DIVERSATEC
10022 Cheshire Rd Sunbury, OH 43074
Main/Fax: 740-965-3400

April 2, 2013

State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
P O Box 50130
Charleston, WV 25305

Reference RFP # ISCN0038

Thank you for this opportunity to respond to the RFP for Network Infrastructure Equipment. Diversatec, an EDGE, MWE and 8a firm and its affiliate All Lines Technology, a regional HP partner, who has locations in West Virginia, Pa., Ohio, Mass. and Atlanta is an Elite Enterprise HP partner, certified in all enterprise product lines.

Key differentiators of the proposed HP networking solutions include:

- Lower cost of ownership: The proposed HP networking products feature industry-leading warranties with technical support and software upgrades, are engineered for high reliability to industry-standard specifications. No need for expensive CISCO *SmartNet* contracts.
- Product lifecycle management: Our team will work with you to ensure that you are informed of product roadmaps and are able to address end-of-life product issues in a proactive fashion. This will enable, the State of West Virginia to maintain a consistent and predictable network infrastructure.
- Lock down and secure your Network with HP's IDM (Identity Driven Manager), that dynamically provisions wired / wireless network security and performance policies based on user, device, location, time, and endpoint posture to support BYOD trends.
- Improve business agility through the ability to deliver new services with standards-based solutions that eliminate vendor lock-in.
- Reduce complexity and eliminate swivel-chair management with a single-pane-of glass management platform and unified wired and wireless access control.
- Protect against cyber-attacks with continuous RF vulnerability protection and a full suite of integrated security solutions.
- End to end solution: HP can deliver world-class networking products, plus deployment and maintenance services.

Diversatec and HP are committed to your project's success and we are confident that our solution addresses your critical business requirements. We look forward to meeting with you to review our capabilities, to discuss the benefits of our proposed solution and to explore the next steps in creating a strong and mutually beneficial relationship.

Sincerely

Dan Frost
General Manager

State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Solicitation

NUMBER	PAGE
ISCN0038	1

ADDRESS CORRESPONDENCE TO ATTENTION OF:
KRISTA FERRELL
304-558-2596

VENDOR
RFQ COPY
TYPE NAME/ADDRESS HERE

SHIP TO
DEPARTMENT OF ADMINISTRATION
JOBSITE
SEE SPECIFICATIONS

DATE PRINTED: 03/06/2013

BID OPENING DATE: 04/16/2013 BID OPENING TIME 1:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
0001	1	EA		205-43		$127846.51

PERIPHERAL DEVICES AND ACCESSORIES, COMPUTER SYSTEM

REQUEST FOR QUOTATION
(RFQ)

THE WEST VIRGINIA STATE PURCHASING DIVISION FOR THE AGENCY, THE WEST VIRGINIA OFFICE OF TECHNOLOGY, IS SOLICITING BIDS TO PROVIDE THE AGENCY WITH NETWORK INFRASTRUCTURE EQUIPMENT FOR WEST VIRGINIA UNIVERSITY (WVU) LOCATED IN MORGANTOWN, WEST VIRGINIA PER THE ATTACHED SPECIFICATIONS.

****** THIS IS THE END OF RFQ ISCN0038 ****** TOTAL: $127846.51

SIGNATURE	TELEPHONE	DATE
Carmen M. Frost		04-11-13
TITLE: President	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO SOLICITATION, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

INSTRUCTIONS TO VENDORS SUBMITTING BIDS

1. **REVIEW DOCUMENTS THOROUGHLY:** The attached documents contain a solicitation for bids. Please read these instructions and all documents attached in their entirety. These instructions provide critical information about requirements that if overlooked could lead to disqualification of a Vendor's bid. All bids must be submitted in accordance with the provisions contained in these instructions and the Solicitation. Failure to do so may result in disqualification of Vendor's bid.

2. **MANDATORY TERMS:** The Solicitation may contain mandatory provisions identified by the use of the words "must," "will," and "shall." Failure to comply with a mandatory term in the Solicitation will result in bid disqualification.

3. **PREBID MEETING:** The item identified below shall apply to this Solicitation.

   [✓] A pre-bid meeting will not be held prior to bid opening.

   [ ] A **NON-MANDATORY PRE-BID** meeting will be held at the following place and time:

   [ ] A **MANDATORY PRE-BID** meeting will be held at the following place and time:

   All Vendors submitting a bid must attend the mandatory pre-bid meeting. Failure to attend the mandatory pre-bid meeting shall result in disqualification of the Vendor's bid. No one person attending the pre-bid meeting may represent more than one Vendor.

   An attendance sheet provided at the pre-bid meeting shall serve as the official document verifying attendance. The State will not accept any other form of proof or documentation to verify attendance. Any person attending the pre-bid meeting on behalf of a Vendor must list on the attendance sheet his or her name and the name of the Vendor he or she is representing. Additionally, the person attending the pre-bid meeting should include the Vendor's E-Mail address, phone number, and Fax number on the attendance sheet. It is the Vendor's responsibility to locate the attendance sheet and provide the required

information. Failure to complete the attendance sheet as required may result in disqualification of Vendor's bid.

All Vendors should arrive prior to the starting time for the pre-bid. Vendors who arrive after the starting time but prior to the end of the pre-bid will be permitted to sign in, but are charged with knowing all matters discussed at the pre-bid.

Questions submitted at least five business days prior to a scheduled pre-bid will be discussed at the pre-bid meeting if possible. Any discussions or answers to questions at the pre-bid meeting are preliminary in nature and are non-binding. Official and binding answers to questions will be published in a written addendum to the Solicitation prior to bid opening.

4. **VENDOR QUESTION DEADLINE:** Vendors may submit questions relating to this Solicitation to the Purchasing Division. Questions must be submitted in writing. All questions must be submitted on or before the date listed below and to the address listed below in order to be considered. A written response will be published in a Solicitation addendum if a response is possible and appropriate. Non-written discussions, conversations, or questions and answers regarding this Solicitation are preliminary in nature and are non-binding.

Question Submission Deadline: March 22, 2013 at 5:00 PM EST

Submit Questions to:

Krista S. Ferrell, Buyer Supervisor
2019 Washington Street, East
P.O. Box 50130
Charleston, WV 25305
Fax: 304-558-4115
Email: krista.s.ferrell@wv.gov

5. **VERBAL COMMUNICATION:** Any verbal communication between the Vendor and any State personnel is not binding, including that made at the mandatory pre-bid conference. Only information issued in writing and added to the Solicitation by an official written addendum by the Purchasing Division is binding.

6. **BID SUBMISSION:** All bids must be signed and delivered by the Vendor to the Purchasing Division at the address listed below on or before the date and time of the bid opening. Any bid received by the Purchasing Division staff is considered to be in the possession of the Purchasing Division and will not be returned for any reason. The bid delivery address is:

Department of Administration, Purchasing Division
2019 Washington Street East
P.O. Box 50130,
Charleston, WV 25305-0130

The bid should contain the information listed below on the face of the envelope or the bid may not be considered:

SEALED BID
BUYER: Krista Ferrell
SOLICITATION NO.: ISCN0038
BID OPENING DATE: April 16, 2013
BID OPENING TIME: 1:30PM
FAX NUMBER: 724-850-9192

In the event that Vendor is responding to a request for proposal, the Vendor shall submit one original technical and one original cost proposal plus n/a convenience copies of each to the Purchasing Division at the address shown above. Additionally, the Vendor should identify the bid type as either a technical or cost proposal on the face of each bid envelope submitted in response to a request for proposal as follows:

BID TYPE: [ ] Technical
[ ] Cost

7. **BID OPENING:** Bids submitted in response to this Solicitation will be opened at the location identified below on the date and time listed below. Delivery of a bid after the bid opening date and time will result in bid disqualification. For purposes of this Solicitation, a bid is considered delivered when time stamped by the official Purchasing Division time clock.

Bid Opening Date and Time:	April 16, 2013 at 1:30 PM EST
Bid Opening Location:	Department of Administration, Purchasing Division 2019 Washington Street East P.O. Box 50130, Charleston, WV 25305-0130

8. **ADDENDUM ACKNOWLEDGEMENT:** Changes or revisions to this Solicitation will be made by an official written addendum issued by the Purchasing Division. Vendor should acknowledge receipt of all addenda issued with this Solicitation by completing an Addendum Acknowledgment Form, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

9. **BID FORMATTING:** Vendor should type or electronically enter the information onto its bid to prevent errors in the evaluation. Failure to type or electronically enter the information may result in bid disqualification.

GENERAL TERMS AND CONDITIONS:

1. **CONTRACTUAL AGREEMENT:** Issuance of a Purchase Order signed by the Purchasing Division Director, or his designee, and approved as to form by the Attorney General's office constitutes acceptance of this Contract made by and between the State of West Virginia and the Vendor. Vendor's signature on its bid signifies Vendor's agreement to be bound by and accept the terms and conditions contained in this Contract.

2. **DEFINITIONS:** As used in this Solicitation / Contract, the following terms shall have the meanings attributed to them below. Additional definitions may be found in the specifications included with this Solicitation / Contract.

   2.1 "Agency" or **"Agencies"** means the agency, board, commission, or other entity of the State of West Virginia that is identified on the first page of the Solicitation or any other public entity seeking to procure goods or services under this Contract.

   2.2 "Contract" means the binding agreement that is entered into between the State and the Vendor to provide the goods and services requested in the Solicitation.

   2.3 "Director" means the Director of the West Virginia Department of Administration, Purchasing Division.

   2.4 "Purchasing Division" means the West Virginia Department of Administration, Purchasing Division.

   2.5 "Purchase Order" means the document signed by the Agency and the Purchasing Division, and approved as to form by the Attorney General, that identifies the Vendor as the successful bidder and Contract holder.

   2.6 "Solicitation" means the official solicitation published by the Purchasing Division and identified by number on the first page thereof.

   2.7 "State" means the State of West Virginia and/or any of its agencies, commissions, boards, etc. as context requires.

   2.8 "Vendor" or **"Vendors"** means any entity submitting a bid in response to the Solicitation, the entity that has been selected as the lowest responsible bidder, or the entity that has been awarded the Contract as context requires.

3. **CONTRACT TERM; RENEWAL; EXTENSION:** The term of this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below:

[ ] **Term Contract**

Initial Contract Term: This Contract becomes effective on [ ] and extends for a period of [ ] year(s).

Renewal Term: This Contract may be renewed upon the mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any request for renewal must be submitted to the Purchasing Division Director thirty (30) days prior to the expiration date of the initial contract term or appropriate renewal term. A Contract renewal shall be in accordance with the terms and conditions of the original contract. Renewal of this Contract is limited to [ ] successive one (1) year periods. Automatic renewal of this Contract is prohibited. Notwithstanding the foregoing, Purchasing Division approval is not required on agency delegated or exempt purchases. Attorney General approval may be required for vendor terms and conditions.

Reasonable Time Extension: At the sole discretion of the Purchasing Division Director, and with approval from the Attorney General's office (Attorney General approval is as to form only), this Contract may be extended for a reasonable time after the initial Contract term or after any renewal term as may be necessary to obtain a new contract or renew this Contract. Any reasonable time extension shall not exceed twelve (12) months. Vendor may avoid a reasonable time extension by providing the Purchasing Division Director with written notice of Vendor's desire to terminate this Contract 30 days prior to the expiration of the then current term. During any reasonable time extension period, the Vendor may terminate this Contract for any reason upon giving the Purchasing Division Director 30 days written notice. Automatic extension of this Contract is prohibited. Notwithstanding the foregoing, Purchasing Division approval is not required on agency delegated or exempt purchases, but Attorney General approval may be required.

[ ] **Fixed Period Contract:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and must be completed within [ ] days.

[✓] **One Time Purchase:** The term of this Contract shall run from the issuance of the Purchase Order until all of the goods contracted for have been delivered, but in no event shall this Contract extend for more than one fiscal year.

[ ] **Other:** See attached.

4. **NOTICE TO PROCEED:** Vendor shall begin performance of this Contract immediately upon receiving notice to proceed unless otherwise instructed by the Agency. Unless otherwise specified, the fully executed Purchase Order will be considered notice to proceed

5. **QUANTITIES:** The quantities required under this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below.

   [ ] **Open End Contract:** Quantities listed in this Solicitation are approximations only, based on estimates supplied by the Agency. It is understood and agreed that the Contract shall cover the quantities actually ordered for delivery during the term of the Contract, whether more or less than the quantities shown.

   [ ] **Service:** The scope of the service to be provided will be more clearly defined in the specifications included herewith.

   [ ] **Combined Service and Goods:** The scope of the service and deliverable goods to be provided will be more clearly defined in the specifications included herewith.

   [✓] **One Time Purchase:** This Contract is for the purchase of a set quantity of goods that are identified in the specifications included herewith. Once those items have been delivered, no additional goods may be procured under this Contract without an appropriate change order approved by the Vendor, Agency, Purchasing Division, and Attorney General's office.

6. **PRICING:** The pricing set forth herein is firm for the life of the Contract, unless specified elsewhere within this Solicitation/Contract by the State. A Vendor's inclusion of price adjustment provisions in its bid, without an express authorization from the State in the Solicitation to do so, may result in bid disqualification.

7. **EMERGENCY PURCHASES:** The Purchasing Division Director may authorize the Agency to purchase goods or services in the open market that Vendor would otherwise provide under this Contract if those goods or services are for immediate or expedited delivery in an emergency. Emergencies shall include, but are not limited to, delays in transportation or an unanticipated increase in the volume of work. An emergency purchase in the open market, approved by the Purchasing Division Director, shall not constitute of breach of this Contract and shall not entitle the Vendor to any form of compensation or damages. This provision does not excuse the State from fulfilling its obligations under a One Time Purchase contract.

8. **REQUIRED DOCUMENTS:** All of the items checked below must be provided to the Purchasing Division by the Vendor as specified below.

   [ ] **BID BOND:** All Vendors shall furnish a bid bond in the amount of five percent (5%) of the total amount of the bid protecting the State of West Virginia. The bid bond must be submitted with the bid.

[ ] **PERFORMANCE BOND:** The apparent successful Vendor shall provide a performance bond in the amount of [ ]. The performance bond must be issued and received by the Purchasing Division prior to Contract award. On construction contracts, the performance bond must be 100% of the Contract value.

[ ] **LABOR/MATERIAL PAYMENT BOND:** The apparent successful Vendor shall provide a labor/material payment bond in the amount of 100% of the Contract value. The labor/material payment bond must be issued and delivered to the Purchasing Division prior to Contract award.

In lieu of the Bid Bond, Performance Bond, and Labor/Material Payment Bond, the Vendor may provide certified checks, cashier's checks, or irrevocable letters of credit. Any certified check, cashier's check, or irrevocable letter of credit provided in lieu of a bond must be of the same amount and delivered on the same schedule as the bond it replaces. A letter of credit submitted in lieu of a performance and labor/material payment bond will only be allowed for projects under $100,000. Personal or business checks are not acceptable.

[ ] **MAINTENANCE BOND:** The apparent successful Vendor shall provide a two (2) year maintenance bond covering the roofing system. The maintenance bond must be issued and delivered to the Purchasing Division prior to Contract award.

[ ] **WORKERS' COMPENSATION INSURANCE:** The apparent successful Vendor shall have appropriate workers' compensation insurance and shall provide proof thereof upon request.

[ ] **INSURANCE:** The apparent successful Vendor shall furnish proof of the following insurance prior to Contract award:

[ ] **Commercial General Liability Insurance:** [ ] or more.

[ ] **Builders Risk Insurance:** builders risk – all risk insurance in an amount equal to 100% of the amount of the Contract.

[ ] [ ]

[ ] [ ]

[ ] [ ]

[ ] [ ]

The apparent successful Vendor shall also furnish proof of any additional insurance requirements contained in the specifications prior to Contract award regardless of whether or not that insurance requirement is listed above.

[ ] **LICENSE(S) / CERTIFICATIONS / PERMITS:** In addition to anything required under the Section entitled Licensing, of the General Terms and Conditions, the apparent successful Vendor shall furnish proof of the following licenses, certifications, and/or permits prior to Contract award, in a form acceptable to the Purchasing Division.

[ ]

[ ]

[ ]

[ ]

The apparent successful Vendor shall also furnish proof of any additional licenses or certifications contained in the specifications prior to Contract award regardless of whether or not that requirement is listed above.

9. **LITIGATION BOND:** The Director reserves the right to require any Vendor that files a protest of an award to submit a litigation bond in the amount equal to one percent of the lowest bid submitted or $5,000, whichever is greater. The entire amount of the bond shall be forfeited if the hearing officer determines that the protest was filed for frivolous or improper purpose, including but not limited to, the purpose of harassing, causing unnecessary delay, or needless expense for the Agency. All litigation bonds shall be made payable to the Purchasing Division. In lieu of a bond, the protester may submit a cashier's check or certified check payable to the Purchasing Division. Cashier's or certified checks will be deposited with and held by the State Treasurer's office. If it is determined that the protest has not been filed for frivolous or improper purpose, the bond or deposit shall be returned in its entirety.

10. **ALTERNATES:** Any model, brand, or specification listed herein establishes the acceptable level of quality only and is not intended to reflect a preference for, or in any way favor, a particular brand or vendor. Vendors may bid alternates to a listed model or brand provided that the alternate is at least equal to the model or brand and complies with the required specifications. The equality of any alternate being bid shall be determined by the State at its sole discretion. Any Vendor bidding an alternate model or brand should clearly identify the alternate items in its bid and should include manufacturer's specifications, industry literature, and/or any other relevant documentation demonstrating the equality of the alternate items. Failure to provide information for alternate items may be grounds for rejection of a Vendor's bid.

11. **EXCEPTIONS AND CLARIFICATIONS:** The Solicitation contains the specifications that shall form the basis of a contractual agreement. Vendor shall clearly mark any exceptions, clarifications, or

other proposed modifications in its bid. Exceptions to, clarifications of, or modifications of a requirement or term and condition of the Solicitation may result in bid disqualification.

12. **LIQUIDATED DAMAGES:** Vendor shall pay liquidated damages in the amount [ ] for [ ] [ ].
This clause shall in no way be considered exclusive and shall not limit the State or Agency's right to pursue any other available remedy.

13. **ACCEPTANCE/REJECTION:** The State may accept or reject any bid in whole, or in part. Vendor's signature on its bid signifies acceptance of the terms and conditions contained in the Solicitation and Vendor agrees to be bound by the terms of the Contract, as reflected in the Purchase Order, upon receipt.

14. **REGISTRATION:** Prior to Contract award, the apparent successful Vendor must be properly registered with the West Virginia Purchasing Division and must have paid the $125 fee if applicable.

15. **COMMUNICATION LIMITATIONS:** In accordance with West Virginia Code of State Rules §148-1-6.6, communication with the State of West Virginia or any of its employees regarding this Solicitation during the solicitation, bid, evaluation or award periods, except through the Purchasing Division, is strictly prohibited without prior Purchasing Division approval. Purchasing Division approval for such communication is implied for all agency delegated and exempt purchases.

16. **FUNDING:** This Contract shall continue for the term stated herein, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise made available, this Contract becomes void and of no effect beginning on July 1 of the fiscal year for which funding has not been appropriated or otherwise made available.

17. **PAYMENT:** Payment in advance is prohibited under this Contract. Payment may only be made after the delivery and acceptance of goods or services. The Vendor shall submit invoices, in arrears, to the Agency at the address on the face of the purchase order labeled "Invoice To."

18. **UNIT PRICE:** Unit prices shall prevail in cases of a discrepancy in the Vendor's bid.

19. **DELIVERY:** All quotations are considered freight on board destination ("F.O.B. destination") unless alternate shipping terms are clearly identified in the bid. Vendor's listing of shipping terms that contradict the shipping terms expressly required by this Solicitation may result in bid disqualification.

20. **INTEREST:** Interest attributable to late payment will only be permitted if authorized by the West Virginia Code. Presently, there is no provision in the law for interest on late payments.

21. **PREFERENCE:** Vendor Preference may only be granted upon written request and only in accordance with the West Virginia Code § 5A-3-37 and the West Virginia Code of State Rules. A Resident Vendor Certification form has been attached hereto to allow Vendor to apply for the preference. Vendor's

failure to submit the Resident Vendor Certification form with its bid will result in denial of Vendor Preference. Vendor Preference does not apply to construction projects.

22. **SMALL, WOMEN-OWNED, OR MINORITY-OWNED BUSINESSES:** For any solicitations publicly advertised for bid on or after July 1, 2012, in accordance with West Virginia Code §5A-3-37(a)(7) and W. Va. CSR § 148-22-9, any non-resident vendor certified as a small, women-owned, or minority-owned business under W. Va. CSR § 148-22-9 shall be provided the same preference made available to any resident vendor. Any non-resident small, women-owned, or minority-owned business must identify itself as such in writing, must submit that writing to the Purchasing Division with its bid, and must be properly certified under W. Va. CSR § 148-22-9 prior to submission of its bid to receive the preferences made available to resident vendors. Preference for a non-resident small, women-owned, or minority owned business shall be applied in accordance with W. Va. CSR § 148-22-9.

23. **TAXES:** The Vendor shall pay any applicable sales, use, personal property or any other taxes arising out of this Contract and the transactions contemplated thereby. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.

24. **CANCELLATION:** The Purchasing Division Director reserves the right to cancel this Contract immediately upon written notice to the vendor if the materials or workmanship supplied do not conform to the specifications contained in the Contract. The Purchasing Division Director may cancel any purchase or Contract upon 30 days written notice to the Vendor in accordance with West Virginia Code of State Rules § 148-1-7.16.2.

25. **WAIVER OF MINOR IRREGULARITIES:** The Director reserves the right to waive minor irregularities in bids or specifications in accordance with West Virginia Code of State Rules § 148-1-4.6.

26. **TIME:** Time is of the essence with regard to all matters of time and performance in this Contract.

27. **APPLICABLE LAW:** This Contract is governed by and interpreted under West Virginia law without giving effect to its choice of law principles. Any information provided in specification manuals, or any other source, verbal or written, which contradicts or violates the West Virginia Constitution, West Virginia Code or West Virginia Code of State Rules is void and of no effect.

28. **COMPLIANCE:** Vendor shall comply with all applicable federal, state, and local laws, regulations and ordinances. By submitting a bid, Vendors acknowledge that they have reviewed, understand, and will comply with all applicable law.

29. **PREVAILING WAGE:** On any contract for the construction of a public improvement, Vendor and any subcontractors utilized by Vendor shall pay a rate or rates of wages which shall not be less than the fair minimum rate or rates of wages (prevailing wage), as established by the West Virginia Division of Labor under West Virginia Code §§ 21-5A-1 et seq. and available at http://www.sos.wv.gov/administrative-law/wagerates/Pages/default.aspx. Vendor shall be responsible for ensuring compliance with prevailing wage requirements and determining when prevailing wage

requirements are applicable. The required contract provisions contained in West Virginia Code of State Rules § 42-7-3 are specifically incorporated herein by reference.

30. **ARBITRATION:** Any references made to arbitration contained in this Contract, Vendor's bid, or in any American Institute of Architects documents pertaining to this Contract are hereby deleted, void, and of no effect.

31. **MODIFICATIONS**: This writing is the parties' final expression of intent. Notwithstanding anything contained in this Contract to the contrary, no modification of this Contract shall be binding without mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). **No Change shall be implemented by the Vendor until such time as the Vendor receives an approved written change order from the Purchasing Division.**

32. **WAIVER:** The failure of either party to insist upon a strict performance of any of the terms or provision of this Contract, or to exercise any option, right, or remedy herein contained, shall not be construed as a waiver or a relinquishment for the future of such term, provision, option, right, or remedy, but the same shall continue in full force and effect. Any waiver must be expressly stated in writing and signed by the waiving party.

33. **SUBSEQUENT FORMS:** The terms and conditions contained in this Contract shall supersede any and all subsequent terms and conditions which may appear on any form documents submitted by Vendor to the Agency or Purchasing Division such as price lists, order forms, invoices, sales agreements, or maintenance agreements, and includes internet websites or other electronic documents. Acceptance or use of Vendor's forms does not constitute acceptance of the terms and conditions contained thereon.

34. **ASSIGNMENT**: Neither this Contract nor any monies due, or to become due hereunder, may be assigned by the Vendor without the express written consent of the Agency, the Purchasing Division, the Attorney General's office (as to form only), and any other government agency or office that may be required to approve such assignments. Notwithstanding the foregoing, Purchasing Division approval may or may not be required on certain agency delegated or exempt purchases.

35. **WARRANTY**: The Vendor expressly warrants that the goods and/or services covered by this Contract will: (a) conform to the specifications, drawings, samples, or other description furnished or specified by the Agency; (b) be merchantable and fit for the purpose intended; and (c) be free from defect in material and workmanship.

36. **STATE EMPLOYEES:** State employees are not permitted to utilize this Contract for personal use and the Vendor is prohibited from permitting or facilitating the same.

37. **BANKRUPTCY**: In the event the Vendor files for bankruptcy protection, the State of West Virginia may deem this Contract null and void, and terminate this Contract without notice.

38. **HIPAA BUSINESS ASSOCIATE ADDENDUM**: The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, is available online at http://www.state.wv.us/admin/purchase/vrc/hipaa.html and is hereby made part of the agreement provided that the Agency meets the definition of a Covered entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the Vendor. Additionally, the HIPAA Privacy, Security, Enforcement & Breach Notification Final Omnibus Rule was published on January 25, 2013. It may be viewed online at http://www.gpo.gov/fdsys/pkg/FR-2013-01-25/pdf/2013-01073.pdf. Any organization, that qualifies as the Agency's Business Associate, is expected to be in compliance with this Final Rule. For those Business Associates entering into contracts with a HIPAA Covered State Agency between January 25, 2013 and the release of the 2013 WV State Agency Business Associate Agreement, or September 23, 2013 (whichever is earlier), be advised that you will be required to comply with the 2013 WV State Agency Business Associate Agreement. For those Business Associates with contracts with a HIPAA Covered State Agency executed prior to January 25, 2013, be advised that upon renewal or modification, you will be required to comply with the 2013 WV State Agency Business Associate Agreement no later than September 22, 2014.

39. **CONFIDENTIALITY**: The Vendor agrees that it will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the Agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the Agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in http://www.state.wv.us/admin/purchase/privacy/default.html.

40. **DISCLOSURE:** Vendor's response to the Solicitation and the resulting Contract are considered public documents and will be disclosed to the public in accordance with the laws, rules, and policies governing the West Virginia Purchasing Division. Those laws include, but are not limited to, the Freedom of Information Act found in West Virginia Code § 29B-1-1 et seq.

    If a Vendor considers any part of its bid to be exempt from public disclosure, Vendor must so indicate by specifically identifying the exempt information, identifying the exemption that applies, providing a detailed justification for the exemption, segregating the exempt information from the general bid information, and submitting the exempt information as part of its bid but in a segregated and clearly identifiable format. Failure to comply with the foregoing requirements will result in public disclosure of the Vendor's bid without further notice. A Vendor's act of marking all or nearly all of its bid as exempt is not sufficient to avoid disclosure and WILL NOT BE HONORED. Vendor's act of marking a bid or any part thereof as "confidential" or "proprietary" is not sufficient to avoid disclosure and WILL NOT BE HONORED. In addition, a legend or other statement indicating that all or substantially all of the bid is exempt from disclosure is not sufficient to avoid disclosure and WILL NOT BE HONORED. Vendor will be required to defend any claimed exemption for nondiclosure in the event of an administrative or judicial challenge to the State's nondisclosure. Vendor must indemnify the State for any costs incurred related to any exemptions claimed by Vendor. Any questions regarding the applicability of the various public records laws should be addressed to your own legal counsel prior to bid submission.

41. **LICENSING:** In accordance with West Virginia Code of State Rules §148-1-6.1.7, Vendor must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agency or political subdivision. Upon request, the Vendor must provide all necessary releases to obtain information to enable the Purchasing Division Director or the Agency to verify that the Vendor is licensed and in good standing with the above entities.

42. **ANTITRUST:** In submitting a bid to, signing a contract with, or accepting a Purchase Order from any agency of the State of West Virginia, the Vendor agrees to convey, sell, assign, or transfer to the State of West Virginia all rights, title, and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to Vendor.

43. **VENDOR CERTIFICATIONS:** By signing its bid or entering into this Contract, Vendor certifies (1) that its bid was made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, person or entity submitting a bid for the same material, supplies, equipment or services; (2) that its bid is in all respects fair and without collusion or fraud; (3) that this Contract is accepted or entered into without any prior understanding, agreement, or connection to any other entity that could be considered a violation of law; and (4) that it has reviewed this RFQ in its entirety; understands the requirements, terms and conditions, and other information contained herein. Vendor's signature on its bid also affirms that neither it nor its representatives have any interest, nor shall acquire any interest, direct or indirect, which would compromise the performance of its services hereunder. Any such interests shall be promptly presented in detail to the Agency.

    The individual signing this bid on behalf of Vendor certifies that he or she is authorized by the Vendor to execute this bid or any documents related thereto on Vendor's behalf; that he or she is authorized to bind the Vendor in a contractual relationship; and that, to the best of his or her knowledge, the Vendor has properly registered with any State agency that may require registration.

44. **PURCHASING CARD ACCEPTANCE:** The State of West Virginia currently utilizes a Purchasing Card program, administered under contract by a banking institution, to process payment for goods and services. The Vendor must accept the State of West Virginia's Purchasing Card for payment of all orders under this Contract unless the box below is checked.

    [ ] Vendor is not required to accept the State of West Virginia's Purchasing Card as payment for all goods and services.

45. **VENDOR RELATIONSHIP:** The relationship of the Vendor to the State shall be that of an independent contractor and no principal-agent relationship or employer-employee relationship is contemplated or created by this Contract. The Vendor as an independent contractor is solely liable for the acts and omissions of its employees and agents. Vendor shall be responsible for selecting,

supervising, and compensating any and all individuals employed pursuant to the terms of this Solicitation and resulting contract. Neither the Vendor, nor any employees or subcontractors of the Vendor, shall be deemed to be employees of the State for any purpose whatsoever. Vendor shall be exclusively responsible for payment of employees and contractors for all wages and salaries, taxes, withholding payments, penalties, fees, fringe benefits, professional liability insurance premiums, contributions to insurance and pension, or other deferred compensation plans, including but not limited to, Workers' Compensation and Social Security obligations, licensing fees, *etc.* and the filing of all necessary documents, forms and returns pertinent to all of the foregoing. Vendor shall hold harmless the State, and shall provide the State and Agency with a defense against any and all claims including, but not limited to, the foregoing payments, withholdings, contributions, taxes, Social Security taxes, and employer income tax returns.

46. **INDEMNIFICATION:** The Vendor agrees to indemnify, defend, and hold harmless the State and the Agency, their officers, and employees from and against: (1) Any claims or losses for services rendered by any subcontractor, person, or firm performing or supplying services, materials, or supplies in connection with the performance of the Contract; (2) Any claims or losses resulting to any person or entity injured or damaged by the Vendor, its officers, employees, or subcontractors by the publication, translation, reproduction, delivery, performance, use, or disposition of any data used under the Contract in a manner not authorized by the Contract, or by Federal or State statutes or regulations; and (3) Any failure of the Vendor, its officers, employees, or subcontractors to observe State and Federal laws including, but not limited to, labor and wage and hour laws.

47. **PURCHASING AFFIDAVIT:** In accordance with West Virginia Code § 5A-3-10a, all Vendors are required to sign, notarize, and submit the Purchasing Affidavit stating that neither the Vendor nor a related party owe a debt to the State in excess of $1,000. The affidavit must be submitted prior to award, but should be submitted with the Vendor's bid. A copy of the Purchasing Affidavit is included herewith.

48. **ADDITIONAL AGENCY AND LOCAL GOVERNMENT USE:** This Contract may be utilized by and extends to other agencies, spending units, and political subdivisions of the State of West Virginia; county, municipal, and other local government bodies; and school districts ("Other Government Entities"). This Contract shall be extended to the aforementioned Other Government Entities on the same prices, terms, and conditions as those offered and agreed to in this Contract. If the Vendor does not wish to extend the prices, terms, and conditions of its bid and subsequent contract to the Other Government Entities, the Vendor must clearly indicate such refusal in its bid. A refusal to extend this Contract to the Other Government Entities shall not impact or influence the award of this Contract in any manner.

49. **CONFLICT OF INTEREST:** Vendor, its officers or members or employees, shall not presently have or acquire any interest, direct or indirect, which would conflict with or compromise the performance of its obligations hereunder. Vendor shall periodically inquire of its officers, members and employees to ensure that a conflict of interest does not arise. Any conflict of interest discovered shall be promptly presented in detail to the Agency.

50. REPORTS: Vendor shall provide the Agency and/or the Purchasing Division with the following reports identified by a checked box below:

[ ] Such reports as the Agency and/or the Purchasing Division may request. Requested reports may include, but are not limited to, quantities purchased, agencies utilizing the contract, total contract expenditures by agency, etc.

[ ] Quarterly reports detailing the total quantity of purchases in units and dollars, along with a listing of purchases by agency. Quarterly reports should be delivered to the Purchasing Division via email at purchasing.requisitions@wv.gov.

51. BACKGROUND CHECK: In accordance with W. Va. Code § 15-2D-3, the Director of the Division of Protective Services shall require any service provider whose employees are regularly employed on the grounds or in the buildings of the Capitol complex or who have access to sensitive or critical information to submit to a fingerprint-based state and federal background inquiry through the state repository. The service provider is responsible for any costs associated with the fingerprint-based state and federal background inquiry.

After the contract for such services has been approved, but before any such employees are permitted to be on the grounds or in the buildings of the Capitol complex or have access to sensitive or critical information, the service provider shall submit a list of all persons who will be physically present and working at the Capitol complex to the Director of the Division of Protective Services for purposes of verifying compliance with this provision.

The State reserves the right to prohibit a service provider's employees from accessing sensitive or critical information or to be present at the Capitol complex based upon results addressed from a criminal background check.

Service providers should contact the West Virginia Division of Protective Services by phone at (304) 558-9911 for more information.

52. PREFERENCE FOR USE OF DOMESTIC STEEL PRODUCTS: Except when authorized by the Director of the Purchasing Division pursuant to W. Va. Code § 5A-3-56, no contractor may use or supply steel products for a State Contract Project other than those steel products made in the United States. A contractor who uses steel products in violation of this section may be subject to civil penalties pursuant to W. Va. Code § 5A-3-56. As used in this section:

a. "State Contract Project" means any erection or construction of, or any addition to, alteration of or other improvement to any building or structure, including, but not limited to, roads or highways, or the installation of any heating or cooling or ventilating plants or other equipment, or the supply of and materials for such projects, pursuant to a contract with the State of West Virginia for which bids were solicited on or after June 6, 2001.

b. "Steel Products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more or

such operations, from steel made by the open heath, basic oxygen, electric furnace, Bessemer or other steel making process.

The Purchasing Division Director may, in writing, authorize the use of foreign steel products if:

a. The cost for each contract item used does not exceed one tenth of one percent (.1%) of the total contract cost or two thousand five hundred dollars ($2,500.00), whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project; or

b. The Director of the Purchasing Division determines that specified steel materials are not produced in the United States in sufficient quantity or otherwise are not reasonably available to meet contract requirements.

53. **PREFERENCE FOR USE OF DOMESTIC ALUMINUM, GLASS, AND STEEL:** In Accordance with W. Va. Code § 5-19-1 et seq., and W. Va. CSR § 148-10-1 et seq., for every contract or subcontract, subject to the limitations contained herein, for the construction, reconstruction, alteration, repair, improvement or maintenance of public works or for the purchase of any item of machinery or equipment to be used at sites of public works, only domestic aluminum, glass or steel products shall be supplied unless the spending officer determines, in writing, after the receipt of offers or bids, (1) that the cost of domestic aluminum, glass or steel products is unreasonable or inconsistent with the public interest of the State of West Virginia, (2) that domestic aluminum, glass or steel products are not produced in sufficient quantities to meet the contract requirements, or (3) the available domestic aluminum, glass, or steel do not meet the contract specifications. This provision only applies to public works contracts awarded in an amount more than fifty thousand dollars ($50,000) or public works contracts that require more than ten thousand pounds of steel products.

The cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than twenty percent (20%) of the bid or offered price for foreign made aluminum, glass, or steel products. If the domestic aluminum, glass or steel products to be supplied or produced in a "substantial labor surplus area", as defined by the United States Department of Labor, the cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than thirty percent (30%) of the bid or offered price for foreign made aluminum, glass, or steel products.

This preference shall be applied to an item of machinery or equipment, as indicated above, when the item is a single unit of equipment or machinery manufactured primarily of aluminum, glass or steel, is part of a public works contract and has the sole purpose or of being a permanent part of a single public works project. This provision does not apply to equipment or machinery purchased by a spending unit for use by that spending unit and not as part of a single public works project.

All bids and offers including domestic aluminum, glass or steel products that exceed bid or offer prices including foreign aluminum, glass or steel products after application of the preferences provided in this provision may be reduced to a price equal to or lower than the lowest bid or offer price for foreign aluminum, glass or steel products plus the applicable preference. If the reduced bid or offer prices are made in writing and supersede the prior bid or offer prices, all bids or offers, including the reduced bid or offer prices, will be reevaluated in accordance with this rule.

CERTIFICATION AND SIGNATURE PAGE

By signing below, I certify that I have reviewed this Solicitation in its entirety; understand the requirements, terms and conditions, and other information contained herein; that I am submitting this bid or proposal for review and consideration; that I am authorized by the bidder to execute this bid or any documents related thereto on bidder's behalf; that I am authorized to bind the bidder in a contractual relationship; and that to the best of my knowledge, the bidder has properly registered with any State agency that may require registration.

Diversatec
(Company)

Carmen M. Frost
(Authorized Signature)

Carmen M Frost President
(Representative Name, Title)

740-965-3400 740-965-3403
(Phone Number) (Fax Number)

04-11-13
(Date)

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: ISCN0038

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

[X]	Addendum No. 1	[ ]	Addendum No. 6
[ ]	Addendum No. 2	[ ]	Addendum No. 7
[ ]	Addendum No. 3	[ ]	Addendum No. 8
[ ]	Addendum No. 4	[ ]	Addendum No. 9
[ ]	Addendum No. 5	[ ]	Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Diversatec
Company

Carmen M. Frost
Authorized Signature

04-11-13
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

SPECIFICATIONS

1. **PURPOSE AND SCOPE:** The West Virginia Purchasing Division is soliciting bids on behalf of the WV Office of Technology to establish a contract for the one time purchase of WVU network infrastructure equipment needed to provide Broadband connectivity between Morgantown and Green Bank, and to provide low-latency switching between the Servers at the Observatory.

   West Virginia University maintains network hardware in support of its campus locaitons in Morgantown, WV, Parkersburg, WV, Montgomery, WV, and Parkersburg, WV as well as various offices throughout each county in West Virginia. The main Internet and Internet2 connectivity is located at the main campus in Morgantown, WV. This connection serves as an aggregate point for various provider networks inlcuding WVNET, NETL, WVU Hospitals, and various other providers. The hardware currently used is a VSS pair of Cisco 6509-E switches. As part of the Broadband Technology Opportunities Program (BTOP), a new 10 GB fiber path has been installed between WVU in Morgantown, WV and the National Radio Astronomy Observatory (NRAO) in Green Bank, WV. This bid is to procure the routing and switching kplatforms needed to terminate the 10 Gbps circuit between these locaitons, and to provide low-latency switching between the servers at the Observatory. This connectivity will enable researchers at WVU to conduct world class research in astronomy, and analyze more than 130 terabytes of dat collected by the green Bank telescopes. In addition, this equipment will be used to update aging hardware, improve network security, and increase the overall network performance at WVU.

2. **DEFINITIONS:** The terms listed below shall have the meanings assigned to them below. Additional definitions can be found in section 2 of the General Terms and Conditions.

   2.1 **"BGP4"** stands for Border Gateway Protocol. BGP is the protocol which is used to make core routing decisions on the Internet; it involves a table of IP networks or "prefixes" which designate network reachability among autonomous systems (AS). BGP is a path vector protocol, or a variant of a Distance-vector routing protocol. The major enhancement in version 4 was support of Classless Inter-Domain Routing and use of route aggregation to decrease the size of routing tables.

   2.2 **"BTOP"** stands for the Broadband Technology Opportunities Program – a national program designed for expanding broadband access and adoption into communities across America.

2.3 **"Contract Item"** means components provided by a qualified, manufacturer-authorized, vendor which is fully compatible and interoperable with the existing network equipment system, in order to upgrade and extend the capabilities of the system. See Appendix B for a list of components required to upgrade and complement the existing network infrastructure.

2.4 **"EIGRP"** stands for Enhanced Interior Gateway Routing Protocol. EIGRP is an open routing protocol loosely based on their original IGRP created by Cisco. EIGRP is an advanced distance-vector routing protocol, with optimizations to minimize both the routing instability incurred after topology changes, as well as the use of bandwidth and processing power in the router. Routers that support EIGRP will automatically redistribute route information to IGRP neighbors by converting the 32 bit EIGRP metric to the 24 bit IGRP metric.

2.5 **"IRB"** stands for Integrated Routing and Bridging. IRB allows the user to route a given protocol between routed interfaces and bridge groups within a single switch router.

2.6 **"MPLS"** stands for multiprotocol label switching. This is a general term that describes the protocol which makes it possible to provide virtual circuits through an IP network.

2.7 **"NETL"** stands for the National Energy Technology Laboratory.

2.8 **"NRAO"** stands for the National Radio Astronomy Observatory.

2.9 **"Pricing Page"** means the pages upon which Vendor should list its proposed price for the Contract Items in the manner requested. The Pricing Page is attached hereto as Exhibit A.

2.10 **"QoS"** stands for Quality of Service.

2.11 **"RFQ"** means the official request for quotation published by the Purchasing Division and identified as ISCN0038

2.12 **"RSP"** is a Cisco term. The supervisor engine or route switch processor (RSP) is a module that is installed in one of the card slots in the router. The supervisor engine or RSP provides switching and local and remote management for the router and also contains the uplink ports for the router. Both types of modules (supervisor engine and RSP) perform the same functions in the router.

2.13 **"VSS"** means virtual switching system.

2.14 **"VPN"** means Virtual Private Network. A VPN extends a private network and the resources contained in the network across public networks like the Internet. It enables a host computer to send and receive data across shared or public networks as if it were a private network with all the functionality, security and management policies of the private network

2.15 **"WVNET"** stands for West Virginia Network for Educational Computing.

2.16 **"WVU"** stands for West Virginia University.

3. GENERAL REQUIREMENTS:

3.1 **Mandatory Contract Item Requirements:** Contract Item must meet or exceed the mandatory requirements listed below.

3.1.1 Vendor must provide standard manufacturer warranty on all equipment listed on the Pricing Page. Agreed and Understood

3.1.2 The Router for WVU must be equipped with redundant power supplies, redundant RSP "**or equal**", providing both fabric redundancy and software redundancy, and 80 Gbps modular line cards. Agreed and Understood

3.1.3 The Router for WVU must have the capability to support 40 Gbps Ethernet and 100 Gbps Ethernet interfaces. Agreed and Understood

3.1.4 The Router for WVU must provide distributed forwarding plane architecture, allowing the line cards to support independent forwarding. Agreed and Understood

3.1.5 The Router for WVU must support IPv6, Layer 2 and Layer 3 VPN, Multiprotocol Label Switching (MPLS), Hierarchical QoS, MPLS Traffic Engineering Fast Reroute, Multi-chassis Link Aggregation, Integrated Routing and Bridging (IRB), Nonstop Forwarding, Nonstop Routing, BGP4, EIGRP and Smart Call Home. Reference Exhibit A

3.1.6 Network Equipment must be fully compatible and interoperable with the existing West Virginia University hardware and system architecture currently in place. Network Equipment components will be installed in existing rack space in order to improve performance and expand the capabilities of WVU connectivity. The existing system has reached its limits for connectivity and this upgrade will improve performance speeds,

allow additional connectivity, and increase the amount of bandwidth traffic supported.

Agreed and Understood

4. CONTRACT AWARD:

4.1 Contract Award: The Contract is intended to provide Agencies with a purchase price for the Contract Items. The Contract shall be awarded to the Vendor that provides the Contract Items meeting the required specifications for the lowest overall total cost as shown on the Pricing Pages.

4.2 Pricing Page: Vendor should complete the Pricing Page by adding the unit price of each item and confirming the extended price and total amount is correct. Vendor should complete the Pricing Page in full as failure to complete the Pricing Page in its entirety may result in Vendor's bid being disqualified.

Vendor may provide **"or equal"** but if providing an **"or equal"** product, Vendor must provide a line-by-line comparison of the product parts listed on the Pricing Page as well as any additional products required to meet the requirements of this RFQ.

Notwithstanding the foregoing, the Purchasing Division may correct errors as it deems appropriate. Vendor should type or electronically enter the information into the Pricing Page to prevent errors in the evaluation.

5. PAYMENT:

5.1 Payment: Vendor shall accept payment in accordance with the payment procedures of the State of West Virginia.

6. DELIVERY AND RETURN:

6.1 Shipment and Delivery: Vendor shall deliver the Contract Components within 30 working days after being awarded this Contract and receiving a purchase order or notice to proceed. Contract Components must be delivered to WVU at 1 Waterfront Place, Morgantown, WV 26506.

6.2 Late Delivery: The Agency placing the order under this Contract must be notified in writing if the shipment of the Contract Items will be delayed for any reason. Any delay in delivery that could cause harm to an Agency will be grounds for cancellation of the Contract, and/or obtaining the Contract Items from a third party.

Any Agency seeking to obtain the Contract Items from a third party under this provision must first obtain approval of the Purchasing Division.

6.3 **Delivery Payment/Risk of Loss:** Vendor shall deliver the Contract Items F.O.B. destination to the Agency's location.

6.4 **Return of Unacceptable Items:** If the Agency deems the Contract Items to be unacceptable, the Contract Items shall be returned to Vendor at Vendor's expense and with no restocking charge. Vendor shall either make arrangements for the return within five (5) days of being notified that items are unacceptable, or permit the Agency to arrange for the return and reimburse Agency for delivery expenses. If the original packaging cannot be utilized for the return, Vendor will supply the Agency with appropriate return packaging upon request. All returns of unacceptable items shall be F.O.B. the Agency's location. The returned product shall either be replaced, or the Agency shall receive a full credit or refund for the purchase price, at the Agency's discretion.

6.5 **Return Due to Agency Error**: Items ordered in error by the Agency will be returned for credit within 30 days of receipt, F.O.B. Vendor's location. Vendor shall not charge a restocking fee if returned products are in a resalable condition. Items shall be deemed to be in a resalable condition if they are unused and in the original packaging. Any restocking fee for items not in a resalable condition shall be the lower of the Vendor's customary restocking fee or 5% of the total invoiced value of the returned items.

Exhibit A ISCN0038

DIVERSATEC

Section	Description	Answer
3.1.1	Manufacturers warranty	Yes
3.1.2	Redundant Power, route proc, service proc, 80 Gb/s Line Card	Yes
3.1.3	40/100 Gb/s capable	Yes
3.1.4	Distributed Forwarding	Yes
3.1.5	IPv6, L2/L3 VPN, MPLS, QoS, EIGRP, BGP4, etc	Yes to all, EIGRP is a proprietary Cisco protocol, HP supports the Open standard OSPF
3.1.6	Must interop with current equipment	Yes

ISCN0038 Bid Price Sheet

QTY	Product Number	Alternate Part # and Descripton of *or equal Products	Description	Unit Price	Extended Price
1	ASR-9010-AC-V2	JC149B - HP 8808 Router Chassis	ASR 9010 AC Chassis with PEM Version 2	$7,171.30	$7,171.30
5	CON-SNTE-ASR901A		SMARTNET 8X5X4 ASR 9010 AC Chassis with PEM Version 2		$0.00
2	ASR-9010-FAN	JC110B - HP 9500/8800 1800W AC Power Supply	ASR-9010 Fan Tray	$762.66	$1,525.32
4	PWR-3KW-AC-V2		3KW AC Power Module Version 2		$0.00
4	PWR-CAB-AC-USA		Power Cord for AC V2 Power Module (USA)		$0.00
2	A9K-RSP440-TR	JC596A - HP 8800 Dual Fabric MPU	ASR9K Route Switch Processor with 440G/slot Fabric and 6GB	$14,688.11	$29,376.22
10	CON-SNTE-A9KRSP4T		SMARTNET 8X5X4 ASR9K Route Switch Processr 440G/slot 6G		$0.00
1	XR-A9K-PXK9-04.02		Cisco IOS XR IP/MPLS Core Software 3DES for RSP440		$0.00
5	CON-SNTE-XRA9KPXK		SMARTNET 8X5X4 Cisco IOS XR IP/MPLS Core Software 3DES		$0.00
1	A9K-MOD80-TR		80G Modular Linecard Packet Transport Optimized		$0.00
5	CON-SNTE-A9KMOD8T		SMARTNET 8X5X4 80G Modular LinecardPcket Transprt Opt		$0.00
1	A9K-MPA-20X1GE	JC606A - HP 8800 16p GbE SFP/8p GbE Combo SPM	ASR 9000 20-port 1GE Modular Port Adapter	$7,160.84	$7,160.84
5	CON-SNTE-A9KMPA2X		SMARTNET 8X5X4 ASR 9000 20-port 1GE Modular Port Adaptr		$0.00
2	SFP-GE-L	JD119B - HP X120 1G SFP LC LX Transceiver	1000BASE-LX/LH SFP (DOM)	$490.36	$980.72
6	SFP-GE-T	JD089B - HP X120 1G SFP RJ45 T Transceiver	1000BASE-T SFP (NEBS 3 ESD)	$195.82	$1,174.92
1	A9K-MPA-4X10GE	JC602A - HP 8800 4-port 10GbE XFP Svc Proc Mod	ASR 9000 4-port 10GE Modular Port Adapter	$9,513.11	$9,513.11
5	CON-SNTE-A9KMPA4X		SMARTNET 8X5X4 ASR 9000 4-port 10GE Modular Port Adaptr		$0.00
2	XFP-10GLR-OC192SR	JD108B - HP X130 10G XFP LC LR Transceiver	Multirate XFP module for 10GBASE-LR and OC192 SR-1	$2,126.73	$4,253.46
1	A9K-IVRF-LIC	JC111A - HP 9500 3500W AC Power Frame	Infrastructure VRF LC License. Support up to 8 VRFs	$381.07	$381.07
5	CON-SNTE-A9KIVRFL		SMARTNET 8X5X4 Infrastructure VRF LC License		$0.00
1	A9K-MOD80-TR	JC111A - HP 9500 3500W AC Power Frame	80G Modular Linecard Packet Transport Optimized	$381.07	$381.07
5	CON-SNTE-A9KMOD8T		SMARTNET 8X5X4 80G Modular LinecardPcket Transprt Opt		$0.00
1	A9K-MPA-4X10GE	JC602A - HP 8800 4-port 10GbE XFP Svc Proc Mod	ASR 9000 4-port 10GE Modular Port Adapter	$9,513.11	$9,513.11

ISCN0038 Bid Price Sheet

5	CON-SNTE-A9KMPA4X		SMARTNET 8X5X4 ASR 9000 4-port 10GE Modular Port Adaptr		$0.00
1	XFP-10G-MM-SR	JD117B - HP X130 10G XFP LC SR Transceiver	10GBASE-SR XFP Module	$992.18	$992.18
2	XFP-10GLR-OC192SR	JD108B - HP X130 10G XFP LC LR Transceiver	Multirate XFP module for 10GBASE-LR and OC192 SR-1	$2,126.73	$4,253.46
1	A9K-IVRF-LIC	JC157A - HP 8800 Router Software License	Infrastructure VRF LC License. Support up to 8 VRFs	$3,739.00	$3,739.00
5	CON-SNTE-A9KIVRFL		SMARTNET 8X5X4 Infrastructure VRF LC License		$0.00
1	A9K-MPA-FILR	HA107A3 2CC - HP 3y 24x7 Networks Group 170 Lic Supp	ASR 9000 MPA Slot Filler	$2,065.64	$2,065.64
6	A9K-LC-FILR		A9K Line Card Slot Filler		$0.00
4	A9K-PEM-V2-FILR		ASR9K Power Entry Module Version 2 Filler		$0.00
1	ASR-9010-4P-KIT	HA109A3 HP 3 yr Support Plus Networks 88xx RouterSupport	ASR-9010 4 Post Mounting Kit	$45,365.09	$45,365.09
			Subtotal		**$127,846.51**
			Shipping charges		
			TOTAL		**$127,846.51**

Rev. 07/12

State of West Virginia

VENDOR PREFERENCE CERTIFICATE

Certification and application* is hereby made for Preference in accordance with ***West Virginia Code***, §5A-3-37. (Does not apply to construction contracts). ***West Virginia Code***, §5A-3-37, provides an opportunity for qualifying vendors to request (at the time of bid) preference for their residency status. Such preference is an evaluation method only and will be applied only to the cost bid in accordance with the ***West Virginia Code***. This certificate for application is to be used to request such preference. The Purchasing Division will make the determination of the Resident Vendor Preference, if applicable.

1. **Application is made for 2.5% resident vendor preference for the reason checked:**
___ Bidder is an individual resident vendor and has resided continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**
___ Bidder is a partnership, association or corporation resident vendor and has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; or 80% of the ownership interest of Bidder is held by another individual, partnership, association or corporation resident vendor who has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**
___ Bidder is a nonresident vendor which has an affiliate or subsidiary which employs a minimum of one hundred state residents and which has maintained its headquarters or principal place of business within West Virginia continuously for the four (4) years immediately preceding the date of this certification; **or,**

2. **Application is made for 2.5% resident vendor preference for the reason checked:**
___ Bidder is a resident vendor who certifies that, during the life of the contract, on average at least 75% of the employees working on the project being bid are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

3. **Application is made for 2.5% resident vendor preference for the reason checked:**
___ Bidder is a nonresident vendor employing a minimum of one hundred state residents or is a nonresident vendor with an affiliate or subsidiary which maintains its headquarters or principal place of business within West Virginia employing a minimum of one hundred state residents who certifies that, during the life of the contract, on average at least 75% of the employees or Bidder's affiliate's or subsidiary's employees are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

4. **Application is made for 5% resident vendor preference for the reason checked:**
___ Bidder meets either the requirement of both subdivisions (1) and (2) or subdivision (1) and (3) as stated above; **or,**

5. **Application is made for 3.5% resident vendor preference who is a veteran for the reason checked:**
___ Bidder is an individual resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard and has resided in West Virginia continuously for the four years immediately preceding the date on which the bid is submitted; **or,**

6. **Application is made for 3.5% resident vendor preference who is a veteran for the reason checked:**
___ Bidder is a resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard, if, for purposes of producing or distributing the commodities or completing the project which is the subject of the vendor's bid and continuously over the entire term of the project, on average at least seventy-five percent of the vendor's employees are residents of West Virginia who have resided in the state continuously for the two immediately preceding years.

7. **Application is made for preference as a non-resident small, women- and minority-owned business, in accordance with *West Virginia Code* §5A-3-59 and *West Virginia Code of State Rules*.**
X Bidder has been or expects to be approved prior to contract award by the Purchasing Division as a certified small, women- and minority-owned business.

Bidder understands if the Secretary of Revenue determines that a Bidder receiving preference has failed to continue to meet the requirements for such preference, the Secretary may order the Director of Purchasing to: (a) reject the bid; or (b) assess a penalty against such Bidder in an amount not to exceed 5% of the bid amount and that such penalty will be paid to the contracting agency or deducted from any unpaid balance on the contract or purchase order.

By submission of this certificate, Bidder agrees to disclose any reasonably requested information to the Purchasing Division and authorizes the Department of Revenue to disclose to the Director of Purchasing appropriate information verifying that Bidder has paid the required business taxes, provided that such information does not contain the amounts of taxes paid nor any other information deemed by the Tax Commissioner to be confidential.

Under penalty of law for false swearing (West Virginia Code, §61-5-3), Bidder hereby certifies that this certificate is true and accurate in all respects; and that if a contract is issued to Bidder and if anything contained within this certificate changes during the term of the contract, Bidder will notify the Purchasing Division in writing immediately.

Bidder: Divaesatec Signed: Carmen M. Frost

Date: 04-11-13 Title: President

RFQ No. _____

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

MANDATE: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Diversatec

Authorized Signature: Carmen M. Frost Date: 04-11-13

State of Ohio

County of Delaware, to-wit:

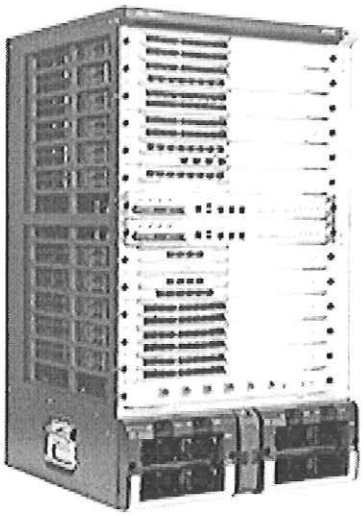
Taken, subscribed, and sworn to before me this 11th day of April, 2013

My Commission expires October 1, 2018.

AFFIX SEAL HERE

NOTARY PUBLIC Anne Kramer

ANNE KRAMER
NOTARY PUBLIC - OHIO
MY COMMISSION EXPIRES 10-1-18



HP 8800 Router Series

Data sheet

Product overview

HP 8800 series routers are components of the HP FlexFabric and FlexCampus modules of the FlexNetwork architecture. They feature a distributed high-performance network processor and high-capacity crossbar nonblocking switching technology that delivers high performance and flexibility. A distributed Quality of Service (QoS) control unit provides end-to-end service with granular control. The routers' distributed operation, administration, and maintenance detection engines implement fault detection within 30 ms to provide uninterrupted core services. These innovative technologies, paired with the QoS control mechanism, deliver smooth operation and high availability of multiple services within the FlexNetwork architecture. 8800 routers are commonly deployed in IP backbone networks, IP MANs, and the core or convergence layers of large IP networks. Offering high forwarding performance and abundant services, the 8800 series delivers on routing performance and flexibility.

Key features

- Fully distributed hardware architecture
- Dedicated OAM engine for high reliability
- Built-in QoS engine for precise services control
- Advanced security mechanism
- Robust MPLS VPN capability

Features and benefits

Quality of Service (QoS)

- **Hierarchical QoS (HQoS):** provides a built-in QoS engine that supports hierarchical QoS (HQoS) and can implement a hierarchical scheduling mechanism based on ports, user groups, users, and user services; also cooperates with MPLS TE to implement bandwidth reservation and scheduling based on tunnels and services
- **Schedule algorithm:** supports PQ, LLQ, WFQ, and CBWFQ
- **Congestion avoidance mechanism:** supports Tail Drop and Weighted Random Early Detection (WRED)

Management

- **Management interface control:** provides management access through modem port and terminal interface, as well as in-band and out-of-band Ethernet ports; provides access through terminal interface, telnet, or SSH
- **Industry-standard CLI with a hierarchical structure:** reduces training time and expenses, and increases productivity in multivendor installations
- **Management security:** includes multiple administration levels, with password protection and restricted access to critical configuration commands; ACLs provide telnet and SNMP access; local and remote syslog capability allows logging of all access
- **SNMP v1, v2, and v3:** provides complete support of SNMP as well as full support of industry-standard MIBs and private MIB extensions
- **Remote monitoring (RMON):** uses standard SNMP to monitor essential network functions; supports events, alarm, history, and statistics group plus a private alarm extension group
- **Debug and sampler utility:** supports ping and traceroute for both IPv4 and IPv6
- **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 and file transfer rates; allows network manager to determine overall network performance and to diagnose and locate network congestion points or failures
- **Network Time Protocol (NTP):** synchronizes timekeeping among distributed time servers and clients; keeps consistent timekeeping among all clock-dependent devices within the network so that the devices can provide diverse applications based on the consistent time
- **Info center:** provides a central information center 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
- **FTP and TFTP support:** FTP allows bidirectional transfers over a TCP/IP network and is used for configuration updates; Trivial FTP is a simpler method using User Datagram Protocol (UDP)
- **Loopback:** supports internal loopback testing for maintenance purposes and high availability; loopback detection protects system from incorrect cabling or network configurations, and can be enabled on a port or VLAN
- **Ethernet OAM:** provides a monitoring tool for Layer 2 performance and fault detection, which reduces failover and network convergence times

Connectivity

- **High port density:** provides up to 12 interface module slots, up to 96 OC3 POS ports, or 576 Gigabit Ethernet ports (fiber) per 8812 system
- **Flexible port selection:** provides a combination of fiber and copper interface modules, 100/1000BASE-X auto-speed selection, and 10/100/1000BASE-T auto-speed detection plus auto duplex and MDI/MDI-X; speed adaptable between 155 M POS and 622 M POS/Gigabit Ethernet
- **Packet storm protection:** protects against broadcast, multicast, or unicast storms with user-defined thresholds
- **Multiple WAN interfaces:** support Fast Ethernet/Gigabit Ethernet/10 GbE ports, OC3~OC192 POS, ATM ports, and 10 GbE RPR

Performance

- **Industry-leading performance:** provides switching capacity up to 1440 Gbps and forwarding performance up to 864 Mpps
- **Flexible chassis selection:** consists of three models: 12 I/O-slot chassis, 8 I/O-slot chassis, 5 I/O-slot chassis
- **Scalable system design:** backplane is designed for smooth bandwidth upgrade

Resiliency and high availability

- **Separate data and control plane:** provide continual services
- **Passive backplane design:** backplane has no active components to increase system reliability
- **Redundant design of main processing unit and power supply:** increases the overall system availability
- **IP Fast Reroute Framework (FRR):** nodes are configured with backup ports and routes; local implementation requires no cooperation of adjacent devices, simplifying the deployment; solves the traditional convergence faults in IP forwarding; realizes restoration within 50 ms, with the restoration time independent of the number of routes and fast link switchovers without route convergence
- **Hitless patch upgrades:** allow patches to be installed without restarting the equipment, increasing network uptime and facilitating maintenance
- **Virtual Router Redundancy Protocol:** helps ensure the system's high availability without changing configurations when a device fails; prevents network interruptions caused by a single link failure
- **Graceful restart:** features are fully supported, including graceful restart for OSPF, IS-IS, BGP, LDP, and RSVP; network remains stable during the active-standby switchover; after the switchover, the device quickly learns the network routes by communicating with adjacent routers; forwarding remains uninterrupted during the switchover to realize NSF
- **Hot-swappable modules:** help ensure the replacement of hardware interface modules without impacting the traffic flow through the system
- **BFD:** BFD for static routing, RIP, OSPF, OSPFv3, IS-IS, IPv6 IS-IS, BGP, BGP4+, PIM, IPv6 PIM, LDP, RSVP, VPLS PW, LSP, VRRP, VRRP3, policy route, and IP FRR

Layer 2 switching

- **VLANs:** support up to 4096 port or IEEE 802.1Q-based VLANs
- **Spanning Tree:** fully supports standard IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol
- **Bridge Protocol Data Unit (BPDU) tunneling:** transmits Spanning Tree Protocol BPDUs transparently, allowing correct tree calculations across service providers, WANs, or MANs
- **Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) protocol snooping:** effectively 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; supports 64 mirroring groups, with an unlimited number of ports per group
- **Port isolation:** increases security by isolating ports within a VLAN while still allowing them to communicate with other VLANs

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
- **Domain Name System (DNS):** is a distributed database that provides translation between a domain name and an IP address, which simplifies network design; supports client and server

Layer 3 routing

- **Static IPv4 routing:** provides simple, manually configured IPv4 routing
- **Routing Information Protocol:** uses a distance vector algorithm with UDP packets for route determination; supports RIPv1 and RIPv2 routing; includes loop protection
- **OSPF:** Interior Gateway Protocol (IGP) using link-state protocol for faster convergence; supports ECMP, NSSA, and MD5 authentication for increased security and graceful restart for faster failure recovery

- **Intermediate system to intermediate system (IS-IS):** Interior Gateway Protocol (IGP) using path vector protocol, 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 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
- **Multiprotocol Label Switching Traffic Engineering (MPLS TE):** Traffic Engineering (TE) is used to enhance traffic over large MPLS networks based on type of traffic and available resources; TE dynamically tunes traffic management attributes and enables true load balancing; MPLS TE supports route backup using Fast Reroute (FRR)
- **Multiprotocol Label Switching (MPLS) Layer 3 VPN:** allows Layer 3 VPNs across a provider network; uses MP-BGP to establish private routes for increased security; supports RFC 2547bis multiple autonomous system VPNs for added flexibility
- **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
- **Virtual Private LAN Service (VPLS):** establishes point-to-multipoint Layer 2 VPNs across a provider network
- **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 VPN:** supports Multicast Domain (MD) multicast VPN, which can be distributed on separate service cards, providing high performance and flexible configuration
- **IPv6 tunneling:** is an important element for the transition from IPv4 to IPv6; 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
- **Border Gateway Protocol 4:** Exterior Gateway Protocol (EGP) with path vector protocol uses TCP for enhanced reliability for the route discovery process, reduces bandwidth consumption by advertising only incremental updates, and supports extensive policies to increase flexibility and scale to large networks

Security

- **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
- **Network login:** standard IEEE 802.1x allows authentication of multiple users per port, or when a port is shared with an IP phone
- **RADIUS:** eases switch security access administration by using a password authentication server
- **TACACS+:** is an authentication tool using TCP with encryption of the full authentication request that provides additional security
- **Media access control (MAC) authentication:** provides simple authentication based on a user's MAC address; supports local or RADIUS-based authentication
- **Attack protection:** protects network from attacks that use a large number of ARP requests by using a host-specific, user-selectable threshold; provides Address Scanning Attack Prevention, MAC Address Flooding Attack Prevention, and STP Attack Prevention
- **Network address translation (NAT):** supports repeated multiplexing of a port and automatic 5-tuple collision detection, enabling NAPT to support unlimited connections; supports blacklist in NAT/NAPT/internal server, a limit on the number of connections, session log, and multi-instance

- **Secure Shell (SSHv2):** uses external servers to securely log in to a remote device; with authentication and encryption, it protects against IP spoofing and plain-text password interception; increases the security of Secure FTP (SFTP) transfers
- **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; supports distributed URPF

Multicast support

- **Internet Group Management Protocol (IGMP):** is used by IP hosts to establish and maintain multicast groups; supports v1, v2, and v3; utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks
- **Protocol Independent Multicast (PIM):** is used for IPv4 and IPv6 multicast applications; supports PIM dense mode (PIM-DM), sparse mode (PIM-SM), and source-specific mode (PIM-SSM)
- **Multicast Source Discovery Protocol (MSDP):** is used for inter-domain multicast applications, allowing multiple PIM-SM domains to interoperate
- **Multicast Border Gateway Protocol (MBGP):** allows multicast traffic to be forwarded across BGP networks, separate from unicast traffic
- **Multicast Listener Discovery Protocol:** is used by IP hosts to establish and maintain multicast groups; supports v1 and v2 and utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv6 multicast networks
- **Multicast VLAN:** allows multiple VLANs to receive the same IPv4 or IPv6 multicast traffic, reducing network bandwidth demand by eliminating multiple streams to each VLAN

Integration

- **Open Application Architecture:** provides both software and hardware platform based on open standards, so that third-party applications can be integrated seamlessly into routers

Additional information

- **Green initiative support:** provides support for RoHS and WEEE regulations

Product architecture

- **10 Gbps Network Processor platform:** is perfect for new service expansion; supports wire-speed 10 GbE POS and precise QoS/H-QoS and multicast VPN
- **Crossbar nonblocking switching:** includes two crossbars on MCU to provide performance and reliability; service processing engine and crossbar work together to complete VoQ and E2E flow control and implement granular switch-fabric-level QoS, offering genuine SLA services
- **10 GbE Resilient Packet Ring (RPR):** provides advanced technology on MAC layer with high usage of ring bandwidth, self-healing, automatic topology discovery, and node plug and play; provides protection switching using steering or wrapping, with fast recovery time of 50 ms, satisfying the carrier-class requirement; provides weighted fair algorithm for bandwidth allocation
- **High-capacity buffer:** each network processor of the 8800 router offers a 200 ms ingress buffer and a 200 ms egress buffer, providing time delay-sensitive services
- **Separate SPE card and interface card:** interface cards are separated from SPE cards to support flexible service configurations
- **Dedicated OAM engine:** reduces CPU loads and improves link fault detection performance; realizes 30 ms fault detection and 20 ms service switchover

Warranty and support

- **1-year warranty:** with advance replacement and 30-calendar-day delivery (available in most countries)
- **Electronic and telephone support:** limited electronic and telephone support is available from HP; 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/warrantysummary

HP 8800 Router Series

Specifications

	 **HP 8812 Router Chassis (JC150B)**	 **HP 8808-V Router Chassis (JC149B)**	 **HP 8805 Router Chassis (JC148B)**
Ports	12 I/O module slots 2 MPU (for management modules) slots	8 I/O module slots 2 MPU (for management modules) slots	5 I/O module slots 2 MPU (for management modules) slots
Physical characteristics			
Dimensions	17.72(d) x 17.4(w) x 29.65(h) in. (45.01 x 44.2 x 75.31 cm) (17U height)	17.72(d) x 17.4(w) x 34.88(h) in. (45.01 x 44.2 x 88.6 cm) (21U height)	17.72(d) x 17.4(w) x 19.13(h) in. (45.01 x 44.2 x 48.59 cm) (11U height)
Full configuration weight	264.55 lb. (120 kg)	242.5 lb. (110 kg)	187.39 lb. (85 kg)
Mounting	EIA standard 19 in. rack	EIA standard 19 in. rack	EIA standard 19 in. rack
Performance			
Throughput	864 million pps	576 million pps	360 million pps
Routing/Switching capacity	1440 Gbps	1440 Gbps	1440 Gbps
Routing table size	3000000 entries	3000000 entries	3000000 entries
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	10% to 90%, noncondensing	10% to 90%, noncondensing	10% 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 95%, noncondensing	5% to 95%, noncondensing	5% to 95%, noncondensing
Electrical characteristics			
Maximum heat dissipation	11935 BTU/hr (12591.43 kJ/hr)	11935 BTU/hr (12591.43 kJ/hr)	6820 BTU/hr (7195.1 kJ/hr)
Voltage	100-120/200-240 VAC	100-120/200-240 VAC	100-120/200-240 VAC
DC voltage	-48 VDC	-48 VDC	-48 VDC
Maximum power rating	3500 W	3500 W	2000 W
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Notes	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.	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.	Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.
Safety	CSA 22.2 No. 60950; cUL (CSA 22.2 No. 60950); CSA 22.2 No. 60950 3rd edition; CSA 22.2 No. 950; CSA 950; cUL (CSA 950); EN 60950/IEC 60950; UL 1950 3rd edition; UL 1950; UL 60950; UL 60950-1; CAN/CSA 22.2 No. 60950; CAN/CSA 22.2 No. 60950-1; AS/NZS 60950; EN 609500 Safety Information Technology Equipment; UL 60950; CSA 22.2 No. 60950/cUL; IEC 60950; IEC 60950-1; EN 60950; EN 60950-1; CSA 22.2 No. 950-95; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1; CSA 60950-1; CSA C22.2 60950-1; EN 60950-1/A11; CSA 22.2 60950-1; EN 60950: 2000, ZB and ZC Deviations; IEC 60950: 1999, Corr Feb 2000, all national deviations; As/NZS 60950:2000, Australia; UL 60950-1:2003; UL 60950-1:2001; CSA 22.2 60950-1:2003; IEC 60950-1:2001; EN 60950-1:2001; CSA 22.2-60950; AS/NZS 60950: 2000 Australia, Russian GOST Safety Approval; CSA 22.2 No. 950 3rd Edition 1995; UL 60950 3rd Edition; CAN/CSA 22.2 No. 60950-00/UL 60950 3rd Edition, Safety Information for Technology Equipment; EN 60950/IEC 60950 3rd Edition; UL 60950 Standard for the Safety of Information Technology Equipment	CSA 22.2 No. 60950; cUL (CSA 22.2 No. 60950); CSA 22.2 No. 60950 3rd edition; CSA 22.2 No. 950; CSA 950; cUL (CSA 950); EN 60950/IEC 60950; UL 1950 3rd edition; UL 1950; UL 60950; UL 60950-1; CAN/CSA 22.2 No. 60950; CAN/CSA 22.2 No. 60950-1; AS/NZS 60950; EN 609500 Safety Information Technology Equipment; UL 60950; CSA 22.2 No. 60950/cUL; IEC 60950; IEC 60950-1; EN 60950; EN 60950-1; CSA 22.2 No. 950-95; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1; CSA 60950-1; CSA C22.2 60950-1; EN 60950-1/A11; CSA 22.2 60950-1; EN 60950: 2000, ZB and ZC Deviations; IEC 60950: 1999, Corr Feb 2000, all national deviations; As/NZS 60950:2000, Australia; UL 60950-1:2003; UL 60950-1:2001; CSA 22.2 60950-1:2003; IEC 60950-1:2001; EN 60950-1:2001; CSA 22.2-60950; AS/NZS 60950: 2000 Australia, Russian GOST Safety Approval; CSA 22.2 No. 950 3rd Edition 1995; UL 60950 3rd Edition; CAN/CSA 22.2 No. 60950-00/UL 60950 3rd Edition, Safety Information for Technology Equipment; EN 60950/IEC 60950 3rd Edition; UL 60950 Standard for the Safety of Information Technology Equipment	CSA 22.2 No. 60950; cUL (CSA 22.2 No. 60950); CSA 22.2 No. 60950 3rd edition; CSA 22.2 No. 950; CSA 950; cUL (CSA 950); EN 60950/IEC 60950; UL 1950 3rd edition; UL 1950; UL 60950; UL 60950-1; CAN/CSA 22.2 No. 60950; CAN/CSA 22.2 No. 60950-1; AS/NZS 60950; EN 609500 Safety Information Technology Equipment; UL 60950; CSA 22.2 No. 60950/cUL; IEC 60950; IEC 60950-1; EN 60950; EN 60950-1; CSA 22.2 No. 950-95; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1; CSA 60950-1; CSA C22.2 60950-1; EN 60950-1/A11; CSA 22.2 60950-1; EN 60950: 2000, ZB and ZC Deviations; IEC 60950: 1999, Corr Feb 2000, all national deviations; As/NZS 60950:2000, Australia; UL 60950-1:2003; UL 60950-1:2001; CSA 22.2 60950-1:2003; IEC 60950-1:2001; EN 60950-1:2001; CSA 22.2-60950; AS/NZS 60950: 2000 Australia, Russian GOST Safety Approval; CSA 22.2 No. 950 3rd Edition 1995; UL 60950 3rd Edition; CAN/CSA 22.2 No. 60950-00/UL 60950 3rd Edition, Safety Information for Technology Equipment; EN 60950/IEC 60950 3rd Edition; UL 60950 Standard for the Safety of Information Technology Equipment

Specifications (continued)

	HP 8812 Router Chassis (JC150B)	HP 8808-V Router Chassis (JC149B)	HP 8805 Router Chassis (JC148B)
Emissions	FCC Class A; FCC part 15 Class A; ICE-003, Canadian Radio Interface Regulation; EN 55022/CISPR-22 Class A; VCCI Class A; EN 55022/CISPR 22 Class A; EN 55022 Class A; CISPR 22; CISPR 22 Class A; EN 55022; EN 55024; CNS 13438 Class B; FCC CFR 47 Part 15; VCCI; ICES-003 (Canada); CISPR 22/A2; EN 55022/A2; ICES-003; AS/NZS CISPR 22; VCCI V-3/2000.04; IEC/EN 61000-3-2; IEC/EN 61000-3-3; EN 55024/A1; IEC 61000:4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-11; EMC Directive 89/336/EEC; VCCI (Japan); EN 55022 1998 Class A; EN 61000-3-2 2000, 61000-3-3; ICES-003 Class A; EN 300 386; FCC Part 15; CISPR 24; ETSI EN 300 386 V1.3.3; AS/NZS CISPR22 Class A; EN 61000-3-2; EN 61000-3-3; CNS 13438 Class A; EN 55024:1998; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-6; EN 61000-4-11; Anatel; ICES-003 Issue 4 Class A	FCC Class A; FCC part 15 Class A; ICE-003, Canadian Radio Interface Regulation; EN 55022/CISPR-22 Class A; VCCI Class A; EN 55022/CISPR 22 Class A; EN 55022 Class A; CISPR 22; CISPR 22 Class A; EN 55022; EN 55024; CNS 13438 Class B; FCC CFR 47 Part 15; VCCI; ICES-003 (Canada); CISPR 22/A2; EN 55022/A2; ICES-003; AS/NZS CISPR 22; VCCI V-3/2000.04; IEC/EN 61000-3-2; IEC/EN 61000-3-3; EN 55024/A1; IEC 61000:4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-11; EMC Directive 89/336/EEC; VCCI (Japan); EN 55022 1998 Class A; EN 61000-3-2 2000, 61000-3-3; ICES-003 Class A; EN 300 386; FCC Part 15; CISPR 24; ETSI EN 300 386 V1.3.3; AS/NZS CISPR22 Class A; EN 61000-3-2; EN 61000-3-3; CNS 13438 Class A; EN 55024:1998; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-6; EN 61000-4-11; Anatel; ICES-003 Issue 4 Class A	FCC Class A; FCC part 15 Class A; ICE-003, Canadian Radio Interface Regulation; EN 55022/CISPR-22 Class A; VCCI Class A; EN 55022/CISPR 22 Class A; EN 55022 Class A; CISPR 22; CISPR 22 Class A; EN 55022; EN 55024; CNS 13438 Class B; FCC CFR 47 Part 15; VCCI; ICES-003 (Canada); CISPR 22/A2; EN 55022/A2; ICES-003; AS/NZS CISPR 22; VCCI V-3/2000.04; IEC/EN 61000-3-2; IEC/EN 61000-3-3; EN 55024/A1; IEC 61000:4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-11; EMC Directive 89/336/EEC; VCCI (Japan); EN 55022 1998 Class A; EN 61000-3-2 2000, 61000-3-3; ICES-003 Class A; EN 300 386; FCC Part 15; CISPR 24; ETSI EN 300 386 V1.3.3; AS/NZS CISPR22 Class A; EN 61000-3-2; EN 61000-3-3; CNS 13438 Class A; EN 55024:1998; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-6; EN 61000-4-11; Anatel; ICES-003 Issue 4 Class A
Management	IMC - Intelligent Management Center; command-line interface; limited command-line interface; configuration menu; out-of-band management (serial RS-232C); out-of-band management; SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB	IMC - Intelligent Management Center; command-line interface; limited command-line interface; configuration menu; out-of-band management (serial RS-232C); out-of-band management; SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB	IMC - Intelligent Management Center; command-line interface; limited command-line interface; configuration menu; out-of-band management (serial RS-232C); out-of-band management; SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB
Services	3-year, parts only, global next-day advance exchange (UW982E)	3-year, parts only, global next-day advance exchange (UW982E)	3-year, parts only, global next-day advance exchange (UW982E)
	3-year, 4-hour onsite, 13x5 coverage for hardware (UW065E)	3-year, 4-hour onsite, 13x5 coverage for hardware (UW065E)	3-year, 4-hour onsite, 13x5 coverage for hardware (UW065E)
	3-year, 4-hour onsite, 24x7 coverage for hardware (UV967E)	3-year, 4-hour onsite, 24x7 coverage for hardware (UV967E)	3-year, 4-hour onsite, 24x7 coverage for hardware (UV967E)
	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (UV990E)	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (UV990E)	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (UV990E)
	3-year, 24x7 SW phone support, software updates (UV993E)	3-year, 24x7 SW phone support, software updates (UV993E)	3-year, 24x7 SW phone support, software updates (UV993E)
	1-year, post-warranty, 4-hour onsite, 13x5 coverage for hardware (HR539E)	1-year, post-warranty, 4-hour onsite, 13x5 coverage for hardware (HR539E)	1-year, post-warranty, 4-hour onsite, 13x5 coverage for hardware (HR539E)
	1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware (HR540E)	1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware (HR540E)	1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware (HR540E)
	4-year, 4-hour onsite, 13x5 coverage for hardware (UW066E)	4-year, 4-hour onsite, 13x5 coverage for hardware (UW066E)	4-year, 4-hour onsite, 13x5 coverage for hardware (UW066E)
	4-year, 4-hour onsite, 24x7 coverage for hardware (UV968E)	4-year, 4-hour onsite, 24x7 coverage for hardware (UV968E)	4-year, 4-hour onsite, 24x7 coverage for hardware (UV968E)
	4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV991E)	4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV991E)	4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV991E)
	4-year, 24x7 SW phone support, software updates (UV994E)	4-year, 24x7 SW phone support, software updates (UV994E)	4-year, 24x7 SW phone support, software updates (UV994E)
	5-year, 4-hour onsite, 13x5 coverage for hardware (UW067E)	5-year, 4-hour onsite, 13x5 coverage for hardware (UW067E)	5-year, 4-hour onsite, 13x5 coverage for hardware (UW067E)
	5-year, 4-hour onsite, 24x7 coverage for hardware (UV969E)	5-year, 4-hour onsite, 24x7 coverage for hardware (UV969E)	5-year, 4-hour onsite, 24x7 coverage for hardware (UV969E)
	5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV992E)	5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV992E)	5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV992E)
	5-year, 24x7 SW phone support, software updates (UV995E)	5-year, 24x7 SW phone support, software updates (UV995E)	5-year, 24x7 SW phone support, software updates (UV995E)
	3 Yr 6 hr Call-to-Repair Onsite (UW058E)	3 Yr 6 hr Call-to-Repair Onsite (UW058E)	3 Yr 6 hr Call-to-Repair Onsite (UW058E)
	4 Yr 6 hr Call-to-Repair Onsite (UW059E)	4 Yr 6 hr Call-to-Repair Onsite (UW059E)	4 Yr 6 hr Call-to-Repair Onsite (UW059E)
	5 Yr 6 hr Call-to-Repair Onsite (UW060E)	5 Yr 6 hr Call-to-Repair Onsite (UW060E)	5 Yr 6 hr Call-to-Repair Onsite (UW060E)
	1-year, 6 hour Call-To-Repair Onsite for hardware (HR543E)	1-year, 6 hour Call-To-Repair Onsite for hardware (HR543E)	1-year, 6 hour Call-To-Repair Onsite for hardware (HR543E)
	1-year, 24x7 software phone support, software updates (HR542E)	1-year, 24x7 software phone support, software updates (HR542E)	1-year, 24x7 software phone support, software updates (HR542E)
	1-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support and software updates (HR541E)	1-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support and software updates (HR541E)	1-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support and software updates (HR541E)

Specifications (continued)

	HP 8812 Router Chassis (JC150B)	HP 8808-V Router Chassis (JC149B)	HP 8805 Router Chassis (JC148B)
	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.	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.	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.

Specifications (continued)

	HP 8812 Router Chassis (JC150B)	HP 8808-V Router Chassis (JC149B)	HP 8805 Router Chassis (JC148B)
Standards and protocols (applies to all products in series)	**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 BGP4 confederations RFC 1997 BGP Communities Attribute RFC 1998 PPP Gandalf FZA Compression Protocol RFC 2385 BGP Session Protection via TCP MD5 RFC 2439 BGP Route Flap Damping RFC 2796 BGP Route Reflection RFC 2842 Capability Advertisement with BGP-4 RFC 2858 BGP-4 Multi-Protocol Extensions RFC 2918 Route Refresh Capability **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 1901 (Community based SNMPv2) RFC 1901-1907 SNMPv2c, SMIv2 and Revised MIB-II RFC 1902 (SNMPv2) RFC 1908 (SNMP v1/2 Coexistence) RFC 1945 Hypertext Transfer Protocol - HTTP/1.0 RFC 2068 Hypertext Transfer Protocol - HTTP/1.1 RFC 2271 FrameWork RFC 2452 MIB for TCP6 RFC 2454 MIB for UDP6 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 2819 (RMON groups Alarm, Event, History and Statistics only) RFC 2819 RMON RFC 3410 (Management Framework) RFC 3416 (SNMP Protocol Operations v2) RFC 3417 (SNMP Transport Mappings) Multiple Configuration Files Multiple Software Images SNMP v3 and RMON RFC support SSHv1/SSHv2 Secure Shell TACACS/TACACS+ **General protocols** IEEE 802.1ad Q-in-Q IEEE 802.1ad Q-in-Q IEEE 802.1ag Service Layer OAM IEEE 802.1ah Provider Backbone Bridges IEEE 802.1AX-2008 Link Aggregation IEEE 802.1D MAC Bridges IEEE 802.1p Priority IEEE 802.1Q (GVRP) IEEE 802.1Q VLANs IEEE 802.1s (MSTP) IEEE 802.1s Multiple Spanning Trees IEEE 802.1v VLAN classification by Protocol and Port IEEE 802.1w Rapid Reconfiguration of Spanning Tree IEEE 802.1X PAE IEEE 802.3 Type 10BASE-T IEEE 802.3ab 1000BASE-T IEEE 802.3ac (VLAN Tagging Extension) IEEE 802.3ad Link Aggregation (LAG) 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 802.3i 10BASE-T IEEE 802.3u 100BASE-X IEEE 802.3x Flow Control IEEE 802.3z 1000BASE-X RFC 768 UDP RFC 783 TFTP Protocol (revision 2) RFC 791 IP RFC 792 ICMP RFC 793 TCP RFC 826 ARP RFC 854 TELNET RFC 855 Telnet Option Specification RFC 856 TELNET RFC 857 Telnet Echo Option RFC 858 Telnet Suppress Go Ahead Option RFC 894 IP over Ethernet RFC 896 Congestion Control in IP/TCP Internetworks RFC 906 TFTP Bootstrap RFC 925 Multi-LAN Address Resolution RFC 950 Internet Standard Subnetting Procedure RFC 951 BOOTP RFC 959 File Transfer Protocol (FTP) RFC 1006 ISO transport services on top of the TCP: Version 3 RFC 1027 Proxy ARP RFC 1034 Domain Concepts and Facilities RFC 1035 Domain Implementation and Specification RFC 1042 IP Datagrams RFC 1058 RIPv1 RFC 1071 Computing the Internet Checksum RFC 1091 Telnet Terminal-Type Option RFC 1093 NSFNET routing architecture RFC 1122 Host Requirements RFC 1141 Incremental updating of the Internet checksum RFC 1142 OSI IS-IS Intra-domain Routing Protocol RFC 1144 Compressing TCP/IP headers for low-speed serial links RFC 1171 Point-to-Point Protocol for the transmission of multi-protocol datagrams over Point-to-Point links 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 1256 ICMP Router Discovery Protocol (IRDP) RFC 1293 Inverse Address Resolution Protocol RFC 1305 NTPv3 RFC 1315 Management Information Base for Frame Relay DTEs RFC 1321 The MD5 Message-Digest Algorithm RFC 1332 The PPP Internet Protocol Control Protocol (IPCP) RFC 1333 PPP Link Quality Monitoring RFC 1334 PPP Authentication Protocols (PAP) RFC 1349 Type of Service RFC 1350 TFTP Protocol (revision 2) RFC 1377 The PPP OSI Network Layer Control Protocol (OSINLCP) RFC 1381 SNMP MIB Extension for X.25 LAPB RFC 1389 RIPv2 MIB Extension RFC 1471 The Definitions of Managed Objects for the Link Control Protocol of the Point-to-Point Protocol RFC 1472 The Definitions of Managed Objects for the Security Protocols of the Point-to-Point Protocol RFC 1490 Multiprotocol Interconnect over Frame Relay RFC 1519 CIDR RFC 1531 Dynamic Host Configuration Protocol RFC 1533 DHCP Options and BOOTP Vendor Extensions	RFC 1534 DHCP/BOOTP Interoperation RFC 1541 DHCP RFC 1542 BOOTP Extensions RFC 1542 Clarifications and Extensions for the Bootstrap Protocol RFC 1552 The PPP Internetworking Packet Exchange Control Protocol (IPXCP) RFC 1577 Classical IP and ARP over ATM RFC 1631 NAT RFC 1638 PPP Bridging Control Protocol (BCP) RFC 1661 The Point-to-Point Protocol (PPP) RFC 1662 PPP in HDLC-like Framing RFC 1695 Definitions of Managed Objects for ATM Management Version 8.0 using SMIv2 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 1812 IPv4 Routing RFC 1829 The ESP DES-CBC Transform RFC 1877 PPP Internet Protocol Control Protocol Extensions for Name Server Addresses RFC 1944 Benchmarking Methodology for Network Interconnect Devices RFC 1945 Hypertext Transfer Protocol - HTTP/1.0 RFC 1973 PPP in Frame Relay RFC 1974 PPP Stac LZS Compression Protocol RFC 1981 Path MTU Discovery for IP version 6 RFC 1990 The PPP Multilink Protocol (MP) RFC 1994 PPP Challenge Handshake Authentication Protocol (CHAP) RFC 2082 RIP-2 MD5 Authentication RFC 2091 Trigger RIP 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 2205 Resource ReSerVation Protocol (RSVP) - Version 1 Functional Specification RFC 2209 Resource ReSerVation Protocol (RSVP) - Version 1 Message Processing Rules RFC 2236 IGMP Snooping RFC 2246 The TLS Protocol Version 1.0 RFC 2251 Lightweight Directory Access Protocol (v3) RFC 2252 Lightweight Directory Access Protocol (v3): Attribute Syntax Definitions RFC 2280 Routing Policy Specification Language (RPSL) RFC 2283 MBGP RFC 2284 EAP over LAN RFC 2338 VRRP RFC 2338 VRRP (Premium Edge License) RFC 2364 PPP Over AAL5 RFC 2374 An Aggregatable Global Unicast Address Format RFC 2451 The ESP CBC-Mode Cipher Algorithms RFC 2453 RIPv2 RFC 2510 Internet X.509 Public Key Infrastructure Certificate Management Protocols RFC 2511 Internet X.509 Certificate Request Message Format RFC 2516 A Method for Transmitting PPP Over Ethernet (PPPoE) RFC 2529 Transmission of IPv6 over IPv4 Domains without Explicit Tunnels RFC 2616 HTTP Compatibility v1.1 RFC 2622 Routing Policy Specification Language (RPSL) RFC 2644 Directed Broadcast Control RFC 2661 L2TP

Specifications (continued)

	HP 8812 Router Chassis (JC150B)	HP 8808-V Router Chassis (JC149B)	HP 8805 Router Chassis (JC148B)
Standards and protocols (applies to all products in series)	RFC 2684 Multiprotocol Encapsulation over ATM Adaptation Layer 5 RFC 2694 DNS extensions to Network Address Translators (DNS_ALG) RFC 2702 Requirements for Traffic Engineering Over MPLS RFC 2716 PPP EAP TLS Authentication Protocol RFC 2747 RSVP Cryptographic Authentication RFC 2763 Dynamic Name-to-System ID mapping support RFC 2765 Stateless IP/ICMP Translation Algorithm (SIIT) RFC 2766 Network Address Translation - Protocol Translation (NAT-PT) RFC 2767 Dual Stacks IPv4 & IPv6 RFC 2784 Generic Routing Encapsulation (GRE) RFC 2787 Definitions of Managed Objects for VRRP 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 RFC 2961 RSVP Refresh Overhead Reduction Extensions RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS RFC 2973 IS-IS Mesh Groups RFC 2993 Architectural Implications of NAT RFC 3022 Traditional IP Network Address Translator (Traditional NAT) RFC 3027 Protocol Complications with the IP Network Address Translator RFC 3031 Multiprotocol Label Switching Architecture RFC 3032 MPLS Label Stack Encoding RFC 3036 LDP Specification RFC 3046 DHCP Relay Agent Information Option RFC 3063 MPLS Loop Prevention Mechanism RFC 3065 Support AS confederation RFC 3137 OSPF Stub Router Advertisement RFC 3209 RSVP-TE Extensions to RSVP for LSP Tunnels RFC 3210 Applicability Statement for Extensions to RSVP for LSP-Tunnels RFC 3212 Constraint-Based LSP setup using LDP (CR-LDP) RFC 3214 LSP Modification Using CR-LDP RFC 3215 LDP State Machine RFC 3246 Expedited Forwarding PHB RFC 3268 Advanced Encryption Standard (AES) Ciphersuites for Transport Layer Security (TLS) RFC 3277 IS-IS Transient Blackhole Avoidance RFC 3279 Algorithms and Identifiers for the Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile RFC 3280 Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile RFC 3392 Support BGP capabilities advertisement RFC 3410 Applicability Statements for SNMP RFC 3416 Protocol Operations for SNMP RFC 3417 Transport Mappings for the Simple Network Management Protocol (SNMP) RFC 3479 Fault Tolerance for the Label Distribution Protocol (LDP) RFC 3487 Graceful Restart Mechanism for LDP RFC 3509 OSPF ABR Behavior RFC 3526 More Modular Exponential (MODP) Diffie-Hellman groups for Internet Key Exchange (IKE) RFC 3564 Requirements for Support of Differentiated Services-aware MPLS Traffic Engineering RFC 3567 Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication RFC 3602 The AES-CBC Cipher Algorithm and Its Use with IPsec RFC 3619 Ethernet Automatic Protection Switching (EAPS) RFC 3623 Graceful OSPF Restart RFC 3704 Unicast Reverse Path Forwarding (URPF) RFC 3706 A Traffic-Based Method of Detecting Dead Internet Key Exchange (IKE) Peers RFC 3768 VRRP RFC 3768 VRRP RFC 3768 VRRP (Premium Edge License) RFC 3784 ISIS TE support RFC 3786 Extending the Number of IS-IS LSP Fragments Beyond the 256 Limit RFC 3811 Definitions of Textual Conventions (TCs) for Multiprotocol Label Switching (MPLS) Management RFC 3812 Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB) RFC 3847 Restart signaling for IS-IS RFC 4213 Basic IPv6 Transition Mechanisms IP Ping **IP multicast** RFC 1112 IGMP RFC 2236 IGMPv2 RFC 2283 Multiprotocol Extensions for BGP-4 RFC 2362 PIM Sparse Mode RFC 2362 PIM Sparse Mode (Premium Edge License) RFC 2362 PIM Sparse Mode RFC 2934 Protocol Independent Multicast MIB for IPv4 RFC 3376 IGMPv3 RFC 3376 IGMPv3 (host joins only) RFC 3569 An Overview of Source-Specific Multicast (SSM) RFC 3618 Multicast Source Discovery Protocol (MSDP) RFC 3973 Draft 2 PIM Dense Mode RFC 3973 Draft 2 PIM Dense Mode RFC 3973 PIM Dense Mode RFC 3973 PIM Dense Mode (Premium Edge License) RFC 3973 PIM Dense Mode RFC 4601 Draft 10 PIM Sparse Mode RFC 4601 Draft 10 PIM Sparse Mode RFC 4605 IGMP/MLD Proxying **IPv6** RFC 1350 TFTP RFC 1881 IPv6 Address Allocation Management RFC 1886 DNS Extension for IPv6 RFC 1887 IPv6 Unicast Address Allocation Architecture RFC 1981 IPv6 Path MTU Discovery RFC 2080 RIPng for IPv6 RFC 2292 Advanced Sockets API for IPv6 RFC 2373 IPv6 Addressing Architecture RFC 2375 IPv6 Multicast Address Assignments 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 2472 IP Version 6 over PPP RFC 2473 Generic Packet Tunneling in IPv6 RFC 2475 IPv6 DiffServ Architecture RFC 2529 Transmission of IPv6 Packets over IPv4 RFC 2545 Use of MP-BGP-4 for IPv6 RFC 2553 Basic Socket Interface Extensions for IPv6 RFC 2710 Multicast Listener Discovery (MLD) for IPv6 RFC 2711 IPv6 Router Alert Option RFC 2740 OSPFv3 for IPv6 RFC 2893 Transition Mechanisms for IPv6 Hosts	and Routers RFC 2925 Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations (Ping only) RFC 2925 Remote Operations MIB (Ping only) RFC 3056 Connection of IPv6 Domains via IPv4 Clouds RFC 3162 RADIUS and IPv6 RFC 3306 Unicast-Prefix-based IPv6 Multicast Addresses RFC 3307 IPv6 Multicast Address Allocation RFC 3315 DHCPv6 (client and relay) RFC 3315 DHCPv6 (client only) RFC 3484 Default Address Selection for IPv6 RFC 3493 Basic Socket Interface Extensions for IPv6 RFC 3513 IPv6 Addressing Architecture RFC 3542 Advanced Sockets API for IPv6 RFC 3587 IPv6 Global Unicast Address Format RFC 3596 DNS Extension for IPv6 RFC 3810 MLDv2 (host joins only) RFC 3810 MLDv2 for IPv6 RFC 3810 Multicast Listener Discovery Version 2 (MLDv2) for IPv6 RFC 4022 MIB for TCP RFC 4113 MIB for UDP RFC 4251 SSHv6 Architecture RFC 4252 SSHv6 Authentication RFC 4252 SSHv6 Transport Layer RFC 4253 SSHv6 Transport Layer RFC 4254 SSHv6 Connection RFC 4291 IP Version 6 Addressing Architecture RFC 4293 MIB for IP RFC 4419 Key Exchange for SSH RFC 4443 ICMPv6 RFC 4541 IGMP & MLD Snooping Switch RFC 4861 IPv6 Neighbor Discovery RFC 4862 IPv6 Stateless Address Auto-configuration RFC 5095 Deprecation of Type 0 Routing Headers in IPv6 RFC 5340 OSPF for IPv6 RFC 5340 OSPFv3 for IPv6 RFC 5722 Handling of Overlapping IPv6 Fragments **MIBs** IEEE 8021-PAE-MIB IEEE 8023-LAG-MIB RFC 1156 (TCP/IP MIB) RFC 1212 Concise MIB Definitions RFC 1213 MIB II RFC 1229 Interface MIB Extensions RFC 1286 Bridge MIB RFC 1493 Bridge MIB RFC 1573 SNMP MIB II RFC 1643 Ethernet MIB RFC 1650 Ethernet-Like MIB RFC 1657 BGP-4 MIB RFC 1724 RIPv2 MIB RFC 1757 Remote Network Monitoring MIB RFC 1850 OSPFv2 MIB RFC 1907 SNMPv2 MIB RFC 2011 SNMPv2 MIB for IP RFC 2012 SNMPv2 MIB for TCP RFC 2013 SNMPv2 MIB for UDP RFC 2021 RMONv2 MIB RFC 2096 IP Forwarding Table MIB RFC 2233 Interface MIB RFC 2233 Interfaces MIB RFC 2273 SNMP-NOTIFICATION-MIB RFC 2452 IPV6-TCP-MIB RFC 2454 IPV6-UDP-MIB RFC 2465 IPv6 MIB RFC 2466 ICMPv6 MIB RFC 2571 SNMP Framework MIB RFC 2572 SNMP-MPD MIB RFC 2573 SNMP-Notification MIB RFC 2573 SNMP-Target MIB

Specifications (continued)

	HP 8812 Router Chassis (JC150B)	HP 8808-V Router Chassis (JC149B)	HP 8805 Router Chassis (JC148B)
Standards and protocols (applies to all products in series)	RFC 2620 RADIUS Accounting MIB RFC 2665 Ethernet-Like-MIB RFC 2668 802.3 MAU MIB RFC 2674 802.1p and IEEE 802.1Q Bridge MIB RFC 2688 MAU-MIB RFC 2737 Entity MIB (Version 2) RFC 2787 VRRP MIB RFC 2819 RMON MIB RFC 2863 The Interfaces Group MIB RFC 2925 Ping MIB RFC 2932IP (Multicast Routing MIB) RFC 2933 IGMP MIB RFC 3273 HC-RMON MIB RFC 3414 SNMP-User based-SM MIB RFC 3415 SNMP-View based-ACM MIB RFC 3418 MIB for SNMPv3 RFC 3621 Power Ethernet MIB RFC 3813 MPLS LSR MIB RFC 3814 MPLS FTN MIB RFC 3815 MPLS LDP MIB RFC 3826 AES for SNMP's USM MIB RFC 4113 UDP MIB RFC 4133 Entity MIB (Version 3) RFC 4221 MPLS FTN MIB LLDP-EXT-DOT1-MIB LLDP-EXT-DOT3-MIB LLDP-MIB **Network management** IEEE 802.1AB Link Layer Discovery Protocol (LLDP) IEEE 802.1D (STP) RFC 1098 A Simple Network Management Protocol (SNMP) RFC 1155 Structure of Management Information RFC 1157 SNMPv1 RFC 1215 SNMP Generic traps RFC 1757 RMON 4 groups: Stats, History, Alarms and Events RFC 1901 SNMPv2 Introduction RFC 1902 SNMPv2 Structure RFC 1903 SNMPv2 Textual Conventions RFC 1904 SNMPv2 Conformance RFC 1905 SNMPv2 Protocol Operations RFC 1906 SNMPv2 Transport Mappings RFC 1918 Private Internet Address Allocation RFC 2272 SNMPv3 Management Protocol RFC 2273 SNMPv3 Applications RFC 2274 USM for SNMPv3 RFC 2275 VACM for SNMPv3 RFC 2570 SNMPv3 Overview RFC 2571 SNMP Management Frameworks RFC 2572 SNMPv3 Message Processing RFC 2573 SNMPv3 Applications RFC 2574 SNMPv3 User-based Security Model (USM) RFC 2575 SNMPv3 View-based Access Control Model (VACM) RFC 2575 VACM for SNMP RFC 2576 Coexistence between SNMP versions RFC 2578 SMIv2 RFC 2581 TCP6 RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm) and 9 (events) RFC 3164 BSD syslog Protocol RFC 3176 sFlow RFC 3411 SNMP Management Frameworks RFC 3412 SNMPv3 Message Processing RFC 3414 SNMPv3 User-based Security Model	(USM) RFC 3415 SNMPv3 View-based Access Control Model VACM) ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED) SNMPv1/v2 SNMPv1/v2c SNMPv1/v2c (read only) SNMPv1/v2c/v3 **OSPF** RFC 1245 OSPF protocol analysis RFC 1246 Experience with OSPF RFC 1253 OSPFv2 MIB RFC 1583 OSPFv2 RFC 1587 OSPF NSSA RFC 1745 OSPF Interactions RFC 1765 OSPF Database Overflow RFC 1850 OSPFv2 Management Information Base (MIB), Traps RFC 2178 OSPFv2 RFC 2328 OSPFv2 RFC 2370 OSPF Opaque LSA Option RFC 3101 OSPF NSSA RFC 3623 Graceful OSPF Restart RFC 5340 OSPF for IPv6 RFC 5340 OSPFv3 for IPv6 **QoS/CoS** IEEE 802.1P (CoS) RFC 2474 DiffServ Precedence, including 8 queues/port RFC 2474 DiffServ precedence, with 4 queues per port RFC 2474 DS Field in the IPv4 and IPv6 Headers RFC 2474 DSCP DiffServ RFC 2474, with 4 queues per port RFC 2475 DiffServ Architecture RFC 2597 DiffServ Assured Forwarding (AF) RFC 2597 DiffServ Assured Forwarding (AF)- partial support RFC 2598 DiffServ Expedited Forwarding (EF) Ingress Rate Limiting **Security** IEEE 802.1X Port Based Network Access Control RFC 1321 The MD5 Message-Digest Algorithm RFC 1492 TACACS+ RFC 2082 RIP-2 MD5 Authentication RFC 2104 Keyed-Hashing for Message Authentication RFC 2138 RADIUS Authentication RFC 2139 RADIUS Accounting RFC 2209 RSVP-Message Processing RFC 2246 Transport Layer Security (TLS) RFC 2459 Internet X.509 Public Key Infrastructure Certificate and CRL Profile RFC 2548 Microsoft Vendor-specific RADIUS Attributes RFC 2716 PPP EAP TLS Authentication Protocol RFC 2818 HTTP Over TLS RFC 2865 RADIUS (client only) RFC 2865 RADIUS Authentication RFC 2866 RADIUS Accounting RFC 2867 RADIUS Accounting Modifications for	Tunnel Protocol Support RFC 2868 RADIUS Attributes for Tunnel Protocol Support RFC 2869 RADIUS Extensions RFC 3567 Intermediate System (IS) to IS Cryptographic Authentication RFC 3576 Dynamic Authorization Extensions to RADIUS RFC 3579 RADIUS Support For Extensible Authentication Protocol (EAP) RFC 3580 IEEE 802.1X RADIUS Access Control Lists (ACLs) Guest VLAN for 802.1x MAC Authentication Port Security Secure Sockets Layer (SSL) SSHv1 Secure Shell SSHv1.5 Secure Shell SSHv1/SSHv2 Secure Shell SSHv2 Secure Shell **VPN** RFC 2403 - HMAC-MD5-96 RFC 2404 - HMAC-SHA1-96 RFC 2405 - DES-CBC Cipher algorithm RFC 2407 - Domain of interpretation RFC 2547 BGP/MPLS VPNs RFC 2764 A Framework for IP Based Virtual Private Networks RFC 2796 BGP Route Reflection - An Alternative to Full Mesh IBGP RFC 2842 Capabilities Advertisement with BGP-4 RFC 2858 Multiprotocol Extensions for BGP-4 RFC 2917 A Core MPLS IP VPN Architecture RFC 2918 Route Refresh Capability for BGP-4 RFC 3107 Carrying Label Information in BGP-4 RFC 3948 - UDP Encapsulation of IPsec ESP Packets RFC 4301 - Security Architecture for the Internet Protocol RFC 4302 - IP Authentication Header (AH) RFC 4303 - IP Encapsulating Security Payload (ESP) RFC 4305 - Cryptographic Algorithm Implementation Requirements for ESP and AH **IPsec** RFC 1828 IP Authentication using Keyed MD5 RFC 2401 IP Security Architecture RFC 2402 IP Authentication Header RFC 2406 IP Encapsulating Security Payload RFC 2407 - Domain of interpretation RFC 2408 - Internet Security Association and Key Management Protocol (ISAKMP) RFC 2409 - The Internet Key Exchange RFC 2410 - The NULL Encryption Algorithm and its use with IPsec RFC 2411 IP Security Document Roadmap RFC 2412 – OAKLEY RFC 2865 - Remote Authentication Dial In User Service (RADIUS) **IKEv1** RFC 2865 - Remote Authentication Dial In User Service (RADIUS) RFC 3748 - Extensible Authentication Protocol (EAP)

HP 8800 Router Series accessories

Transceivers

HP X110 100M SFP LC LH40 Transceiver (JD090A)
HP X110 100M SFP LC LH80 Transceiver (JD091A)
HP X110 100M SFP LC FX Transceiver (JD102B)
HP X110 100M SFP LC LX Transceiver (JD120B)
HP X120 622M SFP LC LX 15km Transceiver (JF829A)
HP X120 622M SFP LC LH 40km 1310 Transceiver (JF830A)
HP X120 622M SFP LC LH 80km 1550 Transceiver (JF831A)
HP X125 1G SFP LC LH40 1310nm Transceiver (JD061A)
HP X120 1G SFP LC LH40 1550nm Transceiver (JD062A)
HP X170 1G SFP LC LH70 1550 Transceiver (JD109A)
HP X170 1G SFP LC LH70 1570 Transceiver (JD110A)
HP X170 1G SFP LC LH70 1590 Transceiver (JD111A)
HP X170 1G SFP LC LH70 1610 Transceiver (JD112A)
HP X170 1G SFP LC LH70 1470 Transceiver (JD113A)
HP X170 1G SFP LC LH70 1490 Transceiver (JD114A)
HP X170 1G SFP LC LH70 1510 Transceiver (JD115A)
HP X170 1G SFP LC LH70 1530 Transceiver (JD116A)
HP X125 1G SFP LC LH70 Transceiver (JD063B)
HP X120 1G SFP LC LH100 Transceiver (JD103A)
HP X120 1G SFP LC BX 10-U Transceiver (JD098B)
HP X120 1G SFP LC BX 10-D Transceiver (JD099B)
HP X120 1G SFP LC SX Transceiver (JD118B)
HP X120 1G SFP LC LX Transceiver (JD119B)
HP X120 1G SFP RJ45 T Transceiver (JD089B)
HP X160 2.5G SFP LC 2km Transceiver (JD084A)
HP X160 2.5G SFP LC 15km Transceiver (JD085A)
HP X160 2.5G SFP LC 40km Transceiver (JD086A)
HP X160 2.5G SFP LC 80km Transceiver (JD087A)
HP X130 10G XFP LC SR Transceiver (JD117B)
HP X135 10G XFP LC ER Transceiver (JD121A)
HP X135 10G XFP LC LR Transceiver (JD088A)
HP X130 10G XFP LC LR Transceiver (JD108B)
HP X130 10G XFP LC ZR Transceiver (JD107A)

Cables

HP X260 E1 BNC 75 ohm 3m Router Cable (JC127A)
HP X260 E1 RJ45 120 ohm 2m Router Cable (JC156A)
HP X260 E1 RJ45 120 ohm 3m Router Cable (JC126A)
HP X260 E1 RJ45 120 ohm 15m Router Cable (JC151A)
HP X260 E1 RJ45 120 ohm 30m Router Cable (JC152A)
HP X260 E1 BNC Extend 10m Router Cable (JC153A)
HP X260 E1 BNC Extend 15m Router Cable (JC154A)
HP X260 E1 BNC Extend 20m Router Cable (JC155A)
HP X260 E1 RJ45 BNC 75-120 ohm Conversion Router Cable (JD511A)
HP X260 T1 RJ45 100 ohm 3m Router Cable (JC128A)
HP X260 T1 Router Cable (JD518A)
HP X260 T1 Voice Router Cable (JD535A)

Mounting Kit

HP X421 Chassis Universal 4-post Rack Mounting Kit (JC665A)

License

HP 8800 Router Software License (JC157A)

Router Modules

HP 8800 Single Service Processing Engine Module (JC139A)
HP 8800 Dual Service Processing Engine Module (JC142A)
HP 8800 Single Service Processing Engine Enhanced Module (JC130A)
HP 8800 Dual Service Processing Engine Enhanced Module (JC133A)
HP 8800 10-port GbE SFP Module (JC131A)
HP 8800 20-port 1000BASE-X Module (JC132B)
HP 8800 20-port 10/100/1000 Ethernet Electrical Interface Module (JC135B)
HP 8800 1-port 10-GbE XFP Module (JC129A)
HP 8800 8-port E1/T1 / 8-port SFP Module (JC134A)
HP 8800 32-port E1/T1 / 2-port GbE SFP Module (JC145A)
HP 8800 1-port OC-3/STM-1 (E1/T1) CPOS / 8-port GbE SFP Module (JC477A)
HP 8800 2-port OC-3/STM-1 (E1/T1) CPOS / 8-port GbE SFP Module (JC478A)
HP 8800 4-port OC-3/STM-1 (E3/T3) CPOS/4-port GbE SFP Module (JC479A)
HP 8800 1-port OC-12/STM-4 (E3/T3) CPOS / 4-port GbE SFP Module (JC480A)
HP 8800 1-port OC-48/STM-16 (OC-3) CPOS SFP Module (JC481A)
HP 8800 8-port OC-3c/OC-12c POS / GbE SFP Module (JC482A)
HP 8800 2-port OC-3c/STM-1c POS SFP / 6-port GbE SFP Module (JC483A)
HP 8800 2-port OC-12c/STM-4c POS SFP / 6-port GbE SFP Module (JC484A)
HP 8800 2-port OC-48c/STM-16c POS SFP / 4-port GbE SFP Module (JC485A)
HP 8800 4-port OC-48c / STM-16c POS SFP Module (JC486A)
HP 8800 1-port OC-192c/STM-64c POS XFP Module (JC487A)
HP 8800 2-port OC-48c/STM-16c RPR SFP Module (JC488A)
HP 8800 1-port OC-192c/STM-64c RPR XFP Module (JC489A)
HP 8800 4-port OC-3c/STM-1c ATM SFP Module (JC490A)
HP 8800 1-port OC-12c/STM-4c ATM SFP Module (JC491A)
HP 8800 Net Analysis Service Processing Module (JC143A)
HP 8800 NAT Processing Module (JC144A)
HP 8800 Dual Fabric Main Processing Unit (JC596A)

HP 8800 Router Series accessories (continued)

HP 8800 Single Processor Service Engine Module (JC598A)
HP 8800 Dual Processor Service Engine Module (JC599A)
HP 8800 Network Address Translation Service Module (JC607A)
HP 8800 48-port GbE SFP Service Processing Module (JC604A)
HP 8800 4-port 10GbE XFP Service Processing Module (JC602A)
HP 8800 2-port 10GbE XFP Service Processing Module (JC605A)
HP 8800 16-port GbE SFP/8-port GbE Combo Service Processing Module (JC606A)
HP 2GB Registered DDR2 SDRAM Memory (JC609A)
HP 8800 Single Fabric Main Processing Unit (JC597A)

Appliance

HP 8800 Firewall Processing Module (JD251A)
HP 8800 VPN Firewall Module (JC640A)

Memory

HP 8800 1GB SDRAM (JC136A)
HP X600 1G Compact Flash Card (JC684A)
HP X600 512M Compact Flash Card (JC685A)
HP X600 256M Compact Flash Card (JC686A)

HP 8812 Router Chassis (JC150B)

HP 9500 3500W AC Power Frame (JC111A)
HP 9500/8800 1800W AC Power Supply (JC110B)
HP 9500/8800 3500W DC Power Supply (JC473A)
HP 8805/8808/8812 (2E) Main Control Unit Module (JC137A)
HP 8805/8808/8812 (1E) Main Control Unit Module (JC138A)
HP 8800 Single Fabric Main Processing Unit (JC597A)
HP 8800 Dual Fabric Main Processing Unit (JC596A)

HP 8808-V Router Chassis (JC149B)

HP 9500 3500W AC Power Frame (JC111A)
HP 9500/8800 1800W AC Power Supply (JC110B)
HP 9500/8800 3500W DC Power Supply (JC473A)
HP 8805/8808/8812 (2E) Main Control Unit Module (JC137A)
HP 8805/8808/8812 (1E) Main Control Unit Module (JC138A)
HP 8800 Single Fabric Main Processing Unit (JC597A)
HP 8800 Dual Fabric Main Processing Unit (JC596A)

HP 8805 Router Chassis (JC148B)

HP 9500/8800 1800W AC Power Supply (JC110B)
HP 9500 3500W AC Power Frame (JC111A)
HP 9500/8800 2000W 36-75V DC Power Supply (JC029B)
HP 8805/8808/8812 (2E) Main Control Unit Module (JC137A)
HP 8805/8808/8812 (1E) Main Control Unit Module (JC138A)
HP 8800 Single Fabric Main Processing Unit (JC597A)
HP 8800 Dual Fabric Main Processing Unit (JC596A)

To learn more, visit www.hp.com/networking

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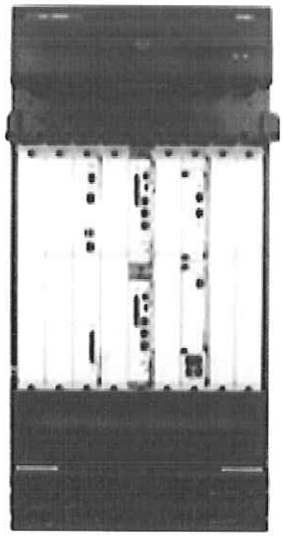


HP A6600 Router Series

Data sheet

Product overview

As the first service convergence routers based on a multi-core processor, the HP A6600 series routers dramatically enhance service processing capacity with HP FlexNetwork architecture. Distributed processing architecture, isolated routing, and service engines, as well as isolated control and service panels, provide higher reliability and continual services. Different software service engines can handle different services such as network address translation (NAT), Quality of Service (QoS), IPSec, and NetStream with no services modules needed. A6600 routers feature a modular design, embedded hardware encryption, as well as flexible deployment configurations, including High-speed Interface Modules (HIMs), Multi-function Interface Modules (MIMs), and Open Application Architecture (OAA)-enabled modules that provide network customization and investment protection. These routers provide carrier-class reliability at network, device, link, and service layers.

Key features

- Multi-core CPU and distributed processing
- Carrier-class reliability and aggregation
- Open Application Architecture platform
- Embedded hardware encryption
- Fully redundant and hot-swappable hardware

Features and benefits

Quality of Service (QoS)

- **Traffic policing:** supports Committed Access Rate (CAR) and line rate
- **Congestion management:** supports FIFO, PQ, CQ, WFQ, CBQ, and RTPQ
- **Other QoS technologies:** support traffic shaping, FR QoS, MPLS QoS, and MP QoS/LFI
- **Congestion avoidance:** weighted Random Early Detection (WRED)/RED

Management

- **Management interface control:** provides management access through modem port, terminal interface, as well as in-band and out-of-band Ethernet ports
- **Management security:** includes multiple administration levels, with password protection and restricted access to critical configuration commands; access control lists (ACLs) provide telnet and SNMP access; local and remote syslog capability allows logging of all access
- **SNMP v1, v2, and v3:** provides complete support of SNMP as well as full support of industry-standard MIBs and private MIB extensions
- **Industry-standard CLI with a hierarchical structure:** reduces training needs and increases productivity in multivendor installations
- **Remote monitoring (RMON):** uses standard SNMP to monitor essential network functions; supports events, alarm, history, and statistics group plus a private alarm extension group
- **Debug and sampler utility:** supports ping and traceroute for both IPv4 and IPv6
- **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 and file transfer rates; allows network manager to determine overall network performance and to diagnose and locate network congestion points or failures
- **Network Time Protocol (NTP):** synchronizes timekeeping among distributed time servers and clients; keeps consistent timekeeping among all clock-dependent devices within the network so that the devices can provide diverse applications based on the consistent time
- **Info center:** provides a central information center 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
- **FTP and TFTP support:** File Transfer Protocol allows bi-directional transfers over a TCP/IP network and is used for configuration updates; Trivial FTP is a simpler method using User Datagram Protocol (UDP)
- **Loopback:** supports internal loopback testing for maintenance purposes and high availability; loopback detection protects the system from incorrect cabling or network configurations and can be enabled on a port or VLAN
- **Internet Group Management Protocol (IGMP):** is used by IP hosts to establish and maintain multicast groups; supports v1, v2, and v3; utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks

Connectivity

- NEW **High port density:** provides up to 16 interface module slots, and high-density Ethernet interface cards; a single card can provide up to 48 GbE interfaces; therefore, the routers can fully satisfy the demand of high-density Ethernet (MSTP) link distribution
- **Multiple WAN interfaces:** support Fast Ethernet/Gigabit Ethernet/10 GbE ports, OC3~OC48 POS/CPOS, and ATM ports
- **Flexible port selection:** provides a combination of fiber and copper interface modules, 100/1000Base-X auto-speed selection, and 10/100/1000Base-T auto-speed detection plus auto duplex and MDI/MDI-X; speed is adaptable between 155 M POS and 622 M POS

Performance

- NEW **Industry-leading performance:** provides up to 252 Mpps forwarding performance
- **Flexible chassis selection:** consists of 4 models: 16 HIM-slot chassis, 8 HIM-slot chassis, 4 HIM-slot chassis, and 2 HIM-slot chassis
- **Scalable system design:** backplane is designed for smooth bandwidth upgrade

Resiliency and high availability

- **Separate data and control planes:** provide greater flexibility and enable continual services
- **Hitless software upgrades:** allow patches to be installed without restarting the device, increasing network uptime and simplifying maintenance
- **Redundant design of main processing unit and power supply:** increases the overall system availability
- **Virtual Router Redundancy Protocol (VRRP):** enables fast convergence of routes and packet forwarding when links fail, ensuring high network availability
- **IP Fast Reroute Framework (FRR):** nodes are configured with backup ports and routes; local implementation requires no cooperation of adjacent devices, simplifying the deployment; solves the traditional convergence faults in IP forwarding; realizes restoration within 50 ms, with the restoration time independent of the number of routes and fast link switchovers without route convergence
- **Graceful restart:** features are fully supported, including graceful restart for OSPF, IS-IS, Border Gateway Protocol (BGP), LDP, and RSVP; network remains stable during the active-standby switchover; after the switchover, the device quickly learns the network routes by communicating with adjacent routers; forwarding remains uninterrupted during the switchover to realize nonstop forwarding (NSF)
- **Hot-swappable modules:** help ensure the replacement of hardware interface modules without impacting the traffic flow through the system

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
- **Domain Name System (DNS):** is a distributed database that provides translation between a domain name and an IP address, which simplifies network design; supports client and server

Layer 3 routing

- **Static IPv4 routing:** provides simple, manually configured IPv4 routing
- **Routing Information Protocol:** uses a distance vector algorithm with UDP packets for route determination; supports RIPv1 and RIPv2 routing; includes loop protection
- **OSPF:** Interior Gateway Protocol (IGP) using link-state protocol for faster convergence; supports ECMP, NSSA, and MD5 authentication for increased security and graceful restart for faster failure recovery
- **Intermediate system to intermediate system (IS-IS):** Interior Gateway Protocol (IGP) using path-vector protocol, 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 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:** extends OSPFv2 to support IPv6 addressing
- **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:** is an important element for the transition from IPv4 to IPv6; 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
- **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, thus reducing complexity and increasing 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 MP-BGP to establish private routes for increased security; supports RFC 2547bis multiple autonomous system VPNs for added flexibility

- **Multiprotocol Label Switching (MPLS) Layer 2 VPN:** establishes simple Layer 2 point-to-point VPNs across a provider network using only MPLS LDPs; 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
- **Policy routing:** allows custom filters for increased performance and security; supports ACLs, IP prefix, AS paths, community lists, and aggregate policies
- **Multicast VPN:** supports Multicast Domain (MD) multicast VPN, which can be distributed on separate service cards, providing high performance and flexible configuration
- **Border Gateway Protocol 4:** Exterior Gateway Protocol (EGP) with path vector protocol uses TCP for enhanced reliability for the route discovery process, reduces bandwidth consumption by advertising only incremental updates, and supports extensive policies to increase flexibility and scale to large networks
- **OSPFv3 MCE:** Multi-VPN-Instance CE (MCE) binds different VPNs to different interfaces on one single CE; the OSPFv3 MCE feature creates and maintains separate OSPFv3 routing tables for each IPv6 VPN to isolate VPN services in the device

Security

- **Access control list:** supports powerful ACLs for both IPv4 and IPv6; ACLs are used for filtering traffic to prevent illegal users from accessing the network or for controlling network traffic flow; 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 also be set to operate on specific dates or times
- **RADIUS:** eases switch security access administration by using a password authentication server
- **TACACS+:** is an authentication tool using TCP with encryption of the full authentication request that provides additional security
- **Network address translation (NAT):** supports repeated multiplexing of a port and automatic 5-tuple collision detection, enabling NAPT to support unlimited connections; supports blacklist in NAT/NAPT/internal server, a limit on the number of connections, session log, and multi-instance
- **Secure Shell (SSHv2):** uses external servers to securely log in to a remote device; with authentication and encryption, it protects against IP spoofing and plain-text password interception; increases the security of Secure FTP (SFTP) transfers
- **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; supports distributed URPF
- **DVPN (Dynamic Virtual Private Network):** 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

Multicast support

- **Internet Group Management Protocol (IGMP):** is used by IP hosts to establish and maintain multicast groups; supports v1, v2, and v3; utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks
- **Protocol Independent Multicast (PIM):** is used for IPv4 and IPv6 multicast applications; supports PIM Dense Mode (PIM-DM), Sparse Mode (PIM-SM), and Source-Specific Mode (PIM-SSM)
- **Multicast Source Discovery Protocol (MSDP):** is used for interdomain multicast applications, allowing multiple PIM-SM domains to interoperate
- **Multicast Border Gateway Protocol (MBGP):** allows multicast traffic to be forwarded across BGP networks, separate from unicast traffic

Integration

- **Embedded VPN firewall:** provides enhanced stateful packet inspection and filtering; provides advanced VPN services with 3DES and AES encryption at high performance and low latency
- **Open Application Architecture (OOA):** provides both software and hardware platform based on open standards so that third-party applications can be integrated seamlessly into routers

Additional information

- **Green initiative support:** provides support for RoHS and WEEE regulations

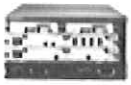
Product architecture

- **Multi-core CPU:** the first service convergence router based on multi-core, multi-thread processing, with eight cores and 32 hardware threads
- **Distributed processing:** the main processing engine and service engine have separate hardware for high performance and parallel processing; the main processing engine is used for route calculation and system management, while the service engine is used for service processing
- **Separate FIP card and interface card:** interface cards are separated from the FIP card to support flexible service configurations

Warranty and support

- **1-year warranty:** with advance replacement and 30-calendar-day delivery (available in most countries)
- **Electronic and telephone support:** limited electronic and telephone support is available from HP; refer to www.hp.com/networking/warranty for details on the support provided and the period during which support is available
- **Software releases:** refer to www.hp.com/networking/warranty for details on the software releases provided and the period during which software releases are available for your product(s)

Specifications

	 HP A6602 Router (JC176A)	 HP A6604 Router Chassis (JC178B)
Ports	2 HIM slots	4 HIM slots 2 MPU (for management modules) slots
Physical characteristics		
Dimensions	18.11(d) x 17.40(w) x 1.73(h) in. (46 x 44.2 x 4.4 cm) (1U height)	18.9(d) x 17.17(w) x 8.66(h) in. (48.01 x 43.61 x 22 cm) (5U height)
Full configuration weight	16.53 lb. (7.5 kg)	83.77 lb. (38 kg)
Memory and processor	Multi-core MIPS @ 1000 MHz, 2 GB DDR2 SDRAM, 4 GB DDR2 SDRAM, 256 MB flash, 1 GB flash; packet buffer size: 128 MB DDR2 SDRAM	
Mounting	EIA standard 19 in. rack	EIA standard 19 in. rack
Performance		
Throughput	4.5 million pps	up to 36 million pps
Routing table size	1000000 entries	2000000 entries
Environment		
Operating temperature	32°F to 113°F (0°C to 45°C)	32°F to 113°F (0°C to 45°C)
Operating relative humidity	10% to 95%, noncondensing	10% to 95%, noncondensing
Electrical characteristics		
Maximum heat dissipation	512 BTU/hr (540.16 kJ/hr)	2217 BTU/hr (2338.94 kJ/hr)
Voltage	100-120/200-240 VAC	100-120/200-240 VAC
Maximum power rating	150 W	650 W
Frequency	50/60 Hz	50/60 Hz
Notes	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.	Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.
Safety	CSA 22.2 No. 60950; cUL (CSA 22.2 No. 60950); CSA 22.2 No. 60950 3rd edition; CSA 22.2 No. 950; CSA 950; cUL (CSA 950); EN 60950/IEC 60950; UL 1950 3rd edition; UL 1950; UL 60950; UL 60950-1; CAN/CSA 22.2 No. 60950; CAN/CSA 22.2 No. 60950-1; EN 60825; AS/NZS 60950; KN 60950; GOST R MEK60950; EN 60825-1 Safety of Laser Products-Part 1; EN 60825-2 Safety of Laser Products-Part 2; EN 609500 Safety Information Technology Equipment; UL 60950; CSA 22.2 No. 60950/cUL; IEC 60950; IEC 60950-1; EN 60950; EN 60950-1; IEC 60825; CSA 22.2 No. 950-95; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1-03; CAN/CSA-C22.2 No. 60950-1; CSA 60950-1; CSA C22.2 60950-1; EU RoHS Compliant; EN 60950-1/A11; CSA 22.2 60950-1; EN 60950: 2000, ZB and ZC Deviations; IEC 60950: 1999, Corr Feb 2000, all national deviations; As/NZS 60950:2000, Australia; UL 60950-1:2003; UL 60950-1:2001; CSA 22.2 60950-1:2003; IEC 60950-1:2001; EN 60950-1:2001; CSA 22.2-60950; AS/NZS 60950: 2000 Australia, Russian GOST Safety Approval; CSA 22.2 No. 950 3rd Edition 1995; UL 60950 3rd Edition; CAN/CSA 22.2 No. 60950-00/UL 60950 3rd Edition, Safety Information for Technology Equipment; EN 60950/IEC 60950 3rd Edition; UL 60950 Standard for the Safety of Information Technology Equipment; EN 60825: Safety of Laser Products	CSA 22.2 No. 60950; cUL (CSA 22.2 No. 60950); CSA 22.2 No. 60950 3rd edition; CSA 22.2 No. 950; CSA 950; cUL (CSA 950); EN 60950/IEC 60950; UL 1950 3rd edition; UL 1950; UL 60950; UL 60950-1; CAN/CSA 22.2 No. 60950; CAN/CSA 22.2 No. 60950-1; EN 60825; AS/NZS 60950; KN 60950; GOST R MEK60950; EN 60825-1 Safety of Laser Products-Part 1; EN 60825-2 Safety of Laser Products-Part 2; EN 609500 Safety Information Technology Equipment; UL 60950; CSA 22.2 No. 60950/cUL; IEC 60950; IEC 60950-1; EN 60950; EN 60950-1; IEC 60825; CSA 22.2 No. 950-95; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1-03; CAN/CSA-C22.2 No. 60950-1; CSA 60950-1; CSA C22.2 60950-1; EU RoHS Compliant; EN 60950-1/A11; CSA 22.2 60950-1; EN 60950: 2000, ZB and ZC Deviations; IEC 60950: 1999, Corr Feb 2000, all national deviations; As/NZS 60950:2000, Australia; UL 60950-1:2003; UL 60950-1:2001; CSA 22.2 60950-1:2003; IEC 60950-1:2001; EN 60950-1:2001; CSA 22.2-60950; AS/NZS 60950: 2000 Australia, Russian GOST Safety Approval; CSA 22.2 No. 950 3rd Edition 1995; UL 60950 3rd Edition; CAN/CSA 22.2 No. 60950-00/UL 60950 3rd Edition, Safety Information for Technology Equipment; EN 60950/IEC 60950 3rd Edition; UL 60950 Standard for the Safety of Information Technology Equipment; EN 60825: Safety of Laser Products
Emissions	FCC part 15 Class A; FCC Rules Part 15, Subpart B Class A; EN 55022/CISPR-22 Class A; VCCI Class A; EN 55022/CISPR 22 Class A; EN 55022 Class A; CISPR 22 Class A; EN 55024; CISPR 22/A2; IEC/EN 61000-3-2; IEC/EN 61000-3-3; EN 55024/A1; IEC 61000:4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-11; BSMI CNS 13438; EMC Directive 89/336/EEC; ICES-003 Class A; ANSI C63.4 2003; CISPR 24; ETSI EN 300 386 V1.3.3; AS/NZS CISPR22 Class A; EN 61000-3-2; EN 61000-3-3; Korean EMI Class A; CNS 13438 Class A; EN 55024:1998; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-6; EN 61000-4-11	FCC part 15 Class A; FCC Rules Part 15, Subpart B Class A; EN 55022/CISPR-22 Class A; VCCI Class A; EN 55022/CISPR 22 Class A; EN 55022 Class A; CISPR 22 Class A; EN 55024; CISPR 22/A2; IEC/EN 61000-3-2; IEC/EN 61000-3-3; EN 55024/A1; IEC 61000:4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-11; BSMI CNS 13438; EMC Directive 89/336/EEC; ICES-003 Class A; ANSI C63.4 2003; CISPR 24; ETSI EN 300 386 V1.3.3; AS/NZS CISPR22 Class A; EN 61000-3-2; EN 61000-3-3; Korean EMI Class A; CNS 13438 Class A; EN 55024:1998; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-6; EN 61000-4-11
Management	IMC - Intelligent Management Center; command-line interface; limited command-line interface; out-of-band management (serial RS-232C); out-of-band management (DB-9 serial port console); out-of-band management; SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB	IMC - Intelligent Management Center; command-line interface; limited command-line interface; out-of-band management (serial RS-232C); out-of-band management (DB-9 serial port console); out-of-band management; SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB

Specifications (continued)

	HP A6602 Router (JC176A)	HP A6604 Router Chassis (JC178B)
Services	3-year, parts only, global next-day advance exchange (HP826E) 3-year, 4-hour onsite, 13x5 coverage for hardware (HP830E) 3-year, 4-hour onsite, 24x7 coverage for hardware (HP817E) 3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (HP820E) 3-year, 24x7 SW phone support, software updates (HP823E) 1-year, post-warranty, 4-hour onsite, 13x5 coverage for hardware (HR524E) 1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware (HR525E) 1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support (HR526E) 4-year, 4-hour onsite, 13x5 coverage for hardware (HP831E) 4-year, 4-hour onsite, 24x7 coverage for hardware (HP818E) 4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (HP821E) 4-year, 24x7 SW phone support, software updates (HP824E) 5-year, 4-hour onsite, 13x5 coverage for hardware (HP832E) 5-year, 4-hour onsite, 24x7 coverage for hardware (HP819E) 5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (HP822E) 5-year, 24x7 SW phone support, software updates (HP825E) 3 Yr 6 hr Call-to-Repair Onsite (HP827E) 4 Yr 6 hr Call-to-Repair Onsite (HP828E) 5 Yr 6 hr Call-to-Repair Onsite (HP829E) 1-year, 6 hour Call-To-Repair Onsite for hardware (HR528E) 1-year, 24x7 software phone support, software updates (HR527E) 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.	3-year, parts only, global next-day advance exchange (UW054E) 3-year, 4-hour onsite, 13x5 coverage for hardware (UW062E) 3-year, 4-hour onsite, 24x7 coverage for hardware (UV930E) 3-year, 4-hour onsite, 24x7 coverage for hardware (HR530E) 3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (UV943E) 3-year, 24x7 SW phone support, software updates (UV955E) 1-year, post-warranty, 4-hour onsite, 13x5 coverage for hardware (HR529E) 1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support (HR531E) 4-year, 4-hour onsite, 13x5 coverage for hardware (UW063E) 4-year, 4-hour onsite, 24x7 coverage for hardware (UV931E) 4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV944E) 4-year, 24x7 SW phone support, software updates (UV956E) 5-year, 4-hour onsite, 13x5 coverage for hardware (UW064E) 5-year, 4-hour onsite, 24x7 coverage for hardware (UV932E) 5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV945E) 5-year, 24x7 SW phone support, software updates (UV957E) 3 Yr 6 hr Call-to-Repair Onsite (UW055E) 4 Yr 6 hr Call-to-Repair Onsite (UW056E) 5 Yr 6 hr Call-to-Repair Onsite (UW057E) 1-year, 6 hour Call-To-Repair Onsite for hardware (HR533E) 1-year, 24x7 software phone support, software updates (HR532E) 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.

Specifications (continued)

	HP A6602 Router (JC176A)	HP A6604 Router Chassis (JC178B)

Standards and protocols
(applies to all products in series)

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 BGP4 confederations
RFC 1997 BGP Communities Attribute
RFC 1998 PPP Gandalf FZA Compression Protocol
RFC 2385 BGP Session Protection via TCP MD5
RFC 2439 BGP Route Flap Damping
RFC 2796 BGP Route Reflection
RFC 2842 Capability Advertisement with BGP-4
RFC 2858 BGP-4 Multi-Protocol Extensions
RFC 2918 Route Refresh Capability

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 1901 (Community based SNMPv2)
RFC 1901-1907 SNMPv2c, SMIv2 and Revised MIB-II
RFC 1902 (SNMPv2)
RFC 1908 (SNMP v1/2 Coexistence)
RFC 1945 Hypertext Transfer Protocol – HTTP/1.0
RFC 2068 Hypertext Transfer Protocol – HTTP/1.1
RFC 2271 FrameWork
RFC 2452 MIB for TCP6
RFC 2454 MIB for UDP6
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 2819 (RMON groups Alarm, Event, History and Statistics only)
RFC 2819 RMON
RFC 3410 (Management Framework)
RFC 3416 (SNMP Protocol Operations v2)
RFC 3417 (SNMP Transport Mappings)
Multiple Configuration Files
Multiple Software Images
SNMP v3 and RMON RFC support
SSHv1/SSHv2 Secure Shell
TACACS/TACACS+

General protocols
IEEE 802.1ad Q-in-Q
IEEE 802.1ad Q-in-Q
IEEE 802.1ag Service Layer OAM
IEEE 802.1ah Provider Backbone Bridges
IEEE 802.1AX-2008 Link Aggregation
IEEE 802.1D MAC Bridges
IEEE 802.1p Priority
IEEE 802.1Q (GVRP)
IEEE 802.1Q VLANs
IEEE 802.1s (MSTP)
IEEE 802.1s Multiple Spanning Trees
IEEE 802.1v VLAN classification by Protocol and Port
IEEE 802.1w Rapid Reconfiguration of Spanning Tree
IEEE 802.1X PAE
IEEE 802.3 Type 10BASE-T
IEEE 802.3ab 1000BASE-T
IEEE 802.3ac (VLAN Tagging Extension)
IEEE 802.3ad Link Aggregation (LAG)
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 802.3i 10BASE-T
IEEE 802.3u 100BASE-X
IEEE 802.3x Flow Control
IEEE 802.3z 1000BASE-X
RFC 768 UDP
RFC 783 TFTP Protocol (revision 2)
RFC 791 IP
RFC 792 ICMP
RFC 793 TCP
RFC 826 ARP
RFC 854 TELNET
RFC 855 Telnet Option Specification
RFC 856 TELNET
RFC 857 Telnet Echo Option
RFC 858 Telnet Suppress Go Ahead Option
RFC 894 IP over Ethernet
RFC 896 Congestion Control in IP/TCP Internetworks
RFC 906 TFTP Bootstrap
RFC 925 Multi-LAN Address Resolution
RFC 950 Internet Standard Subnetting Procedure
RFC 951 BOOTP
RFC 959 File Transfer Protocol (FTP)
RFC 1006 ISO transport services on top of the TCP: Version 3
RFC 1027 Proxy ARP
RFC 1034 Domain Concepts and Facilities
RFC 1035 Domain Implementation and Specification
RFC 1042 IP Datagrams
RFC 1058 RIPv1
RFC 1071 Computing the Internet Checksum
RFC 1091 Telnet Terminal-Type Option
RFC 1093 NSFNET routing architecture
RFC 1122 Host Requirements
RFC 1141 Incremental updating of the Internet checksum
RFC 1142 OSI IS-IS Intra-domain Routing Protocol
RFC 1144 Compressing TCP/IP headers for low-speed serial links
RFC 1171 Point-to-Point Protocol for the transmission of multi-protocol datagrams over Point-to-Point links
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 1256 ICMP Router Discovery Protocol (IRDP)
RFC 1293 Inverse Address Resolution Protocol
RFC 1305 NTPv3
RFC 1315 Management Information Base for Frame Relay DTEs
RFC 1321 The MD5 Message-Digest Algorithm
RFC 1332 The PPP Internet Protocol Control Protocol (IPCP)
RFC 1333 PPP Link Quality Monitoring
RFC 1334 PPP Authentication Protocols (PAP)
RFC 1334 PPP Authentication Protocols (PAP)
RFC 1349 Type of Service
RFC 1350 TFTP Protocol (revision 2)
RFC 1377 The PPP OSI Network Layer Control Protocol (OSINLCP)
RFC 1381 SNMP MIB Extension for X.25 LAPB
RFC 1389 RIPv2 MIB Extension
RFC 1471 The Definitions of Managed Objects for the Link Control Protocol of the Point-to-Point Protocol
RFC 1472 The Definitions of Managed Objects for the Security Protocols of the Point-to-Point Protocol
RFC 1490 Multiprotocol Interconnect over Frame Relay
RFC 1519 CIDR
RFC 1531 Dynamic Host Configuration Protocol
RFC 1533 DHCP Options and BOOTP Vendor Extensions
RFC 1534 DHCP/BOOTP Interoperation
RFC 1541 DHCP
RFC 1542 BOOTP Extensions
RFC 1542 Clarifications and Extensions for the Bootstrap Protocol
RFC 1552 The PPP Internetworking Packet Exchange Control Protocol (IPXCP)
RFC 1577 Classical IP and ARP over ATM
RFC 1631 NAT
RFC 1638 PPP Bridging Control Protocol (BCP)
RFC 1661 The Point-to-Point Protocol (PPP)
RFC 1662 PPP in HDLC-like Framing
RFC 1695 Definitions of Managed Objects for ATM Management Version 8.0 using SMIv2
RFC 1700 Assigned Numbers
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 1812 IPv4 Routing
RFC 1829 The ESP DES-CBC Transform
RFC 1877 PPP Internet Protocol Control Protocol Extensions for Name Server Addresses
RFC 1944 Benchmarking Methodology for Network Interconnect Devices
RFC 1945 Hypertext Transfer Protocol – HTTP/1.0
RFC 1973 PPP in Frame Relay
RFC 1974 PPP Stac LZS Compression Protocol
RFC 1981 Path MTU Discovery for IP version 6
RFC 1990 The PPP Multilink Protocol (MP)
RFC 1994 PPP Challenge Handshake Authentication Protocol (CHAP)
RFC 2082 RIP-2 MD5 Authentication
RFC 2091 Trigger RIP
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 2205 Resource ReSerVation Protocol (RSVP) - Version 1 Functional Specification
RFC 2209 Resource ReSerVation Protocol (RSVP) – Version 1 Message Processing Rules
RFC 2236 IGMP Snooping
RFC 2246 The TLS Protocol Version 1.0
RFC 2251 Lightweight Directory Access Protocol (v3)
RFC 2252 Lightweight Directory Access Protocol (v3): Attribute Syntax Definitions
RFC 2280 Routing Policy Specification Language (RPSL)
RFC 2283 MBGP
RFC 2284 EAP over LAN
RFC 2338 VRRP
RFC 2338 VRRP (Premium Edge License)
RFC 2364 PPP Over AAL5
RFC 2374 An Aggregatable Global Unicast Address Format
RFC 2451 The ESP CBC-Mode Cipher Algorithms
RFC 2453 RIPv2
RFC 2510 Internet X.509 Public Key Infrastructure Certificate Management Protocols
RFC 2511 Internet X.509 Certificate Request Message Format
RFC 2516 A Method for Transmitting PPP Over Ethernet (PPPoE)
RFC 2529 Transmission of IPv6 over IPv4 Domains without Explicit Tunnels
RFC 2616 HTTP Compatibility v1.1
RFC 2622 Routing Policy Specification Language (RPSL)

Specifications (continued)

	HP A6602 Router (JC176A)	HP A6604 Router Chassis (JC178B)

Standards and protocols
(applies to all products in series)

RFC 2663 NAT Terminology and Considerations
RFC 2684 Multiprotocol Encapsulation over ATM Adaptation Layer 5
RFC 2694 DNS extensions to Network Address Translators (DNS_ALG)
RFC 2702 Requirements for Traffic Engineering Over MPLS
RFC 2716 PPP EAP TLS Authentication Protocol
RFC 2747 RSVP Cryptographic Authentication
RFC 2763 Dynamic Name-to-System ID mapping support
RFC 2765 Stateless IP/ICMP Translation Algorithm (SIIT)
RFC 2766 Network Address Translation - Protocol Translation (NAT-PT)
RFC 2767 Dual Stacks IPv4 & IPv6
RFC 2784 Generic Routing Encapsulation (GRE)
RFC 2787 Definitions of Managed Objects for VRRP
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
RFC 2961 RSVP Refresh Overhead Reduction Extensions
RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS
RFC 2973 IS-IS Mesh Groups
RFC 2993 Architectural Implications of NAT
RFC 3022 Traditional IP Network Address Translator (Traditional NAT)
RFC 3027 Protocol Complications with the IP Network Address Translator
RFC 3031 Multiprotocol Label Switching Architecture
RFC 3032 MPLS Label Stack Encoding
RFC 3036 LDP Specification
RFC 3046 DHCP Relay Agent Information Option
RFC 3063 MPLS Loop Prevention Mechanism
RFC 3065 Support AS confederation
RFC 3137 OSPF Stub Router Advertisement
RFC 3209 RSVP-TE Extensions to RSVP for LSP Tunnels
RFC 3210 Applicability Statement for Extensions to RSVP for LSP-Tunnels
RFC 3212 Constraint-Based LSP setup using LDP (CR-LDP)
RFC 3214 LSP Modification Using CR-LDP
RFC 3215 LDP State Machine
RFC 3246 Expedited Forwarding PHB
RFC 3268 Advanced Encryption Standard (AES) Ciphersuites for Transport Layer Security (TLS)
RFC 3277 IS-IS Transient Blackhole Avoidance
RFC 3279 Algorithms and Identifiers for the Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile
RFC 3280 Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile
RFC 3392 Support BGP capabilities advertisement
RFC 3410 Applicability Statements for SNMP
RFC 3416 Protocol Operations for SNMP
RFC 3417 Transport Mappings for the Simple Network Management Protocol (SNMP)
RFC 3479 Fault Tolerance for the Label Distribution Protocol (LDP)
RFC 3487 Graceful Restart Mechanism for LDP
RFC 3509 OSPF ABR Behavior
RFC 3526 More Modular Exponential (MODP) Diffie-Hellman groups for Internet Key Exchange (IKE)
RFC 3564 Requirements for Support of Differentiated Services-aware MPLS Traffic Engineering
RFC 3567 Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication
RFC 3602 The AES-CBC Cipher Algorithm and Its Use with IPsec
RFC 3619 Ethernet Automatic Protection Switching (EAPS)
RFC 3623 Graceful OSPF Restart
RFC 3704 Unicast Reverse Path Forwarding (URPF)
RFC 3706 A Traffic-Based Method of Detecting Dead Internet Key Exchange (IKE) Peers
RFC 3768 VRRP
RFC 3768 VRRP
RFC 3768 VRRP (Premium Edge License)
RFC 3784 ISIS TE support
RFC 3786 Extending the Number of IS-IS LSP Fragments Beyond the 256 Limit
RFC 3811 Definitions of Textual Conventions (TCs) for Multiprotocol Label Switching (MPLS) Management
RFC 3812 Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB)
RFC 3847 Restart signaling for IS-IS
RFC 4213 Basic IPv6 Transition Mechanisms
IP Ping

IP multicast
RFC 1112 IGMP
RFC 2236 IGMPv2
RFC 2283 Multiprotocol Extensions for BGP-4
RFC 2362 PIM Sparse Mode
RFC 2362 PIM Sparse Mode (Premium Edge License)
RFC 2362 PIM Sparse Mode
RFC 2934 Protocol Independent Multicast MIB for IPv4
RFC 3376 IGMPv3
RFC 3376 IGMPv3 (host joins only)
RFC 3569 An Overview of Source-Specific Multicast (SSM)
RFC 3618 Multicast Source Discovery Protocol (MSDP)
RFC 3973 Draft 2 PIM Dense Mode
RFC 3973 Draft 2 PIM Dense Mode
RFC 3973 PIM Dense Mode
RFC 3973 PIM Dense Mode (Premium Edge License)
RFC 3973 PIM Dense Mode
RFC 4601 Draft 10 PIM Sparse Mode
RFC 4601 Draft 10 PIM Sparse Mode
RFC 4605 IGMP/MLD Proxying

IPv6
RFC 1350 TFTP
RFC 1881 IPv6 Address Allocation Management
RFC 1886 DNS Extension for IPv6
RFC 1887 IPv6 Unicast Address Allocation Architecture
RFC 1981 IPv6 Path MTU Discovery
RFC 2080 RIPng for IPv6
RFC 2292 Advanced Sockets API for IPv6
RFC 2373 IPv6 Addressing Architecture
RFC 2375 IPv6 Multicast Address Assignments
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 2472 IP Version 6 over PPP
RFC 2473 Generic Packet Tunneling in IPv6
RFC 2475 IPv6 DiffServ Architecture
RFC 2529 Transmission of IPv6 Packets over IPv4
RFC 2545 Use of MP-BGP-4 for IPv6
RFC 2553 Basic Socket Interface Extensions for IPv6
RFC 2710 Multicast Listener Discovery (MLD) for IPv6
RFC 2711 IPv6 Router Alert Option
RFC 2740 OSPFv3 for IPv6
RFC 2893 Transition Mechanisms for IPv6 Hosts and Routers
RFC 2925 Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations (Ping only)
RFC 2925 Remote Operations MIB (Ping only)
RFC 3056 Connection of IPv6 Domains via IPv4 Clouds
RFC 3162 RADIUS and IPv6
RFC 3306 Unicast-Prefix-based IPv6 Multicast Addresses
RFC 3307 IPv6 Multicast Address Allocation
RFC 3315 DHCPv6 (client and relay)
RFC 3315 DHCPv6 (client only)
RFC 3363 DNS support
RFC 3484 Default Address Selection for IPv6
RFC 3493 Basic Socket Interface Extensions for IPv6
RFC 3513 IPv6 Addressing Architecture
RFC 3542 Advanced Sockets API for IPv6
RFC 3587 IPv6 Global Unicast Address Format
RFC 3596 DNS Extension for IPv6
RFC 3810 MLDv2 (host joins only)
RFC 3810 MLDv2 for IPv6
RFC 3810 Multicast Listener Discovery Version 2 (MLDv2) for IPv6
RFC 4022 MIB for TCP
RFC 4113 MIB for UDP
RFC 4251 SSHv6 Architecture
RFC 4252 SSHv6 Authentication
RFC 4252 SSHv6 Transport Layer
RFC 4253 SSHv6 Transport Layer
RFC 4254 SSHv6 Connection
RFC 4291 IP Version 6 Addressing Architecture
RFC 4293 MIB for IP
RFC 4419 Key Exchange for SSH
RFC 4443 ICMPv6
RFC 4541 IGMP & MLD Snooping Switch
RFC 4861 IPv6 Neighbor Discovery
RFC 4862 IPv6 Stateless Address Auto-configuration
RFC 5095 Deprecation of Type 0 Routing Headers in IPv6
RFC 5340 OSPF for IPv6
RFC 5340 OSPFv3 for IPv6
RFC 5722 Handling of Overlapping IPv6 Fragments

MIBs
IEEE 8021-PAE-MIB
IEEE 8023-LAG-MIB
RFC 1156 (TCP/IP MIB)
RFC 1212 Concise MIB Definitions
RFC 1213 MIB II
RFC 1229 Interface MIB Extensions
RFC 1286 Bridge MIB
RFC 1493 Bridge MIB
RFC 1573 SNMP MIB II
RFC 1643 Ethernet MIB
RFC 1650 Ethernet-Like MIB
RFC 1657 BGP-4 MIB
RFC 1724 RIPv2 MIB
RFC 1757 Remote Network Monitoring MIB
RFC 1850 OSPFv2 MIB
RFC 1907 SNMPv2 MIB
RFC 2011 SNMPv2 MIB for IP
RFC 2012 SNMPv2 MIB for TCP
RFC 2013 SNMPv2 MIB for UDP
RFC 2021 RMONv2 MIB
RFC 2096 IP Forwarding Table MIB
RFC 2233 Interface MIB
RFC 2233 Interfaces MIB
RFC 2273 SNMP-NOTIFICATION-MIB
RFC 2452 IPV6-TCP-MIB
RFC 2454 IPV6-UDP-MIB
RFC 2465 IPv6 MIB
RFC 2466 ICMPv6 MIB
RFC 2571 SNMP Framework MIB
RFC 2572 SNMP-MPD MIB

Specifications (continued)

	HP A6602 Router (JC176A)	HP A6604 Router Chassis (JC178B)
Standards and protocols (applies to all products in series)	RFC 2574 SNMP USM MIB RFC 2618 RADIUS Client MIB RFC 2620 RADIUS Accounting MIB RFC 2665 Ethernet-Like-MIB RFC 2668 802.3 MAU MIB RFC 2674 802.1p and IEEE 802.1Q Bridge MIB RFC 2688 MAU-MIB RFC 2737 Entity MIB (Version 2) RFC 2787 VRRP MIB RFC 2819 RMON MIB RFC 2863 The Interfaces Group MIB RFC 2925 Ping MIB RFC 2932IP (Multicast Routing MIB) RFC 2933 IGMP MIB RFC 3273 HC-RMON MIB RFC 3414 SNMP-User based-SM MIB RFC 3415 SNMP-View based-ACM MIB RFC 3418 MIB for SNMPv3 RFC 3621 Power Ethernet MIB RFC 3813 MPLS LSR MIB RFC 3814 MPLS FTN MIB RFC 3815 MPLS LDP MIB RFC 3826 AES for SNMP's USM MIB RFC 4113 UDP MIB RFC 4133 Entity MIB (Version 3) RFC 4221 MPLS FTN MIB LLDP-EXT-DOT1-MIB LLDP-EXT-DOT3-MIB LLDP-MIB **Network management** IEEE 802.1AB Link Layer Discovery Protocol (LLDP) IEEE 802.1D (STP) RFC 1098 A Simple Network Management Protocol (SNMP) RFC 1155 Structure of Management Information RFC 1157 SNMPv1 RFC 1215 SNMP Generic traps RFC 1757 RMON 4 groups: Stats, History, Alarms and Events RFC 1901 SNMPv2 Introduction RFC 1902 SNMPv2 Structure RFC 1903 SNMPv2 Textual Conventions RFC 1904 SNMPv2 Conformance RFC 1905 SNMPv2 Protocol Operations RFC 1906 SNMPv2 Transport Mappings RFC 1918 Private Internet Address Allocation RFC 2272 SNMPv3 Management Protocol RFC 2273 SNMPv3 Applications RFC 2274 USM for SNMPv3 RFC 2275 VACM for SNMPv3 RFC 2570 SNMPv3 Overview RFC 2571 SNMP Management Frameworks RFC 2572 SNMPv3 Message Processing RFC 2573 SNMPv3 Applications RFC 2574 SNMPv3 User-based Security Model (USM) RFC 2575 SNMPv3 View-based Access Control Model (VACM) RFC 2575 VACM for SNMP RFC 2576 Coexistence between SNMP versions RFC 2578 SMIv2 RFC 2581 TCP6 RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm) and 9 (events) RFC 3164 BSD syslog Protocol RFC 3176 sFlow RFC 3411 SNMP Management Frameworks RFC 3412 SNMPv3 Message Processing	RFC 3414 SNMPv3 User-based Security Model (USM) RFC 3415 SNMPv3 View-based Access Control Model VACM) ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED) SNMPv1/v2 SNMPv1/v2c SNMPv1/v2c (read only) SNMPv1/v2c/v3 **OSPF** RFC 1245 OSPF protocol analysis RFC 1246 Experience with OSPF RFC 1253 OSPFv2 MIB RFC 1583 OSPFv2 RFC 1587 OSPF NSSA RFC 1745 OSPF Interactions RFC 1765 OSPF Database Overflow RFC 1850 OSPFv2 Management Information Base (MIB), traps RFC 2178 OSPFv2 RFC 2328 OSPFv2 RFC 2328 OSPFv2 RFC 2328 OSPFv2 (Premium Edge License) RFC 2370 OSPF Opaque LSA Option RFC 3101 OSPF NSSA RFC 3623 Graceful OSPF Restart RFC 5340 OSPF for IPv6 RFC 5340 OSPFv3 for IPv6 **QoS/CoS** IEEE 802.1P (CoS) RFC 2474 DiffServ Precedence, including 8 queues/port RFC 2474 DiffServ precedence, with 4 queues per port RFC 2474 DS Field in the IPv4 and IPv6 Headers RFC 2474 DSCP DiffServ RFC 2474, with 4 queues per port RFC 2475 DiffServ Architecture RFC 2597 DiffServ Assured Forwarding (AF) RFC 2597 DiffServ Assured Forwarding (AF)- partial support RFC 2598 DiffServ Expedited Forwarding (EF) Ingress Rate Limiting **Security** IEEE 802.1X Port Based Network Access Control RFC 1321 The MD5 Message-Digest Algorithm RFC 1492 TACACS+ RFC 2082 RIP-2 MD5 Authentication RFC 2104 Keyed-Hashing for Message Authentication RFC 2138 RADIUS Authentication RFC 2139 RADIUS Accounting RFC 2209 RSVP-Message Processing RFC 2246 Transport Layer Security (TLS) RFC 2459 Internet X.509 Public Key Infrastructure Certificate and CRL Profile RFC 2548 Microsoft Vendor-specific RADIUS Attributes RFC 2716 PPP EAP TLS Authentication Protocol RFC 2818 HTTP Over TLS RFC 2865 RADIUS (client only) RFC 2865 RADIUS Authentication	RFC 2866 RADIUS Accounting RFC 2867 RADIUS Accounting Modifications for Tunnel Protocol Support RFC 2868 RADIUS Attributes for Tunnel Protocol Support RFC 2869 RADIUS Extensions RFC 3567 Intermediate System (IS) to IS Cryptographic Authentication RFC 3576 Dynamic Authorization Extensions to RADIUS RFC 3579 RADIUS Support For Extensible Authentication Protocol (EAP) RFC 3580 IEEE 802.1X RADIUS Access Control Lists (ACLs) Guest VLAN for 802.1x MAC Authentication Port Security Secure Sockets Layer (SSL) SSHv1 Secure Shell SSHv1.5 Secure Shell SSHv1/SSHv2 Secure Shell SSHv2 Secure Shell **VPN** RFC 2403 - HMAC-MD5-96 RFC 2404 - HMAC-SHA1-96 RFC 2405 - DES-CBC Cipher algorithm RFC 2407 - Domain of interpretation RFC 2547 BGP/MPLS VPNs RFC 2764 A Framework for IP Based Virtual Private Networks RFC 2796 BGP Route Reflection - An Alternative to Full Mesh IBGP RFC 2842 Capabilities Advertisement with BGP-4 RFC 2858 Multiprotocol Extensions for BGP-4 RFC 2917 A Core MPLS IP VPN Architecture RFC 2918 Route Refresh Capability for BGP-4 RFC 3107 Carrying Label Information in BGP-4 RFC 4301 - Security Architecture for the Internet Protocol RFC 4302 - IP Authentication Header (AH) RFC 4303 - IP Encapsulating Security Payload (ESP) RFC 4305 - Cryptographic Algorithm Implementation Requirements for ESP and AH **IPsec** RFC 1828 IP Authentication using Keyed MD5 RFC 2401 IP Security Architecture RFC 2402 IP Authentication Header RFC 2406 IP Encapsulating Security Payload RFC 2407 - Domain of Interpretation RFC 2408 - Internet Security Association and Key Management Protocol (ISAKMP) RFC 2409 - The Internet Key Exchange RFC 2410 - The NULL Encryption Algorithm and its use with IPsec RFC 2411 IP Security Document Roadmap RFC 2412 – OAKLEY RFC 2865 - Remote Authentication Dial In User Service (RADIUS) **IKEv1** RFC 2865 - Remote Authentication Dial In User Service (RADIUS) RFC 3748 - Extensible Authentication Protocol (EAP)

Specifications (continued)

	 HP A6616 Router Chassis (JC496A)	 HP A6608 Router Chassis (JC177B)
Ports	16 HIM slots 2 MPU (for management modules) slots	8 HIM slots 2 MPU (for management modules) slots
Physical characteristics		
Dimensions	18.74(d) x 17.17(w) x 34.88(h) in. (47.6 x 43.61 x 88.6 cm) (20U height)	18.74(d) x 17.17(w) x 12.13(h) in. (47.6 x 43.61 x 30.81 cm) (7U height)
Full configuration weight	220.46 lb. (100 kg)	110.23 lb. (50 kg)
Mounting	EIA standard 19 in. rack	EIA standard 19 in. rack
Performance		
Throughput	up to 252 million pps	up to 108 million pps
Routing table size	2000000 entries	2000000 entries
Environment		
Operating temperature	32°F to 113°F (0°C to 45°C)	32°F to 113°F (0°C to 45°C)
Operating relative humidity	10% to 95%, noncondensing	10% to 95%, noncondensing
Electrical characteristics		
Maximum heat dissipation	6650 BTU/hr (7015.75 kJ/hr)	2217 BTU/hr (2338.94 kJ/hr)
Voltage	100-120/200-240 VAC	100-120/200-240 VAC
Maximum power rating	1950 W	650 W
Frequency	50/60 Hz	50/60 Hz
Notes	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.	Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.
Safety	CSA 22.2 No. 60950; cUL (CSA 22.2 No. 60950); CSA 22.2 No. 60950 3rd edition; CSA 22.2 No. 950; CSA 950; cUL (CSA 950); EN 60950/IEC 60950; UL 1950 3rd edition; UL 1950; UL 60950; UL 60950-1; CAN/CSA 22.2 No. 60950; CAN/CSA 22.2 No. 60950-1; EN 60825; AS/NZS 60950; KN 60950; GOST R MEK60950; EN 60825-1 Safety of Laser Products-Part 1; EN 60825-2 Safety of Laser Products-Part 2; EN 609500 Safety Information Technology Equipment; UL 60950; CSA 22.2 No. 60950/cUL; IEC 60950; IEC 60950-1; EN 60950; EN 60950-1; IEC 60825; CSA 22.2 No. 950-95; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1-03; CAN/CSA-C22.2 No. 60950-1; CSA 60950-1; CSA C22.2 60950-1; EU RoHS Compliant; EN 60950-1/A11; CSA 22.2 60950-1; EN 60950: 2000, ZB and ZC Deviations; IEC 60950: 1999, Corr Feb 2000, all national deviations; As/NZS 60950:2000, Australia; UL 60950-1:2003; UL 60950-1:2001; CSA 22.2 60950-1:2003; IEC 60950-1:2001; EN 60950-1:2001; CSA 22.2-60950; AS/NZS 60950: 2000 Australia, Russian GOST Safety Approval; CSA 22.2 No. 950 3rd Edition 1995; UL 60950 3rd Edition; CAN/CSA 22.2 No. 60950-00/UL 60950 3rd Edition, Safety Information for Technology Equipment; EN 60950/IEC 60950 3rd Edition; UL 60950 Standard for the Safety of Information Technology Equipment; EN 60825: Safety of Laser Products	CSA 22.2 No. 60950; cUL (CSA 22.2 No. 60950); CSA 22.2 No. 60950 3rd edition; CSA 22.2 No. 950; CSA 950; cUL (CSA 950); EN 60950/IEC 60950; UL 1950 3rd edition; UL 1950; UL 60950; UL 60950-1; CAN/CSA 22.2 No. 60950; CAN/CSA 22.2 No. 60950-1; EN 60825; AS/NZS 60950; KN 60950; GOST R MEK60950; EN 60825-1 Safety of Laser Products-Part 1; EN 60825-2 Safety of Laser Products-Part 2; EN 609500 Safety Information Technology Equipment; UL 60950; CSA 22.2 No. 60950/cUL; IEC 60950; IEC 60950-1; EN 60950; EN 60950-1; IEC 60825; CSA 22.2 No. 950-95; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1-03; CAN/CSA-C22.2 No. 60950-1; CSA 60950-1; CSA C22.2 60950-1; EU RoHS Compliant; EN 60950-1/A11; CSA 22.2 60950-1; EN 60950: 2000, ZB and ZC Deviations; IEC 60950: 1999, Corr Feb 2000, all national deviations; As/NZS 60950:2000, Australia; UL 60950-1:2003; UL 60950-1:2001; CSA 22.2 60950-1:2003; IEC 60950-1:2001; EN 60950-1:2001; CSA 22.2-60950; AS/NZS 60950: 2000 Australia, Russian GOST Safety Approval; CSA 22.2 No. 950 3rd Edition 1995; UL 60950 3rd Edition; CAN/CSA 22.2 No. 60950-00/UL 60950 3rd Edition, Safety Information for Technology Equipment; EN 60950/IEC 60950 3rd Edition; UL 60950 Standard for the Safety of Information Technology Equipment; EN 60825: Safety of Laser Products
Emissions	FCC part 15 Class A; FCC Rules Part 15, Subpart B Class A; EN 55022/CISPR-22 Class A; VCCI Class A; EN 55022/CISPR 22 Class A; EN 55022 Class A; CISPR 22 Class A; EN 55024; CISPR 22/A2; IEC/EN 61000-3-2; IEC/EN 61000-3-3; EN 55024/A1; IEC 61000:4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-11; BSMI CNS 13438; EMC Directive 89/336/EEC; ICES-003 Class A; ANSI C63.4 2003; CISPR 24; ETSI EN 300 386 V1.3.3; AS/NZS CISPR22 Class A; EN 61000-3-2; EN 61000-3-3; Korean EMI Class A; CNS 13438 Class A; EN 55024:1998; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-6; EN 61000-4-11	FCC part 15 Class A; FCC Rules Part 15, Subpart B Class A; EN 55022/CISPR-22 Class A; VCCI Class A; EN 55022/CISPR 22 Class A; EN 55022 Class A; CISPR 22 Class A; EN 55024; CISPR 22/A2; IEC/EN 61000-3-2; IEC/EN 61000-3-3; EN 55024/A1; IEC 61000:4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-11; BSMI CNS 13438; EMC Directive 89/336/EEC; ICES-003 Class A; ANSI C63.4 2003; CISPR 24; ETSI EN 300 386 V1.3.3; AS/NZS CISPR22 Class A; EN 61000-3-2; EN 61000-3-3; Korean EMI Class A; CNS 13438 Class A; EN 55024:1998; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-6; EN 61000-4-11
Management	IMC - Intelligent Management Center; command-line interface; limited command-line interface; out-of-band management (serial RS-232C); out-of-band management (DB-9 serial port console); out-of-band management; SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB	IMC - Intelligent Management Center; command-line interface; limited command-line interface; out-of-band management (serial RS-232C); out-of-band management (DB-9 serial port console); out-of-band management; SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB

Specifications (continued)

	HP A6616 Router Chassis (JC496A)	HP A6608 Router Chassis (JC177B)
Services	3-year, parts only, global next-day advance exchange (UW054E) 3-year, 4-hour onsite, 13x5 coverage for hardware (UW062E) 3-year, 4-hour onsite, 24x7 coverage for hardware (UV930E) 3-year, 4-hour onsite, 24x7 coverage for hardware (HR530E) 3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (UV943E) 3-year, 24x7 SW phone support, software updates (UV955E) 1-year, post-warranty, 4-hour onsite, 13x5 coverage for hardware (HR529E) 1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support (HR531E) 4-year, 4-hour onsite, 13x5 coverage for hardware (UW063E) 4-year, 4-hour onsite, 24x7 coverage for hardware (UV931E) 4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV944E) 4-year, 24x7 SW phone support, software updates (UV956E) 5-year, 4-hour onsite, 13x5 coverage for hardware (UW064E) 5-year, 4-hour onsite, 24x7 coverage for hardware (UV932E) 5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV945E) 5-year, 24x7 SW phone support, software updates (UV957E) 3 Yr 6 hr Call-to-Repair Onsite (UW055E) 4 Yr 6 hr Call-to-Repair Onsite (UW056E) 5 Yr 6 hr Call-to-Repair Onsite (UW057E) 1-year, 6 hour Call-To-Repair Onsite for hardware (HR533E) 1-year, 24x7 software phone support, software updates (HR532E) 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.	3-year, parts only, global next-day advance exchange (UW054E) 3-year, 4-hour onsite, 13x5 coverage for hardware (UW062E) 3-year, 4-hour onsite, 24x7 coverage for hardware (UV930E) 3-year, 4-hour onsite, 24x7 coverage for hardware (HR530E) 3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (UV943E) 3-year, 24x7 SW phone support, software updates (UV955E) 1-year, post-warranty, 4-hour onsite, 13x5 coverage for hardware (HR529E) 1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support (HR531E) 4-year, 4-hour onsite, 13x5 coverage for hardware (UW063E) 4-year, 4-hour onsite, 24x7 coverage for hardware (UV931E) 4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV944E) 4-year, 24x7 SW phone support, software updates (UV956E) 5-year, 4-hour onsite, 13x5 coverage for hardware (UW064E) 5-year, 4-hour onsite, 24x7 coverage for hardware (UV932E) 5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV945E) 5-year, 24x7 SW phone support, software updates (UV957E) 3 Yr 6 hr Call-to-Repair Onsite (UW055E) 4 Yr 6 hr Call-to-Repair Onsite (UW056E) 5 Yr 6 hr Call-to-Repair Onsite (UW057E) 1-year, 6 hour Call-To-Repair Onsite for hardware (HR533E) 1-year, 24x7 software phone support, software updates (HR532E) 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.

Specifications (continued)

	HP A6616 Router Chassis (JC496A)	HP A6608 Router Chassis (JC177B)

Standards and protocols
(applies to all products in series)

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 BGP4 confederations
RFC 1997 BGP Communities Attribute
RFC 1998 PPP Gandalf FZA Compression Protocol
RFC 2385 BGP Session Protection via TCP MD5
RFC 2439 BGP Route Flap Damping
RFC 2796 BGP Route Reflection
RFC 2842 Capability Advertisement with BGP-4
RFC 2858 BGP-4 Multi-Protocol Extensions
RFC 2918 Route Refresh Capability

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 1901 (Community based SNMPv2)
RFC 1901-1907 SNMPv2c, SMIv2 and Revised MIB-II
RFC 1902 (SNMPv2)
RFC 1908 (SNMP v1/2 Coexistence)
RFC 1945 Hypertext Transfer Protocol – HTTP/1.0
RFC 2068 Hypertext Transfer Protocol – HTTP/1.1
RFC 2271 FrameWork
RFC 2452 MIB for TCP6
RFC 2454 MIB for UDP6
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 2819 (RMON groups Alarm, Event, History and Statistics only)
RFC 2819 RMON
RFC 3410 (Management Framework)
RFC 3416 (SNMP Protocol Operations v2)
RFC 3417 (SNMP Transport Mappings)
Multiple Configuration Files
Multiple Software Images
SNMP v3 and RMON RFC support
SSHv1/SSHv2 Secure Shell
TACACS/TACACS+

General protocols
IEEE 802.1ad Q-in-Q
IEEE 802.1ad Q-in-Q
IEEE 802.1ag Service Layer OAM
IEEE 802.1ah Provider Backbone Bridges
IEEE 802.1AX-2008 Link Aggregation
IEEE 802.1D MAC Bridges
IEEE 802.1p Priority
IEEE 802.1Q (GVRP)
IEEE 802.1Q VLANs
IEEE 802.1s (MSTP)
IEEE 802.1s Multiple Spanning Trees
IEEE 802.1v VLAN classification by Protocol and Port
IEEE 802.1w Rapid Reconfiguration of Spanning Tree
IEEE 802.1X PAE
IEEE 802.3 Type 10BASE-T
IEEE 802.3ab 1000BASE-T
IEEE 802.3ac (VLAN Tagging Extension)
IEEE 802.3ad Link Aggregation (LAG)
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 802.3i 10BASE-T
IEEE 802.3u 100BASE-X
IEEE 802.3x Flow Control
IEEE 802.3z 1000BASE-X
RFC 768 UDP
RFC 783 TFTP Protocol (revision 2)
RFC 791 IP
RFC 792 ICMP
RFC 793 TCP
RFC 826 ARP
RFC 854 TELNET
RFC 855 Telnet Option Specification
RFC 856 TELNET
RFC 857 Telnet Echo Option
RFC 858 Telnet Suppress Go Ahead Option
RFC 894 IP over Ethernet
RFC 896 Congestion Control in IP/TCP Internetworks
RFC 906 TFTP Bootstrap
RFC 925 Multi-LAN Address Resolution
RFC 950 Internet Standard Subnetting Procedure
RFC 951 BOOTP
RFC 959 File Transfer Protocol (FTP)
RFC 1006 ISO transport services on top of the TCP: Version 3
RFC 1027 Proxy ARP
RFC 1034 Domain Concepts and Facilities
RFC 1035 Domain Implementation and Specification
RFC 1042 IP Datagrams
RFC 1058 RIPv1
RFC 1071 Computing the Internet Checksum
RFC 1091 Telnet Terminal-Type Option
RFC 1093 NSFNET routing architecture
RFC 1122 Host Requirements
RFC 1141 Incremental updating of the Internet checksum
RFC 1142 OSI IS-IS Intra-domain Routing Protocol
RFC 1144 Compressing TCP/IP headers for low-speed serial links
RFC 1171 Point-to-Point Protocol for the transmission of multi-protocol datagrams over Point-to-Point links
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 1256 ICMP Router Discovery Protocol (IRDP)
RFC 1293 Inverse Address Resolution Protocol
RFC 1305 NTPv3
RFC 1315 Management Information Base for Frame Relay DTEs
RFC 1321 The MD5 Message-Digest Algorithm
RFC 1332 The PPP Internet Protocol Control Protocol (IPCP)
RFC 1333 PPP Link Quality Monitoring
RFC 1334 PPP Authentication Protocols (PAP)
RFC 1334 PPP Authentication Protocols (PAP)
RFC 1349 Type of Service
RFC 1350 TFTP Protocol (revision 2)
RFC 1377 The PPP OSI Network Layer Control Protocol (OSINLCP)
RFC 1381 SNMP MIB Extension for X.25 LAPB
RFC 1389 RIPv2 MIB Extension
RFC 1471 The Definitions of Managed Objects for the Link Control Protocol of the Point-to-Point Protocol
RFC 1472 The Definitions of Managed Objects for the Security Protocols of the Point-to-Point Protocol
RFC 1490 Multiprotocol Interconnect over Frame Relay
RFC 1519 CIDR
RFC 1531 Dynamic Host Configuration Protocol
RFC 1533 DHCP Options and BOOTP Vendor Extensions
RFC 1534 DHCP/BOOTP Interoperation
RFC 1541 DHCP
RFC 1542 BOOTP Extensions
RFC 1542 Clarifications and Extensions for the Bootstrap Protocol
RFC 1552 The PPP Internetworking Packet Exchange Control Protocol (IPXCP)
RFC 1577 Classical IP and ARP over ATM
RFC 1631 NAT
RFC 1638 PPP Bridging Control Protocol (BCP)
RFC 1661 The Point-to-Point Protocol (PPP)
RFC 1662 PPP in HDLC-like Framing
RFC 1695 Definitions of Managed Objects for ATM Management Version 8.0 using SMIv2
RFC 1700 Assigned Numbers
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 1812 IPv4 Routing
RFC 1829 The ESP DES-CBC Transform
RFC 1877 PPP Internet Protocol Control Protocol Extensions for Name Server Addresses
RFC 1944 Benchmarking Methodology for Network Interconnect Devices
RFC 1945 Hypertext Transfer Protocol – HTTP/1.0
RFC 1973 PPP in Frame Relay
RFC 1974 PPP Stac LZS Compression Protocol
RFC 1981 Path MTU Discovery for IP version 6
RFC 1990 The PPP Multilink Protocol (MP)
RFC 1994 PPP Challenge Handshake Authentication Protocol (CHAP)
RFC 2082 RIP-2 MD5 Authentication
RFC 2091 Trigger RIP
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 2205 Resource ReSerVation Protocol (RSVP) - Version 1 Functional Specification
RFC 2209 Resource ReSerVation Protocol (RSVP) – Version 1 Message Processing Rules
RFC 2236 IGMP Snooping
RFC 2246 The TLS Protocol Version 1.0
RFC 2251 Lightweight Directory Access Protocol (v3)
RFC 2252 Lightweight Directory Access Protocol (v3): Attribute Syntax Definitions
RFC 2280 Routing Policy Specification Language (RPSL)
RFC 2283 MBGP
RFC 2284 EAP over LAN
RFC 2338 VRRP
RFC 2338 VRRP (Premium Edge License)
RFC 2364 PPP Over AAL5
RFC 2374 An Aggregatable Global Unicast Address Format
RFC 2451 The ESP CBC-Mode Cipher Algorithms
RFC 2453 RIPv2
RFC 2510 Internet X.509 Public Key Infrastructure Certificate Management Protocols
RFC 2511 Internet X.509 Certificate Request Message Format
RFC 2516 A Method for Transmitting PPP Over Ethernet (PPPoE)
RFC 2529 Transmission of IPv6 over IPv4 Domains without Explicit Tunnels
RFC 2616 HTTP Compatibility v1.1
RFC 2622 Routing Policy Specification Language (RPSL)

Specifications (continued)

	HP A6616 Router Chassis (JC496A)	HP A6608 Router Chassis (JC177B)

Standards and protocols
(applies to all products in series)

RFC 2663 NAT Terminology and Considerations
RFC 2684 Multiprotocol Encapsulation over ATM Adaptation Layer 5
RFC 2694 DNS extensions to Network Address Translators (DNS_ALG)
RFC 2702 Requirements for Traffic Engineering Over MPLS
RFC 2716 PPP EAP TLS Authentication Protocol
RFC 2747 RSVP Cryptographic Authentication
RFC 2763 Dynamic Name-to-System ID mapping support
RFC 2765 Stateless IP/ICMP Translation Algorithm (SIIT)
RFC 2766 Network Address Translation - Protocol Translation (NAT-PT)
RFC 2767 Dual Stacks IPv4 & IPv6
RFC 2784 Generic Routing Encapsulation (GRE)
RFC 2787 Definitions of Managed Objects for VRRP
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
RFC 2961 RSVP Refresh Overhead Reduction Extensions
RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS
RFC 2973 IS-IS Mesh Groups
RFC 2993 Architectural Implications of NAT
RFC 3022 Traditional IP Network Address Translator (Traditional NAT)
RFC 3027 Protocol Complications with the IP Network Address Translator
RFC 3031 Multiprotocol Label Switching Architecture
RFC 3032 MPLS Label Stack Encoding
RFC 3036 LDP Specification
RFC 3046 DHCP Relay Agent Information Option
RFC 3063 MPLS Loop Prevention Mechanism
RFC 3065 Support AS confederation
RFC 3137 OSPF Stub Router Advertisement
RFC 3209 RSVP-TE Extensions to RSVP for LSP Tunnels
RFC 3210 Applicability Statement for Extensions to RSVP for LSP-Tunnels
RFC 3212 Constraint-Based LSP setup using LDP (CR-LDP)
RFC 3214 LSP Modification Using CR-LDP
RFC 3215 LDP State Machine
RFC 3246 Expedited Forwarding PHB
RFC 3268 Advanced Encryption Standard (AES) Ciphersuites for Transport Layer Security (TLS)
RFC 3277 IS-IS Transient Blackhole Avoidance
RFC 3279 Algorithms and Identifiers for the Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile
RFC 3280 Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile
RFC 3392 Support BGP capabilities advertisement
RFC 3410 Applicability Statements for SNMP
RFC 3416 Protocol Operations for SNMP
RFC 3417 Transport Mappings for the Simple Network Management Protocol (SNMP)
RFC 3479 Fault Tolerance for the Label Distribution Protocol (LDP)
RFC 3487 Graceful Restart Mechanism for LDP
RFC 3509 OSPF ABR Behavior
RFC 3526 More Modular Exponential (MODP) Diffie-Hellman groups for Internet Key Exchange (IKE)
RFC 3564 Requirements for Support of Differentiated Services-aware MPLS Traffic Engineering
RFC 3567 Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication
RFC 3602 The AES-CBC Cipher Algorithm and Its Use with IPsec
RFC 3619 Ethernet Automatic Protection Switching (EAPS)
RFC 3623 Graceful OSPF Restart
RFC 3704 Unicast Reverse Path Forwarding (URPF)
RFC 3706 A Traffic-Based Method of Detecting Dead Internet Key Exchange (IKE) Peers
RFC 3768 VRRP
RFC 3768 VRRP
RFC 3768 VRRP (Premium Edge License)
RFC 3784 ISIS TE support
RFC 3786 Extending the Number of IS-IS LSP Fragments Beyond the 256 Limit
RFC 3811 Definitions of Textual Conventions (TCs) for Multiprotocol Label Switching (MPLS) Management
RFC 3812 Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB)
RFC 3847 Restart signaling for IS-IS
RFC 4213 Basic IPv6 Transition Mechanisms
IP Ping

IP multicast
RFC 1112 IGMP
RFC 2236 IGMPv2
RFC 2283 Multiprotocol Extensions for BGP-4
RFC 2362 PIM Sparse Mode
RFC 2362 PIM Sparse Mode (Premium Edge License)
RFC 2362 PIM Sparse Mode
RFC 2934 Protocol Independent Multicast MIB for IPv4
RFC 3376 IGMPv3
RFC 3376 IGMPv3 (host joins only)
RFC 3569 An Overview of Source-Specific Multicast (SSM)
RFC 3618 Multicast Source Discovery Protocol (MSDP)
RFC 3973 Draft 2 PIM Dense Mode
RFC 3973 Draft 2 PIM Dense Mode
RFC 3973 PIM Dense Mode
RFC 3973 PIM Dense Mode (Premium Edge License)
RFC 3973 PIM Dense Mode
RFC 4601 Draft 10 PIM Sparse Mode
RFC 4601 Draft 10 PIM Sparse Mode
RFC 4605 IGMP/MLD Proxying

IPv6
RFC 1350 TFTP
RFC 1881 IPv6 Address Allocation Management
RFC 1886 DNS Extension for IPv6
RFC 1887 IPv6 Unicast Address Allocation Architecture
RFC 1981 IPv6 Path MTU Discovery
RFC 2080 RIPng for IPv6
RFC 2292 Advanced Sockets API for IPv6
RFC 2373 IPv6 Addressing Architecture
RFC 2375 IPv6 Multicast Address Assignments
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 2472 IP Version 6 over PPP
RFC 2473 Generic Packet Tunneling in IPv6
RFC 2475 IPv6 DiffServ Architecture
RFC 2529 Transmission of IPv6 Packets over IPv4
RFC 2545 Use of MP-BGP-4 for IPv6
RFC 2553 Basic Socket Interface Extensions for IPv6
RFC 2710 Multicast Listener Discovery (MLD) for IPv6
RFC 2711 IPv6 Router Alert Option
RFC 2740 OSPFv3 for IPv6
RFC 2893 Transition Mechanisms for IPv6 Hosts and Routers
RFC 2925 Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations (Ping only)
RFC 2925 Remote Operations MIB (Ping only)
RFC 3056 Connection of IPv6 Domains via IPv4 Clouds
RFC 3162 RADIUS and IPv6
RFC 3306 Unicast-Prefix-based IPv6 Multicast Addresses
RFC 3307 IPv6 Multicast Address Allocation
RFC 3315 DHCPv6 (client and relay)
RFC 3315 DHCPv6 (client only)
RFC 3363 DNS support
RFC 3484 Default Address Selection for IPv6
RFC 3493 Basic Socket Interface Extensions for IPv6
RFC 3513 IPv6 Addressing Architecture
RFC 3542 Advanced Sockets API for IPv6
RFC 3587 IPv6 Global Unicast Address Format
RFC 3596 DNS Extension for IPv6
RFC 3810 MLDv2 (host joins only)
RFC 3810 MLDv2 for IPv6
RFC 3810 Multicast Listener Discovery Version 2 (MLDv2) for IPv6
RFC 4022 MIB for TCP
RFC 4113 MIB for UDP
RFC 4251 SSHv6 Architecture
RFC 4252 SSHv6 Authentication
RFC 4252 SSHv6 Transport Layer
RFC 4253 SSHv6 Transport Layer
RFC 4254 SSHv6 Connection
RFC 4291 IP Version 6 Addressing Architecture
RFC 4293 MIB for IP
RFC 4419 Key Exchange for SSH
RFC 4443 ICMPv6
RFC 4541 IGMP & MLD Snooping Switch
RFC 4861 IPv6 Neighbor Discovery
RFC 4862 IPv6 Stateless Address Auto-configuration
RFC 5095 Deprecation of Type 0 Routing Headers in IPv6
RFC 5340 OSPF for IPv6
RFC 5340 OSPFv3 for IPv6
RFC 5722 Handling of Overlapping IPv6 Fragments

MIBs
IEEE 8021-PAE-MIB
IEEE 8023-LAG-MIB
RFC 1156 (TCP/IP MIB)
RFC 1212 Concise MIB Definitions
RFC 1213 MIB II
RFC 1229 Interface MIB Extensions
RFC 1286 Bridge MIB
RFC 1493 Bridge MIB
RFC 1573 SNMP MIB II
RFC 1643 Ethernet MIB
RFC 1650 Ethernet-Like MIB
RFC 1657 BGP-4 MIB
RFC 1724 RIPv2 MIB
RFC 1757 Remote Network Monitoring MIB
RFC 1850 OSPFv2 MIB
RFC 1907 SNMPv2 MIB
RFC 2011 SNMPv2 MIB for IP
RFC 2012 SNMPv2 MIB for TCP
RFC 2013 SNMPv2 MIB for UDP
RFC 2021 RMONv2 MIB
RFC 2096 IP Forwarding Table MIB
RFC 2233 Interface MIB
RFC 2233 Interfaces MIB
RFC 2273 SNMP-NOTIFICATION-MIB
RFC 2452 IPV6-TCP-MIB
RFC 2454 IPV6-UDP-MIB
RFC 2465 IPv6 MIB
RFC 2466 ICMPv6 MIB
RFC 2571 SNMP Framework MIB
RFC 2572 SNMP-MPD MIB

Specifications (continued)

	HP A6616 Router Chassis (JC496A)	HP A6608 Router Chassis (JC177B)

Standards and protocols
(applies to all products in series)

RFC 2574 SNMP USM MIB
RFC 2618 RADIUS Client MIB
RFC 2620 RADIUS Accounting MIB
RFC 2665 Ethernet-Like-MIB
RFC 2668 802.3 MAU MIB
RFC 2674 802.1p and IEEE 802.1Q Bridge MIB
RFC 2688 MAU-MIB
RFC 2737 Entity MIB (Version 2)
RFC 2787 VRRP MIB
RFC 2819 RMON MIB
RFC 2863 The Interfaces Group MIB
RFC 2925 Ping MIB
RFC 2932IP (Multicast Routing MIB)
RFC 2933 IGMP MIB
RFC 3273 HC-RMON MIB
RFC 3414 SNMP-User based-SM MIB
RFC 3415 SNMP-View based-ACM MIB
RFC 3418 MIB for SNMPv3
RFC 3621 Power Ethernet MIB
RFC 3813 MPLS LSR MIB
RFC 3814 MPLS FTN MIB
RFC 3815 MPLS LDP MIB
RFC 3826 AES for SNMP's USM MIB
RFC 4113 UDP MIB
RFC 4133 Entity MIB (Version 3)
RFC 4221 MPLS FTN MIB
LLDP-EXT-DOT1-MIB
LLDP-EXT-DOT3-MIB
LLDP-MIB

Network management
IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
IEEE 802.1D (STP)
RFC 1098 A Simple Network Management Protocol (SNMP)
RFC 1155 Structure of Management Information
RFC 1157 SNMPv1
RFC 1215 SNMP Generic traps
RFC 1757 RMON 4 groups: Stats, History, Alarms and Events
RFC 1901 SNMPv2 Introduction
RFC 1902 SNMPv2 Structure
RFC 1903 SNMPv2 Textual Conventions
RFC 1904 SNMPv2 Conformance
RFC 1905 SNMPv2 Protocol Operations
RFC 1906 SNMPv2 Transport Mappings
RFC 1918 Private Internet Address Allocation
RFC 2272 SNMPv3 Management Protocol
RFC 2273 SNMPv3 Applications
RFC 2274 USM for SNMPv3
RFC 2275 VACM for SNMPv3
RFC 2570 SNMPv3 Overview
RFC 2571 SNMP Management Frameworks
RFC 2572 SNMPv3 Message Processing
RFC 2573 SNMPv3 Applications
RFC 2574 SNMPv3 User-based Security Model (USM)
RFC 2575 SNMPv3 View-based Access Control Model (VACM)
RFC 2575 VACM for SNMP
RFC 2576 Coexistence between SNMP versions
RFC 2578 SMIv2
RFC 2581 TCP6
RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm) and 9 (events)
RFC 3164 BSD syslog Protocol
RFC 3176 sFlow
RFC 3411 SNMP Management Frameworks
RFC 3412 SNMPv3 Message Processing
RFC 3414 SNMPv3 User-based Security Model (USM)
RFC 3415 SNMPv3 View-based Access Control Model VACM)
ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED)
SNMPv1/v2
SNMPv1/v2c
SNMPv1/v2c (read only)
SNMPv1/v2c/v3

OSPF
RFC 1245 OSPF protocol analysis
RFC 1246 Experience with OSPF
RFC 1253 OSPFv2 MIB
RFC 1583 OSPFv2
RFC 1587 OSPF NSSA
RFC 1745 OSPF Interactions
RFC 1765 OSPF Database Overflow
RFC 1850 OSPFv2 Management Information Base (MIB), traps
RFC 2178 OSPFv2
RFC 2328 OSPFv2
RFC 2328 OSPFv2
RFC 2328 OSPFv2 (Premium Edge License)
RFC 2370 OSPF Opaque LSA Option
RFC 3101 OSPF NSSA
RFC 3623 Graceful OSPF Restart
RFC 5340 OSPF for IPv6
RFC 5340 OSPFv3 for IPv6

QoS/CoS
IEEE 802.1P (CoS)
RFC 2474 DiffServ Precedence, including 8 queues/port
RFC 2474 DiffServ precedence, with 4 queues per port
RFC 2474 DS Field in the IPv4 and IPv6 Headers
RFC 2474 DSCP DiffServ
RFC 2474, with 4 queues per port
RFC 2475 DiffServ Architecture
RFC 2597 DiffServ Assured Forwarding (AF)
RFC 2597 DiffServ Assured Forwarding (AF)- partial support
RFC 2598 DiffServ Expedited Forwarding (EF)
Ingress Rate Limiting

Security
IEEE 802.1X Port Based Network Access Control
RFC 1321 The MD5 Message-Digest Algorithm
RFC 1492 TACACS+
RFC 2082 RIP-2 MD5 Authentication
RFC 2104 Keyed-Hashing for Message Authentication
RFC 2138 RADIUS Authentication
RFC 2139 RADIUS Accounting
RFC 2209 RSVP-Message Processing
RFC 2246 Transport Layer Security (TLS)
RFC 2459 Internet X.509 Public Key Infrastructure Certificate and CRL Profile
RFC 2548 Microsoft Vendor-specific RADIUS Attributes
RFC 2716 PPP EAP TLS Authentication Protocol
RFC 2818 HTTP Over TLS
RFC 2865 RADIUS (client only)
RFC 2865 RADIUS Authentication
RFC 2866 RADIUS Accounting
RFC 2867 RADIUS Accounting Modifications for Tunnel Protocol Support
RFC 2868 RADIUS Attributes for Tunnel Protocol Support
RFC 2869 RADIUS Extensions
RFC 3567 Intermediate System (IS) to IS Cryptographic Authentication
RFC 3576 Dynamic Authorization Extensions to RADIUS
RFC 3579 RADIUS Support For Extensible Authentication Protocol (EAP)
RFC 3580 IEEE 802.1X RADIUS
Access Control Lists (ACLs)
Guest VLAN for 802.1x
MAC Authentication
Port Security
Secure Sockets Layer (SSL)
SSHv1 Secure Shell
SSHv1.5 Secure Shell
SSHv1/SSHv2 Secure Shell
SSHv2 Secure Shell

VPN
RFC 2403 - HMAC-MD5-96
RFC 2404 - HMAC-SHA1-96
RFC 2405 - DES-CBC Cipher algorithm
RFC 2407 - Domain of interpretation
RFC 2547 BGP/MPLS VPNs
RFC 2764 A Framework for IP Based Virtual Private Networks
RFC 2796 BGP Route Reflection - An Alternative to Full Mesh IBGP
RFC 2842 Capabilities Advertisement with BGP-4
RFC 2858 Multiprotocol Extensions for BGP-4
RFC 2917 A Core MPLS IP VPN Architecture
RFC 2918 Route Refresh Capability for BGP-4
RFC 3107 Carrying Label Information in BGP-4
RFC 4301 - Security Architecture for the Internet Protocol
RFC 4302 - IP Authentication Header (AH)
RFC 4303 - IP Encapsulating Security Payload (ESP)
RFC 4305 - Cryptographic Algorithm Implementation Requirements for ESP and AH

IPsec
RFC 1828 IP Authentication using Keyed MD5
RFC 2401 IP Security Architecture
RFC 2402 IP Authentication Header
RFC 2406 IP Encapsulating Security Payload
RFC 2407 - Domain of interpretation
RFC 2408 - Internet Security Association and Key Management Protocol (ISAKMP)
RFC 2409 - The Internet Key Exchange
RFC 2410 - The NULL Encryption Algorithm and its use with IPsec
RFC 2411 IP Security Document Roadmap
RFC 2412 – OAKLEY
RFC 2865 - Remote Authentication Dial In User Service (RADIUS)

IKEv1
RFC 2865 - Remote Authentication Dial In User Service (RADIUS)
RFC 3748 - Extensible Authentication Protocol (EAP)

Transceivers

HP X110 100M SFP LC LH40 Transceiver (JD090A)
HP X110 100M SFP LC LH80 Transceiver (JD091A)
HP X110 100M SFP LC FX Transceiver (JD102B)
HP X110 100M SFP LC LX Transceiver (JD120B)
HP X120 622M SFP LC LX 15km Transceiver (JF829A)
HP X120 622M SFP LC LH 40km 1310 Transceiver (JF830A)
HP X120 622M SFP LC LH 80km 1550 Transceiver (JF831A)
HP X124 1G SFP LC LH40 1310nm Transceiver (JD061A)
HP X120 1G SFP LC LH40 1550nm Transceiver (JD062A)
HP X120 1G SFP LC BX 10-U Transceiver (JD098B)
HP X120 1G SFP LC BX 10-D Transceiver (JD099B)
HP X120 1G SFP LC LH100 Transceiver (JD103A)
HP X120 1G SFP LC SX Transceiver (JD118B)
HP X120 1G SFP LC LX Transceiver (JD119B)
HP X125 1G SFP LC LH70 Transceiver (JD063B)
HP X125 1G SFP RJ45 T Transceiver (JD089B)
HP X160 2.5G SFP LC 2km Transceiver (JD084A)
HP X160 2.5G SFP LC 15km Transceiver (JD085A)
HP X160 2.5G SFP LC 40km Transceiver (JD086A)
HP X160 2.5G SFP LC 80km Transceiver (JD087A)
HP X135 10G XFP LC ER Transceiver (JD121A)
HP X130 10G XFP LC LR Transceiver (JD108B)
HP X130 10G XFP LC SR Transceiver (JD117B)

Cables

HP X200 V.24 DTE 3m Serial Port Cable (JD519A)
HP X200 V.24 DCE 3m Serial Port Cable (JD521A)
HP X200 V.35 DTE 3m Serial Port Cable (JD523A)
HP X200 V.35 DCE 3m Serial Port Cable (JD525A)
HP X200 X.21 DTE 3m Serial Port Cable (JD527A)
HP X200 X.21 DCE 3m Serial Port Cable (JD529A)
HP X260 RS449 3m DTE Serial Port Cable (JF825A)
HP X260 RS449 3m DCE Serial Port Cable (JF826A)
HP X260 RS530 3m DTE Serial Port Cable (JF827A)
HP X260 RS530 3m DCE Serial Port Cable (JF828A)
HP X260 8E1 BNC 75 ohm 3m Router Cable (JD512A)
HP X260 E1 RJ45 BNC 75-120 ohm Conversion Router Cable (JD511A)

Security Modules

HP A6600 VPN Firewall Module (JC639A)

Router Modules

HP A6600 1-port OC-3/STM-1 (E1/T1) CPOS SFP HIM Module (JC161A)
HP A6600 2-port OC-3/STM-1 (E1/T1) CPOS SFP HIM Module (JC162A)
HP A6600 2-port OC-3/STM-1 (E3/T3) CPOS SFP HIM Module (JC169A)
HP A6600 1-port OC-3/STM-1 (E3/T3) CPOS SFP HIM Module (JC170A)
HP A6600 4-port OC-3c/STM-1c or 2-port OC-12c/STM-4c POS SFP HIM Module (JC172A)
HP A6600 2-port OC-3c/STM-1c or 1-port OC-12c/STM-4c POS SFP HIM Module (JC173A)
HP A6600 1-port OC-48c/STM-16c POS/CPOS SFP HIM Module (JC494A)
HP A6600 1-port OC-3c/STM-1c ATM SFP HIM Module (JC175A)
HP A6600 2-port OC-3c/STM-1c ATM SFP HIM Module (JC495A)
HP 4-port GbE SFP HIM A6600 Module (JC171A)
HP 8-port GbE SFP HIM A6600 Module (JC174A)
HP A6600 4-port Gig-T HIM Module (JC163A)
HP A6600 8-port Gig-T HIM Module (JC164A)
HP A6600 1-port 10-GbE XFP HIM Module (JC168A)
HP A-MSR 2-port Enhanced Sync/Async Serial MIM Module (JD540A)
HP A-MSR 4-port Enhanced Sync/Async Serial MIM Module (JD541A)
HP A-MSR 8-port Enhanced Sync/Async Serial MIM Module (JD552A)
HP A-MSR 2-port Gig-T MIM Module (JD548A)
HP A-MSR 8-port E1/CE1/PRI (75ohm) MIM Module (JD563A)
HP A-MSR 8-port E1/Fractional E1 (75ohm) MIM Module (JF255A)
HP A-MSR 8-port T1/CT1/PRI MIM Module (JC160A)
HP A-MSR 1-port E3/CE3/FE3 MIM Module (JD630A)
HP A-MSR 8-port T1/Fractional T1 MIM Module (JC159A)
HP A-MSR 1-port T3/CT3/FT3 MIM Module (JD628A)
NEW HP A6600 8-port 10/100Base-T HIM Module (JC575A)
NEW HP A6600 2-port OC-48c/STM-16c RPR SFP HIM Module (JC576A)

Memory

HP A6600 1 GB SDRAM Memory (JC179A)

HP A6602 Router (JC176A)

HP A-RPS800 Redundant Power System (JD183A)
HP X290 1m RPS Cable (JD637A)

HP A6604 Router Chassis (JC178B)

HP A7500 650W DC Power Supply (JD209A)
HP A7500 650W AC Power Supply (JD217A)
NEW HP A6604 Dustproof Frame (JC572A)
NEW HP A6604 Spare Fan Assembly (JC569A)
HP A6600 Router Software License (JC180A)
HP A6600 RPE-X1 Main Processing Unit (JC165A)
HP FIP-100 A6600 Module (JC166A)
HP FIP-200 A6600 Module (JC167A)
NEW HP A6600 RSE-X1 Main Processing Unit (JC566A)

HP A6600 Router Series accessories (continued)

NEW HP A6600 24-port GbE SFP Service Aggregation Platform (SAP) Module (JC568A)
NEW HP A6600 48-port Gig-T Service Aggregation Platform (SAP) Module (JC567A)
HP A6600 FIP-110 Flexible Interface Platform Module (JC166B)
HP A6600 FIP-210 Flexible Interface Platform Module (JC167B)
HP A6600 VPN Firewall Module (JD250A)

HP A6616 Router Chassis (JC496A)

HP A6600 650W AC Power Supply (JC492A)
HP A6600 650W DC Power Supply (JC493A)
NEW HP A6616 Spare Fan Assembly (JC571A)
NEW HP A6616 Dustproof Frame (JC574A)
HP A6600 RPE-X1 Carrier Card (JC497A)
HP A6600 Router Software License (JC180A)
HP A6600 RPE-X1 Main Processing Unit (JC165A)
HP FIP-100 A6600 Module (JC166A)
HP FIP-200 A6600 Module (JC167A)
NEW HP A6600 RSE-X1 Main Processing Unit (JC566A)
NEW HP A6600 24-port GbE SFP Service Aggregation Platform (SAP) Module (JC568A)
NEW HP A6600 48-port Gig-T Service Aggregation Platform (SAP) Module (JC567A)
HP A6600 FIP-110 Flexible Interface Platform Module (JC166B)
HP A6600 FIP-210 Flexible Interface Platform Module (JC167B)
HP A6600 VPN Firewall Module (JD250A)

HP A6608 Router Chassis (JC177B)

HP A7500 650W DC Power Supply (JD209A)
HP A7500 650W AC Power Supply (JD217A)
NEW HP A6608 Spare Fan Assembly (JC570A)
NEW HP A6608 Dustproof Frame (JC573A)
HP A6600 Router Software License (JC180A)
HP A6600 RPE-X1 Main Processing Unit (JC165A)
HP FIP-100 A6600 Module (JC166A)
HP FIP-200 A6600 Module (JC167A)
NEW HP A6600 RSE-X1 Main Processing Unit (JC566A)
NEW HP A6600 24-port GbE SFP Service Aggregation Platform (SAP) Module (JC568A)
NEW HP A6600 48-port Gig-T Service Aggregation Platform (SAP) Module (JC567A)
HP A6600 FIP-110 Flexible Interface Platform Module (JC166B)
HP A6600 FIP-210 Flexible Interface Platform Module (JC167B)
HP A6600 VPN Firewall Module (JD250A)

To learn more, visit www.hp.com/networking

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HP A12500 Switch Series

Data sheet

Product overview

The HP A12500 Switch series comprises a pair of powerful, next-generation routing switches with outstanding capacity for the network core or the data center. Besides innovative Intelligent Resilient Framework (IRF) technology that provides unprecedented levels of performance and high availability, HP A12500 series switches incorporate the Open Application Architecture (OAA), which enables flexible deployment options for new services. These switches also have energy-efficiency features that drive down operational expenses. The A12500 series is ideal for organizations contemplating large-scale data center or campus consolidations, business continuity and disaster recovery sites, metropolitan area network deployments, and other applications requiring a robust, high-performance switching platform.

Key features

- Advanced architecture: midplane, CLOS
- 6.66 Tb switching capacity, ready for 13.32 Tbps
- High-density 10 GbE access with 128 1:1. 512 4:1
- 40 GbE/100 GbE future access
- Redundant switching fabric, power supply, fan tray

Features and benefits

Quality of Service (QoS)

- **Virtual Output Queue (VoQ):** prevents head-of-line blocking (HOL) per port on peak time and distributes it over a period of time, increasing the switch performance
- **IEEE 802.1p prioritization:** delivers data to devices based on the priority and type of traffic
- **Layer 4 prioritization:** enables prioritization based on TCP/UDP port numbers
- **Broadcast control:** allows limitation of broadcast traffic rate to cut down on unwanted broadcast traffic on the network
- **Advanced classifier-based QoS:** classifies traffic using multiple match criteria based on Layer 2, 3, and 4 information; applies QoS policies such as setting priority level and rate limit to selected traffic on a per-port or per-VLAN basis
- **Bandwidth shaping:**
  - **Port-based rate limiting:** provides per-port ingress/egress enforced maximum bandwidth
  - **Classifier-based rate limiting:** uses ACL to enforce maximum bandwidth for ingress/egress traffic on each port

Data center optimized

- **Very high performance without compromise:** provides 6.66 Tbps, 2160 Mpps (A12518), 3.06 Tbps, and 960 Mpps (A12508); leveraging the latest generation of ASICs, the A12500 product family offers outstanding performance and density to build next-generation data centers
- **Very high density (10 GbE):** the A12518 switch supports up to 512 10-GbE (4:1) or 128 10-GbE (1:1) per physical rack (44RU); the A12508 switch supports up to 256 10-GbE (4:1) or 64 10-GbE (1:1); with two A12508 switches per physical rack (44RU), the density becomes 512 10-GbE (4:1) or 128 10-GbE (1:1)
- **Very high density (GbE):** the A12518 switch supports up to 864 1-GbE (1:1) in a physical (44RU) rack; the A12508 switch supports up to 384 1-GbE (1:1); with two A12508 switches per physical rack (44RU), the density becomes 768 1-GbE (1:1)
- **Scalable system design:** both the A12518 and A12508 switches are built using the latest switching architectures and technologies (CLOS architecture, midplane design), providing the flexibility and scalability for future higher 10 GbE density modules as well as 40 GbE/100 GbE interfaces
- **Ultramodern architecture:** using the latest evolution in switching design, CLOS, the A12500 switch combines performance and ultimate flexibility to provide a smooth evolution path to 13.32 Tbps and potentially 25 Tbps; no other switching architecture (Shared Memory/Crossbar) scales to these levels of performance
- **Jumbo Frames:** to accelerate the level of performances, the A12500 switch supports Jumbo Frames (9K) for intra-data-center communication, or for data center to data center traffic (disaster recovery), reducing the amount of time required for data backup and recovery

Compartmentalization

- **Department protection:** using network virtualization standards (QinQ, VRF, and MPLS), the A12500 switch allows organizations to isolate different business units with different resources (VRFs); using standard-based mechanisms, the network is completely virtualized, reducing cost and operations

Management

- **IRF capability:** provides single IP address management for a resilient virtual switching fabric of up to two switches
- **sFlow:** provides scalable, ASIC-based network monitoring and accounting; this allows network operators to gather a variety of sophisticated network statistics and information for capacity planning and real-time network monitoring purposes
- **IEEE 802.1ab LLDP discovery:** advertises and receives management information from adjacent devices on a network
- **USB support:**
  - **File copy:** allows users to copy switch files to and from a USB flash drive
- **Multiple configuration files:** can be stored to the flash image
- **Command-line interface (CLI):** provides a secure, easy-to-use command-line interface for configuring the module via SSH or a switch console; provides direct real-time session visibility

- **Logging:** provides local and remote logging of events via SNMP (v2c and v3) and syslog; provides log throttling and log filtering to reduce the number of log events generated
- **Management interface control:** each of the following interfaces can be enabled or disabled depending on security preferences: console port, telnet port, and SSH port
- **Out of band interface:** isolates management traffic from user data plane traffic for a complete isolation and total reachability, no matter what happens in the data plane
- **Network management:** Intelligent Management Console (IMC) centrally configures, updates, monitors, and troubleshoots
- **Network management:** SNMP v2c/v3 MIB-II with traps
- **RADIUS accounting:** logs all session details that can be used to generate usage reports or interface to a billing system
- **RMON:** provides advanced monitoring and reporting capabilities for statistics, history, alarms, and events
- **Remote Intelligent Mirroring:** mirrors ingress ACL-selected traffic from a switch port or VLAN to a local or remote switch port anywhere on the network

Connectivity

- **IPv6 native support:**
  - **IPv6 host:** enables switches to be managed and deployed at the IPv6 network's edge
  - **Dual stack (IPv4 and IPv6):** transitions from IPv4 to IPv6, supporting connectivity for both protocols
  - **Multicast Listener Discovery (MLD) snooping:** forwards IPv6 multicast traffic to the appropriate interface
  - **IPv6 ACL/QoS:** supports ACL and QoS for IPv6 network traffic, preventing traffic flooding
  - **IPv6 routing:** supports IPv6 static routes and IPv6 versions of RIP and OSPF routing protocols

Performance

- **6.66 Tbps (A12518) and 3.06 Tbps (A12508) fully nonblocking CLOS architecture:** includes a high-performance switch design with a nonblocking architecture
- **High-performance bandwidth:** with up to 6.66 Tbps capacity, providing nonblocking throughput for 128 10-GbE ports at Layer 2 and Layer 3 IPv4, Layer 3 IPv6, and MPLS (A12518 switch), or 64 10-GbE ports (A12508 switch)
- **Hardware-based wire-speed access control lists (ACLs):** feature-rich ACL implementation (TCAM based) helps ensure high levels of security and ease of administration without impacting network performance
- **High-performance processor system:** supervisory module uses three different processors to isolate key tasks: control plane (STP, OSPF, BGP, MPLS, etc.), fast recovery protocols (RRPP, BFD, etc.), and chassis management (temperature, power, etc.)

Resiliency and high availability

- **Intelligent Resilient Framework (IRF):** creates virtual resilient switching fabrics, where two or more switches perform as a single Layer 2 switch, Layer 3 router; switches do not have to be co-located and can be part of a disaster recovery system; servers or switches can be attached using standard LACP for automatic load-balancing and high availability; simplifies network operation by eliminating the complexity of Spanning Tree, Equal-Cost Multipath (ECMP), or VRRP
- **Ultrafast protocol convergence:** 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
- **Complete set of routing protocols (Layer 3 IPv4 and IPv6):** doesn't require customers to think about which protocol is being supported by the A12500 switch; virtually all existing routing protocols (RIP, OSPF, IS-IS, and BGP) are supported for both Layer 3 IPv4 and Layer 3 IPv6; this is also the case for both unicast and multicast, with complete support of PIM-DM, PIM-SM, PIM-SSM, and MSDP
- **Hot patching:** the A12500 switch supports hot patching, allowing in-service patching for some isolated software problems
- **Non Stop Forwarding/Graceful Restart (NSF/GR):** using standardized-based IETF protocols, the A12500 switch provides nonstop forwarding (switching/routing) for Layer 3 routing protocols (Control Plane - OSPF, BGP, and MPLS), providing hitless failover
- **Ultrareliable architecture:** combining hardware redundancy at every layer (power supplies, fans, supervisory modules, etc.) and a multilayered software approach based on the Resilient Virtual Switching Fabric concept (using the IRF technology), the A12500 product family is able to provide the highest level of availability; following design guidelines from HP networking, customers are now able to build data centers providing an end-to-end availability reaching five 9s
- **Rapid Ring Protection Protocol (RRPP):** provides fast recovery for ring Ethernet-based topology

Layer 2 switching

- **GARP VLAN Registration Protocol (GVRP):** allows automatic learning and dynamic assignment of VLANs
- **IP multicast snooping and data-driven IGMP:** automatically prevents flooding of IP multicast traffic
- **IEEE 802.1ad QinQ:** increases the scalability of an Ethernet network by providing a hierarchical structure; connects multiple LANs on a high-speed campus or metro network
- **BPDU tunneling:** transmits Spanning Tree Protocol BPDUs transparently, allowing correct tree calculations across service providers, WANs, or MANs
- **VLAN support and tagging:** supports the IEEE 802.1Q (4K VLAN IDs)
- **Spanning Tree:** brought by Comware, the A12500 product family supports the entire set of STP protocols (STP, RSTP, and MSTP), facilitating a complete integration with standard networks

Layer 3 routing

- **Layer 3 IPv4 routing:** provides routing of IPv4 at media speed; supports static routes, RIP and RIPv2, OSPF, IS-IS, and BGP
- **RIP and RIPng support:** provides complete support of RIP for both IPv4 and IPv6
- **OSPF and OSPFv3 support:** provides complete support of OSPF for both IPv4 and IPv6
- **IS-IS and IS-ISv6 support:** provides complete support of IS-IS for both IPv4 and IPv6
- **Equal-Cost Multipath (ECMP):** enables multiple equal-cost links in a routing environment to increase link redundancy and scale bandwidth
- **Layer 3 IPv6 routing:** provides routing of IPv6 at media speed; supports static routes, RIPng, OSPFv3, IS-ISv6, and BGP4+
- **IPv6 tunneling:** allows a smooth transition from IPv4 to IPv6 by encapsulating IPv6 traffic over an existing IPv4 infrastructure
- **Complete multicast protocol stack:** PIM-DM, PIM-SM, PIM-SSM, MSDP, and extensions to BGP provide one of the most complete multicast protocol stacks
- **Policy routing:** allows custom filters for increased performance and security; supports ACLs, IP prefix, AS paths, community lists, and aggregate policies

- **MPLS support:** provides extended support of MPLS, including MPLS VPNs and MPLS Traffic Engineering (MPLS TE)
- **VPLS support:** provides extended support of VPLS for data center to data center communication at Layer 2; provides support of hierarchical VPLS for scalability

Security

- **IEEE 802.1X and RADIUS network logins:** control port-based access for authentication and accountability
- **Secure File Transfer Protocol (FTP):** allows secure file transfer to and from the switch; protects against unwanted file downloads or unauthorized copying of switch configuration file
- **Switch management logon security:** can require either RADIUS or TACACS+ authentication for secure switch CLI logon
- **DHCP protection:** blocks DHCP packets from unauthorized DHCP servers, preventing denial-of-service attacks
- **Dynamic ARP protection:** blocks ARP broadcasts from unauthorized hosts, preventing eavesdropping or theft of network data
- **Secure Shell (SSHv2):** encrypts all transmitted data for secure, remote command-line interface (CLI) access over IP networks
- **Secure management access:** securely encrypts all access methods (CLI, GUI, or MIB) through SSHv2 and SNMPv3
- **Access control lists (ACLs):** provide IPv4 and IPv6 filtering based on source/destination IP address/subnet and source/destination TCP/UDP port number
- **MAC authentication:** provides simple authentication based on a user's MAC address; supports local or RADIUS-based authentication

Convergence

- **Layer 2, 3, and 4 QoS mechanisms:** support DiffServ priority tagging based on IP address, IP Type of Service (ToS), Layer 3 protocol, TCP/UDP port number, and source port
- **IP multicast snooping and data-driven IGMP:** automatically prevents flooding of IP multicast traffic
- **LLDP-MED:** is a standard extension that automatically configures network devices, including LLDP-capable IP phones
- **Internet Group Management Protocol (IGMP):** is used by IP hosts to establish and maintain multicast groups; supports v1, v2, and v3; utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks
- **Protocol Independent Multicast (PIM):** is used for IPv4 and IPv6 multicast applications; supports PIM dense mode (PIM-DM), sparse mode (PIM-SM), and source-specific mode (PIM-SSM)
- **Multicast Source Discovery Protocol (MSDP):** is used for inter-domain multicast applications, allowing multiple PIM-SM domains to interoperate
- **Multicast VLAN:** allows multiple VLANs to receive the same IPv4 or IPv6 multicast traffic, reducing network bandwidth demand by eliminating multiple streams to each VLAN

Monitor and diagnostics

- **Port mirroring:** enables traffic on a port to be simultaneously sent to a network analyzer for monitoring

Investment protection

- **Modular switch fabric:** provides investment protection by enabling future performance upgrades and increased port density
- **Environmentally friendly:** ROHS support and low power consumption based on the latest technology provide outstanding power efficiency

Warranty and support

- **1-year warranty:** with advance replacement and 10-calendar-day delivery (available in most countries)
- **Electronic and telephone support:** limited electronic and telephone support is available from HP; refer to www.hp.com/networking/warranty for details on the support provided and the period during which support is available
- **Software releases:** refer to www.hp.com/networking/warranty for details on the software releases provided and the period during which software releases are available for your product(s)

Specifications

	 HP A12518 Switch Chassis (JF430B)	 HP A12508 Switch Chassis (JF431B)
Ports	18 open module slots 2 MPU (for management modules) slots 9 switch fabric slots Supports a maximum of 512 10-GbE ports or 864 Gigabit ports, or a combination	8 open module slots 2 MPU (for management modules) slots 9 switch fabric slots Supports a maximum of 256 10-GbE ports or 384 Gigabit ports, or a combination
Physical characteristics		
Dimensions	29.13(d) x 17.4(w) x 66.38(h) in. (74 x 44.2 x 168.6 cm) (38U height)	29.13(d) x 17.4(w) x 38.39(h) in. (74.0 x 44.2 x 97.5 cm) (22U height)
Weight	352.74 lb. (160 kg)	209.44 lb. (95 kg)
Full configuration weight	639.33 lb. (290 kg)	374.78 lb. (170 kg)
Memory and processor		
Gigabit Module	PowerPC @ 667 MHz, 512 MB RAM; packet buffer size: 512 MB RAM (Ingress, shared by 24 1-GbE ports)	PowerPC @ 667 MHz, 512 MB RAM; packet buffer size: 512 MB RAM (Ingress, shared by 24 1-GbE ports)
10G Module	PowerPC @ 667 MHz, 512 MB RAM; packet buffer size: 512 MB RAM (Ingress/shared by 2 10-GbE ports)	PowerPC @ 667 MHz, 512 MB RAM; packet buffer size: 512 MB RAM (Ingress/shared by 2 10-GbE ports)
Management Module	Primary CPU: PowerPC @ 1000 MHz, 128 MB flash MB, 256 MB compact flash, 1 GB RAM	Primary CPU: PowerPC @ 1000 MHz, 128 MB flash MB, 256 MB compact flash, 1 GB RAM
Fabric	PowerPC @ 400 MHz, 128 MB RAM MB	PowerPC @ 400 MHz, 128 MB RAM MB
Mounting	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet	Mounts in an EIA-standard 19 in. telco rack or equipment cabinet
Performance		
Throughput	2160 million pps	960 million pps
Routing/Switching capacity	6660 Gbps	3060 Gbps
Environment		
Operating temperature	32°F to 104°F (0°C to 40°C)	32°F to 104°F (0°C to 40°C)
Operating relative humidity	5% to 95%, noncondensing	5% to 95%, noncondensing
Nonoperating/Storage temperature	-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 95%, noncondensing	5% to 95%, noncondensing
Electrical characteristics		
Description		Achieved Miercom Certified Green Award 10 Gigabit Ethernet modules consume half the power compared to competitive products; redundant, scalable, 90% efficient power supplies deliver high reliability in data center; new ASIC technology has low power consumption when providing rich features
Maximum heat dissipation	32859 BTU/hr (34666.24 kJ/hr)	14587 BTU/hr (15389.29 kJ/hr)
Voltage	100-120 / 200-240 VAC	100-120 / 200-240 VAC
Maximum power rating	10700 W	4750 W
Notes	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.	Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.
Safety	CE Labeled; cUL Certified; UL Listed; EN 60825-1 Safety of Laser Products-Part 1; EN 60825-2 Safety of Laser Products-Part 2; IEC 60825; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1-03; Anatel; ULAR; GOST; EN 60950-1/A11; FDA 21 CFR Subchapter J; NOM; UL 60950-1:2003; EN 60950-1:2001; ROHS Compliance	CE Labeled; cUL Certified; UL Listed; EN 60825-1 Safety of Laser Products-Part 1; EN 60825-2 Safety of Laser Products-Part 2; IEC 60825; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1-03; Anatel; ULAR; GOST; EN 60950-1/A11; FDA 21 CFR Subchapter J; NOM; UL 60950-1:2003; EN 60950-1:2001; ROHS Compliance
Emissions	VCCI Class A; EN 55022 Class A; VCCI V-3/2000.04; ICES-003 Class A; AS/NZS CISPR22 Class A; EMC Directive 2004/108/EC; FCC (CFR 47, Part 15) Class A	VCCI Class A; EN 55022 Class A; VCCI V-3/2000.04; ICES-003 Class A; AS/NZS CISPR22 Class A; EMC Directive 2004/108/EC; FCC (CFR 47, Part 15) Class A
Immunity		
Generic	ETSI EN 300 386 V1.3.3	ETSI EN 300 386 V1.3.3
EN	EN 55024:1998+ A1:2001 + A2:2003	EN 55024:1998+ A1:2001 + A2:2003
ESD	EN 61000-4-2; IEC61000-4-2	EN 61000-4-2; IEC61000-4-2
Radiated	EN 61000-4-3; IEC61000-4-3	EN 61000-4-3; IEC61000-4-3
EFT/Burst	EN 61000-4-4; IEC61000-4-4	EN 61000-4-4; IEC61000-4-4
Surge	EN 61000-4-5; IEC61000-4-5	EN 61000-4-5; IEC61000-4-5
Conducted	EN 61000-4-6; IEC61000-4-6	EN 61000-4-6; IEC61000-4-6
Power frequency magnetic field	IEC 61000-4-8; EN61000-4-8	IEC 61000-4-8; EN61000-4-8
Voltage dips and interruptions	EN 61000-4-11; IEC61000-4-11	EN 61000-4-11; IEC61000-4-11
Harmonics	EN 61000-3-2, IEC 61000-3-2	EN 61000-3-2, IEC 61000-3-2
Flicker	EN 61000-3-3, IEC 61000-3-3	EN 61000-3-3, IEC 61000-3-3

Specifications (continued)

	HP A12518 Switch Chassis (JF430B)	HP A12508 Switch Chassis (JF431B)
Management	IMC - Intelligent Management Center; command-line interface; out-of-band management (serial RS-232C); SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface	IMC - Intelligent Management Center; command-line interface; out-of-band management (serial RS-232C); SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface
Services	3-year, 4-hour onsite, 13x5 coverage for hardware (UX046E) 3-year, 4-hour onsite, 24x7 coverage for hardware (UX049E) 3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support (UX052E) 3-year, 24x7 SW phone support, software updates (UX055E) Installation with minimum configuration, system-based pricing (UX034E) 4-year, 4-hour onsite, 13x5 coverage for hardware (UX047E) 4-year, 4-hour onsite, 24x7 coverage for hardware (UX050E) 4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UX053E) 4-year, 24x7 SW phone support, software updates (UX056E) 5-year, 4-hour onsite, 13x5 coverage for hardware (UX048E) 5-year, 4-hour onsite, 24x7 coverage for hardware (UX051E) 5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UX054E) 5-year, 24x7 SW phone support, software updates (UX057E) 3 Yr 6 hr Call-to-Repair Onsite (UX058E) 4 Yr 6 hr Call-to-Repair Onsite (UX059E) 5 Yr 6 hr Call-to-Repair Onsite (UX060E) 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.	3-year, 4-hour onsite, 13x5 coverage for hardware (UW984E) 3-year, 4-hour onsite, 24x7 coverage for hardware (UW987E) 3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support (UW990E) 3-year, 24x7 SW phone support, software updates (UW993E) Installation with minimum configuration, system-based pricing (UX034E) 4-year, 4-hour onsite, 13x5 coverage for hardware (UW985E) 4-year, 4-hour onsite, 24x7 coverage for hardware (UW988E) 4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UW991E) 4-year, 24x7 SW phone support, software updates (UW994E) 5-year, 4-hour onsite, 13x5 coverage for hardware (UW986E) 5-year, 4-hour onsite, 24x7 coverage for hardware (UW989E) 5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UW992E) 5-year, 24x7 SW phone support, software updates (UW995E) 3 Yr 6 hr Call-to-Repair Onsite (UW996E) 4 Yr 6 hr Call-to-Repair Onsite (UW997E) 5 Yr 6 hr Call-to-Repair Onsite (UW998E) 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.

Specifications (continued)

	HP A12518 Switch Chassis (JF430B)	HP A12508 Switch Chassis (JF431B)
Standards and protocols (applies to all products in series)	**BGP** 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 BGP4 confederations RFC 1997 BGP Communities Attribute RFC 1998 PPP Gandalf FZA Compression Protocol RFC 2385 BGP Session Protection via TCP MD5 RFC 2439 BGP Route Flap Damping RFC 2796 BGP Route Reflection RFC 2842 Capability Advertisement with BGP-4 RFC 2858 BGP-4 Multi-Protocol Extensions RFC 2918 Route Refresh Capability **Denial of service protection** RFC 2267 Network Ingress Filtering Automatic Filtering of well known Denial of Service Packets CPU DoS Protection Rate Limiting by ACLs **Device management** RFC 1155 Structure and Mgmt Information (SMIv1) RFC 1157 SNMPv1/v2c RFC 1305 NTPv3 RFC 1945 Hypertext Transfer Protocol – HTTP/1.0 RFC 2271 FrameWork RFC 2452 MIB for TCP6 RFC 2454 MIB for UDP6 RFC 2573 (SNMPv3 Applications) RFC 2578-2580 SMIv2 RFC 2579 (SMIv2 Text Conventions) RFC 2580 (SMIv2 Conformance) RFC 2819 (RMON groups Alarm, Event, History and Statistics only) RFC 2819 RMON RFC 3417 (SNMP Transport Mappings) SNMP v3 and RMON RFC support SSHv1/SSHv2 Secure Shell TACACS/TACACS+ **General protocols** IEEE 802.1ad Q-in-Q IEEE 802.1ag Service Layer OAM IEEE 802.1ah Provider Backbone Bridges IEEE 802.1D MAC Bridges IEEE 802.1p Priority IEEE 802.1Q VLANs IEEE 802.1s Multiple Spanning Trees IEEE 802.1v VLAN classification by Protocol and Port IEEE 802.1w Rapid Reconfiguration of Spanning Tree IEEE 802.1X PAE IEEE 802.3ab 1000BASE-T IEEE 802.3ad Link Aggregation (LAG) IEEE 802.3ae 10-Gigabit Ethernet IEEE 802.3ah Ethernet in First Mile over Point to Point Fiber - EFMF IEEE 802.3i 10BASE-T IEEE 802.3u 100BASE-X IEEE 802.3x Flow Control IEEE 802.3z 1000BASE-X RFC 768 UDP RFC 783 TFTP Protocol (revision 2) RFC 791 IP RFC 792 ICMP RFC 793 TCP RFC 826 ARP RFC 854 TELNET RFC 868 Time Protocol RFC 903 RARP RFC 951 BOOTP RFC 959 File Transfer Protocol (FTP)	RFC 1027 Proxy ARP RFC 1042 IP Datagrams RFC 1350 TFTP Protocol (revision 2) RFC 1519 CIDR RFC 1542 BOOTP Extensions RFC 1812 IPv4 Routing RFC 2131 DHCP RFC 2338 VRRP RFC 2784 Generic Routing Encapsulation (GRE) RFC 2865 Remote Authentication Dial In User Service (RADIUS) **IP multicast** RFC 1112 IGMP RFC 2236 IGMPv2 RFC 2283 Multiprotocol Extensions for BGP-4 RFC 2362 PIM Sparse Mode RFC 2934 Protocol Independent Multicast MIB for IPv4 RFC 3376 IGMPv3 RFC 3618 Multicast Source Discovery Protocol (MSDP) **IPv6** RFC 1350 TFTP RFC 1981 IPv6 Path MTU Discovery 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 2473 Generic Packet Tunneling in IPv6 RFC 2475 IPv6 DiffServ Architecture RFC 2529 Transmission of IPv6 Packets over IPv4 RFC 2710 Multicast Listener Discovery (MLD) for IPv6 RFC 2740 OSPFv3 for IPv6 RFC 2893 Transition Mechanisms for IPv6 Hosts and Routers RFC 2925 Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations (Ping only) RFC 3315 DHCPv6 (client only) RFC 3484 Default Address Selection for IPv6 RFC 3513 IPv6 Addressing Architecture RFC 3587 IPv6 Global Unicast Address Format RFC 3810 Multicast Listener Discovery Version 2 (MLDv2) for IPv6 RFC 4251 SSHv6 Architecture RFC 4252 SSHv6 Authentication RFC 4253 SSHv6 Transport Layer RFC 4254 SSHv6 Connection RFC 4541 IGMP & MLD Snooping Switch RFC 4862 IPv6 Stateless Address Auto-configuration **MIBs** IEEE8023-LAG-MIB RFC 1213 MIB II RFC 1229 Interface MIB Extensions RFC 1286 Bridge MIB RFC 1493 Bridge MIB RFC 1573 SNMP MIB II RFC 1643 Ethernet MIB RFC 1657 BGP-4 MIB RFC 1724 RIPv2 MIB RFC 1757 Remote Network Monitoring MIB RFC 1850 OSPFv2 MIB RFC 2011 SNMPv2 MIB for IP RFC 2012 SNMPv2 MIB for TCP RFC 2013 SNMPv2 MIB for UDP RFC 2021 RMONv2 MIB RFC 2096 IP Forwarding Table MIB RFC 2233 Interfaces MIB RFC 2273 SNMP-NOTIFICATION-MIB RFC 2452 IPV6-TCP-MIB RFC 2454 IPV6-UDP-MIB	RFC 2465 IPv6 MIB RFC 2466 ICMPv6 MIB RFC 2571 SNMP Framework MIB RFC 2572 SNMP-MPD MIB RFC 2573 SNMP-Target MIB RFC 2613 SMON MIB RFC 2618 RADIUS Client MIB RFC 2620 RADIUS Accounting MIB RFC 2665 Ethernet-Like-MIB RFC 2674 802.1p and IEEE 802.1Q Bridge MIB RFC 2737 Entity MIB (Version 2) RFC 2787 VRRP MIB RFC 2819 RMON MIB RFC 2863 The Interfaces Group MIB RFC 2925 Ping MIB RFC 2932IP (Multicast Routing MIB) RFC 2933 IGMP MIB RFC 3273 HC-RMON MIB RFC 3414 SNMP-User based-SM MIB RFC 3415 SNMP-View based-ACM MIB RFC 3418 MIB for SNMPv3 RFC 3621 Power Ethernet MIB RFC 3813 MPLS LSR MIB RFC 3814 MPLS FTN MIB RFC 3815 MPLS LDP MIB RFC 3826 AES for SNMP's USM MIB RFC 4133 Entity MIB (Version 3) LLDP-EXT-DOT1-MIB LLDP-EXT-DOT3-MIB LLDP-MIB **MPLS** RFC 2205 Resource ReSerVation Protocol (RSVP) - Version 1 Functional Specification RFC 2209 Resource ReSerVation Protocol (RSVP) RFC 2702 Requirements for Traffic Engineering Over MPLS RFC 2858 Multiprotocol Extensions for BGP-4 RFC 3031 Multiprotocol Label Switching Architecture RFC 3032 MPLS Label Stack Encoding RFC 3036 LDP Specification RFC 3107 Carrying Label Information in BGP-4 RFC 3209 RSVP-TE: Extensions to RSVP for LSP Tunnels RFC 3479 Fault Tolerance for the Label Distribution Protocol (LDP) RFC 3487 Graceful Restart Mechanism for LDP RFC 4090 Fast Reroute Extensions to RSVP-TE for LSP Tunnels RFC 4364 BGP/MPLS IP Virtual Private Networks (VPNs) RFC 4379 Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures RFC 4447 Pseudowire Setup and Maintenance Using LDP RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks RFC 4664 Framework for Layer 2 Virtual Private Networks RFC 4665 Service Requirements for Layer 2 Provider Provisioned Virtual Private Networks RFC 4761 Virtual Private LAN Service (VPLS) Using BGP for Auto-Discovery and Signaling RFC 4762 Virtual Private LAN Service (VPLS) Using Label Distribution Protocol (LDP) Signaling **Network management** IEEE 802.1AB Link Layer Discovery Protocol (LLDP) IEEE 802.1D (STP) RFC 1155 Structure of Management Information RFC 1157 SNMPv1 RFC 1215 SNMP Generic traps RFC 1757 RMON 4 groups: Stats, History, Alarms and Events RFC 1905 SNMPv2 Protocol Operations

Specifications (continued)

	HP A12518 Switch Chassis (JF430B)	HP A12508 Switch Chassis (JF431B)
Standards and protocols (applies to all products in series)	RFC 2273 SNMPv3 Applications RFC 2274 USM for SNMPv3 RFC 2571 SNMP Management Frameworks RFC 2572 SNMPv3 Message Processing RFC 2573 SNMPv3 Applications RFC 2576 Coexistence between SNMP versions RFC 2578 SMIv2 RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm) and 9 (events) RFC 3164 BSD syslog Protocol RFC 3415 SNMPv3 View-based Access Control Model VACM) ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED) SNMPv1/v2c/v3 **OSPF** RFC 1245 OSPF protocol analysis RFC 1246 Experience with OSPF RFC 1587 OSPF NSSA RFC 1765 OSPF Database Overflow RFC 1850 OSPFv2 Management Information Base (MIB), traps	RFC 2328 OSPFv2 RFC 2370 OSPF Opaque LSA Option RFC 3101 OSPF NSSA RFC 3623 Graceful OSPF Restart **QoS/CoS** IEEE 802.1P (CoS) RFC 2212 Guaranteed Quality of Service RFC 2474 DS Field in the IPv4 and IPv6 Headers RFC 2475 DiffServ Architecture RFC 2597 DiffServ Assured Forwarding (AF) RFC 2598 DiffServ Expedited Forwarding (EF) RFC 2697 A Single Rate Three Color Marker RFC 2698 A Two Rate Three Color Marker Bi-directional Rate Shaping **Security** IEEE 802.1X Port Based Network Access Control RFC 1321 The MD5 Message-Digest Algorithm RFC 2082 RIP-2 MD5 Authentication RFC 2104 Keyed-Hashing for Message Authentication RFC 2716 PPP EAP TLS Authentication Protocol RFC 2865 RADIUS Authentication RFC 2866 RADIUS Accounting RFC 2867 RADIUS Accounting Modifications for Tunnel Protocol Support RFC 2868 RADIUS Attributes for Tunnel Protocol Support RFC 2869 RADIUS Extensions RFC 3567 Intermediate System (IS) to IS Cryptographic Authentication Access Control Lists (ACLs) Guest VLAN for 802.1x MAC Authentication SSHv2 Secure Shell Web Authentication **IKEv1** RFC 2865 - Remote Authentication Dial In User Service (RADIUS)

HP A12500 Switch Series accessories

Modules

HP A12500 Main Processing Unit (JC072A)
HP A12508 Fabric Module (JC067B)
HP A12518 Fabric Module (JC066A)
HP A12500 48-port Gig-T LEB Module (JC074A)
HP A12500 48-port Gig-T LEC Module (JC065A)
HP A12500 48-port GbE SFP LEB Module (JC075A)
HP A12500 48-port GbE SFP LEC Module (JC069A)
HP A12500 4-port 10-GbE XFP LEB Module (JC076A)
HP A12500 4-port 10-GbE XFP LEC Module (JC070A)
HP A12500 8-port 10-GbE XFP LEB Module (JC073A)
HP A12500 8-port 10-GbE XFP LEC Module (JC068A)
HP A12500 32-port 10-GbE SFP+ REB Module (JC064A)
HP A12500 32-port 10-GbE SFP+ REC Module (JC476A)
HP A12500 Spare Power Monitor Module (JC502A)

Transceivers

HP X124 1G SFP LC LH40 1310nm Transceiver (JD061A)
HP X120 1G SFP LC LH40 1550nm Transceiver (JD062A)
HP X125 1G SFP LC LH70 Transceiver (JD063B)
HP X125 1G SFP RJ45 T Transceiver (JD089B)
HP X120 1G SFP LC BX 10-U Transceiver (JD098B)
HP X120 1G SFP LC BX 10-D Transceiver (JD099B)
HP X120 1G SFP LC LH100 Transceiver (JD103A)
HP X130 10G XFP SC ZR Transceiver (JD107A)
HP X130 10G XFP SC LR Transceiver (JD108B)
HP X170 1G SFP LC LH70 1550 Transceiver (JD109A)
HP X170 1G SFP LC LH70 1570 Transceiver (JD110A)
HP X170 1G SFP LC LH70 1590 Transceiver (JD111A)
HP X170 1G SFP LC LH70 1610 Transceiver (JD112A)
HP X170 1G SFP LC LH70 1470 Transceiver (JD113A)
HP X170 1G SFP LC LH70 1490 Transceiver (JD114A)
HP X170 1G SFP LC LH70 1510 Transceiver (JD115A)
HP X170 1G SFP LC LH70 1530 Transceiver (JD116A)
HP X130 10G XFP LC SR Transceiver (JD117B)
HP X120 1G SFP LC SX Transceiver (JD118B)
HP X120 1G SFP LC LX Transceiver (JD119B)
HP X135 10G XFP LC ER Transceiver (JD121A)
HP X120 100M/1G SFP LC LX Transceiver (JF832A)
HP X110 100M SFP LC FX Transceiver (JF833A)
HP X240 SFP+ SFP+ 3 m Direct Attach Cable (JD097B)
HP X240 SFP+ SFP+ 5m Direct Attach Cable (JG081B)

Cables

HP A12500 Side Cable Management Guide (JC084A)
NEW HP 0.5 m PremierFlex OM3+ LC/LC Optical Cable (BK837A)
NEW HP 1 m PremierFlex OM3+ LC/LC Optical Cable (BK838A)
NEW HP 2 m PremierFlex OM3+ LC/LC Optical Cable (BK839A)
NEW HP 5 m PremierFlex OM3+ LC/LC Optical Cable (BK840A)
NEW HP 15 m PremierFlex OM3+ LC/LC Optical Cable (BK841A)
NEW HP 30 m PremierFlex OM3+ LC/LC Optical Cable (BK842A)
NEW HP 50 m PremierFlex OM3+ LC/LC Optical Cable (BK843A)

Power Supply

HP A12500 AC Power Entry Module (JF426A)
HP A12500 2000W AC Power Supply (JF429A)

Fan Tray

HP A12508 Fan Assembly (JC081A)
HP A12518 Fan Assembly (JC080A)
HP A12508 Optional Air Filter (JC082A)
HP A12518 Optional Air Filter (JC083A)

Memory

HP A-Series 1GB SDRAM (JC071A)

Products within this series have achieved sufficient scores in each of the rated criteria to achieve the Miercom Certified Green distinction Award. See the Specifications section of this series for more information.

To learn more, visit www.hp.com/networking

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H3C SR6600 Router RT-FIP-210-H3 Flexible Interface Platform Datasheet

Hangzhou H3C Technologies Co., Ltd.

H3C

ITolP Solutions Expert

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1 Overview

Nowadays, telecommunication carriers, large-scale enterprises, and professional users pose an increasingly high requirement on the distribution capability and processing performance of routers at the distribution layer. H3C SR6600 routers (hereinafter referred to as the SR6600) except for the SR6602 router (hereinafter referred to as the SR6602) use an distributed architecture, where routing engines are independent of service engines, and their control plane is independent of service plane. Therefore, system service and control operates independently of each other, no packet loss occurs during active/standby switchover, and each service engine can implement distributed NAT, IPsec, or Netstream, all of which thus enhance the whole service capability of the system.

RT-FIP-210-H3 flexible interface platform 210 (FIP-210) provides two high-speed interface module (HIM) slots, which are compatible with HIMs of the SR6600 and some MIMs of H3C MSR/AR series routers. The FIP-210 provides two fixed GE interfaces (combo interfaces), which work at the optical interface mode (using SFP modules) or electrical interface mode (supporting MDI/MDIX autosensing), supports comprehensive service features, and thus effectively enhances interface density on routers and reduces user investment.

2 Features

High-performance Processing

The FIP-210 uses high-performance multi-core multi-thread processors and provides two HIM slots, which are compatible with some MIMs. The FIP-210 can process packets powerfully and support 10 GE, 2.5 G POS, GE, 155/622 M POS, 155 M CPOS, 155 M ATM, FE, E1, and SAE.

Comprehensive Service Features

FIP-210 uses various interface modules to support different types of interfaces and comprehensive service features. It supports link layer protocols such as Ethernet, PPP, multilink PPP, High-Level Data Link Control (HDLC), frame relay, multilink frame relay, ATM, and point-to-point protocol over Ethernet (PPPoE), and supports IPv4, IPv6, and MPLS forwarding. In addition, the FIP-210 works on the H3C Comware V5 platform to support comprehensive routing protocols, network layer protocols, security features, and QoS.

Support for Hot Swapping

Both FIP-210 and its interface modules are hot swappable. Hot swapping of the FIP-210 and the interface modules does not affect other FIPs or interface modules.

Caution

Use the **remove slot** command to uninstall a card before swapping it. Otherwise, the device or card may be damaged.

3 Service Features

Table 1 Service features

Feature	Description
Compatible products	SR6604 SR6608 SR6616
Supported protocols	FIP-210 uses its fixed Ethernet interfaces or configured HIMs/MIMs to support the following service features: Link layer protocols: • Ethernet • High-Level Data Link Control (HDLC) • Point-to-Point Protocol (PPP), RFC 1662 • Frame Relay, RFC 1490 • Frame Relay Fragmentation, FRF.12 • Multilink PPP (supporting software and hardware MPs, with a maximum of 12 unframed sub channels in a binding for hardware MP), RFC 1990 • Multilink Link fragmentation and interleaving (LFI) • Multilink frame relay, FRF.16 • ATM • Point-to-point protocol over Ethernet (PPPoE) Network layer protocols: • IPv4/IPv6 • MPLS • GRE/NAT/IPsec/L2TP
Supported HIMs/MIMs	• RT-HIM-1EXP-H3 • RT-HIM-1POS/STM16-H3 • RT-HIM-4GBE/8GBE-WAN-H3 • RT-HIM-4GBP/8GBP-H3 • RT-HIM-MSP2P/MSP4P-H3 • RT-HIM-8FE-H3 • RT-HIM-1CPOS/STM1-H3, RT-HIM-2CPOS/STM-1-H3 • RT-HIM-CLS1P/CLS2P-H3 • RT-HIM-AL1P/AL2P-H3 • RT-HIM-RS2P-H3 ..... • RT-MIM-2GBE-H3 • RT-MIM-1CE3-H3 • RT-MIM-1CT3-H3 • RT-MIM-8E1(75)-H3

Feature	Description
	• RT-MIM-8E1(75)-F-H3 • RT-MIM-8T1-H3 • RT-MIM-8T1-F-H3 • RT-MIM-2/4/8SAE-H3 • RT-MIM-IMA-8E1(75)-H3 • RT-MIM-IMA-4E1(75)-V2-H3 • RT-MIM-IMA-4T1-V2-H3 .....
Reliability	• Support for hot swapping • Support for online hot swapping of HIMs/MIMs • Support for online exchange of fixed Gigabit Ethernet SFP modules
Network management	SNMP v1/v2c/v3

4 Specifications

Module Types

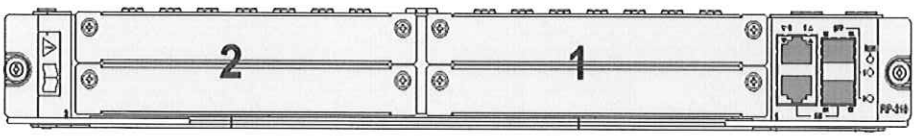
Table 1 FIP-210 module type

Module name	Module type	Description
RT-FIP-210-H3	Flexible interface platform 210	FIP-210, two HIM slots, two 10/100/1000 Mbps WAN ports (RJ-45 and SFP combo ports)

Physical Description

Front View

Figure 1 Front view of the FIP-210



System Specifications

Table 2 System specifications of the FIP-210

Item	FIP-210
Processor	MIPS CPU, 1 GHz
Flash	4 MB

Item	FIP-210	
Memory type and size	DDR2 SDRAM 2 GB (default)	
NVRAM	128 KB	
GE interface	2 (electrical-optical)	
	Electrical interface	10 Mbps, half/full-duplex
		100 Mbps, half/full-duplex
		1000 Mbps, full-duplex
	Optical interface	1000 Mbps, full-duplex
HIM	Two HIMs	
MIM	Two MIMs	

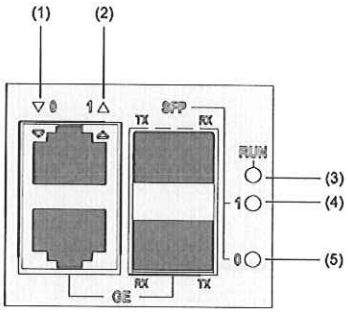
Note

The FIP-210 requires the memory to use two DDR2 SDRAMs with the same size.

LEDs

FIP-210 provides five LEDs: RUN, SFP1, SFP0, GE0, and GE1. The following table describes the LEDs:

Figure 2 FIP-210 LEDs



(1) 10/100/1000 Mbps electrical Ethernet interface LED (GE0)	(2) 10/100/1000 Mbps electrical Ethernet interface LED (GE1)
(3) Run LED (RUN)	(4) 1000 Mbps optical Ethernet interface LED (SFP1)
(5) 1000 Mbps optical Ethernet interface LED (SFP0)	

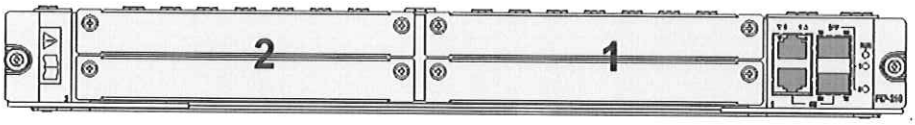
Table 3 Description of the FIP-210 LEDs

LEDs	Status	Meaning
RUN (green)	Off	No power is input or the module is faulty.
	Slow flashing (1 Hz)	The module is operating normally.
	Fast flashing (8 Hz)	The application software is being loaded.
SFP0 to SFP1 yellow/green	Off	No optical fiber link is present.
	Solid green	An optical fiber link is present.
	Flashing green	Data is being received or transmitted on the optical fiber link.
	Solid yellow	Optical fiber check has failed.
GE0 to GE1 yellow/green	Off	No link is present.
	Solid green	A 1000 Mbps link is present.
	Flashing green	Data is being received or transmitted at a rate of 1000 Mbps.
	Solid yellow	A 10/100 Mbps link is present.
	Flashing yellow	Data is being received or transmitted at a rate of 10/100 Mbps.

Slot Description

The interface module slots on the FIP-210 are Slot 1 and Slot 2 from right to left, as shown in Figure 3.

Figure 3 Interface module slots on an FIP-210

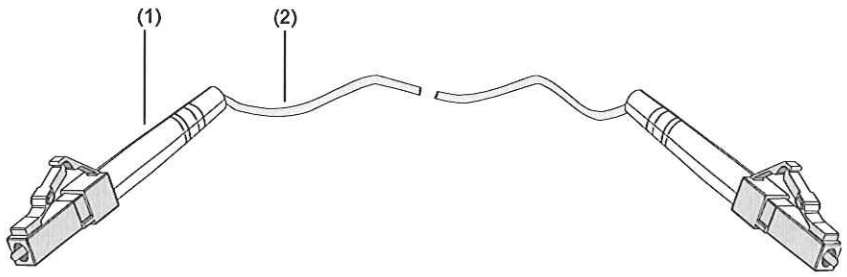


Interface Cables

The FIP-210 provides two Gigabit Ethernet (Combo) interfaces, which use optical fiber with LC connectors when working in the fiber mode, and use straight-through or crossover cables when working in the copper mode.

- The following figure shows the optical fiber with LC connectors:

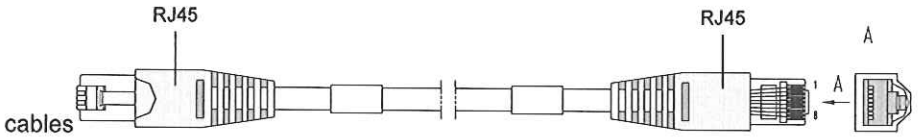
Figure 4 Optical fiber with LC connectors



(1) LC-type connector	(2) Optical fiber

- Straight-through and crossover cables are shown in the following figure:

Figure 5 Straight-through and crossover



Note

- The media dependent interface (MDI) is a typical Ethernet interface provided by network adapters. The media-dependent interface crossover (MDIX) is commonly found on a hub or LAN switch.
- When 10/100 Mbps and half/full-duplex mode are specified for an electrical Ethernet interface, the electrical Ethernet interface operates in the forced mode. When 1000 Mbps is specified, or the speed and the duplex mode are not simultaneously specified for an electrical Ethernet interface, the electrical Ethernet interface operates in the auto-negotiation mode.
- When operating in the forced and auto-negotiation mode, the two Gigabit Ethernet electrical interfaces of the FIP-210 can support MDI/MDIX autosensing (support crossover and straight-through lines).

5 Operating Environment

For long-term working modes:

Temperature: 0°C to 45°C (32°F to 113°F)

Humidity: 10% to 95%

For short-term working modes:

Temperature: –10°C to 55°C (14°F to 131°F)

Humidity: 5% to 95%

6 Security Standards

- IEC standard
- UL standard
- EN standard
- GB standard
- Low voltage directive (LVD)
- Requirements of Food and Drug Administration (FDA)

7 EMC Standards

- CE standard
- FCC standard
- VCCI standard

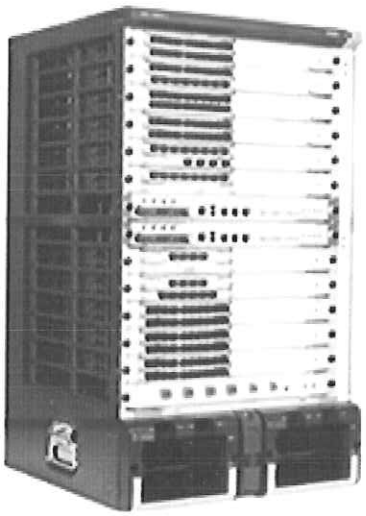
8 Ordering Information

When purchasing the FIP-210, log in to www.h3c.com for more information. Table 1 describes the ordering information of the FIP-210.

Table 1 Description of the FIP-210

Module model	Description
RT-FIP-210-H3	FIP-210, 2 HIM slots (compatible with MIMs), 2 10/100/1000 Mbps WAN ports (RJ-45 and SFP combo ports)
SFP optical modules	
SFP-GE-SX-MM850-A	1000BASE-SX SFP Transceiver, Multi-Mode (850 nm, 550 m, LC)
SFP-GE-LX-SM1310-A	1000BASE-LX SFP Transceiver, Single Mode(1310 nm, 10 km, LC)
SFP-GE-LH40-SM1310	1000BASE-LX SFP Transceiver, Single Mode(1310 nm, 40 km, LC)
SFP-GE-LH40-SM1550	1000BASE-LX SFP Transceiver, Single Mode(1550 nm, 40 km, LC)
SFP-GE-LH70-SM1550	1000BASE-LX SFP Transceiver, Single Mode(1550 nm, 70 km, LC)

Module model	Description
SFP-GE-LH100-SM1550	1000BASE-LX SFP Transceiver, Single Mode(1550 nm, 100 km, LC)



HP 8800 Router Series

Data sheet

Product overview

HP 8800 series routers are components of the HP FlexFabric and FlexCampus modules of the FlexNetwork architecture. They feature a distributed high-performance network processor and high-capacity crossbar nonblocking switching technology that delivers high performance and flexibility. A distributed Quality of Service (QoS) control unit provides end-to-end service with granular control. The routers' distributed operation, administration, and maintenance detection engines implement fault detection within 30 ms to provide uninterrupted core services. These innovative technologies, paired with the QoS control mechanism, deliver smooth operation and high availability of multiple services within the FlexNetwork architecture. 8800 routers are commonly deployed in IP backbone networks, IP MANs, and the core or convergence layers of large IP networks. Offering high forwarding performance and abundant services, the 8800 series delivers on routing performance and flexibility.

Key features

- Fully distributed hardware architecture
- Dedicated OAM engine for high reliability
- Built-in QoS engine for precise services control
- Advanced security mechanism
- Robust MPLS VPN capability

Features and benefits

Quality of Service (QoS)

- **Hierarchical QoS (HQoS):** provides a built-in QoS engine that supports hierarchical QoS (HQoS) and can implement a hierarchical scheduling mechanism based on ports, user groups, users, and user services; also cooperates with MPLS TE to implement bandwidth reservation and scheduling based on tunnels and services
- **Schedule algorithm:** supports PQ, LLQ, WFQ, and CBWFQ
- **Congestion avoidance mechanism:** supports Tail Drop and Weighted Random Early Detection (WRED)

Management

- **Management interface control:** provides management access through modem port and terminal interface, as well as in-band and out-of-band Ethernet ports; provides access through terminal interface, telnet, or SSH
- **Industry-standard CLI with a hierarchical structure:** reduces training time and expenses, and increases productivity in multivendor installations
- **Management security:** includes multiple administration levels, with password protection and restricted access to critical configuration commands; ACLs provide telnet and SNMP access; local and remote syslog capability allows logging of all access
- **SNMP v1, v2, and v3:** provides complete support of SNMP as well as full support of industry-standard MIBs and private MIB extensions
- **Remote monitoring (RMON):** uses standard SNMP to monitor essential network functions; supports events, alarm, history, and statistics group plus a private alarm extension group
- **Debug and sampler utility:** supports ping and traceroute for both IPv4 and IPv6
- **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 and file transfer rates; allows network manager to determine overall network performance and to diagnose and locate network congestion points or failures
- **Network Time Protocol (NTP):** synchronizes timekeeping among distributed time servers and clients; keeps consistent timekeeping among all clock-dependent devices within the network so that the devices can provide diverse applications based on the consistent time
- **Info center:** provides a central information center 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
- **FTP and TFTP support:** FTP allows bidirectional transfers over a TCP/IP network and is used for configuration updates; Trivial FTP is a simpler method using User Datagram Protocol (UDP)
- **Loopback:** supports internal loopback testing for maintenance purposes and high availability; loopback detection protects system from incorrect cabling or network configurations, and can be enabled on a port or VLAN
- **Ethernet OAM:** provides a monitoring tool for Layer 2 performance and fault detection, which reduces failover and network convergence times

Connectivity

- **High port density:** provides up to 12 interface module slots, up to 96 OC3 POS ports, or 576 Gigabit Ethernet ports (fiber) per 8812 system
- **Flexible port selection:** provides a combination of fiber and copper interface modules, 100/1000BASE-X auto-speed selection, and 10/100/1000BASE-T auto-speed detection plus auto duplex and MDI/MDI-X; speed adaptable between 155 M POS and 622 M POS/Gigabit Ethernet
- **Packet storm protection:** protects against broadcast, multicast, or unicast storms with user-defined thresholds
- **Multiple WAN interfaces:** support Fast Ethernet/Gigabit Ethernet/10 GbE ports, OC3~OC192 POS, ATM ports, and 10 GbE RPR

Performance

- **Industry-leading performance:** provides switching capacity up to 1440 Gbps and forwarding performance up to 864 Mpps
- **Flexible chassis selection:** consists of three models: 12 I/O-slot chassis, 8 I/O-slot chassis, 5 I/O-slot chassis
- **Scalable system design:** backplane is designed for smooth bandwidth upgrade

Resiliency and high availability

- **Separate data and control plane:** provide continual services
- **Passive backplane design:** backplane has no active components to increase system reliability
- **Redundant design of main processing unit and power supply:** increases the overall system availability
- **IP Fast Reroute Framework (FRR):** nodes are configured with backup ports and routes; local implementation requires no cooperation of adjacent devices, simplifying the deployment; solves the traditional convergence faults in IP forwarding; realizes restoration within 50 ms, with the restoration time independent of the number of routes and fast link switchovers without route convergence
- **Hitless patch upgrades:** allow patches to be installed without restarting the equipment, increasing network uptime and facilitating maintenance
- **Virtual Router Redundancy Protocol:** helps ensure the system's high availability without changing configurations when a device fails; prevents network interruptions caused by a single link failure
- **Graceful restart:** features are fully supported, including graceful restart for OSPF, IS-IS, BGP, LDP, and RSVP; network remains stable during the active-standby switchover; after the switchover, the device quickly learns the network routes by communicating with adjacent routers; forwarding remains uninterrupted during the switchover to realize NSF
- **Hot-swappable modules:** help ensure the replacement of hardware interface modules without impacting the traffic flow through the system
- **BFD:** BFD for static routing, RIP, OSPF, OSPFv3, IS-IS, IPv6 IS-IS, BGP, BGP4+, PIM, IPv6 PIM, LDP, RSVP, VPLS PW, LSP, VRRP, VRRP3, policy route, and IP FRR

Layer 2 switching

- **VLANs:** support up to 4096 port or IEEE 802.1Q-based VLANs
- **Spanning Tree:** fully supports standard IEEE 802.1D Spanning Tree Protocol, IEEE 802.1w Rapid Spanning Tree Protocol for faster convergence, and IEEE 802.1s Multiple Spanning Tree Protocol
- **Bridge Protocol Data Unit (BPDU) tunneling:** transmits Spanning Tree Protocol BPDUs transparently, allowing correct tree calculations across service providers, WANs, or MANs
- **Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) protocol snooping:** effectively 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; supports 64 mirroring groups, with an unlimited number of ports per group
- **Port isolation:** increases security by isolating ports within a VLAN while still allowing them to communicate with other VLANs

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
- **Domain Name System (DNS):** is a distributed database that provides translation between a domain name and an IP address, which simplifies network design; supports client and server

Layer 3 routing

- **Static IPv4 routing:** provides simple, manually configured IPv4 routing
- **Routing Information Protocol:** uses a distance vector algorithm with UDP packets for route determination; supports RIPv1 and RIPv2 routing; includes loop protection
- **OSPF:** Interior Gateway Protocol (IGP) using link-state protocol for faster convergence; supports ECMP, NSSA, and MD5 authentication for increased security and graceful restart for faster failure recovery

- **Intermediate system to intermediate system (IS-IS):** Interior Gateway Protocol (IGP) using path vector protocol, 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 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
- **Multiprotocol Label Switching Traffic Engineering (MPLS TE):** Traffic Engineering (TE) is used to enhance traffic over large MPLS networks based on type of traffic and available resources; TE dynamically tunes traffic management attributes and enables true load balancing; MPLS TE supports route backup using Fast Reroute (FRR)
- **Multiprotocol Label Switching (MPLS) Layer 3 VPN:** allows Layer 3 VPNs across a provider network; uses MP-BGP to establish private routes for increased security; supports RFC 2547bis multiple autonomous system VPNs for added flexibility
- **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
- **Virtual Private LAN Service (VPLS):** establishes point-to-multipoint Layer 2 VPNs across a provider network
- **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 VPN:** supports Multicast Domain (MD) multicast VPN, which can be distributed on separate service cards, providing high performance and flexible configuration
- **IPv6 tunneling:** is an important element for the transition from IPv4 to IPv6; 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
- **Border Gateway Protocol 4:** Exterior Gateway Protocol (EGP) with path vector protocol uses TCP for enhanced reliability for the route discovery process, reduces bandwidth consumption by advertising only incremental updates, and supports extensive policies to increase flexibility and scale to large networks

Security

- **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
- **Network login:** standard IEEE 802.1x allows authentication of multiple users per port, or when a port is shared with an IP phone
- **RADIUS:** eases switch security access administration by using a password authentication server
- **TACACS+:** is an authentication tool using TCP with encryption of the full authentication request that provides additional security
- **Media access control (MAC) authentication:** provides simple authentication based on a user's MAC address; supports local or RADIUS-based authentication
- **Attack protection:** protects network from attacks that use a large number of ARP requests by using a host-specific, user-selectable threshold; provides Address Scanning Attack Prevention, MAC Address Flooding Attack Prevention, and STP Attack Prevention
- **Network address translation (NAT):** supports repeated multiplexing of a port and automatic 5-tuple collision detection, enabling NAPT to support unlimited connections; supports blacklist in NAT/NAPT/internal server, a limit on the number of connections, session log, and multi-instance

- **Secure Shell (SSHv2):** uses external servers to securely log in to a remote device; with authentication and encryption, it protects against IP spoofing and plain-text password interception; increases the security of Secure FTP (SFTP) transfers
- **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; supports distributed URPF

Multicast support

- **Internet Group Management Protocol (IGMP):** is used by IP hosts to establish and maintain multicast groups; supports v1, v2, and v3; utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv4 multicast networks
- **Protocol Independent Multicast (PIM):** is used for IPv4 and IPv6 multicast applications; supports PIM dense mode (PIM-DM), sparse mode (PIM-SM), and source-specific mode (PIM-SSM)
- **Multicast Source Discovery Protocol (MSDP):** is used for inter-domain multicast applications, allowing multiple PIM-SM domains to interoperate
- **Multicast Border Gateway Protocol (MBGP):** allows multicast traffic to be forwarded across BGP networks, separate from unicast traffic
- **Multicast Listener Discovery Protocol:** is used by IP hosts to establish and maintain multicast groups; supports v1 and v2 and utilizes Any-Source Multicast (ASM) or Source-Specific Multicast (SSM) to manage IPv6 multicast networks
- **Multicast VLAN:** allows multiple VLANs to receive the same IPv4 or IPv6 multicast traffic, reducing network bandwidth demand by eliminating multiple streams to each VLAN

Integration

- **Open Application Architecture:** provides both software and hardware platform based on open standards, so that third-party applications can be integrated seamlessly into routers

Additional information

- **Green initiative support:** provides support for RoHS and WEEE regulations

Product architecture

- **10 Gbps Network Processor platform:** is perfect for new service expansion; supports wire-speed 10 GbE POS and precise QoS/H-QoS and multicast VPN
- **Crossbar nonblocking switching:** includes two crossbars on MCU to provide performance and reliability; service processing engine and crossbar work together to complete VoQ and E2E flow control and implement granular switch-fabric-level QoS, offering genuine SLA services
- **10 GbE Resilient Packet Ring (RPR):** provides advanced technology on MAC layer with high usage of ring bandwidth, self-healing, automatic topology discovery, and node plug and play; provides protection switching using steering or wrapping, with fast recovery time of 50 ms, satisfying the carrier-class requirement; provides weighted fair algorithm for bandwidth allocation
- **High-capacity buffer:** each network processor of the 8800 router offers a 200 ms ingress buffer and a 200 ms egress buffer, providing time delay-sensitive services
- **Separate SPE card and interface card:** interface cards are separated from SPE cards to support flexible service configurations
- **Dedicated OAM engine:** reduces CPU loads and improves link fault detection performance; realizes 30 ms fault detection and 20 ms service switchover

Warranty and support

- **1-year warranty:** with advance replacement and 30-calendar-day delivery (available in most countries)
- **Electronic and telephone support:** limited electronic and telephone support is available from HP; 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/warrantysummary

Specifications

	 HP 8812 Router Chassis (JC150B)	 HP 8808-V Router Chassis (JC149B)	 HP 8805 Router Chassis (JC148B)
Ports	12 I/O module slots 2 MPU (for management modules) slots	8 I/O module slots 2 MPU (for management modules) slots	5 I/O module slots 2 MPU (for management modules) slots
Physical characteristics			
Dimensions	17.72(d) x 17.4(w) x 29.65(h) in. (45.01 x 44.2 x 75.31 cm) (17U height)	17.72(d) x 17.4(w) x 34.88(h) in. (45.01 x 44.2 x 88.6 cm) (21U height)	17.72(d) x 17.4(w) x 19.13(h) in. (45.01 x 44.2 x 48.59 cm) (11U height)
Full configuration weight	264.55 lb. (120 kg)	242.5 lb. (110 kg)	187.39 lb. (85 kg)
Mounting	EIA standard 19 in. rack	EIA standard 19 in. rack	EIA standard 19 in. rack
Performance			
Throughput	864 million pps	576 million pps	360 million pps
Routing/Switching capacity	1440 Gbps	1440 Gbps	1440 Gbps
Routing table size	3000000 entries	3000000 entries	3000000 entries
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	10% to 90%, noncondensing	10% to 90%, noncondensing	10% 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 95%, noncondensing	5% to 95%, noncondensing	5% to 95%, noncondensing
Electrical characteristics			
Maximum heat dissipation	11935 BTU/hr (12591.43 kJ/hr)	11935 BTU/hr (12591.43 kJ/hr)	6820 BTU/hr (7195.1 kJ/hr)
Voltage	100-120/200-240 VAC	100-120/200-240 VAC	100-120/200-240 VAC
DC voltage	-48 VDC	-48 VDC	-48 VDC
Maximum power rating	3500 W	3500 W	2000 W
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Notes	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.	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.	Maximum power rating and maximum heat dissipation are the worst-case theoretical maximum numbers provided for planning the infrastructure with fully loaded PoE (if equipped), 100% traffic, all ports plugged in, and all modules populated.
Safety	CSA 22.2 No. 60950; cUL (CSA 22.2 No. 60950); CSA 22.2 No. 60950 3rd edition; CSA 22.2 No. 950; CSA 950; cUL (CSA 950); EN 60950/IEC 60950; UL 1950 3rd edition; UL 1950; UL 60950; UL 60950-1; CAN/CSA 22.2 No. 60950; CAN/CSA 22.2 No. 60950-1; AS/NZS 60950; EN 609500 Safety Information Technology Equipment; UL 60950; CSA 22.2 No. 60950/cUL; IEC 60950; IEC 60950-1; EN 60950; EN 60950-1; CSA 22.2 No. 950-95; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1; CSA 60950-1; CSA C22.2 60950-1; EN 60950-1/A11; CSA 22.2 60950-1; EN 60950: 2000, ZB and ZC Deviations; IEC 60950: 1999, Corr Feb 2000, all national deviations; As/NZS 60950:2000, Australia; UL 60950-1:2003; UL 60950-1:2001; CSA 22.2 60950-1:2003; IEC 60950-1:2001; EN 60950-1:2001; CSA 22.2-60950; AS/NZS 60950: 2000 Australia, Russian GOST Safety Approval; CSA 22.2 No. 950 3rd Edition 1995; UL 60950 3rd Edition; CAN/CSA 22.2 No. 60950-00/UL 60950 3rd Edition, Safety Information for Technology Equipment; EN 60950/IEC 60950 3rd Edition; UL 60950 Standard for the Safety of Information Technology Equipment	CSA 22.2 No. 60950; cUL (CSA 22.2 No. 60950); CSA 22.2 No. 60950 3rd edition; CSA 22.2 No. 950; CSA 950; cUL (CSA 950); EN 60950/IEC 60950; UL 1950 3rd edition; UL 1950; UL 60950; UL 60950-1; CAN/CSA 22.2 No. 60950; CAN/CSA 22.2 No. 60950-1; AS/NZS 60950; EN 609500 Safety Information Technology Equipment; UL 60950; CSA 22.2 No. 60950/cUL; IEC 60950; IEC 60950-1; EN 60950; EN 60950-1; CSA 22.2 No. 950-95; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1; CSA 60950-1; CSA C22.2 60950-1; EN 60950-1/A11; CSA 22.2 60950-1; EN 60950: 2000, ZB and ZC Deviations; IEC 60950: 1999, Corr Feb 2000, all national deviations; As/NZS 60950:2000, Australia; UL 60950-1:2003; UL 60950-1:2001; CSA 22.2 60950-1:2003; IEC 60950-1:2001; EN 60950-1:2001; CSA 22.2-60950; AS/NZS 60950: 2000 Australia, Russian GOST Safety Approval; CSA 22.2 No. 950 3rd Edition 1995; UL 60950 3rd Edition; CAN/CSA 22.2 No. 60950-00/UL 60950 3rd Edition, Safety Information for Technology Equipment; EN 60950/IEC 60950 3rd Edition; UL 60950 Standard for the Safety of Information Technology Equipment	CSA 22.2 No. 60950; cUL (CSA 22.2 No. 60950); CSA 22.2 No. 60950 3rd edition; CSA 22.2 No. 950; CSA 950; cUL (CSA 950); EN 60950/IEC 60950; UL 1950 3rd edition; UL 1950; UL 60950; UL 60950-1; CAN/CSA 22.2 No. 60950; CAN/CSA 22.2 No. 60950-1; AS/NZS 60950; EN 609500 Safety Information Technology Equipment; UL 60950; CSA 22.2 No. 60950/cUL; IEC 60950; IEC 60950-1; EN 60950; EN 60950-1; CSA 22.2 No. 950-95; IEC 60950-1:2001 (with CB Report); CAN/CSA-C22.2 No. 60950-1; CSA 60950-1; CSA C22.2 60950-1; EN 60950-1/A11; CSA 22.2 60950-1; EN 60950: 2000, ZB and ZC Deviations; IEC 60950: 1999, Corr Feb 2000, all national deviations; As/NZS 60950:2000, Australia; UL 60950-1:2003; UL 60950-1:2001; CSA 22.2 60950-1:2003; IEC 60950-1:2001; EN 60950-1:2001; CSA 22.2-60950; AS/NZS 60950: 2000 Australia, Russian GOST Safety Approval; CSA 22.2 No. 950 3rd Edition 1995; UL 60950 3rd Edition; CAN/CSA 22.2 No. 60950-00/UL 60950 3rd Edition, Safety Information for Technology Equipment; EN 60950/IEC 60950 3rd Edition; UL 60950 Standard for the Safety of Information Technology Equipment

Specifications (continued)

	HP 8812 Router Chassis (JC150B)	HP 8808-V Router Chassis (JC149B)	HP 8805 Router Chassis (JC148B)
Emissions	FCC Class A; FCC part 15 Class A; ICE-003, Canadian Radio Interface Regulation; EN 55022/CISPR-22 Class A; VCCI Class A; EN 55022/CISPR 22 Class A; EN 55022 Class A; CISPR 22; CISPR 22 Class A; EN 55022; EN 55024; CNS 13438 Class B; FCC CFR 47 Part 15; VCCI; ICES-003 (Canada); CISPR 22/A2; EN 55022/A2; ICES-003; AS/NZS CISPR 22; VCCI V-3/2000.04; IEC/EN 61000-3-2; IEC/EN 61000-3-3; EN 55024/A1; IEC 61000:4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-11; EMC Directive 89/336/EEC; VCCI (Japan); EN 55022 1998 Class A; EN 61000-3-2 2000, 61000-3-3; ICES-003 Class A; EN 300 386; FCC Part 15; CISPR 24; ETSI EN 300 386 V1.3.3; AS/NZS CISPR22 Class A; EN 61000-3-2; EN 61000-3-3; CNS 13438 Class A; EN 55024:1998; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-6; EN 61000-4-11; Anatel; ICES-003 Issue 4 Class A	FCC Class A; FCC part 15 Class A; ICE-003, Canadian Radio Interface Regulation; EN 55022/CISPR-22 Class A; VCCI Class A; EN 55022/CISPR 22 Class A; EN 55022 Class A; CISPR 22; CISPR 22 Class A; EN 55022; EN 55024; CNS 13438 Class B; FCC CFR 47 Part 15; VCCI; ICES-003 (Canada); CISPR 22/A2; EN 55022/A2; ICES-003; AS/NZS CISPR 22; VCCI V-3/2000.04; IEC/EN 61000-3-2; IEC/EN 61000-3-3; EN 55024/A1; IEC 61000:4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-11; EMC Directive 89/336/EEC; VCCI (Japan); EN 55022 1998 Class A; EN 61000-3-2 2000, 61000-3-3; ICES-003 Class A; EN 300 386; FCC Part 15; CISPR 24; ETSI EN 300 386 V1.3.3; AS/NZS CISPR22 Class A; EN 61000-3-2; EN 61000-3-3; CNS 13438 Class A; EN 55024:1998; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-6; EN 61000-4-11; Anatel; ICES-003 Issue 4 Class A	FCC Class A; FCC part 15 Class A; ICE-003, Canadian Radio Interface Regulation; EN 55022/CISPR-22 Class A; VCCI Class A; EN 55022/CISPR 22 Class A; EN 55022 Class A; CISPR 22; CISPR 22 Class A; EN 55022; EN 55024; CNS 13438 Class B; FCC CFR 47 Part 15; VCCI; ICES-003 (Canada); CISPR 22/A2; EN 55022/A2; ICES-003; AS/NZS CISPR 22; VCCI V-3/2000.04; IEC/EN 61000-3-2; IEC/EN 61000-3-3; EN 55024/A1; IEC 61000:4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-11; EMC Directive 89/336/EEC; VCCI (Japan); EN 55022 1998 Class A; EN 61000-3-2 2000, 61000-3-3; ICES-003 Class A; EN 300 386; FCC Part 15; CISPR 24; ETSI EN 300 386 V1.3.3; AS/NZS CISPR22 Class A; EN 61000-3-2; EN 61000-3-3; CNS 13438 Class A; EN 55024:1998; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5; EN 61000-4-6; EN 61000-4-11; Anatel; ICES-003 Issue 4 Class A
Management	IMC - Intelligent Management Center; command-line interface; limited command-line interface; configuration menu; out-of-band management (serial RS-232C); out-of-band management; SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB	IMC - Intelligent Management Center; command-line interface; limited command-line interface; configuration menu; out-of-band management (serial RS-232C); out-of-band management; SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB	IMC - Intelligent Management Center; command-line interface; limited command-line interface; configuration menu; out-of-band management (serial RS-232C); out-of-band management; SNMP Manager; Telnet; RMON1; FTP; in-line and out-of-band; terminal interface (serial RS-232C); modem interface; IEEE 802.3 Ethernet MIB; Ethernet Interface MIB
Services	3-year, parts only, global next-day advance exchange (UW982E)	3-year, parts only, global next-day advance exchange (UW982E)	3-year, parts only, global next-day advance exchange (UW982E)
	3-year, 4-hour onsite, 13x5 coverage for hardware (UW065E)	3-year, 4-hour onsite, 13x5 coverage for hardware (UW065E)	3-year, 4-hour onsite, 13x5 coverage for hardware (UW065E)
	3-year, 4-hour onsite, 24x7 coverage for hardware (UV967E)	3-year, 4-hour onsite, 24x7 coverage for hardware (UV967E)	3-year, 4-hour onsite, 24x7 coverage for hardware (UV967E)
	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (UV990E)	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (UV990E)	3-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 SW phone support and SW updates (UV990E)
	3-year, 24x7 SW phone support, software updates (UV993E)	3-year, 24x7 SW phone support, software updates (UV993E)	3-year, 24x7 SW phone support, software updates (UV993E)
	1-year, post-warranty, 4-hour onsite, 13x5 coverage for hardware (HR539E)	1-year, post-warranty, 4-hour onsite, 13x5 coverage for hardware (HR539E)	1-year, post-warranty, 4-hour onsite, 13x5 coverage for hardware (HR539E)
	1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware (HR540E)	1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware (HR540E)	1-year, post-warranty, 4-hour onsite, 24x7 coverage for hardware (HR540E)
	4-year, 4-hour onsite, 13x5 coverage for hardware (UW066E)	4-year, 4-hour onsite, 13x5 coverage for hardware (UW066E)	4-year, 4-hour onsite, 13x5 coverage for hardware (UW066E)
	4-year, 4-hour onsite, 24x7 coverage for hardware (UV968E)	4-year, 4-hour onsite, 24x7 coverage for hardware (UV968E)	4-year, 4-hour onsite, 24x7 coverage for hardware (UV968E)
	4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV991E)	4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV991E)	4-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV991E)
	4-year, 24x7 SW phone support, software updates (UV994E)	4-year, 24x7 SW phone support, software updates (UV994E)	4-year, 24x7 SW phone support, software updates (UV994E)
	5-year, 4-hour onsite, 13x5 coverage for hardware (UW067E)	5-year, 4-hour onsite, 13x5 coverage for hardware (UW067E)	5-year, 4-hour onsite, 13x5 coverage for hardware (UW067E)
	5-year, 4-hour onsite, 24x7 coverage for hardware (UV969E)	5-year, 4-hour onsite, 24x7 coverage for hardware (UV969E)	5-year, 4-hour onsite, 24x7 coverage for hardware (UV969E)
	5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV992E)	5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV992E)	5-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone (UV992E)
	5-year, 24x7 SW phone support, software updates (UV995E)	5-year, 24x7 SW phone support, software updates (UV995E)	5-year, 24x7 SW phone support, software updates (UV995E)
	3 Yr 6 hr Call-to-Repair Onsite (UW058E)	3 Yr 6 hr Call-to-Repair Onsite (UW058E)	3 Yr 6 hr Call-to-Repair Onsite (UW058E)
	4 Yr 6 hr Call-to-Repair Onsite (UW059E)	4 Yr 6 hr Call-to-Repair Onsite (UW059E)	4 Yr 6 hr Call-to-Repair Onsite (UW059E)
	5 Yr 6 hr Call-to-Repair Onsite (UW060E)	5 Yr 6 hr Call-to-Repair Onsite (UW060E)	5 Yr 6 hr Call-to-Repair Onsite (UW060E)
	1-year, 6 hour Call-To-Repair Onsite for hardware (HR543E)	1-year, 6 hour Call-To-Repair Onsite for hardware (HR543E)	1-year, 6 hour Call-To-Repair Onsite for hardware (HR543E)
	1-year, 24x7 software phone support, software updates (HR542E)	1-year, 24x7 software phone support, software updates (HR542E)	1-year, 24x7 software phone support, software updates (HR542E)
	1-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support and software updates (HR541E)	1-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support and software updates (HR541E)	1-year, 4-hour onsite, 24x7 coverage for hardware, 24x7 software phone support and software updates (HR541E)

Specifications (continued)

	HP 8812 Router Chassis (JC150B)	HP 8808-V Router Chassis (JC149B)	HP 8805 Router Chassis (JC148B)
	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.	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.	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.

Specifications (continued)

	HP 8812 Router Chassis (JC150B)	HP 8808-V Router Chassis (JC149B)	HP 8805 Router Chassis (JC148B)
Standards and protocols (applies to all products in series)	**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 BGP4 confederations RFC 1997 BGP Communities Attribute RFC 1998 PPP Gandalf FZA Compression Protocol RFC 2385 BGP Session Protection via TCP MD5 RFC 2439 BGP Route Flap Damping RFC 2796 BGP Route Reflection RFC 2842 Capability Advertisement with BGP-4 RFC 2858 BGP-4 Multi-Protocol Extensions RFC 2918 Route Refresh Capability **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 1901 (Community based SNMPv2) RFC 1901-1907 SNMPv2c, SMIv2 and Revised MIB-II RFC 1902 (SNMPv2) RFC 1908 (SNMP v1/2 Coexistence) RFC 1945 Hypertext Transfer Protocol – HTTP/1.0 RFC 2068 Hypertext Transfer Protocol – HTTP/1.1 RFC 2271 FrameWork RFC 2452 MIB for TCP6 RFC 2454 MIB for UDP6 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 2819 (RMON groups Alarm, Event, History and Statistics only) RFC 2819 RMON RFC 3410 (Management Framework) RFC 3416 (SNMP Protocol Operations v2) RFC 3417 (SNMP Transport Mappings) Multiple Configuration Files Multiple Software Images SNMP v3 and RMON RFC support SSHv1/SSHv2 Secure Shell TACACS/TACACS+ **General protocols** IEEE 802.1ad Q-in-Q IEEE 802.1ad Q-in-Q IEEE 802.1ag Service Layer OAM IEEE 802.1ah Provider Backbone Bridges IEEE 802.1AX-2008 Link Aggregation IEEE 802.1D MAC Bridges IEEE 802.1p Priority IEEE 802.1Q (GVRP) IEEE 802.1Q VLANs IEEE 802.1s (MSTP) IEEE 802.1s Multiple Spanning Trees IEEE 802.1v VLAN classification by Protocol and Port IEEE 802.1w Rapid Reconfiguration of Spanning Tree IEEE 802.1X PAE IEEE 802.3 Type 10BASE-T IEEE 802.3ab 1000BASE-T IEEE 802.3ac (VLAN Tagging Extension) IEEE 802.3ad Link Aggregation (LAG) 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 802.3i 10BASE-T IEEE 802.3u 100BASE-X IEEE 802.3x Flow Control IEEE 802.3z 1000BASE-X RFC 768 UDP RFC 783 TFTP Protocol (revision 2) RFC 791 IP RFC 792 ICMP RFC 793 TCP RFC 826 ARP RFC 854 TELNET RFC 855 Telnet Option Specification RFC 856 TELNET RFC 857 Telnet Echo Option RFC 858 Telnet Suppress Go Ahead Option RFC 894 IP over Ethernet RFC 896 Congestion Control in IP/TCP Internetworks RFC 906 TFTP Bootstrap RFC 925 Multi-LAN Address Resolution RFC 950 Internet Standard Subnetting Procedure RFC 951 BOOTP RFC 959 File Transfer Protocol (FTP) RFC 1006 ISO transport services on top of the TCP: Version 3 RFC 1027 Proxy ARP RFC 1034 Domain Concepts and Facilities RFC 1035 Domain Implementation and Specification RFC 1042 IP Datagrams RFC 1058 RIPv1 RFC 1071 Computing the Internet Checksum RFC 1091 Telnet Terminal-Type Option RFC 1093 NSFNET routing architecture RFC 1122 Host Requirements RFC 1141 Incremental updating of the Internet checksum RFC 1142 OSI IS-IS Intra-domain Routing Protocol RFC 1144 Compressing TCP/IP headers for low-speed serial links RFC 1171 Point-to-Point Protocol for the transmission of multi-protocol datagrams over Point-to-Point links 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 1256 ICMP Router Discovery Protocol (IRDP) RFC 1293 Inverse Address Resolution Protocol RFC 1305 NTPv3 RFC 1315 Management Information Base for Frame Relay DTEs RFC 1321 The MD5 Message-Digest Algorithm RFC 1332 The PPP Internet Protocol Control Protocol (IPCP) RFC 1333 PPP Link Quality Monitoring RFC 1334 PPP Authentication Protocols (PAP) RFC 1349 Type of Service RFC 1350 TFTP Protocol (revision 2) RFC 1377 The PPP OSI Network Layer Control Protocol (OSINLCP) RFC 1381 SNMP MIB Extension for X.25 LAPB RFC 1389 RIPv2 MIB Extension RFC 1471 The Definitions of Managed Objects for the Link Control Protocol of the Point-to-Point Protocol RFC 1472 The Definitions of Managed Objects for the Security Protocols of the Point-to-Point Protocol RFC 1490 Multiprotocol Interconnect over Frame Relay RFC 1519 CIDR RFC 1531 Dynamic Host Configuration Protocol RFC 1533 DHCP Options and BOOTP Vendor Extensions	RFC 1534 DHCP/BOOTP Interoperation RFC 1541 DHCP RFC 1542 BOOTP Extensions RFC 1542 Clarifications and Extensions for the Bootstrap Protocol RFC 1552 The PPP Internetworking Packet Exchange Control Protocol (IPXCP) RFC 1577 Classical IP and ARP over ATM RFC 1631 NAT RFC 1638 PPP Bridging Control Protocol (BCP) RFC 1661 The Point-to-Point Protocol (PPP) RFC 1662 PPP in HDLC-like Framing RFC 1695 Definitions of Managed Objects for ATM Management Version 8.0 using SMIv2 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 1812 IPv4 Routing RFC 1829 The ESP DES-CBC Transform RFC 1877 PPP Internet Protocol Control Protocol Extensions for Name Server Addresses RFC 1944 Benchmarking Methodology for Network Interconnect Devices RFC 1945 Hypertext Transfer Protocol – HTTP/1.0 RFC 1973 PPP in Frame Relay RFC 1974 PPP Stac LZS Compression Protocol RFC 1981 Path MTU Discovery for IP version 6 RFC 1990 The PPP Multilink Protocol (MP) RFC 1994 PPP Challenge Handshake Authentication Protocol (CHAP) RFC 2082 RIP-2 MD5 Authentication RFC 2091 Trigger RIP 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 2205 Resource ReSerVation Protocol (RSVP) - Version 1 Functional Specification RFC 2209 Resource ReSerVation Protocol (RSVP) – Version 1 Message Processing Rules RFC 2236 IGMP Snooping RFC 2246 The TLS Protocol Version 1.0 RFC 2251 Lightweight Directory Access Protocol (v3) RFC 2252 Lightweight Directory Access Protocol (v3): Attribute Syntax Definitions RFC 2280 Routing Policy Specification Language (RPSL) RFC 2283 MBGP RFC 2284 EAP over LAN RFC 2338 VRRP RFC 2338 VRRP (Premium Edge License) RFC 2364 PPP Over AAL5 RFC 2374 An Aggregatable Global Unicast Address Format RFC 2451 The ESP CBC-Mode Cipher Algorithms RFC 2453 RIPv2 RFC 2510 Internet X.509 Public Key Infrastructure Certificate Management Protocols RFC 2511 Internet X.509 Certificate Request Message Format RFC 2516 A Method for Transmitting PPP Over Ethernet (PPPoE) RFC 2529 Transmission of IPv6 over IPv4 Domains without Explicit Tunnels RFC 2616 HTTP Compatibility v1.1 RFC 2622 Routing Policy Specification Language (RPSL) RFC 2644 Directed Broadcast Control RFC 2661 L2TP

Specifications (continued)

	HP 8812 Router Chassis (JC150B)	HP 8808-V Router Chassis (JC149B)	HP 8805 Router Chassis (JC148B)
Standards and protocols (applies to all products in series)	RFC 2684 Multiprotocol Encapsulation over ATM Adaptation Layer 5 RFC 2694 DNS extensions to Network Address Translators (DNS_ALG) RFC 2702 Requirements for Traffic Engineering Over MPLS RFC 2716 PPP EAP TLS Authentication Protocol RFC 2747 RSVP Cryptographic Authentication RFC 2763 Dynamic Name-to-System ID mapping support RFC 2765 Stateless IP/ICMP Translation Algorithm (SIIT) RFC 2766 Network Address Translation - Protocol Translation (NAT-PT) RFC 2767 Dual Stacks IPv4 & IPv6 RFC 2784 Generic Routing Encapsulation (GRE) RFC 2787 Definitions of Managed Objects for VRRP 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 RFC 2961 RSVP Refresh Overhead Reduction Extensions RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS RFC 2973 IS-IS Mesh Groups RFC 2993 Architectural Implications of NAT RFC 3022 Traditional IP Network Address Translator (Traditional NAT) RFC 3027 Protocol Complications with the IP Network Address Translator RFC 3031 Multiprotocol Label Switching Architecture RFC 3032 MPLS Label Stack Encoding RFC 3036 LDP Specification RFC 3046 DHCP Relay Agent Information Option RFC 3063 MPLS Loop Prevention Mechanism RFC 3065 Support AS confederation RFC 3137 OSPF Stub Router Advertisement RFC 3209 RSVP-TE Extensions to RSVP for LSP Tunnels RFC 3210 Applicability Statement for Extensions to RSVP for LSP-Tunnels RFC 3212 Constraint-Based LSP setup using LDP (CR-LDP) RFC 3214 LSP Modification Using CR-LDP RFC 3215 LDP State Machine RFC 3246 Expedited Forwarding PHB RFC 3268 Advanced Encryption Standard (AES) Ciphersuites for Transport Layer Security (TLS) RFC 3277 IS-IS Transient Blackhole Avoidance RFC 3279 Algorithms and Identifiers for the Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile RFC 3280 Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile RFC 3392 Support BGP capabilities advertisement RFC 3410 Applicability Statements for SNMP RFC 3416 Protocol Operations for SNMP RFC 3417 Transport Mappings for the Simple Network Management Protocol (SNMP) RFC 3479 Fault Tolerance for the Label Distribution Protocol (LDP) RFC 3487 Graceful Restart Mechanism for LDP RFC 3509 OSPF ABR Behavior RFC 3526 More Modular Exponential (MODP) Diffie-Hellman groups for Internet Key Exchange (IKE) RFC 3564 Requirements for Support of Differentiated Services-aware MPLS Traffic Engineering RFC 3567 Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication RFC 3602 The AES-CBC Cipher Algorithm and Its	Use with IPsec RFC 3619 Ethernet Automatic Protection Switching (EAPS) RFC 3623 Graceful OSPF Restart RFC 3704 Unicast Reverse Path Forwarding (URPF) RFC 3706 A Traffic-Based Method of Detecting Dead Internet Key Exchange (IKE) Peers RFC 3768 VRRP RFC 3768 VRRP RFC 3768 VRRP (Premium Edge License) RFC 3784 ISIS TE support RFC 3786 Extending the Number of IS-IS LSP Fragments Beyond the 256 Limit RFC 3811 Definitions of Textual Conventions (TCs) for Multiprotocol Label Switching (MPLS) Management RFC 3812 Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB) RFC 3847 Restart signaling for IS-IS RFC 4213 Basic IPv6 Transition Mechanisms IP Ping **IP multicast** RFC 1112 IGMP RFC 2236 IGMPv2 RFC 2283 Multiprotocol Extensions for BGP-4 RFC 2362 PIM Sparse Mode RFC 2362 PIM Sparse Mode (Premium Edge License) RFC 2362 PIM Sparse Mode RFC 2934 Protocol Independent Multicast MIB for IPv4 RFC 3376 IGMPv3 RFC 3376 IGMPv3 (host joins only) RFC 3569 An Overview of Source-Specific Multicast (SSM) RFC 3618 Multicast Source Discovery Protocol (MSDP) RFC 3973 Draft 2 PIM Dense Mode RFC 3973 Draft 2 PIM Dense Mode RFC 3973 PIM Dense Mode RFC 3973 PIM Dense Mode (Premium Edge License) RFC 3973 PIM Dense Mode RFC 4601 Draft 10 PIM Sparse Mode RFC 4601 Draft 10 PIM Sparse Mode RFC 4605 IGMP/MLD Proxying **IPv6** RFC 1350 TFTP RFC 1881 IPv6 Address Allocation Management RFC 1886 DNS Extension for IPv6 RFC 1887 IPv6 Unicast Address Allocation Architecture RFC 1981 IPv6 Path MTU Discovery RFC 2080 RIPng for IPv6 RFC 2292 Advanced Sockets API for IPv6 RFC 2373 IPv6 Addressing Architecture RFC 2375 IPv6 Multicast Address Assignments 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 2472 IP Version 6 over PPP RFC 2473 Generic Packet Tunneling in IPv6 RFC 2475 IPv6 DiffServ Architecture RFC 2529 Transmission of IPv6 Packets over IPv4 RFC 2545 Use of MP-BGP-4 for IPv6 RFC 2553 Basic Socket Interface Extensions for IPv6 RFC 2710 Multicast Listener Discovery (MLD) for IPv6 RFC 2711 IPv6 Router Alert Option RFC 2740 OSPFv3 for IPv6 RFC 2893 Transition Mechanisms for IPv6 Hosts	and Routers RFC 2925 Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations (Ping only) RFC 2925 Remote Operations MIB (Ping only) RFC 3056 Connection of IPv6 Domains via IPv4 Clouds RFC 3162 RADIUS and IPv6 RFC 3306 Unicast-Prefix-based IPv6 Multicast Addresses RFC 3307 IPv6 Multicast Address Allocation RFC 3315 DHCPv6 (client and relay) RFC 3315 DHCPv6 (client only) RFC 3484 Default Address Selection for IPv6 RFC 3493 Basic Socket Interface Extensions for IPv6 RFC 3513 IPv6 Addressing Architecture RFC 3542 Advanced Sockets API for IPv6 RFC 3587 IPv6 Global Unicast Address Format RFC 3596 DNS Extension for IPv6 RFC 3810 MLDv2 (host joins only) RFC 3810 MLDv2 for IPv6 RFC 3810 Multicast Listener Discovery Version 2 (MLDv2) for IPv6 RFC 4022 MIB for TCP RFC 4113 MIB for UDP RFC 4251 SSHv6 Architecture RFC 4252 SSHv6 Authentication RFC 4252 SSHv6 Transport Layer RFC 4253 SSHv6 Transport Layer RFC 4254 SSHv6 Connection RFC 4291 IP Version 6 Addressing Architecture RFC 4293 MIB for IP RFC 4419 Key Exchange for SSH RFC 4443 ICMPv6 RFC 4541 IGMP & MLD Snooping Switch RFC 4861 IPv6 Neighbor Discovery RFC 4862 IPv6 Stateless Address Auto-configuration RFC 5095 Deprecation of Type 0 Routing Headers in IPv6 RFC 5340 OSPF for IPv6 RFC 5340 OSPFv3 for IPv6 RFC 5722 Handling of Overlapping IPv6 Fragments **MIBs** IEEE 8021-PAE-MIB IEEE 8023-LAG-MIB RFC 1156 (TCP/IP MIB) RFC 1212 Concise MIB Definitions RFC 1213 MIB II RFC 1229 Interface MIB Extensions RFC 1286 Bridge MIB RFC 1493 Bridge MIB RFC 1573 SNMP MIB II RFC 1643 Ethernet MIB RFC 1650 Ethernet-Like MIB RFC 1657 BGP-4 MIB RFC 1724 RIPv2 MIB RFC 1757 Remote Network Monitoring MIB RFC 1850 OSPFv2 MIB RFC 1907 SNMPv2 MIB RFC 2011 SNMPv2 MIB for IP RFC 2012 SNMPv2 MIB for TCP RFC 2013 SNMPv2 MIB for UDP RFC 2021 RMONv2 MIB RFC 2096 IP Forwarding Table MIB RFC 2233 Interface MIB RFC 2233 Interfaces MIB RFC 2273 SNMP-NOTIFICATION-MIB RFC 2452 IPV6-TCP-MIB RFC 2454 IPV6-UDP-MIB RFC 2465 IPv6 MIB RFC 2466 ICMPv6 MIB RFC 2571 SNMP Framework MIB RFC 2572 SNMP-MPD MIB RFC 2573 SNMP-Notification MIB RFC 2573 SNMP-Target MIB

Specifications (continued)

	HP 8812 Router Chassis (JC150B)	HP 8808-V Router Chassis (JC149B)	HP 8805 Router Chassis (JC148B)
Standards and protocols (applies to all products in series)	RFC 2620 RADIUS Accounting MIB RFC 2665 Ethernet-Like-MIB RFC 2668 802.3 MAU MIB RFC 2674 802.1p and IEEE 802.1Q Bridge MIB RFC 2688 MAU-MIB RFC 2737 Entity MIB (Version 2) RFC 2787 VRRP MIB RFC 2819 RMON MIB RFC 2863 The Interfaces Group MIB RFC 2925 Ping MIB RFC 2932IP (Multicast Routing MIB) RFC 2933 IGMP MIB RFC 3273 HC-RMON MIB RFC 3414 SNMP-User based-SM MIB RFC 3415 SNMP-View based-ACM MIB RFC 3418 MIB for SNMPv3 RFC 3621 Power Ethernet MIB RFC 3813 MPLS LSR MIB RFC 3814 MPLS FTN MIB RFC 3815 MPLS LDP MIB RFC 3826 AES for SNMP's USM MIB RFC 4113 UDP MIB RFC 4133 Entity MIB (Version 3) RFC 4221 MPLS FTN MIB LLDP-EXT-DOT1-MIB LLDP-EXT-DOT3-MIB LLDP-MIB **Network management** IEEE 802.1AB Link Layer Discovery Protocol (LLDP) IEEE 802.1D (STP) RFC 1098 A Simple Network Management Protocol (SNMP) RFC 1155 Structure of Management Information RFC 1157 SNMPv1 RFC 1215 SNMP Generic traps RFC 1757 RMON 4 groups: Stats, History, Alarms and Events RFC 1901 SNMPv2 Introduction RFC 1902 SNMPv2 Structure RFC 1903 SNMPv2 Textual Conventions RFC 1904 SNMPv2 Conformance RFC 1905 SNMPv2 Protocol Operations RFC 1906 SNMPv2 Transport Mappings RFC 1918 Private Internet Address Allocation RFC 2272 SNMPv3 Management Protocol RFC 2273 SNMPv3 Applications RFC 2274 USM for SNMPv3 RFC 2275 VACM for SNMPv3 RFC 2570 SNMPv3 Overview RFC 2571 SNMP Management Frameworks RFC 2572 SNMPv3 Message Processing RFC 2573 SNMPv3 Applications RFC 2574 SNMPv3 User-based Security Model (USM) RFC 2575 SNMPv3 View-based Access Control Model (VACM) RFC 2575 VACM for SNMP RFC 2576 Coexistence between SNMP versions RFC 2578 SMIv2 RFC 2581 TCP6 RFC 2819 Four groups of RMON: 1 (statistics), 2 (history), 3 (alarm) and 9 (events) RFC 3164 BSD syslog Protocol RFC 3176 sFlow RFC 3411 SNMP Management Frameworks RFC 3412 SNMPv3 Message Processing RFC 3414 SNMPv3 User-based Security Model	(USM) RFC 3415 SNMPv3 View-based Access Control Model VACM) ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED) SNMPv1/v2 SNMPv1/v2c SNMPv1/v2c (read only) SNMPv1/v2c/v3 **OSPF** RFC 1245 OSPF protocol analysis RFC 1246 Experience with OSPF RFC 1253 OSPFv2 MIB RFC 1583 OSPFv2 RFC 1587 OSPF NSSA RFC 1745 OSPF Interactions RFC 1765 OSPF Database Overflow RFC 1850 OSPFv2 Management Information Base (MIB), traps RFC 2178 OSPFv2 RFC 2328 OSPFv2 RFC 2370 OSPF Opaque LSA Option RFC 3101 OSPF NSSA RFC 3623 Graceful OSPF Restart RFC 5340 OSPF for IPv6 RFC 5340 OSPFv3 for IPv6 **QoS/CoS** IEEE 802.1P (CoS) RFC 2474 DiffServ Precedence, including 8 queues/port RFC 2474 DiffServ precedence, with 4 queues per port RFC 2474 DS Field in the IPv4 and IPv6 Headers RFC 2474 DSCP DiffServ RFC 2474, with 4 queues per port RFC 2475 DiffServ Architecture RFC 2597 DiffServ Assured Forwarding (AF) RFC 2597 DiffServ Assured Forwarding (AF)- partial support RFC 2598 DiffServ Expedited Forwarding (EF) Ingress Rate Limiting **Security** IEEE 802.1X Port Based Network Access Control RFC 1321 The MD5 Message-Digest Algorithm RFC 1492 TACACS+ RFC 2082 RIP-2 MD5 Authentication RFC 2104 Keyed-Hashing for Message Authentication RFC 2138 RADIUS Authentication RFC 2139 RADIUS Accounting RFC 2209 RSVP-Message Processing RFC 2246 Transport Layer Security (TLS) RFC 2459 Internet X.509 Public Key Infrastructure Certificate and CRL Profile RFC 2548 Microsoft Vendor-specific RADIUS Attributes RFC 2716 PPP EAP TLS Authentication Protocol RFC 2818 HTTP Over TLS RFC 2865 RADIUS (client only) RFC 2865 RADIUS Authentication RFC 2866 RADIUS Accounting RFC 2867 RADIUS Accounting Modifications for	Tunnel Protocol Support RFC 2868 RADIUS Attributes for Tunnel Protocol Support RFC 2869 RADIUS Extensions RFC 3567 Intermediate System (IS) to IS Cryptographic Authentication RFC 3576 Dynamic Authorization Extensions to RADIUS RFC 3579 RADIUS Support For Extensible Authentication Protocol (EAP) RFC 3580 IEEE 802.1X RADIUS Access Control Lists (ACLs) Guest VLAN for 802.1x MAC Authentication Port Security Secure Sockets Layer (SSL) SSHv1 Secure Shell SSHv1.5 Secure Shell SSHv1/SSHv2 Secure Shell SSHv2 Secure Shell **VPN** RFC 2403 - HMAC-MD5-96 RFC 2404 - HMAC-SHA1-96 RFC 2405 - DES-CBC Cipher algorithm RFC 2407 - Domain of interpretation RFC 2547 BGP/MPLS VPNs RFC 2764 A Framework for IP Based Virtual Private Networks RFC 2796 BGP Route Reflection - An Alternative to Full Mesh IBGP RFC 2842 Capabilities Advertisement with BGP-4 RFC 2858 Multiprotocol Extensions for BGP-4 RFC 2917 A Core MPLS IP VPN Architecture RFC 2918 Route Refresh Capability for BGP-4 RFC 3107 Carrying Label Information in BGP-4 RFC 3948 - UDP Encapsulation of IPsec ESP Packets RFC 4301 - Security Architecture for the Internet Protocol RFC 4302 - IP Authentication Header (AH) RFC 4303 - IP Encapsulating Security Payload (ESP) RFC 4305 - Cryptographic Algorithm Implementation Requirements for ESP and AH **IPsec** RFC 1828 IP Authentication using Keyed MD5 RFC 2401 IP Security Architecture RFC 2402 IP Authentication Header RFC 2406 IP Encapsulating Security Payload RFC 2407 - Domain of interpretation RFC 2408 - Internet Security Association and Key Management Protocol (ISAKMP) RFC 2409 - The Internet Key Exchange RFC 2410 - The NULL Encryption Algorithm and its use with IPsec RFC 2411 IP Security Document Roadmap RFC 2412 – OAKLEY RFC 2865 - Remote Authentication Dial In User Service (RADIUS) **IKEv1** RFC 2865 - Remote Authentication Dial In User Service (RADIUS) RFC 3748 - Extensible Authentication Protocol (EAP)

HP 8800 Router Series accessories

Transceivers

HP X110 100M SFP LC LH40 Transceiver (JD090A)
HP X110 100M SFP LC LH80 Transceiver (JD091A)
HP X110 100M SFP LC FX Transceiver (JD102B)
HP X110 100M SFP LC LX Transceiver (JD120B)
HP X120 622M SFP LC LX 15km Transceiver (JF829A)
HP X120 622M SFP LC LH 40km 1310 Transceiver (JF830A)
HP X120 622M SFP LC LH 80km 1550 Transceiver (JF831A)
HP X125 1G SFP LC LH40 1310nm Transceiver (JD061A)
HP X120 1G SFP LC LH40 1550nm Transceiver (JD062A)
HP X170 1G SFP LC LH70 1550 Transceiver (JD109A)
HP X170 1G SFP LC LH70 1570 Transceiver (JD110A)
HP X170 1G SFP LC LH70 1590 Transceiver (JD111A)
HP X170 1G SFP LC LH70 1610 Transceiver (JD112A)
HP X170 1G SFP LC LH70 1470 Transceiver (JD113A)
HP X170 1G SFP LC LH70 1490 Transceiver (JD114A)
HP X170 1G SFP LC LH70 1510 Transceiver (JD115A)
HP X170 1G SFP LC LH70 1530 Transceiver (JD116A)
HP X125 1G SFP LC LH70 Transceiver (JD063B)
HP X120 1G SFP LC LH100 Transceiver (JD103A)
HP X120 1G SFP LC BX 10-U Transceiver (JD098B)
HP X120 1G SFP LC BX 10-D Transceiver (JD099B)
HP X120 1G SFP LC SX Transceiver (JD118B)
HP X120 1G SFP LC LX Transceiver (JD119B)
HP X120 1G SFP RJ45 T Transceiver (JD089B)
HP X160 2.5G SFP LC 2km Transceiver (JD084A)
HP X160 2.5G SFP LC 15km Transceiver (JD085A)
HP X160 2.5G SFP LC 40km Transceiver (JD086A)
HP X160 2.5G SFP LC 80km Transceiver (JD087A)
HP X130 10G XFP LC SR Transceiver (JD117B)
HP X135 10G XFP LC ER Transceiver (JD121A)
HP X135 10G XFP LC LR Transceiver (JD088A)
HP X130 10G XFP LC LR Transceiver (JD108B)
HP X130 10G XFP LC ZR Transceiver (JD107A)

Cables

HP X260 E1 BNC 75 ohm 3m Router Cable (JC127A)
HP X260 E1 RJ45 120 ohm 2m Router Cable (JC156A)
HP X260 E1 RJ45 120 ohm 3m Router Cable (JC126A)
HP X260 E1 RJ45 120 ohm 15m Router Cable (JC151A)
HP X260 E1 RJ45 120 ohm 30m Router Cable (JC152A)
HP X260 E1 BNC Extend 10m Router Cable (JC153A)
HP X260 E1 BNC Extend 15m Router Cable (JC154A)
HP X260 E1 BNC Extend 20m Router Cable (JC155A)
HP X260 E1 RJ45 BNC 75-120 ohm Conversion Router Cable (JD511A)
HP X260 T1 RJ45 100 ohm 3m Router Cable (JC128A)
HP X260 T1 Router Cable (JD518A)
HP X260 T1 Voice Router Cable (JD535A)

Mounting Kit

HP X421 Chassis Universal 4-post Rack Mounting Kit (JC665A)

License

HP 8800 Router Software License (JC157A)

Router Modules

HP 8800 Single Service Processing Engine Module (JC139A)
HP 8800 Dual Service Processing Engine Module (JC142A)
HP 8800 Single Service Processing Engine Enhanced Module (JC130A)
HP 8800 Dual Service Processing Engine Enhanced Module (JC133A)
HP 8800 10-port GbE SFP Module (JC131A)
HP 8800 20-port 1000BASE-X Module (JC132B)
HP 8800 20-port 10/100/1000 Ethernet Electrical Interface Module (JC135B)
HP 8800 1-port 10-GbE XFP Module (JC129A)
HP 8800 8-port E1/T1 / 8-port SFP Module (JC134A)
HP 8800 32-port E1/T1 / 2-port GbE SFP Module (JC145A)
HP 8800 1-port OC-3/STM-1 (E1/T1) CPOS / 8-port GbE SFP Module (JC477A)
HP 8800 2-port OC-3/STM-1 (E1/T1) CPOS / 8-port GbE SFP Module (JC478A)
HP 8800 4-port OC-3/STM-1 (E3/T3) CPOS/4-port GbE SFP Module (JC479A)
HP 8800 1-port OC-12/STM-4 (E3/T3) CPOS / 4-port GbE SFP Module (JC480A)
HP 8800 1-port OC-48/STM-16 (OC-3) CPOS SFP Module (JC481A)
HP 8800 8-port OC-3c/OC-12c POS / GbE SFP Module (JC482A)
HP 8800 2-port OC-3c/STM-1c POS SFP / 6-port GbE SFP Module (JC483A)
HP 8800 2-port OC-12c/STM-4c POS SFP / 6-port GbE SFP Module (JC484A)
HP 8800 2-port OC-48c/STM-16c POS SFP / 4-port GbE SFP Module (JC485A)
HP 8800 4-port OC-48c / STM-16c POS SFP Module (JC486A)
HP 8800 1-port OC-192c/STM-64c POS XFP Module (JC487A)
HP 8800 2-port OC-48c/STM-16c RPR SFP Module (JC488A)
HP 8800 1-port OC-192c/STM-64c RPR XFP Module (JC489A)
HP 8800 4-port OC-3c/STM-1c ATM SFP Module (JC490A)
HP 8800 1-port OC-12c/STM-4c ATM SFP Module (JC491A)
HP 8800 Net Analysis Service Processing Module (JC143A)
HP 8800 NAT Processing Module (JC144A)
HP 8800 Dual Fabric Main Processing Unit (JC596A)

HP 8800 Router Series accessories (continued)

HP 8800 Single Processor Service Engine Module (JC598A)
HP 8800 Dual Processor Service Engine Module (JC599A)
HP 8800 Network Address Translation Service Module (JC607A)
HP 8800 48-port GbE SFP Service Processing Module (JC604A)
HP 8800 4-port 10GbE XFP Service Processing Module (JC602A)
HP 8800 2-port 10GbE XFP Service Processing Module (JC605A)
HP 8800 16-port GbE SFP/8-port GbE Combo Service Processing Module (JC606A)
HP 2GB Registered DDR2 SDRAM Memory (JC609A)
HP 8800 Single Fabric Main Processing Unit (JC597A)

Appliance

HP 8800 Firewall Processing Module (JD251A)
HP 8800 VPN Firewall Module (JC640A)

Memory

HP 8800 1GB SDRAM (JC136A)
HP X600 1G Compact Flash Card (JC684A)
HP X600 512M Compact Flash Card (JC685A)
HP X600 256M Compact Flash Card (JC686A)

HP 8812 Router Chassis (JC150B)

HP 9500 3500W AC Power Frame (JC111A)
HP 9500/8800 1800W AC Power Supply (JC110B)
HP 9500/8800 3500W DC Power Supply (JC473A)
HP 8805/8808/8812 (2E) Main Control Unit Module (JC137A)
HP 8805/8808/8812 (1E) Main Control Unit Module (JC138A)
HP 8800 Single Fabric Main Processing Unit (JC597A)
HP 8800 Dual Fabric Main Processing Unit (JC596A)

HP 8808-V Router Chassis (JC149B)

HP 9500 3500W AC Power Frame (JC111A)
HP 9500/8800 1800W AC Power Supply (JC110B)
HP 9500/8800 3500W DC Power Supply (JC473A)
HP 8805/8808/8812 (2E) Main Control Unit Module (JC137A)
HP 8805/8808/8812 (1E) Main Control Unit Module (JC138A)
HP 8800 Single Fabric Main Processing Unit (JC597A)
HP 8800 Dual Fabric Main Processing Unit (JC596A)

HP 8805 Router Chassis (JC148B)

HP 9500/8800 1800W AC Power Supply (JC110B)
HP 9500 3500W AC Power Frame (JC111A)
HP 9500/8800 2000W 36-75V DC Power Supply (JC029B)
HP 8805/8808/8812 (2E) Main Control Unit Module (JC137A)
HP 8805/8808/8812 (1E) Main Control Unit Module (JC138A)
HP 8800 Single Fabric Main Processing Unit (JC597A)
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