 entries (IPv6) | 200000 entries (IPv4), 200000 entries (IPv6) | 200000 entries (IPv4), 200000 entries (IPv6) |
| 1 Mpps (64-byte packets) | 500 Kpps (64-byte packets) | 500 Kpps (64-byte packets) |
| 200000 entries (IPv4), 200000 entries (IPv6) | 200000 entries (IPv4), 200000 entries (IPv6) | 200000 entries (IPv4), 200000 entries (IPv6) |

| Environment | | |
| Operating temperature | 32°F to 113°F (0°C to 45°C) | 32°F to 113°F (0°C to 45°C) | 32°F to 113°F (0°C to 45°C) |
| Operating relative humidity | 5% to 90%, noncondensing | 5% to 90%, noncondensing | 5% to 90%, noncondensing |
| Nonoperating/Storage temperature | -40°F to 158°F (-40°C to 70°C) | -40°F to 158°F (-40°C to 70°C) | -40°F to 158°F (-40°C to 70°C) |
| Nonoperating/Storage relative humidity | 5% to 90%, noncondensing | 5% to 90%, noncondensing | 5% to 90%, noncondensing |
| Altitude | up to 16,404 ft (5 km) | up to 16,404 ft (5 km) | up to 16,404 ft (5 km) |
### Specifications

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</thead>
<tbody>
<tr>
<td><strong>Electrical characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Maximum heat dissipation</td>
<td>78 BTU/hr (82.29 kJ/hr)</td>
<td>170 BTU/hr (179.35 kJ/hr)</td>
</tr>
<tr>
<td>AC voltage</td>
<td>100–240 VAC</td>
<td>100–240 VAC</td>
</tr>
<tr>
<td>DC voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum power rating</td>
<td>54 W</td>
<td>54 W</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>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.</td>
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</tr>
</tbody>
</table>

| **Reliability**                 | 92.73                             | 92.2                             | 96.2                             |
| MTBF (years)                    |                                   |                                 |                                 |

| **Safety**                      |                                   |                                 |                                 |

| **Emissions**                   |                                   |                                 |                                 |
| FCC part 68, CS-03              | FCC part 68, CS-03                 | FCC part 68, CS-03               |                                 |

| **Management**                  |                                   |                                 |                                 |
| Intelligent Management Center (IMC); command-line interface; limited command-line interface; configuration menu; out-of-band management (RJ-45 Ethernet), SNMP Manager, Telnet, RMON1, FTP, in-line and out-of-band management (serial RS-232C or Micro USB); IEEE 802.3 Ethernet MIB | Intelligent Management Center (IMC); command-line interface; limited command-line interface; configuration menu; out-of-band management (RJ-45 Ethernet), SNMP Manager, Telnet, RMON1, FTP, in-line and out-of-band management (serial RS-232C or Micro USB); IEEE 802.3 Ethernet MIB | Intelligent Management Center (IMC); command-line interface; limited command-line interface; configuration menu; out-of-band management (RJ-45 Ethernet), SNMP Manager, Telnet, RMON1, FTP, in-line and out-of-band management (serial RS-232C or Micro USB); IEEE 802.3 Ethernet MIB |

| **Services**                    | Refer to the Hewlett Packard Enterprise website at 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. | Refer to the Hewlett Packard Enterprise website at 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. | Refer to the Hewlett Packard Enterprise website at 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 1267 Border Gateway Protocol 3 (BGP-3)
- RFC 1657 Definitions of Managed Objects for BGPv4
- RFC 1771 BGPv4
- RFC 1772 Application of the BGP
- RFC 1773 Experience with the BGP-4 Protocol
- RFC 1774 BGP-4 Protocol Analysis
- RFC 1997 BGP Communities Attribute
- RFC 2439 BGP Route Flap Damping
- RFC 2547 BGP/MPLS VPNs
- RFC 2796 BGP Route Reflection
- RFC 2842 Capability Advertisement with BGP-4
- RFC 2858 BGP-4 Multi-Protocol Extensions
- RFC 2918 Route Refresh Capability
- RFC 3065 Autonomous System Confederations for BGP
- RFC 3107 Support BGP carry Label for MPLS
- RFC 3392 Capabilities Advertisement with BGP-4
- RFC 4271 A Border Gateway Protocol 4 (BGP-4)
- RFC 4273 Definitions of Managed Objects for BGP-4
- RFC 4274 BGP-4 Protocol Analysis

### Denial of service protection
- CPU DoS Protection
- Rate Limiting by ACLs

### Device management
- RFC 1155 Structure and Management Information (SMIv1)
- RFC 1157 SNMPv1/v2c
- RFC 1305 NTPv3
- RFC 1591 DNS (client)
- RFC 1902 (SNMP) IPv4, IPv6, and Other Protocols

### General protocols
- RFC 768 UDP
- RFC 760 DoD standard Internet Protocol
- RFC 764 Telnet Protocol specification
- RFC 777 Internet Control Message Protocol
- RFC 783 TFTP Protocol (revision 2)
- RFC 791 IP
- RFC 792 ICMP
- RFC 793 TCP
- RFC 813 Window and Acknowledgement Strategy in TCP
- RFC 815 IP datagram reassembly algorithms
- RFC 826 ARP
- RFC 854 Telnet Protocol Specification
- RFC 855 Telnet Option Specifications
- RFC 856 Telnet Binary Transmission
- RFC 857 Telnet Echo Option
- RFC 858 Telnet Suppress Go Ahead Option
- RFC 862 Echo Service (TCP Echo)
- RFC 879 TCP maximum segment size and related topics
- RFC 882 Domain names: Concepts and facilities
- RFC 883 Domain names: Implementation specification
- RFC 894 A Standard for the Transmission of IP Datagrams over Ethernet Networks
- RFC 896 Congestion Control in IP/TCP Internetworks
- RFC 906 Bootstrap loading using TFTP (Trivial File Transfer Protocol)
- RFC 917 Internet Subnets
- RFC 929 Broadcasting Internet Datagrams
- RFC 922 Broadcasting Internet Datagrams in the Presence of Subnets (IP_BROAD)
- RFC 925 Multi-LAN Address Resolution Protocol—HTTP/1.0
- RFC 950 Internet Standard Subnetting Implementation
- RFC 951 BOOTP
- RFC 952 Domain system changes and observations
- RFC 988 Host extensions for IP multicasting
- RFC 1027 Proxy ARP
- RFC 1034 Domain names—concepts and facilities
- RFC 1035 Domain names—implementation and specification
- RFC 1048 Bootstrap Protocol (BOOTP) implementation and specification
- RFC 1054 Host extensions for IP multicasting
- RFC 1058 RIPv1
- RFC 1059 Network Time Protocol (version 2) specification and implementation
- RFC 1060 Assigned numbers
- RFC 1065 IP Maximum Transmission Unit (MTU) discovery options
- RFC 1071 Computing the Internet checksum
- RFC 1072 TCP extensions for long-delay paths
- RFC 1079 Telnet terminal speed option
- RFC 1084 BOOTP (Bootstrap Protocol) implementation and specification
- RFC 1091 Telnet Terminal-Type Option
- RFC 1093 NSFNET routing architecture
- RFC 1101 DNS encoding of network names and other types
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| HPE X120 1G SFP LC LX Transceiver (JD119B) | | |
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| HPE X260 RS449 3m DTE Serial Port Cable (JF825A) | | |
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| HPE X260 RSS30 3m DTE Serial Port Cable (JF827A) | | |
| HPE X260 RSS30 3m DCE Serial Port Cable (JF828A) | | |
| HPE X260 Auxiliary Router Cable (JD508A) | | |
| HPE X260 E1 (2) BNC 75 ohm 3m Router Cable (JD175A) | | |
| HPE X260 E1 BNC 20m Router Cable (JD514A) | | |
| HPE X260 E1 RJ45 BNC 75-120 ohm Conversion Router Cable (JD511A) | | |
| HPE X260 2E1 BNC 3m Router Cable (JD643A) | | |
| HPE X260 T1 Router Cable (JD518A) | | |
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