HP MSR4000 TAA-compliant Router Series

Key features

- Up to 36 Mpps forwarding performance; support for multiple concurrent services
- High reliability with separated hardware data and control planes, and dual main processing units (MPUs)
- HP Open Application Platform (OAP) for HP AllianceOne applications
- Powerful aggregation capacity; integrated 10GbE; support for up to 64 E1 or eight E3/T3 ports
- Zero-touch solution with single-pane-of-glass management

Product overview

The HP MSR4000 Router Series, the next generation of router from HP, is a component of the HP FlexBranch solution, which is a part of the comprehensive HP FlexNetwork architecture. These routers feature a modular design that delivers unmatched application services for extra large branch offices, headquarters, and campuses. This gives your IT personnel the benefit of reduced complexity, and simplified configuration, deployment, and management. The MSR4000 series leverages separated data and control planes, dual main processing units (MPUs), and support for up to four power supplies, which provides outstanding performance and reliability.

The MSR4000 routers provide a full-featured, resilient routing platform with the latest multicore CPUs, offer 10 Gigabit SFP+ integrated, provide an enhanced PCI bus, and ship with the latest version of HP Comware software to help enable high performance with concurrent services. The MSR4000 series provides a full-featured, resilient routing platform, including IPv6 and Multiprotocol Label Switching (MPLS), with up to 36 Mpps forwarding capacity and 28 Gb/s of IPSec virtual private network (VPN) encrypted throughput. These routers also support HP Open Application Platform (OAP) modules to deliver integrated industry-leading HP AllianceOne partner applications such as virtualization, unified communications and collaboration (UC&C), and application optimization capabilities.

The MSR4000 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 36 Mpps (24.2 Gb/s); meets the bandwidth-intensive application demands of enterprise businesses

• Powerful security capacity

  The MSR4000 series is available with standard or high encryption, an embedded hardware encryption accelerator to improve encryption performance; IPSec encryption throughput can be up to 28 Gb/s with a maximum of 10,000 IPSec VPN tunnels

Product architecture
• Ideal multiservice platform

  Provides WAN router, Ethernet switch, stateful firewall, VPN, and Session Initiation Protocol (SIP) or voice gateway all in one device

• Advanced hardware architecture

  Provides multicore processors, Gigabit switching, and PCIe bus; dual main processing units, four internal power supplies (N+1 configuration), and internal and external CF cards are offered; new high-performance MIM modules (HMIM) supported

• New operating system version

  Ships with new Comware v7 Operating System delivering the latest in virtualization and routing

• Open Application Platform architecture

  Provides unmatched application and services flexibility, with the potential to deliver the functionality of multiple devices, creating capital and operational expense savings and lasting investment protection

• Distributed architecture with separation of data and control planes

  Delivers enhanced fault tolerance and facilitates near continuous operation and zero service disruption during planned or unplanned control-plane events; service processing units (SPUs) perform data forwarding, encryption or decryption, and analyzing or filtering of data packets; main processing units perform route calculation, forward table maintenance, and configure and monitor the SPU

• Field-programmable gate array (FPGA)

  Improves the bandwidth of I/O module slots from 100 Mb/s to 1000 Mb/s, and improves uplink performance from 1 Gb/s to 10 Gb/s

• Multi Gigabit Fabric (MGF)

  Eases utilization of the main processor by transmitting Layer 2 packets directly via the MGF

• Main processing unit (MPU)

  Provides 1GbE management port; has default of 512 MB internal CF and 2 GB DDR3 memory

• Service processing units (SPU)

  Includes four 1000BASE-T and four SFP (combo) slots, two voice processing module slots, and 2 GB DDR3 memory; SPU 200/300 also has one 10GbE SFP+ slot; forwarding performance: 10 Mpps (SPU-100), 20 Mpps (SPU-200), 36 Mpps (SPU-300)

Connectivity

• Powerful aggregation capacity

Supports integrated 10GbE LAN, and up to 64 E1 or eight E3/T3 ports

• High-density port connectivity

Provides up to eight interface module slots and up to four on-board Gigabit Ethernet and one 10GbE ports

• Multiple WAN interfaces

Provides traditional links with E1, T1, Serial, ATM, and ISDN; high-density Ethernet access with WAN Fast Ethernet and Gigabit Ethernet with POE/POE+; and high-speed E3/T3, 155 Mb/s OC3 access options

• 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

• USB interface

Uses USB memory disk to download and upload configuration or 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

Controls and manages 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 up to 4,094 VLANS or IEEE 802.1Q-based VLANs

• sFlow

Allows traffic sampling

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
• 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)
• Hierarchical quality of service (HQoS) or Nested QoS

Manages traffic uniformly, and hierarchically schedules traffic by user, network service, and application; provides more granular traffic control and quality assurance services than traditional QoS

• 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) or random early detection (RED)

Delivers congestion avoidance capabilities through the use of queue management algorithms

• Other QoS technologies

Supports traffic shaping, MPLS QoS, MP QoS or LFI, and Control Plane Policing (CoPP)

Security

- Dynamic Virtual Private Network (DVPN)

  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, DVPN technology is more flexible and has richer features, such as NAT traversal of DVPN 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 using a user or 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

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 VPN and 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

- Embedded NetStream

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

- 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
- 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

- In-Service Software Upgrade (ISSU)

Lowers downtime caused by planned maintenance and software upgrades

- 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

- Multiple internal power supply slots

Delivers higher reliability with a maximum of four internal power supplies, which can be installed

- 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

• HP 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

Offers 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 both 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

Warranty and support
• 1-year Warranty

Advance hardware replacement with 10-calendar-day delivery (available in most countries)

• Electronic and telephone support (for Warranty 2.0)

Limited electronic and 24x7 telephone support is available from HP for the entire warranty period; to reach our support centers, refer to hp.com/networking/contact-support; for details on the duration of support provided with your product purchase, refer to hp.com/networking/warrantysummary

• Software releases

To find software for your product, refer to hp.com/networking/support; for details on the software releases available with your product purchase, refer to hp.com/networking/warrantysummary

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Specifications

	HP MSR4060 Router Chassis (JG403A) HP MSR4000 TAA-compliant MPU-100 Main Processing Unit (JG869A)	HP MSR4080 Router Chassis (JG402A) HP MSR4000 TAA-compliant MPU-100 Main Processing Unit (JG869A)
I/O ports and slots	2 MPU (Main Processing Unit) slots 1 SPU (Service Processing Unit) slot 6 HMIM slots 4 Power Supply slots	2 MPU (Main Processing Unit) slots 1 SPU (Service Processing Unit) slot 8 HMIM slots 4 Power Supply slots
Physical characteristics Dimensions Weight	17.32(w) x 18.9(d) x 6.89(h) in (44 x 48 x 17.50 cm) (4U height) 45.52 lb (20.65 kg)	17.32(w) x 18.9(d) x 8.64(h) in (44 x 48 x 21.95 cm) (5U height) 49.93 lb (22.65 kg)
Memory and processor	MPU-100, 2 cores RISC @ 1 GHz, 512 MB flash capacity, 2 GB DDR3 SDRAM SPU-100, 8 cores RISC @ 1 GHz, 2 GB DDR3 SDRAM SPU-200, 16 cores RISC @ 1 GHz, 2 GB DDR3 SDRAM SPU-300, 32 cores RISC @ 1 GHz, 2 GB DDR3 SDRAM	MPU-100, 2 cores RISC @ 1 GHz, 512 MB flash capacity, 2 GB DDR3 SDRAM SPU-100, 8 cores RISC @ 1 GHz, 2 GB DDR3 SDRAM SPU-200, 16 cores RISC @ 1 GHz, 2 GB DDR3 SDRAM SPU-300, 32 cores RISC @ 1 GHz, 2 GB DDR3 SDRAM
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.
Performance Throughput Routing table size Forwarding table size	SPU-100/SPU-200/SPU-300 (10Mpps/20Mpps/36Mpps) 1000000 entries (IPv4), 1000000 entries (IPv6) 1000000 entries (IPv4), 1000000 entries (IPv6)	SPU-100/SPU-200/SPU-300 (10Mpps/20Mpps/36Mpps) 1000000 entries (IPv4), 1000000 entries (IPv6) 1000000 entries (IPv4), 1000000 entries (IPv6)
Environment Operating temperature Operating relative humidity Nonoperating/Storage temperature Nonoperating/Storage relative humidity Altitude	32°F to 113°F (0°C to 45°C) 5% to 90%, noncondensing -40°F to 158°F (-40°C to 70°C) 5% to 90%, noncondensing up to 16,404 ft (5 km)	32°F to 113°F (0°C to 45°C) 5% to 90%, noncondensing -40°F to 158°F (-40°C to 70°C) 5% to 90%, noncondensing up to 16,404 ft (5 km)

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Electrical characteristics		
Frequency	50/60 Hz	50/60 Hz
Maximum heat dissipation	285/347 BTU/hr (300.67/366.09 kJ/hr), lower number is with SPU-100 module installed; higher number is for SPU-200	297/358 BTU/hr (313.33/377.69 kJ/hr), lower number is with SPU-100 module installed; higher number is for SPU-200
AC voltage	100 - 240 VAC	100 - 240 VAC
DC voltage	-36 to -75 VDC	-36 to -75 VDC
Maximum power rating	300 W	300 W
PoE power	480 W	480 W
	Note 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. PoE Power is the power supplied by the internal power supply, it is dependent on the type and quantity of power supplies and may be supplemented with the use of a External Power Supply (EPS). No default power supply is included in the chassis; a minimum of one/maximum of four power supplies should be ordered.	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. PoE Power is the power supplied by the internal power supply, it is dependent on the type and quantity of power supplies and may be supplemented with the use of a External Power Supply (EPS). No default power supply is included in the chassis; a minimum of one/maximum of four power supplies should be ordered.
Reliability		
MTBF (years)	178.66	178.66
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; EN 60950-1; CAN/CSA-C22.2 No. 60950-1; FDA 21 CFR Subchapter J; AS/NZS 60950-1; GB 4943.1	UL 60950-1; EN 60825-1 Safety of Laser Products-Part 1; EN 60825-2 Safety of Laser Products-Part 2; IEC 60950-1; EN 60950-1; CAN/CSA-C22.2 No. 60950-1; FDA 21 CFR Subchapter J; AS/NZS 60950-1; GB 4943.1
Emissions	EN 61000-4-11:2004; ANSI C63.4-2009; AS/NZS CISPR 22:2009; CISPR 22 Ed2.0 2008-09; EN 55022:2010; EN 61000-3-3:2008; GB 9254-2008; IEC 61000-3-2 Ed3.0 (2009-02); IEC 61000-3-3 Ed2.0 (2008-06); VCCI V-4/2012.04; CISPR 24 Ed2.0 2010-08; EN 55024:2010; EN 61000-3-2:2006+A1:2009+A2:2009; EN 61000-4-2:2009; EN 61000-4-29:2000; EN 61000-4-3:2006; EN 61000-4-4:2012; EN 61000-4-5:2006; EN 61000-4-6:2009; EN 61000-4-8:2010; ETSI EN 300 386 V1.6.1(2012-09); FCC 47 CFR Part 15 (latest current version); ICES-003 Issue 5; IEC 61000-4-11 Ed2.0 (2004-03); IEC 61000-4-2 Ed2.0 (2008-12); IEC 61000-4-29 Ed1.0 (2000-08); IEC 61000-4-3 Ed3.2 (2010-04); IEC 61000-4-4 Ed3.0 (2012-04); IEC 61000-4-5 Ed2.0 (2005-11); IEC 61000-4-6 Ed3.0 (2008-10); IEC 61000-4-8 Ed2.0 (2009-09); VCCI V-3/2013.04	EN 61000-4-11:2004; ANSI C63.4-2009; AS/NZS CISPR 22:2009; CISPR 22 Ed2.0 2008-09; EN 55022:2010; EN 61000-3-3:2008; GB 9254-2008; IEC 61000-3-2 Ed3.0 (2009-02); IEC 61000-3-3 Ed2.0 (2008-06); VCCI V-4/2012.04; CISPR 24 Ed2.0 2010-08; EN 55024:2010; EN 61000-3-2:2006+A1:2009+A2:2009; EN 61000-4-2:2009; EN 61000-4-29:2000; EN 61000-4-3:2006; EN 61000-4-4:2012; EN 61000-4-5:2006; EN 61000-4-6:2009; EN 61000-4-8:2010; ETSI EN 300 386 V1.6.1(2012-09); FCC 47 CFR Part 15 (latest current version); ICES-003 Issue 5; IEC 61000-4-11 Ed2.0 (2004-03); IEC 61000-4-2 Ed2.0 (2008-12); IEC 61000-4-29 Ed1.0 (2000-08); IEC 61000-4-3 Ed3.2 (2010-04); IEC 61000-4-4 Ed3.0 (2012-04); IEC 61000-4-5 Ed2.0 (2005-11); IEC 61000-4-6 Ed3.0 (2008-10); IEC 61000-4-8 Ed2.0 (2009-09); VCCI V-3/2013.04

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Telecom	FCC part 68; CS-03	FCC part 68; CS-03
Management	IMC—Intelligent Management Center; 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; modem interface; out-of-band management (serial RS-232C or Micro USB); IEEE 802.3 Ethernet MIB	IMC—Intelligent Management Center; 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; modem interface; out-of-band management (serial RS-232C or Micro USB); IEEE 802.3 Ethernet MIB
Services	Refer to the HP website at 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.	Refer to the HP website at 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 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 1965 BGP-4 confederations 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 RFC 4275 BGP-4 MIB Implementation Survey	RFC 4276 BGP-4 Implementation Report RFC 4277 Experience with the BGP-4 Protocol RFC 4360 BGP Extended Communities Attribute RFC 4456 BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP) RFC 4724 Graceful Restart Mechanism for BGP RFC 4760 Multiprotocol Extensions for BGP-4 RFC 1998 An Application of the BGP Community Attribute in Multi-home Routing
Denial of service protection	CPU DoS Protection	Rate Limiting by ACLs	
Device management	RFC 1155 Structure and Mgmt Information (SMIv1) RFC 1157 SNMPv1/v2c RFC 1305 NTPv3 RFC 1591 DNS (client) RFC 1902 (SNMPv2)	RFC 1908 (SNMP v1/2 Coexistence) RFC 1945 Hypertext Transfer Protocol—HTTP/1.0 RFC 2271 Framework RFC 2573 (SNMPv3 Applications) RFC 2576 (Coexistence between SNMP V1, V2, V3)	RFC 2578-2580 SMIv2 RFC 2579 (SMIv2 Text Conventions) RFC 2580 (SMIv2 Conformance) RFC 3416 (SNMP Protocol Operations v2) RFC 3417 (SNMP Transport Mappings)
General protocols	RFC 768 UDP RFC 783 TFTP Protocol (revision 2) RFC 791 IP RFC 792 ICMP RFC 793 TCP RFC 826 ARP RFC 896 Congestion Control in IP/TCP Internetworks RFC 917 Internet Subnets RFC 925 Multi-LAN Address Resolution RFC 950 Internet Standard Subnetting Procedure RFC 951 BOOTP RFC 959 File Transfer Protocol (FTP) RFC 1027 Proxy ARP RFC 1048 BOOTP (Bootstrap Protocol) vendor information extensions RFC 1058 RIPv1 RFC 1091 Telnet Terminal-Type Option RFC 1093 NSFNET routing architecture RFC 1141 Incremental updating of the Internet checksum RFC 1142 OSI IS-IS Intra-domain Routing Protocol RFC 1166 Internet address used by Internet Protocol (IP) RFC 1191 Path MTU discovery	RFC 1195 OSI ISIS for IP and Dual Environments RFC 1213 Management Information Base for Network Management of TCP/IP-based internets RFC 1253 (OSPF v2) RFC 1305 NTPv3 (IPv4 only) RFC 1321 The MD5 Message-Digest Algorithm RFC 1323 TCP Extensions for High Performance RFC 1349 Type of Service RFC 1350 TFTP Protocol (revision 2) RFC 1449 Transport Mappings for version 2 of the Simple Network Management Protocol (SNMPv2) RFC 1519 CIDR RFC 1542 BOOTP Extensions RFC 1542 Clarifications and Extensions for the Bootstrap Protocol RFC 1624 Incremental Internet Checksum RFC 1631 NAT RFC 1701 Generic Routing Encapsulation RFC 1702 Generic Routing Encapsulation over IPv4 networks RFC 1721 RIP-2 Analysis RFC 1722 RIP-2 Applicability RFC 1723 RIP v2 RFC 1724 RIP Version 2 MIB Extension	RFC 1777 Lightweight Directory Access Protocol RFC 1812 IPv4 Routing RFC 1825 Security Architecture for the Internet Protocol RFC 1826 IP Authentication Header RFC 1827 IP Encapsulating Security Payload (ESP) RFC 1829 The ESP DES-CBC Transform RFC 1945 Hypertext Transfer Protocol—HTTP/1.0 RFC 1966 BGP Route Reflection An alternative to full mesh IBGP RFC 1981 Path MTU Discovery for IP version 6 RFC 2003 IP Encapsulation within IP RFC 2018 TCP Selective Acknowledgement Options RFC 2082 RIP-2 MD5 Authentication RFC 2104 HMAC: Keyed-Hashing for Message Authentication RFC 2131 DHCP RFC 2132 DHCP Options and BOOTP Vendor Extensions RFC 2138 Remote Authentication Dial In User Service (RADIUS) RFC 2236 IGMP Snooping RFC 2246 The TLS Protocol Version 1.0

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RFC 2251 Lightweight Directory Access Protocol (v3)

RFC 2252 Lightweight Directory Access Protocol (v3): Attribute Syntax Definitions

RFC 2283 MBGP

RFC 2309 Recommendations on queue management and congestion avoidance in the Internet

RFC 2338 VRRP

RFC 2451 The ESP CBC-Mode Cipher Algorithms

RFC 2453 RIPv2

RFC 2474 Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers

RFC 2510 Internet X.509 Public Key Infrastructure Certificate Management Protocols

RFC 2519 A Framework for Inter-Domain Route Aggregation

RFC 2529 Transmission of IPv6 over IPv4 Domains without Explicit Tunnels

RFC 2548 (MS-RAS-Vendor only)

RFC 2581 TCP Congestion Control

RFC 2597 Assured Forwarding PHB Group

RFC 2598 An Expedited Forwarding PHB

RFC 2616 HTTP Compatibility v1.1

RFC 2661 L2TP

RFC 2663 NAT Terminology and Considerations

RFC 2694 DNS extensions to Network Address Translators (DNS_ALG)

RFC 2698 A Two Rate Three Color Marker

RFC 2716 PPP EAP TLS Authentication Protocol

RFC 2747 RSVP Cryptographic Authentication

RFC 2763 Dynamic Name-to-System ID mapping

RFC 2784 Generic Routing Encapsulation (GRE)

RFC 2827 Network Ingress Filtering: Defeating Denial of Service Attacks Which Employ IP Source Address Spoofing

RFC 2865 Remote Authentication Dial In User Service (RADIUS)

RFC 2866 RADIUS Accounting

RFC 2868 RADIUS Attributes for Tunnel Protocol Support

RFC 2869 RADIUS Extensions

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RFC 2973 IS-IS Mesh Groups

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RFC 3022 Traditional IP Network Address Translator (Traditional NAT)

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RFC 3036 LDP Specification

RFC 3037 LDP (Label Distribution Protocol) Applicability

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RFC 3973 Protocol Independent Multicast - Dense Mode (PIM-DM): Protocol Specification (Revised)

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RFC 4061 Benchmarking Basic OSPF Single Router Control Plane Convergence

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RFC 4253 The Secure Shell (SSH) Transport Layer Protocol

RFC 4254 The Secure Shell (SSH) Connection Protocol

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(VPN) Management Information Base

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Standards and Protocols

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	HP X120 1G SFP LC LH40 1550nm Transceiver (JD062A)
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