Standards Supported in Junos OS 12.1

Published: 2012-03-08
Part Number: , Revision

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Revision History
Feb 2012—B2 Junos OS 12.1

The information in this document is current as of the date on the title page.

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PART 1

Overview

CHAPTER 1

Accessing Standards Documents

Accessing Standards Documents on the Internet

The following information about the location of standards on the Internet is accurate as of February 2011. It is subject to change and is provided only as a courtesy to the reader.

Information about accessing MIBs is provided in the entry for each MIB.

- ANSI standards are published by the American National Standards Institute. You can search for specific standards at http://webstore.ansi.org.
- FRF (Frame Relay Forum) standards are published by the Broadband Forum. They can be accessed at http://www.broadband-forum.org/technical/frametechspec.php.
- GR (Generic Requirements) standards are published by Telcordia. Information about them can be accessed by clicking the "Document Center" link at http://telecom-info.telcordia.com/site-cgi/ido/.
- IEEE standards are published by the Institute of Electrical and Electronics Engineers. They can be accessed at http://standards.ieee.org/getieee802/index.html.
- ISO/IEC standards are published by the International Organization for Standardization/International Electrotechnical Commission. They can be accessed at http://www.iso.org/iso/iso_catalogue/catalogue_tc/.
- INCITS standards are published by the InterNational Committee for Information Technology Standards. They can be accessed at https://standards.incits.org/.
- Internet drafts are published by the Internet Engineering Task Force (IETF). They can be accessed at http://tools.ietf.org/id/.
- ITU–T Recommendations are published by the International Telecommunication Union. They can be accessed at http://www.itu.int/rec/T-REC.
- RFCs are published by the IETF. They can be accessed at http://www.ietf.org/rfc.html.

PART 2

Supported Standards

CHAPTER 2

Chassis and System Standards

Supported BOOTP and DHCP Standards

The Junos OS substantially supports the following RFCs, which define standards for bootstrap protocol (BOOTP) and Dynamic Host Control Protocol (DHCP).

- RFC 951, *BOOTSTRAP PROTOCOL (BOOTP)*
- RFC 1001, *PROTOCOL STANDARD FOR A NetBIOS SERVICE ON A TCP/UDP TRANSPORT: CONCEPTS AND METHODS*
- RFC 1002, *PROTOCOL STANDARD FOR A NetBIOS SERVICE ON A TCP/UDP TRANSPORT: DETAILED SPECIFICATIONS*
- RFC 1035, *DOMAIN NAMES - IMPLEMENTATION AND SPECIFICATION*
- RFC 1534, *Interoperation Between DHCP and BOOTP*
- RFC 1700, *ASSIGNED NUMBERS*
- RFC 2131, *Dynamic Host Configuration Protocol*

  DHCP over virtual LAN (VLAN)-tagged interfaces is not supported.
- RFC 2132, *DHCP Options and BOOTP Vendor Extensions*
- RFC 3046, *DHCP Relay Agent Information Option*
- RFC 3118, *Authentication for DHCP Messages*

  Only Section 4, “Configuration token,” is supported.
- RFC 3315, *Dynamic Host Configuration Protocol for IPv6 (DHCPv6)*

  Address assignment is supported with IP version 4 (IPv4) but not IP version 6 (IPv6).
- RFC 3397, *Dynamic Host Configuration Protocol (DHCP) Domain Search Option*

- RFC 3633, *IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) version 6*
- RFC 3925, *Vendor-Identifying Vendor Options for Dynamic Host Configuration Protocol version 4 (DHCPv4)*
- RFC 4649, *Dynamic Host Configuration Protocol for IPv6 (DHCPv6) Relay Agent Remote-ID Option*

Related Documentation

- Accessing Standards Documents on the Internet on page 3

Supported Mobile IP Standards

The Junos OS supports only static configuration of home agent addresses and IP tunnels; dynamic configuration is not supported. The Junos OS does not support the Mobile IP foreign agent, accounting, QoS, policy, data path, or logical interfaces per mobile node (for a mobile subscriber).

The Junos OS substantially supports the following RFCs, which define standards for Mobile IP.

- RFC 2794, *Mobile IP Network Access Identifier Extension for IPv4*
- RFC 3024, *Reverse Tunneling for Mobile IP, revised*
- RFC 3344, *IP Mobility Support for IPv4*

  Only the Mobile IP home agent is supported.
- RFC 3543, *Registration Revocation in Mobile IPv4*
- RFC 4433, *Mobile IPv4 Dynamic Home Agent (HA) Assignment*

The following RFC does not define a standard, but provides information about Mobile IP. The IETF classifies it as “Informational.”

- RFC 2977, *Mobile IP Authentication, Authorization, and Accounting Requirements*

  Accounting is not supported.

Related Documentation

- Accessing Standards Documents on the Internet on page 3

Supported Network Management Standards

The Junos OS supports the majority of network management features defined in the following standards documents.

- Extended Security Options (ESO) Consortium, *ESO Consortium MIB*.

  As of February 2011, the text of this MIB is accessible at http://www.snmp.com/eso/esoConsortiumMIB.txt.

- Institute of Electrical and Electronics Engineers (IEEE) Standard 802.3ad, *Aggregation of Multiple Link Segments* (published as Clause 43 in Section 3 of the 802.3 specification)

  Only the following MIB objects are supported:

  - **dot3adAggPortDebugActorChangeCount**
  - **dot3adAggPortDebugActorSyncTransitionCount**
  - **dot3adAggPortDebugMuxState**
  - **dot3adAggPortDebugPartnerChangeCount**
  - **dot3adAggPortDebugPartnerSyncTransitionCount**
  - **dot3adAggPortDebugRxState**
  - **dot3adAggPortListTable**
  - **dot3adAggPortStatsTable**
  - **dot3adAggPortTable**
  - **dot3adAggTable**
  - **dot3adTablesLastChanged**

  Gigabit Ethernet interfaces on J Series Services Routers do not support the 802.3ad MIB.

- Integrated Local Management Interface (ILMI) MIB in the *Integrated Local Management Interface (ILMI) Specification, Version 4.0*.

  As of February 2011, this document is accessible at http://www.broadband-forum.org/ftp/pub/approved-specs/af-ilmi-0065.000.pdf.

  Only the **atmfMYIPNmAddress** and **atmfPortMyIfname** objects are supported.

- Internet Assigned Numbers Authority (IANA), *IANAiftype Textual Convention MIB* (referenced by RFC 2863, *The Interfaces Group MIB*)

  As of February 2011, the text of this MIB is accessible at http://www.iana.org/assignments/ianaiftype-mib.

- RFC 1122, *Requirements for Internet Hosts -- Communication Layers*

- RFC 1155, *Structure and Identification of Management Information for TCP/IP-based Internets*
- RFC 1156, *Management Information Base for Network Management of TCP/IP-based internets*
- RFC 1157, *A Simple Network Management Protocol (SNMP)*
- RFC 1195, *Use of OSI IS-IS for Routing in TCP/IP and Dual Environments*

  Only the following MIB objects are supported:

  - **isisAdjIPAddr**
  - **isisAreaAddr**
  - **isisCirc**
  - **isisCircLevel**
  - **isisIPRA**
  - **isisISAdj**
  - **isisISAdjAreaAddr**
  - **isisISAdjProtSupp**
  - **isisMANAreaAddr**
  - **isisPacketCount**
  - **isisRa**
  - **isisSysProtSupp**
  - **isisSummAddr**
  - **isisSystem**
- RFC 1212, *Concise MIB Definitions*

- RFC 1213, *Management Information Base for Network Management of TCP/IP-based internets: MIB-II*

  Only the following features are supported:

  - Junos-specific secured access list
  - Master configuration keywords
  - MIB II and its SNMP version 2 derivatives, including the following:
    - Interface management
    - IP (except for the **ipRouteTable** object, which has been replaced by **ipCidrRouteTable** [RFC 2096, *IP Forwarding Table MIB*])
    - SNMP management
    - Statistics counters
  - Reconfigurations upon receipt of the SIGHUP signal
  - SNMP version 1 **Get** and **GetNext** requests and version 2 **GetBulk** requests

- RFC 1215, *A Convention for Defining Traps for use with the SNMP*

  Only MIB II SNMP version 1 traps and version 2 notifications are supported.

- RFC 1406, *Definitions of Managed Objects for the DS1 and E1 Interface Types* (obsoleted by RFC 2495)

  The T1 MIB is supported.

- RFC 1407, *Definitions of Managed Objects for the DS3/E3 Interface Type* (obsoleted by RFC 2496)

  The T3 MIB is supported.

- RFC 1472, *The Definitions of Managed Objects for the Security Protocols of the Point-to-Point Protocol*
- RFC 1473, *The Definitions of Managed Objects for the IP Network Control Protocol of the Point-to-Point Protocol*
- RFC 1657, *Definitions of Managed Objects for the Fourth Version of the Border Gateway Protocol (BGP-4) using SMIv2*

  The **bgpBackwardTransition** and **bgpEstablished** notifications are not supported.

- RFC 1695, *Definitions of Managed Objects for ATM Management Version 8.0 Using SMIv2* (obsoleted by RFC 2515)
- RFC 1724, *RIP Version 2 MIB Extension*

- RFC 1850, *OSPF Version 2 Management Information Base*

  The following features are not supported:

  - Host Table
  - **ospfLsdbApproachingOverflow** trap
  - **ospfLsdbOverflow** trap
  - **ospfOriginateLSA** trap
  - **ospfOriginateNewLsas** MIB object
  - **ospfRxNewLsas** MIB object

- RFC 1905, *Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)* (obsoleted by RFC 3416)
- RFC 1907, *Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2)* (obsoleted by RFC 3418)
- RFC 2011, *SNMPv2 Management Information Base for the Internet Protocol using SMIv2*
- RFC 2012, *SNMPv2 Management Information Base for the Transmission Control Protocol using SMIv2*
- RFC 2013, *SNMPv2 Management Information Base for the User Datagram Protocol using SMIv2*
- RFC 2068, *Hypertext Transfer Protocol -- HTTP/1.1*
- RFC 2096, *IP Forwarding Table MIB*

  The **ipCidrRouteTable** object is extended to include the tunnel name when the next hop is through an RSVP-signaled label-switched path (LSP).

- RFC 2115, *Management Information Base for Frame Relay DTEs Using SMIv2*

  Only the **frDlcmiTable** object is supported.

- RFC 2233, *The Interfaces Group MIB using SMIv2* (obsoleted by RFC 2863)
- RFC 2287, *Definitions of System-Level Managed Objects for Applications*

  Only the following MIB objects are supported:

  - **sysApplElmtRunTable**
  - **sysApplInstallElmtTable**
  - **sysApplInstallPkgTable**
  - **sysApplMapTable**

- RFC 2465, *Management Information Base for IP Version 6: Textual Conventions and General Group*

  IP version 6 (IPv6) and Internet Control Message Protocol version 6 (ICMPv6) statistics are not supported.

- RFC 2466, *Management Information Base for IP Version 6: ICMPv6 Group*
- RFC 2495, *Definitions of Managed Objects for the DS1, E1, DS2 and E2 Interface Types*

  The following MIB objects are not supported:

  - **dsx1FarEndConfigTable**
  - **dsx1FarEndCurrentTable**
  - **dsx1FarEndIntervalTable**
  - **dsx1FarEndTotalTable**
  - **dsx1FracTable**
- RFC 2496, *Definitions of Managed Objects for the DS3/E3 Interface Type*

  The following MIB objects are not supported:

  - **dsx3FarEndConfigTable**
  - **dsx3FarEndCurrentTable**
  - **dsx3FarEndIntervalTable**
  - **dsx3FarEndTotalTable**
  - **dsx3FracTable**
- RFC 2515, *Definitions of Managed Objects for ATM Management*

  The following MIB objects are not supported:

  - **aal5VccTable**
  - **atmVcCrossConnectTable**
  - **atmVpCrossConnectTable**
- RFC 2558, *Definitions of Managed Objects for the SONET/SDH Interface Type* (obsoleted by RFC 3592)
- RFC 2571, *An Architecture for Describing SNMP Management Frameworks*

  Only read-only access is supported.
- RFC 2572, *Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)* (obsoleted by RFC 3412)

  Only read-only access is supported.
- RFC 2578, *Structure of Management Information Version 2 (SMIv2)*
- RFC 2579, *Textual Conventions for SMIv2*
- RFC 2580, *Conformance Statements for SMIv2*

- RFC 2662, *Definitions of Managed Objects for the ADSL Lines*

  Supported on J Series Services Routers. All MIB tables, objects, and traps applicable to the asymmetric digital subscriber line (ADSL) transceiver unit–remote (ATU-R) agent are supported.

- RFC 2665, *Definitions of Managed Objects for the Ethernet-like Interface Types*
- RFC 2667, *IP Tunnel MIB*
- RFC 2787, *Definitions of Managed Objects for the Virtual Router Redundancy Protocol*

  The following features are not supported:

  - Row creation
  - **Set** operation
  - **vrrpStatsPacketLengthErrors** MIB object

- RFC 2790, *Host Resources MIB*

  Only the following MIB objects are supported:

  - **hrStorageTable** object. The file systems **/**, **/config**, **/var**, and **/tmp** always return the same index number. When SNMP restarts, the index numbers for the remaining file systems might change.
  - Objects in the **hrSystem** group.
  - Objects in the **hrSWInstalled** group.

- RFC 2819, *Remote Network Monitoring Management Information Base*

  Only the following MIB objects are supported:

  - **alarmTable**
  - **etherStatsTable** object for Ethernet interfaces
  - **eventTable**
  - **logTable**

- RFC 2863, *The Interfaces Group MIB*
- RFC 2864, *The Inverted Stack Table Extension to the Interfaces Group MIB*

- RFC 2925, *Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations*

  Only the following MIB objects are supported:

  - **pingCtlTable**
  - **pingMaxConcurrentRequests**
  - **pingProbeHistoryTable**
  - **pingResultsTable**
  - **traceRouteCtlTable**
  - **traceRouteHopsTable**
  - **traceRouteProbeHistoryTable**
  - **traceRouteResultsTable**
- RFC 2932, *IPv4 Multicast Routing MIB*
- RFC 2933, *Internet Group Management Protocol MIB*
- RFC 2981, *Event MIB*
- RFC 3014, *Notification Log MIB*
- RFC 3019, *IP Version 6 Management Information Base for The Multicast Listener Discovery Protocol*
- RFC 3411, *An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks*
- RFC 3412, *Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)*
- RFC 3413, *Simple Network Management Protocol (SNMP) Applications*

  The proxy MIB is not supported.
- RFC 3414, *User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)*
- RFC 3415, *View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)*
- RFC 3416, *Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)*
- RFC 3417, *Transport Mappings for the Simple Network Management Protocol (SNMP)*
- RFC 3418, *Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)*
- RFC 3498, *Definitions of Managed Objects for Synchronous Optical Network (SONET) Linear Automatic Protection Switching (APS) Architectures*

  Support is implemented under the Juniper Networks enterprise branch.

- RFC 3592, *Definitions of Managed Objects for the Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) Interface Type*
- 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)*

  Only read-only access is supported, and the following features and MIB objects are not supported:

  - MPLS tunnels as interfaces
  - **mplsTunnelCRLDPResTable** object
  - **mplsTunnelPerfTable** object
  - The following objects in the **TunnelResource** table:
    - **mplsTunnelResourceExBurstSize**
    - **mplsTunnelResourceMaxBurstSize**
    - **mplsTunnelResourceMeanBurstSize**
    - **mplsTunnelResourceMeanRate**
    - **mplsTunnelResourceWeight**

  The **mplsTunnelCHopTable** object is supported on ingress routers only.

  

  NOTE: The branch used by the proprietary LDP MIB (**ldpmib.mib**) conflicts with RFC 3812. **ldpmib.mib** has been deprecated and replaced by **jnx-mpls-ldp.mib**.

- RFC 3813, *Multiprotocol Label Switching (MPLS) Label Switching Router (LSR) Management Information Base (MIB)*

  Only read-only access is supported, and the following MIB objects are not supported:

  - **mplsInSegmentMapTable**
  - **mplsInSegmentPerfTable**
  - **mplsInterfacePerfTable**
  - **mplsOutSegmentPerfTable**
  - **mplsXCDown**
  - **mplsXCUp**

- RFC 3815, *Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)*

  Only the following MIB objects are supported:

  - **mplsLdpLsrID**
  - **mplsLdpSesPeerAddrTable**

- RFC 3826, *The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model*
- RFC 4188, *Definitions of Managed Objects for Bridges*
- Internet draft draft-ietf-bfd-mib-02.txt, *Bidirectional Forwarding Detection Management Information Base*

  Only read-only access is supported, and the **bfdSessDown** and **bfdSessUp** traps are supported. Objects in the **bfdSessMapTable** and **bfdSessPerfTable** tables are not supported. The MIB that supports this draft is **mib-jnx-bfd-exp.txt** under the Juniper Networks Enterprise **jnxExperiment** branch.

- Internet draft draft-ietf-idr-bgp4-mibv2-04.txt, *Definitions of Managed Objects for the Fourth Version of Border Gateway Protocol (BGP-4), Second Version*

  Only the following MIB objects are supported:

  - **jnxBgpM2PrefixInPrefixes**
  - **jnxBgpM2PrefixInPrefixesAccepted**
  - **jnxBgpM2PrefixInPrefixesRejected**

- Internet draft draft-ietf-isis-wg-mib-07.txt, *Management Information Base for IS-IS*

  Only the following tables are supported:

  - **isisISAdjAreaAddrTable**
  - **isisISAdjIPAddrTable**
  - **isisISAdjProtSuppTable**
  - **isisISAdjTable**

- Internet draft draft-ietf-msdp-mib-08.txt, *Multicast Source Discovery protocol MIB*

  The following MIB objects are not supported:

  - **msdpBackwardTransition**
  - **msdpEstablished**
  - **msdpRequestsTable**

- Internet draft draft-ietf-ospf-ospfv3-mib-11.txt, *Management Information Base for OSPFv3*

  Only read-only access is supported, and only for the **ospfv3NbrTable** table. The MIB that supports this draft is **mib-jnx-ospfv3mib.txt** under the Juniper Networks Enterprise **jnxExperiment** branch; MIB object names are prefixed with **jnx** (for example, **jnxOspfv3NbrAddressType**).

- Internet draft draft-reeder-snmpv3-usm-3desede-00.txt, *Extension to the User-Based Security Model (USM) to Support Triple-DES EDE in "Outside" CBC Mode*

The following RFCs do not define standards, but provide information about network management. The IETF classifies them variously as "Best Current Practice," "Experimental" or "Informational."

- RFC 1901, *Introduction to Community-based SNMPv2*
- RFC 2330, *Framework for IP Performance Metrics*
- RFC 2934, *Protocol Independent Multicast MIB for IPv4*
- RFC 3410, *Introduction and Applicability Statements for Internet Standard Management Framework*
- RFC 3584, *Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework*

Related Documentation

- Network Management Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported RADIUS and TACACS+ Standards for User Authentication

For validation of the identity of users who attempt to access a router, the Junos OS supports RADIUS authentication, TACACS+ authentication, and authentication by means of Junos user accounts configured on the router. The Junos OS supports the configuration of Juniper Networks-specific RADIUS and TACACS+ attributes, and the creation of template accounts.

All users who can log in to the router must already be assigned to a Junos login class. A *login class* defines its members' access privileges during a login session, the commands they can and cannot issue, the configuration statements they can and cannot view or change, and the idle time before a member's login session is terminated.

The Junos OS substantially supports the following RFCs, which define standards for RADIUS and TACACS+.

- RFC 1492, *An Access Control Protocol, Sometimes Called TACACS*
- RFC 2865, *Remote Authentication Dial In User Service (RADIUS)*
- RFC 3162, *RADIUS and IPv6*
- RFC 4818, *RADIUS Delegated-IPv6-Prefix Attribute*

The following Internet drafts do not define standards, but provide information about RADIUS. The IETF classifies them as "Informational."

- RFC 2866, *RADIUS Accounting*
- RFC 2868, *RADIUS Attributes for Tunnel Protocol Support*
- RFC 2869, *RADIUS Extensions*
- RFC 4679, *DSL Forum Vendor-Specific RADIUS Attributes*
- RFC 5176, *Dynamic Authorization Extensions to Remote Authentication Dial In User Service (RADIUS)*

Related Documentation

- Supported System Access Standards on page 19
- Accessing Standards Documents on the Internet on page 3

Supported System Access Standards

The Junos OS substantially supports the following protocols and applications for remote access to routers: telnet, FTP, rlogin, and finger. In addition, the Canada and U.S. version of the Junos OS substantially supports SSH as an access protocol.

The Junos OS substantially supports RFC 1994, *PPP Challenge Handshake Authentication Protocol (CHAP)*.

The Canada and U.S. version of the Junos OS substantially supports the following RFCs, which define standards for technologies used with Secure Sockets Layer (SSL):

- RFC 1319, *The MD2 Message-Digest Algorithm*
- RFC 1321, *The MD5 Message-Digest Algorithm*
- RFC 2246, *The TLS Protocol Version 1.0*
- RFC 3280, *Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile*

The following RFCs provide information about TFTP, which Junos OS supports as a remote access protocol. The IETF does not include the RFCs in its Standards track, instead assigning them status "Unknown (Legacy Stream)".

- RFC 783, *THE TFTP PROTOCOL (REVISION 2)*.
- RFC 906, *Bootstrap Loading using TFTP*.

Related Documentation

- Supported RADIUS and TACACS+ Standards for User Authentication on page 18
- Accessing Standards Documents on the Internet on page 3

Supported Time Synchronization Standard

The Junos OS substantially supports RFC 1305, *Network Time Protocol (Version 3) Specification, Implementation and Analysis*.

RFC 2030, *Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI*, does not define a standard, but provides information about time synchronization technology. The IETF classifies it as "Informational."

In CLI operational mode, you can set the current date and time on the router manually or from an NTP server.

Related Documentation

- Accessing Standards Documents on the Internet on page 3

CHAPTER 3

Interface Standards

Supported ATM Interface Standards

The Junos OS substantially supports the following standards for Asynchronous Transfer Mode (ATM) interfaces.

- International Telecommunication Union–Telecommunication Standardization (ITU–T) Recommendation I.432.3, *B-ISDN user-network interface - Physical layer specification: 1544 kbit/s and 2048 kbit/s operation*
- RFC 1483, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*

  Only routed protocol data units (PDUs) are supported.
- RFC 2225, *Classical IP and ARP over ATM*

  Only responses are supported.
- RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*

  Only routed PDUs and Ethernet bridged PDUs are supported.

Related Documentation

- Accessing Standards Documents on the Internet on page 3

Supported Ethernet Interface Standards

The Junos OS substantially supports the following standards for Ethernet interfaces.

- Institute of Electrical and Electronics Engineers (IEEE) Standard 802.1ag, *IEEE Standard for Local and metropolitan area networks—Virtual Bridged Local Area Networks, Amendment 5: Connectivity Fault Management*
- IEEE Standard 802.1ah, *IEEE Standard for Local and metropolitan area networks—Virtual Bridged Local Area Networks, Amendment 7: Provider Backbone Bridges*
- IEEE Standard 802.1Q, *IEEE Standard for Local and metropolitan area networks—Virtual Bridged Local Area Networks*
- IEEE Standard 802.1Qbb, *IEEE Standard for Local and Metropolitan Area Networks---Virtual Bridged Local Area Networks - Amendment: Enhanced Transmission Selection*
- IEEE Standard 802.1Qbb, *IEEE Standard for Local and Metropolitan Area Networks---Virtual Bridged Local Area Networks - Amendment: Priority-based Flow Control*
- IEEE Standard 802.1s, *IEEE Standard for Multiple Instances of Spanning Tree Protocol (MSTP)---Virtual Bridged Local Area Networks*
- IEEE Standard 802.3, *IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements, Part 3: Carrier sense multiple access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications*
- IEEE Standard 802.3ab, *1000BASE-T* (published as Clause 40 in Section 3 of the 802.3 specification)
- IEEE Standard 802.3ad, *Aggregation of Multiple Link Segments* (published as Clause 43 in Section 3 of the 802.3 specification)
- IEEE Standard 802.3ae, *10-Gigabit Ethernet* (published as Clauses 44-53 in Section 4of the 802.3 specification)
- IEEE Standard 802.3ah, *Operations, Administration, and Maintenance (OAM)* (published as Clause 57 in Section 5 of the 802.3 specification)
- IEEE Standard 802.3z, *1000BASE-X* (published as Clauses 34-39, 41-42 in Section 3 of the 802.3 specification)
- InterNational Committee for Information Technology Standards (INCITS) T11, *Fibre Channel Interfaces*
- International Telecommunication Union–Telecommunication Standardization (ITU–T) Recommendation Y.1731, *OAM functions and mechanisms for Ethernet based networks*

Related Documentation

- Accessing Standards Documents on the Internet on page 3

Supported Frame Relay Interface Standards

The Junos OS substantially supports the following standards for Frame Relay interfaces.

- American National Standards Institute (ANSI), *Annex D, Additional Procedures for Permanent Virtual Connections (PVCs) Using Unnumbered Information Frames* to T1.617-1991, *Integrated Services Digital Network (ISDN)—Signaling Specification for Frame Relay Bearer Service for Digital Subscriber Signaling System Number 1 (DSS1)*
- Broadband Forum standard FRF.12, *Frame Relay Fragmentation Implementation Agreement*
- FRF.15, *End-to-End Multilink Frame Relay Implementation Agreement*
- FRF.16.1, *Multilink Frame Relay UNI/NNI Implementation Agreement*
- International Telecommunication Union–Telecommunication Standardization (ITU–T), *Annex A, Additional procedures for Permanent Virtual Connection (PVC) status management (using Unnumbered Information frames)* to Recommendation Q.933, *ISDN Digital Subscriber Signalling System No. 1 (DSS1) - Signalling specifications for frame mode switched and permanent virtual connection control and status monitoring*
- RFC 1973, *PPP in Frame Relay*
- RFC 2390, *Inverse Address Resolution Protocol*
- RFC 2427, *Multiprotocol Interconnect over Frame Relay* (obsoletes RFC 1490)
- RFC 2590, *Transmission of IPv6 Packets over Frame Relay Networks Specification*
- Internet draft draft-martini-frame-encap-mpls-01.txt, *Frame Relay Encapsulation over Pseudo-Wires* (expires December 2002)

  Translation of the command/response bit and sequence numbers and padding are not supported.

Related Documentation

- Accessing Standards Documents on the Internet on page 3

Supported GRE and IP-IP Interface Standards

The Junos OS substantially supports the following RFCs, which define standards for generic routing encapsulation (GRE) and IP-IP interfaces.

- RFC 2003, *IP Encapsulation within IP*
- RFC 2784, *Generic Routing Encapsulation (GRE)*
- RFC 2890, *Key and Sequence Number Extensions to GRE*

  The key field is supported, but the sequence number field is not.

The following RFCs do not define standards, but provide information about GRE, IP-IP, and related technologies. The IETF classifies them as “Informational.”

- RFC 1701, *Generic Routing Encapsulation (GRE)*

- RFC 1702, *Generic Routing Encapsulation over IPv4 networks*
- RFC 2547, *BGP/MPLS VPNs* (over GRE tunnels)

Related Documentation

- Accessing Standards Documents on the Internet on page 3

Supported PPP Interface Standards

The Junos OS substantially supports the following RFCs, which define standards for Point-to-Point Protocol (PPP) interfaces.

- RFC 1332, *The PPP Internet Protocol Control Protocol (IPCP)*
- RFC 1334, *PPP Authentication Protocols*
- RFC 1661, *The Point-to-Point Protocol (PPP)*
- RFC 1662, *PPP in HDLC-like Framing*
- RFC 1989, *PPP Link Quality Monitoring*
- RFC 1990, *The PPP Multilink Protocol (MP)*
- RFC 2364, *PPP Over AAL5*
- RFC 2615, *PPP over SONET/SDH*
- RFC 2686, *The Multi-Class Extension to Multi-Link PPP*

  The following features are not supported:

  - Negotiation of address field compression and protocol field compression PPP NCP options; instead, a full 4-byte PPP header is always sent
  - Prefix elision
- RFC 3021, *Using 31-Bit Prefixes on IPv4 Point-to-Point Links*

The following RFCs do not define standards, but provide information about PPP. The IETF classifies them as “Informational.”

- RFC 1877, *PPP Internet Protocol Control Protocol Extensions for Name Server Addresses*
- RFC 2153, *PPP Vendor Extensions*

Related Documentation

- Accessing Standards Documents on the Internet on page 3

Supported SDH and SONET Interface Standards

The Junos OS substantially supports the following standards for SDH and SONET interfaces.

- American National Standards Institute (ANSI) standard T1.105-2001, *Synchronous Optical Network (SONET) – Basic Description including Multiplex Structure, Rates, and Formats*
- ANSI standard T1.105.02-2001, *Synchronous Optical Network (SONET) – Payload Mappings*
- ANSI standard T1.105.06-2002, *Synchronous Optical Network (SONET): Physical Layer Specifications*
- GR-253-CORE (Telcordia Generic Requirements standard), *Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria* (replaces GR-1377-CORE, *SONET OC-192 Transport System Generic Criteria*)
- GR-499-CORE, *Transport Systems Generic Requirements (TSGR): Common Requirements*
- International Telecommunication Union–Telecommunication Standardization (ITU–T) Recommendation G.691, *Optical interfaces for single channel STM-64 and other SDH systems with optical amplifiers*
- ITU–T Recommendation G.707 (1996), *Network node interface for the synchronous digital hierarchy (SDH)*
- ITU–T Recommendation G.783 (1994), *Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks*
- ITU–T Recommendation G.813 (1996), *Timing characteristics of SDH equipment slave clocks (SEC)*
- ITU–T Recommendation G.825 (1993), *The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)*
- ITU–T Recommendation G.826 (1999), *Error performance parameters and objectives for international, constant bit-rate digital paths at or above the primary rate*
- ITU–T Recommendation G.831 (1993), *Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)*
- ITU–T Recommendation G.957 (1995), *Optical interfaces for equipments and systems relating to the synchronous digital hierarchy*
- ITU–T Recommendation G.958 (1994), *Digital line systems based on the synchronous digital hierarchy for use on optical fibre cables*
- ITU–T Recommendation I.432 (1993), *B-ISDN user-network interface – Physical layer specification*
- RFC 1619, *PPP over SONET/SDH*

Related Documentation
- Accessing Standards Documents on the Internet on page 3

Supported Serial Interface Standards

The Junos OS substantially supports the following standards for serial interfaces.

- International Telecommunication Union–Telecommunication Standardization (ITU–T) Recommendation V.35, *Data transmission at 48 kilobits per second using 60-108 kHz group band circuits*
- ITU–T Recommendation X.21 (1992), *Interface between Data Terminal Equipment and Data Circuit-terminating Equipment for synchronous operation on public data networks*

Related Documentation
- Accessing Standards Documents on the Internet on page 3

Supported T3 Interface Standard

The Junos OS substantially supports International Telecommunication Union–Telecommunication Standardization (ITU–T) Recommendation G.703, *Physical/electrical characteristics of hierarchical digital interfaces*.

Related Documentation
- Accessing Standards Documents on the Internet on page 3

CHAPTER 4

Layer 2 Standards

Supported Layer 2 Networking Standards

The Junos OS substantially supports the following standards for Layer 2 networking.

- Institute of Electrical and Electronics Engineers (IEEE) Standard 802.1ab, *IEEE Standard for Local and metropolitan area networks—Station and Media Access Control Connectivity Discovery*
- IEEE Standard 802.1D, *IEEE Standard for Local and Metropolitan Area Networks: Media Access Control (MAC) Bridges*

  This document includes the standard for Rapid Spanning Tree Protocol (RSTP), which is often referred to as 802.1w. It also discusses Quality of Service (QoS) at the MAC level, often referred to as 802.1p.

Related Documentation

- Supported L2TP Standards on page 28
- Supported Layer 2 Circuit Standards on page 28
- Supported Layer 2 VPN Standard on page 29
- Accessing Standards Documents on the Internet on page 3

Supported L2TP Standards

On routers equipped with one or more Adaptive Services PICs (both standalone and integrated versions) or Multiservices PICs or DPCs, the Junos OS substantially supports the following RFC, which defines the standard for Layer 2 Tunneling Protocol (L2TP).

- RFC 2661, *Layer Two Tunneling Protocol "L2TP"*

The following RFC does not define a standard, but provides information about technology related to L2TP. The IETF classifies it as "Informational."

- RFC 2866, *RADIUS Accounting*

Related Documentation

- Services PIC and DPC Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported Layer 2 Circuit Standards

The Junos OS substantially supports the following RFCs, which define standards for Layer 2 circuits.

- RFC 4447, *Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)*

  The Junos OS does not support Section 5.3, "The Generalized PWid FEC Element."

- RFC 4448, *Encapsulation Methods for Transport of Ethernet over MPLS Networks*

The following Internet drafts do not define standards, but provide information about Layer 2 technologies. The IETF classifies them as "Historic."

- Internet draft draft-martini-l2circuit-encap-mpls-11.txt, *Encapsulation Methods for Transport of Layer 2 Frames Over IP and MPLS Networks*

  The Junos OS differs from the Internet draft in the following ways:

  - A packet with a sequence number of 0 (zero) is treated as out of sequence.
  - Any packet that does not have the next incremental sequence number is considered out of sequence.
  - When out-of-sequence packets arrive, the expected sequence number for the neighbor is set to the sequence number in the Layer 2 circuit control word.

- Internet draft draft-martini-l2circuit-trans-mpls-19.txt, *Transport of Layer 2 Frames Over MPLS*

Related Documentation

- Supported Carrier-of-Carriers and Interprovider VPN Standards on page 57
- Supported Layer 2 VPN Standard on page 29
- Supported Layer 3 VPN Standards on page 58

- Supported Multicast VPN Standards on page 59
- Supported VPLS Standards on page 59
- Accessing Standards Documents on the Internet on page 3

Supported Layer 2 VPN Standard

The Junos OS substantially supports Internet draft draft-kompella-ppvpn-l2vpn-03.txt, *Layer 2 VPNs Over Tunnels*.

Related Documentation

- Supported Carrier-of-Carriers and Interprovider VPN Standards on page 57
- Supported Layer 2 Circuit Standards on page 28
- Supported Layer 3 VPN Standards on page 58
- Supported Multicast VPN Standards on page 59
- Supported VPLS Standards on page 59
- Accessing Standards Documents on the Internet on page 3

CHAPTER 5

MPLS Applications Standards

Supported GMPLS Standards

The Junos OS substantially supports the following RFCs and Internet drafts, which define standards for Generalized MPLS (GMPLS).

- RFC 3471, *Generalized Multi-Protocol* [sic] *Label Switching (GMPLS) Signaling Functional Description*

  Only the following features are supported:

  - Bidirectional LSPs (upstream label only)
  - Control channel separation
  - Generalized label (suggested label only)
  - Generalized label request (bandwidth encoding only)

- RFC 3473, *Generalized Multi-Protocol* [sic] *Label Switching (GMPLS) Signaling Resource ReserVation* [sic] *Protocol-Traffic Engineering (RSVP-TE) Extensions*

  Only Section 9, "Fault Handling," is supported.

- RFC 4206, *Label Switched Paths (LSP) Hierarchy with Generalized Multi-Protocol* [sic] *Label Switching (GMPLS) Traffic Engineering (TE)*

- Internet draft draft-ietf-ccamp-gmpls-routing-09.txt, *Routing Extensions in Support of Generalized Multi-Protocol* [sic] *Label Switching*

  Only interface switching is supported.

- Internet draft draft-ietf-ccamp-gmpls-rsvp-te-ason-02.txt, *Generalized MPLS (GMPLS) RSVP-TE Signalling in support of Automatically Switched Optical Network (ASON)* (expires January 2005)

- Internet draft draft-ietf-ccamp-gmpls-sonet-sdh-08.txt, *Generalized Multi-Protocol* [sic] *Label Switching Extensions for SONET and SDH Control*

  Only S,U,K,L,M-format labels and SONET traffic parameters are supported.

- Internet draft draft-ietf-ccamp-lmp-10.txt, *Link Management Protocol (LMP)*
- Internet draft draft-ietf-ccamp-ospf-gmpls-extensions-12.txt, *OSPF Extensions in Support of Generalized Multi-Protocol* [sic] *Label Switching*

  The following sub-TLV types for the Link type, link, value (TLV) are not supported:

  - Link Local/Remote Identifiers (type 11)
  - Link Protection Type (type 14)
  - Shared Risk Link Group (SRLG) (type 16)

  The features described in Section 2 of the draft, "Implications on Graceful Restart," are also not supported.

  The Interface Switching Capability Descriptor (type 15) sub-TLV type is implemented, but only for packet switching.

- Internet draft draft-ietf-mpls-bundle-04.txt, *Link Bundling in MPLS Traffic Engineering*

Related Documentation

- Supported LDP Standards on page 32
- Supported MPLS Standards on page 33
- Supported RSVP Standards on page 35
- Accessing Standards Documents on the Internet on page 3

Supported LDP Standards

The Junos OS substantially supports the following RFCs, which define standards for LDP.

- RFC 3212, *Constraint-Based LSP Setup using LDP*
- RFC 3478, *Graceful Restart Mechanism for Label Distribution Protocol*

The following RFCs do not define standards, but provide information about LDP. The IETF classifies them as "Informational."

- RFC 3215, *LDP State Machine*
- RFC 5036, *LDP Specification*

  For the following features described in the indicated sections of the RFC, the Junos OS supports one of the possible modes but not the other:

  - Label distribution control (section 2.6.1): Ordered mode is supported, but not Independent mode.
  - Label retention (section 2.6.2): Liberal mode is supported, but not Conservative mode.

  - Label advertisement (section 2.6.3): Downstream Unsolicited mode is supported, but not Downstream on Demand mode.

- RFC 5443, *LDP IGP Synchronization*

Related Documentation

- Supported GMPLS Standards on page 31
- Supported MPLS Standards on page 33
- Supported RSVP Standards on page 35
- Accessing Standards Documents on the Internet on page 3

Supported MPLS Standards

The Junos OS substantially supports the following RFCs and Internet drafts, which define standards for MPLS and traffic engineering.

- RFC 2858, *Multiprotocol Extensions for BGP-4*
- RFC 3031, *Multiprotocol Label Switching Architecture*
- RFC 3032, *MPLS Label Stack Encoding*
- RFC 3140, *Per Hop Behavior Identification Codes*
- RFC 3270, *Multi-Protocol* [sic] *Label Switching (MPLS) Support of Differentiated Services*

  Only E-LSPs are supported.
- RFC 3443, *Time To Live (TTL) Processing in Multi-Protocol* [sic] *Label Switching (MPLS) Networks*
- RFC 3478, *Graceful Restart Mechanism for Label Distribution Protocol*
- RFC 4090, *Fast Reroute Extensions to RSVP-TE for LSP Tunnels*

  Node protection in facility backup is not supported.
- RFC 4124, *Protocol Extensions for Support of Diffserv-aware MPLS Traffic Engineering*
- RFC 4364, *BGP/MPLS IP Virtual Private Networks (VPNs)*
- RFC 4379, *Detecting Multi-Protocol* [sic] *Label Switched (MPLS) Data Plane Failures*

  The traceroute functionality is supported only on transit routers.
- RFC 4950, *ICMP Extensions for Multiprotocol Label Switching*
- Internet draft draft-ietf-bfd-mpls-02.txt, *BFD for MPLS LSPs*
- Internet draft draft-ietf-mpls-rsvp-te-p2mp-01.txt, *Extensions to RSVP-TE for Point to Multipoint TE LSPs* (expires June 2005)
- Internet draft draft-ietf-mpls-soft-preemption-02.txt, *MPLS Traffic Engineering Soft preemption*

The following RFCs and Internet drafts do not define standards, but provide information about MPLS, traffic engineering, and related technologies. The IETF classifies them variously as “Experimental,” “Historic,” or “Informational.”

- RFC 2547, *BGP/MPLS VPNs*
- RFC 2702, *Requirements for Traffic Engineering Over MPLS*
- RFC 3063, *MPLS Loop Prevention Mechanism*
- RFC 3208, *PGM Reliable Transport Protocol Specification*

  Only the network element is supported.
- RFC 3469, *Framework for Multi-Protocol* [sic] *Label Switching (MPLS)-based Recovery*
- RFC 3564, *Requirements for Support of Differentiated Services-aware MPLS Traffic Engineering*
- RFC 4125, *Maximum Allocation Bandwidth Constraints Model for Diffserv-aware MPLS Traffic Engineering*
- RFC 4127, *Russian Dolls Bandwidth Constraints Model for Diffserv-aware MPLS Traffic Engineering*
- Internet draft draft-martini-l2circuit-encap-mpls-11.txt, *Encapsulation Methods for Transport of Layer 2 Frames Over IP and MPLS Networks*

  The Junos OS differs from the Internet draft in the following ways:

  - A packet with a sequence number of 0 is treated as out of sequence.
  - Any packet which does not have the next incremental sequence number is considered out of sequence.
  - When out-of-sequence packets arrive, the expected sequence number for the neighbor is set to the sequence number in the Layer 2 circuit control word.
- Internet draft draft-martini-l2circuit-trans-mpls-19.txt, *Transport of Layer 2 Frames Over MPLS*
- Internet draft draft-raggarwa-mpls-p2mp-te-02.txt, *Establishing Point to Multipoint MPLS TE LSPs*

  The features discussed in the indicated sections of the draft are not supported:

  - Nonadjacent signaling for branch LSPs (section 7.1)
  - Make-before-break and fast reroute (section 9)
  - LSP hierarchy using point-to-point LSPs (section 10)

Related Documentation

- Supported GMPLS Standards on page 31
- Supported LDP Standards on page 32
- Supported RSVP Standards on page 35
- Accessing Standards Documents on the Internet on page 3

Supported RSVP Standards

The Junos OS substantially supports the following RFCs and Internet drafts, which define standards for RSVP.

- RFC 2205, *Resource ReSerVation* [sic] *Protocol (RSVP)—Version 1 Functional Specification*
- RFC 2210, *The Use of RSVP with IETF Integrated Services*
- RFC 2211, *Specification of the Controlled-Load Network Element Service*
- RFC 2212, *Specification of Guaranteed Quality of Service*
- RFC 2215, *General Characterization Parameters for Integrated Service Network Elements*
- RFC 2745, *RSVP Diagnostic Messages*
- RFC 2747, *RSVP Cryptographic Authentication* (updated by RFC 3097)
- RFC 2961, *RSVP Refresh Overhead Reduction Extensions*
- RFC 3097, *RSVP Cryptographic Authentication—Updated Message Type Value*
- RFC 3209, *RSVP-TE: Extensions to RSVP for LSP Tunnels*

  The Null Service Object for maximum transmission unit (MTU) signaling in RSVP is not supported.
- RFC 3473, *Generalized Multi-Protocol* [sic] *Label Switching (GMPLS) Signaling Resource ReserVation* [sic] *Protocol-Traffic Engineering (RSVP-TE) Extensions*

  Only Section 9, “Fault Handling,” is supported.
- RFC 3477, *Signalling Unnumbered Links in Resource ReSerVation* [sic] *Protocol - Traffic Engineering (RSVP-TE)*
- RFC 4090, *Fast Reroute Extensions to RSVP-TE for LSP Tunnels*

  Node protection in facility backup is not supported.
- RFC 4203, *OSPF Extensions in Support of Generalized Multi-Protocol* [sic] *Label Switching (GMPLS)*

  (OSPF extensions can carry traffic engineering information over unnumbered links.)
- RFC 4558, *Node-ID Based Resource Reservation Protocol (RSVP) Hello: A Clarification Statement*
- RFC 4561, *Definition of a Record Route Object (RRO) Node-Id Sub-Object*

  The RRO node ID subobject is for use in inter-AS link and node protection configurations.
- Internet draft draft-ietf-mpls-rsvp-te-p2mp-01.txt, *Extensions to RSVP-TE for Point to Multipoint TE LSPs* (expires June 2005)

The following RFCs do not define standards, but provide information about RSVP and related technologies. The IETF classifies them variously as “Experimental” or “Informational.”

- RFC 2209, *Resource ReSerVation* [sic] *Protocol (RSVP)—Version 1 Message Processing Rules*
- RFC 2216, *Network Element Service Specification Template*
- RFC 4125, *Maximum Allocation Bandwidth Constraints Model for Diffserv-aware MPLS Traffic Engineering*
- RFC 4127, *Russian Dolls Bandwidth Constraints Model for Diffserv-aware MPLS Traffic Engineering*

Related Documentation

- Supported GMPLS Standards on page 31
- Supported LDP Standards on page 32
- Supported MPLS Standards on page 33
- Accessing Standards Documents on the Internet on page 3

CHAPTER 6

Packet Processing Standards

Supported CoS Standards

The Junos OS substantially supports the following standards for class of service (CoS).

- IEEE Standard 802.1D, *IEEE Standard for Local and Metropolitan Area Networks: Media Access Control (MAC) Bridges*

  This document discusses Quality of Service (QoS) at the MAC level, often referred to as 802.1p.
- RFC 2474, *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*
- RFC 2597, *Assured Forwarding PHB Group*
- RFC 2598, *An Expedited Forwarding PHB*

The following RFCs do not define standards, but provide information about CoS and related technologies. The IETF classifies them as "Informational."

- RFC 2475, *An Architecture for Differentiated Services*
- RFC 2697, *A Single Rate Three Color Marker*
- RFC 2698, *A Two Rate Three Color Marker*
- RFC 2983, *Differentiated Services and Tunnels*
- RFC 3140, *Per Hop Behavior Identification Codes*
- RFC 3246, *An Expedited Forwarding PHB (Per-Hop Behavior)*
- RFC 3260, *New Terminology and Clarifications for Diffserv*

Related Documentation

- CoS Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported Packet Filtering Standards

The Junos OS provides a packet-filtering language that enables you to control the flow of packets being forwarded to a network destination, as well as packets destined for and sent by the router. It substantially supports the following RFCs, which define standards for packet filtering.

- RFC 792, *INTERNET CONTROL MESSAGE PROTOCOL - DARPA INTERNET PROGRAM PROTOCOL SPECIFICATION*
- RFC 2460, *Internet Protocol, Version 6 (IPv6) Specification*
- RFC 2474, *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*
- RFC 2597, *Assured Forwarding PHB Group*
- RFC 2598, *An Expedited Forwarding PHB*
- RFC 3246, *An Expedited Forwarding PHB (Per-Hop Behavior)*
- RFC 4291, *IP Version 6 Addressing Architecture*
- RFC 4443, *Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification*

The following RFCs do not define standards, but provide information about packet filtering and related technologies. The IETF classifies them as "Informational."

- RFC 2267, *Network Ingress Filtering: Defeating Denial of Service Attacks which employ IP Source Address Spoofing*
- RFC 2475, *An Architecture for Differentiated Services*
- RFC 2983, *Differentiated Services and Tunnels*
- RFC 3260, *New Terminology and Clarifications for Diffserv*

Related Documentation

- Packet Filtering Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported Policing Standard

The Junos OS supports policing, or rate limiting, to limit the amount of traffic that passes through an interface. For information about rate limiting, see RFC 2698, *A Two Rate Three Color Marker*.

The Junos implementation of policing uses a token-bucket algorithm and supports the following features:

- Adaptive shaping for Frame Relay traffic
- Virtual channels

Related Documentation

- Accessing Standards Documents on the Internet on page 3

CHAPTER 7

Routing Protocol Standards

Supported BGP Standards

The Junos OS substantially supports the following RFCs and Internet drafts, which define standards for IP version 4 (IPv4) BGP.

For a list of supported IP version 6 (IPv6) BGP standards, see "Supported IPv6 Standards" on page 46.

Junos BGP supports authentication for protocol exchanges (MD5 authentication).

- RFC 1745, *BGP4/IDRP for IP—OSPF Interaction*
- RFC 1772, *Application of the Border Gateway Protocol in the Internet*
- RFC 1997, *BGP Communities Attribute*
- RFC 2283, *Multiprotocol Extensions for BGP-4*
- RFC 2385, *Protection of BGP Sessions via the TCP MD5 Signature Option*
- RFC 2439, *BGP Route Flap Damping*
- RFC 2545, *Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing*
- RFC 2796, *BGP Route Reflection – An Alternative to Full Mesh IBGP*
- RFC 2858, *Multiprotocol Extensions for BGP-4*
- RFC 2918, *Route Refresh Capability for BGP-4*

- RFC 3065, *Autonomous System Confederations for BGP*
- RFC 3107, *Carrying Label Information in BGP-4*
- RFC 3392, *Capabilities Advertisement with BGP-4*
- RFC 4271, *A Border Gateway Protocol 4 (BGP-4)*
- RFC 4360, *BGP Extended Communities Attribute*
- RFC 4364, *BGP/MPLS IP Virtual Private Networks (VPNs)*
- RFC 4456, *BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP)*
- RFC 4659, *BGP-MPLS IP Virtual Private Network (VPN) Extension for IPv6 VPN*
- RFC 4486, *Subcodes for BGP Cease Notification Message*
- RFC 4724, *Graceful Restart Mechanism for BGP*
- RFC 4760, *Multiprotocol Extensions for BGP-4*
- RFC 4781, *Graceful Restart Mechanism for BGP with MPLS*
- RFC 4893, *BGP Support for Four-octet AS Number Space*
- RFC 4798, *Connecting IPv6 Islands over IPv4 MPLS Using IPv6 Provider Edge Routers (6PE)*

  Option 4b (eBGP redistribution of labeled IPv6 routes from AS to neighboring AS) is not supported.
- RFC 5396, *Textual Representation of Autonomous System (AS) Numbers*
- RFC 5668, *4-Octet AS Specific BGP Extended Community*
- Internet draft draft-ietf-idr-flow-spec-00.txt, *Dissemination of flow specification rules*
- Internet draft draft-ietf-idr-link-bandwidth-01.txt, *BGP Link Bandwidth Extended Community* (expires August 2010)
- Internet draft draft-kato-bgp-ipv6-link-local-00.txt, *BGP4+ Peering Using IPv6 Link-local Address*
- Internet draft draft-ietf-idr-add-paths-04.txt, *Advertisement of Multiple Paths in BGP* (expires February 2011)
- Internet draft draft-ietf-idr-aigp-06, *The Accumulated IGP Metric Attribute for BGP* (expires December 2011)

The following RFCs and Internet draft do not define standards, but provide information about BGP and related technologies. The IETF classifies them variously as “Experimental” or “Informational.”

- RFC 1965, *Autonomous System Confederations for BGP*
- RFC 1966, *BGP Route Reflection—An alternative to full mesh IBGP*
- RFC 2270, *Using a Dedicated AS for Sites Homed to a Single Provider*
- Internet draft draft-ietf-ngtrans-bgp-tunnel-04.txt, *Connecting IPv6 Islands across IPv4 Clouds with BGP* (expires July 2002)

Related Documentation

- Supported IPv6 Standards on page 46
- Accessing Standards Documents on the Internet on page 3

Supported ES-IS Standards

The Junos OS substantially supports the following standards for End System–to–Intermediate System (ES-IS).

- International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) standard 8473, *Information technology — Protocol for providing the connectionless-mode network service*
- ISO/IEC standard 9542, *Information processing systems — Telecommunications and information exchange between systems — End system to Intermediate system routeing* [sic] *exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473)*

Related Documentation

- Supported IS-IS Standards on page 49
- IS-IS Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported ICMP and Neighbor Discovery Standards

The Junos OS substantially supports the following RFCs, which define standards for Internet Control Message Protocol (ICMP, for IP version 4 [IPv4]) and neighbor discovery (for IP version 6 [IPv6]).

- RFC 1256, *ICMP Router Discovery Messages*
- RFC 4861, *Neighbor Discovery for IP Version 6 (IPv6)*
- RFC 4862, *IPv6 Stateless Address Autoconfiguration*
- RFC 4443, *Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification*

Related Documentation

- Supported IPv4, TCP, and UDP Standards on page 45
- Supported IPv6 Standards on page 46
- Accessing Standards Documents on the Internet on page 3

Supported IP Multicast Protocol Standards

Junos OS substantially supports the following RFCs and Internet drafts, which define standards for IP multicast protocols, including the Distance Vector Multicast Routing Protocol (DVMRP), Internet Group Management Protocol (IGMP), Multicast Listener Discovery (MLD), Multicast Source Discovery Protocol (MSDP), Pragmatic General Multicast (PGM), Protocol Independent Multicast (PIM), Session Announcement Protocol (SAP), and Session Description Protocol (SDP).

- RFC 1112, *Host Extensions for IP Multicasting* (defines IGMP Version 1)
- RFC 2236, *Internet Group Management Protocol, Version 2*
- RFC 2327, *SDP: Session Description Protocol*
- RFC 2710, *Multicast Listener Discovery (MLD) for IPv6*
- RFC 2858, *Multiprotocol Extensions for BGP-4*
- RFC 3031, *Multiprotocol Label Switching Architecture*
- RFC 3376, *Internet Group Management Protocol, Version 3*
- RFC 3590, *Source Address Selection for the Multicast Listener Discovery (MLD) Protocol*
- RFC 4601, *Protocol Independent Multicast – Sparse Mode (PIM-SM): Protocol Specification (Revised)*
- RFC 4607, *Source-Specific Multicast for IP*
- RFC 5015, *Bidirectional Protocol Independent Multicast (BIDIR-PIM)*
- *Using IGMPv3 and MLDv2 for Source-Specific Multicast*
- Internet draft draft-ietf-l3vpn-2547bis-mcast-10.txt, *Multicast in MPLS/BGP IP VPNs*
- Internet draft draft-ietf-l3vpn-2547bis-mcast-bgp-08.txt, *BGP Encodings and Procedures for Multicast in MPLS/BGP IP VPNs*
- Internet draft draft-ietf-pim-sm-bsr-05.txt, *Bootstrap Router (BSR) Mechanism for PIM*

  The scoping mechanism is not supported.
- Internet draft draft-raggarwa-l3vpn-2547-mvpn-00.txt, *Base Specification for Multicast in BGP/MPLS VPNs* (expires December 2004)

The following RFCs and Internet drafts do not define standards, but provide information about multicast protocols and related technologies. The IETF classifies them variously as “Best Current Practice,” “Experimental,” or “Informational.”

- RFC 1075, *Distance Vector Multicast Routing Protocol*
- RFC 2362, *Protocol Independent Multicast-Sparse Mode (PIM-SM): Protocol Specification*
- RFC 2365, *Administratively Scoped IP Multicast*
- RFC 2547, *BGP/MPLS VPNs*

- RFC 2974, *Session Announcement Protocol*
- RFC 3208, *PGM Reliable Transport Protocol Specification*
- RFC 3446, *Anycast Rendevous* [sic] *Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)*
- RFC 3569, *An Overview of Source-Specific Multicast (SSM)*
- RFC 3618, *Multicast Source Discovery Protocol (MSDP)*
- RFC 3810, *Multicast Listener Discovery Version 2 (MLDv2) for IPv6*
- RFC 3973, *Protocol Independent Multicast – Dense Mode (PIM-DM): Protocol Specification (Revised)*
- RFC 4364, *BGP/MPLS IP Virtual Private Networks (VPNs)*
- Internet draft draft-ietf-idmr-dvmrp-v3-11.txt, *Distance Vector Multicast Routing Protocol*
- Internet draft draft-ietf-mboned-ssm232-08.txt, *Source-Specific Protocol Independent Multicast in 232/8*
- Internet draft draft-ietf-mmusic-sap-00.txt, *SAP: Session Announcement Protocol*
- Internet draft draft-rosen-vpn-mcast-07.txt, *Multicast in MPLS/BGP VPNs*

  Only section 7, "Data MDT: Optimizing flooding," is supported.

Related Documentation

- Accessing Standards Documents on the Internet on page 3

Supported IPv4, TCP, and UDP Standards

The Junos OS substantially supports the following RFCs, which define standards for IP version 4 (IPv4), Transmission Control Protocol (TCP), and User Datagram Protocol (UDP).

- RFC 768, *User Datagram Protocol*
- RFC 791, *INTERNET PROTOCOL - DARPA INTERNET PROGRAM PROTOCOL SPECIFICATION*
- RFC 792, *INTERNET CONTROL MESSAGE PROTOCOL - DARPA INTERNET PROGRAM PROTOCOL SPECIFICATION*
- RFC 793, *TRANSMISSION CONTROL PROTOCOL - DARPA INTERNET PROGRAM PROTOCOL SPECIFICATION*
- RFC 826, *Ethernet Address Resolution Protocol—or—Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware*
- RFC 854, *TELNET PROTOCOL SPECIFICATION*
- RFC 862, *Echo Protocol*
- RFC 863, *Discard Protocol*
- RFC 894, *A Standard for the Transmission of IP Datagrams over Ethernet Networks*

- RFC 896, *Congestion Control in IP/TCP Internetworks*
- RFC 903, *A Reverse Address Resolution Protocol*
- RFC 919, *BROADCASTING INTERNET DATAGRAMS*
- RFC 922, *BROADCASTING INTERNET DATAGRAMS IN THE PRESENCE OF SUBNETS*
- RFC 959, *FILE TRANSFER PROTOCOL (FTP)*
- RFC 1027, *Using ARP to Implement Transparent Subnet Gateways*
- RFC 1042, *A Standard for the Transmission of IP Datagrams over IEEE 802 Networks*
- RFC 1157, A *Simple Network Management Protocol (SNMP)*
- RFC 1166, *INTERNET NUMBERS*
- RFC 1195, *Use of OSI IS-IS for Routing in TCP/IP and Dual Environments*
- RFC 1256, *ICMP Router Discovery Messages*
- RFC 1305, *Network Time Protocol (Version 3) Specification, Implementation and Analysis*
- RFC 1519, *Classless Inter-Domain Routing (CIDR): an Address Assignment and Aggregation Strategy*
- RFC 1812, *Requirements for IP Version 4 Routers*
- RFC 2338, *Virtual Router Redundancy Protocol* (obsoleted by RFC 3768 in April 2004)
- RFC 2873, *TCP Processing of the IPv4 Precedence Field*
- RFC 3021, *Using 31-Bit Prefixes on IPv4 Point-to-Point Links*
- RFC 3246, *An Expedited Forwarding PHB (Per-Hop Behavior)*

The following RFCs do not define standards, but provide information about IP, TCP, UDP, and related technologies. The IETF classifies them as "Informational."

- RFC 1878, *Variable Length Subnet Table For IPv4*
- RFC 1948, *Defending Against Sequence Number Attacks*

Related Documentation

- Supported IPv6 Standards on page 46
- Accessing Standards Documents on the Internet on page 3

Supported IPv6 Standards

The Junos OS substantially supports the following RFCs and Internet drafts, which define standards for IP version 6 (IPv6).

- RFC 1157, *A Simple Network Management Protocol (SNMP)*
- RFC 1195, *Use of OSI IS-IS for Routing in TCP/IP and Dual Environments*

- RFC 1213, *Management Information Base for Network Management of TCP/IP-based internets: MIB-II*

  Only the following features are supported:

  - Junos-specific secured access list
  - Master configuration keywords
  - MIB II and its SNMP version 2 derivatives, including the following:
    - Interface management
    - IP (except for the **ipRouteTable** object, which has been replaced by **ipCidrRouteTable** [RFC 2096, *IP Forwarding Table MIB*])
    - SNMP management
    - Statistics counters
  - Reconfigurations upon receipt of the SIGHUP signal
  - SNMP version 1 **Get** and **GetNext** requests and version 2 **GetBulk** requests

- RFC 1215, *A Convention for Defining Traps for use with the SNMP*

  Only MIB II SNMP version 1 traps and version 2 notifications are supported.

- RFC 1771, *A Border Gateway Protocol 4 (BGP-4)*
- RFC 1772, *Application of the Border Gateway Protocol in the Internet*
- RFC 1902, *Structure of Management Information for Version 2 of the Simple Network Management Protocol (SNMPv2)*
- RFC 1905, *Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)*
- RFC 1981, *Path MTU Discovery for IP version 6*
- RFC 2080, *RIPng for IPv6*
- RFC 2081, *RIPng Protocol Applicability Statement*
- RFC 2283, *Multiprotocol Extensions for BGP-4*
- RFC 2373, *IP Version 6 Addressing Architecture*
- RFC 2460, *Internet Protocol, Version 6 (IPv6) Specification*
- RFC 2464, *Transmission of IPv6 Packets over Ethernet Networks*
- RFC 2465, *Management Information Base for IP Version 6: Textual Conventions and General Group*

  IP version 6 (IPv6) and Internet Control Message Protocol version 6 (ICMPv6) statistics are not supported.

- RFC 2472, *IP Version 6 over PPP*

- RFC 2474, *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*
- RFC 2491, *IPv6 Over Non-Broadcast Multiple Access (NBMA) networks*
- RFC 2492, *IPv6 over ATM Networks*
- RFC 2526, *Reserved IPv6 Subnet Anycast Addresses*
- RFC 2545, *Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing*
- RFC 2578, *Structure of Management Information Version 2 (SMIv2)*
- RFC 2675, *IPv6 Jumbograms*
- RFC 2711, *IPv6 Router Alert Option*
- RFC 2740, *OSPF for IPv6*
- RFC 2878, *PPP Bridging Control Protocol (BCP)*
- RFC 2893, *Transition Mechanisms for IPv6 Hosts and Routers*
- RFC 3315, *Dynamic Host Configuration Protocol for IPv6 (DHCPv6)*

  Address assignment is supported with IP version 4 (IPv4) but not IP version 6 (IPv6).
- RFC 3484, *Default Address Selection for Internet Protocol version 6 (IPv6)*
- RFC 3513, *Internet Protocol Version 6 (IPv6) Addressing Architecture*
- RFC 3515, *The Session Initiation Protocol (SIP) Refer Method*
- RFC 3768, *Virtual Router Redundancy Protocol (VRRP)*
- draft-ietf-vrrp-unified-spec-02.txt*Virtual Router Redundancy Protocol Version 3 for IPv4 and IPv6*
- RFC 3810, *Multicast Listener Discovery Version 2 (MLDv2) for IPv6*
- RFC 4291, *IP Version 6 Addressing Architecture*
- RFC 4443, *Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification*
- RFC 4659, *BGP-MPLS IP Virtual Private Network (VPN) Extension for IPv6 VPN*
- RFC 4861 *Neighbor Discovery for IP Version 6 (IPv6)*
- RFC 4862, *IPv6 Stateless Address Autoconfiguration*
- RFC 5095, *Deprecation of Type 0 Routing Headers in IPv6*
- RFC 5308, *Routing IPv6 with IS-IS*
- Internet draft draft-ietf-idr-flow-spec-00.txt, *Dissemination of flow specification rules*
- Internet draft-ietf-softwire-dual-stack-lite-04.txt, *Dual-Stack Lite Broadband Deployments Following IPv4 Exhaustion*

- Internet draft draft-kato-bgp-ipv6-link-local-00.txt, *BGP4+ Peering Using IPv6 Link-local Address*
- RFC 4798, *Connecting IPv6 Islands over IPv4 MPLS Using IPv6 Provider Edge Routers (6PE)*

  Option 4b (eBGP redistribution of labeled IPv6 routes from AS to neighboring AS) is not supported.

The following RFCs and Internet draft do not define standards, but provide information about IPv6 and related technologies. The IETF classifies them variously as "Experimental" or "Informational."

- RFC 1901, *Introduction to Community-based SNMPv2*
- RFC 2767, *Dual Stack Hosts using the "Bump-In-the-Stack" Technique (BIS)*
- RFC 3587, *IPv6 Global Unicast Address Format*
- Internet draft-ietf-ngtrans-bgp-tunnel-04.txt, *Connecting IPv6 Islands across IPv4 Clouds with BGP*

  Only MP-BGP over IP version 4 (IPv4) approach is supported.

Related Documentation

- Supported IPv4, TCP, and UDP Standards on page 45
- Accessing Standards Documents on the Internet on page 3

Supported IS-IS Standards

The Junos OS substantially supports the following standards for IS-IS.

- International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 8473, *Information technology — Protocol for providing the connectionless-mode network service*
- ISO/IEC 10589, *Information technology — Telecommunications and information exchange between systems — Intermediate System to Intermediate System intra-domain routeing* [sic] *information exchange protocol for use in conjunction with the protocol for providing the connectionless-mode network service (ISO 8473)*
- RFC 1195, *Use of OSI IS-IS for Routing in TCP/IP and Dual Environments*
- RFC 5120, *M-ISIS: Multi Topology (MT) Routing in Intermediate System to Intermediate Systems (IS-ISs)*
- RFC 5130, *A Policy Control Mechanism in IS-IS Using Administrative Tags*
- RFC 5286, *Basic Specification for IP Fast Reroute: Loop-Free Alternates*
- RFC 5301, *Dynamic Hostname Exchange Mechanism for IS-IS*
- RFC 5302, *Domain-wide Prefix Distribution with Two-Level IS-IS*
- RFC 5303, *Three-Way Handshake for IS-IS Point-to-Point Adjacencies*
- RFC 5304, *IS-IS Cryptographic Authentication*

- RFC 5305, *IS-IS Extensions for Traffic Engineering*
- RFC 5306, *Restart Signaling for IS-IS*
- RFC 5307, *IS-IS Extensions in Support of Generalized Multi-Protocol* [sic] *Label Switching (GMPLS)*
- RFC 5308, *Routing IPv6 with IS-IS*
- Internet draft draft-ietf-bfd-base-09.txt, *Bidirectional Forwarding Detection*

  Transmission of echo packets is not supported.
- Internet draft draft-ietf-isis-restart-02.txt, *Restart signaling for IS-IS*

The following RFCs do not define standards, but provide information about IS-IS and related technologies. The IETF classifies them as "Informational."

- RFC 2973, *IS-IS Mesh Groups*
- RFC 3358, *Optional Checksums in Intermediate System to Intermediate System (ISIS)* [sic]
- RFC 3359, *Reserved Type, Length and Value (TLV) Codepoints in Intermediate System to Intermediate System*
- RFC 3373, *Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point-to-Point Adjacencies*
- RFC 3567, *Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication*
- RFC 3787, *Recommendations for Interoperable IP Networks using Intermediate System to Intermediate System (IS-IS)*
- RFC 5309, *Point-to-Point Operation over LAN in Link State Routing Protocols*
- Internet draft draft-ietf-isis-wg-255adj-02.txt, *Maintaining more than 255 circuits in IS-IS*

Related Documentation

- IS-IS Features in the Junos OS
- Supported ES-IS Standards on page 43
- Accessing Standards Documents on the Internet on page 3

Supported OSPF and OSPFv3 Standards

The Junos OS substantially supports the following RFCs and Internet drafts, which define standards for OSPF and OSPF version 3 (OSPFv3).

- RFC 1583, *OSPF Version 2*
- RFC 1765, *OSPF Database Overflow*
- RFC 1793, *Extending OSPF to Support Demand Circuits*
- RFC 2154, *OSPF with Digital Signatures*

- RFC 2328, *OSPF Version 2*
- RFC 2370, *The OSPF Opaque LSA Option*

  Support is provided by the **update-threshold** configuration statement at the **[edit protocols rsvp interface *interface-name*]** hierarchy level.
- RFC 2740, *OSPF for IPv6*
- RFC 3101, *The OSPF Not-So-Stubby Area (NSSA) Option*
- RFC 3623, *Graceful OSPF Restart*
- RFC 3630, *Traffic Engineering (TE) Extensions to OSPF Version 2*
- RFC 4203, *OSPF Extensions in Support of Generalized Multi-Protocol* [sic] *Label Switching (GMPLS)*

  Only interface switching is supported.
- RFC 4552, *Authentication/Confidentiality for OSPFv3*
- RFC 4576, *Using a Link State Advertisement (LSA) Options Bit to Prevent Looping in BGP/MPLS IP Virtual Private Networks (VPNs)*
- RFC 4577, *OSPF as the Provider/Customer Edge Protocol for BGP/MPLS IP Virtual Private Networks (VPNs)*
- RFC 4811, *OSPF Out-of-Band Link State Database (LSDB) Resynchronization*
- RFC 4812, *OSPF Restart Signaling*
- RFC 4813, *OSPF Link-Local Signaling*
- RFC 4915, *Multi-Topology (MT) Routing in OSPF*
- RFC 5185, *OSPF Multi-Area Adjacency*
- RFC 5286, *Basic Specification for IP Fast Reroute: Loop-Free Alternates*
- Internet draft draft-ietf-ospf-af-alt-10.txt, *Support of address families in OSPFv3*
- Internet draft draft-katz-ward-bfd-02.txt, *Bidirectional Forwarding Detection*

  Transmission of echo packets is not supported.

The following RFCs and Internet drafts do not define standards, but provide information about OSPF and related technologies. The IETF classifies them as “Informational.”

- RFC 3137, *OSPF Stub Router Advertisement*
- RFC 3509, *Alternative Implementations of OSPF Area Border Routers*
- RFC 5309, *Point-to-Point Operation over LAN in Link State Routing Protocols*

Related Documentation

- Supported IPv6 Standards on page 46
- OSPF Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported RIP and RIPng Standards

The Junos OS substantially supports the following RFCs, which define standards for RIP (for IP version 4 [IPv4]) and RIP next generation (RIPng, for IP version 6 [IPv6]).

The Junos OS supports authentication for all RIP protocol exchanges (MD5 or simple authentication).

- RFC 1058, *Routing Information Protocol*
- RFC 2080, *RIPng for IPv6*
- RFC 2082, *RIP-2 MD5 Authentication*

  Multiple keys using distinct key IDs are not supported.
- RFC 2453, *RIP Version 2*

The following RFC does not define a standard, but provides information about RIPng. The IETF classifies it as "Informational."

- RFC 2081, *RIPng Protocol Applicability Statement*

Related Documentation

- Supported IPv4, TCP, and UDP Standards on page 45
- Supported IPv6 Standards on page 46
- Accessing Standards Documents on the Internet on page 3

CHAPTER 8

Services PIC and DPC Standards

Supported DTCP Standard

The Junos OS substantially supports Internet draft draft-cavuto-dtcp-03.txt, *DTCP: Dynamic Tasking Control Protocol*.

Related Documentation

- Accessing Standards Documents on the Internet on page 3

Supported Flow Monitoring and Discard Accounting Standards

On routers equipped with one or more Adaptive Services PICs (both standalone and integrated versions), Monitoring Services PICs, or Multiservices PICs or DPCs, the Junos OS substantially supports the standards for cflowd version 5 and version 8 formats that are maintained by CAIDA and accessible at http://www.caida.org.

The following RFC does not define a standard, but provides information about flow monitoring. The IETF classifies it as "Informational."

- RFC 3954, *Cisco Systems NetFlow Services Export Version 9*

Related Documentation

- Services PIC and DPC Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported IPsec and IKE Standards

On routers equipped with one or more Adaptive Services PICs (both standalone and integrated versions) or Multiservices PICs or DPCs, the Canada and U.S. version of the Junos OS substantially supports the following RFCs, which define standards for IP Security (IPsec) and Internet Key Exchange (IKE).

- RFC 2085, *HMAC-MD5 IP Authentication with Replay Prevention*
- RFC 2401, *Security Architecture for the Internet Protocol*
- RFC 2402, *IP Authentication Header*

  This RFC is not supported on the ES PIC.
- RFC 2403, *The Use of HMAC-MD5-96 within ESP and AH*
- RFC 2404, *The Use of HMAC-SHA-1-96 within ESP and AH*
- RFC 2405, *The ESP DES-CBC Cipher Algorithm With Explicit IV*
- RFC 2406, *IP Encapsulating Security Payload (ESP)*
- RFC 2407, *The Internet IP Security Domain of Interpretation for ISAKMP*
- RFC 2408, *Internet Security Association and Key Management Protocol (ISAKMP)*
- RFC 2409, *The Internet Key Exchange (IKE)*
- RFC 2410, *The NULL Encryption Algorithm and Its Use With IPsec*
- RFC 3602, *The AES-CBC Cipher Algorithm and Its Use with IPsec*
- RFC 3948, *UDP Encapsulation of IPsec ESP Packets*
- RFC 4301, *Security Architecture for the Internet Protocol*
- RFC 4302, *IP Authentication Header*

  This RFC is not supported on the ES PIC.
- RFC 4303, *IP Encapsulating Security Payload (ESP)*

The following RFCs and Internet draft do not define standards, but provide information about IPsec, IKE, and related technologies. The IETF classifies them as "Informational."

- RFC 2104, *HMAC: Keyed-Hashing for Message Authentication*
- RFC 2412, *The OAKLEY Key Determination Protocol*
- RFC 3706, *A Traffic-Based Method of Detecting Dead Internet Key Exchange (IKE) Peers*
- Internet draft draft-eastlake-sha2-02.txt, *US Secure Hash Algorithms (SHA and HMAC-SHA)* (expires July 2006)

Related Documentation

- Services PIC and DPC Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported L2TP Standards

On routers equipped with one or more Adaptive Services PICs (both standalone and integrated versions) or Multiservices PICs or DPCs, the Junos OS substantially supports the following RFC, which defines the standard for Layer 2 Tunneling Protocol (L2TP).

- RFC 2661, *Layer Two Tunneling Protocol "L2TP"*

The following RFC does not define a standard, but provides information about technology related to L2TP. The IETF classifies it as "Informational."

- RFC 2866, *RADIUS Accounting*

Related Documentation

- Services PIC and DPC Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported Link Services Standards

On routers equipped with one or more Adaptive Services PICs (both standalone and integrated versions) or Multiservices PICs or DPCs, the Junos OS substantially supports the following RFCs, which define standards for link services.

- RFC 1990, *The PPP Multilink Protocol (MP)*
- RFC 2364, *PPP Over AAL5*
- RFC 2686, *The Multi-Class Extension to Multi-Link PPP*

  The following features are not supported:

  - Negotiation of address field compression and protocol field compression PPP NCP options; instead, a full 4-byte PPP header is always sent
  - Prefix elision

Related Documentation

- Services PIC and DPC Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported NAT and SIP Standards

On routers equipped with one or more Adaptive Services PICs (both standalone and integrated versions) or Multiservices PICs or DPCs, the Junos OS substantially supports the following Network Address Translation (NAT) and Session Initiation Protocol (SIP) standards. NAT supports SIP dialogs and UDP/IP version 4 (IPv4) transport of SIP messages.

The Junos OS substantially supports the following RFC and Internet draft.

- RFC 3261, *SIP: Session Initiation Protocol*

- Internet draft draft-mrw-behave-nat66-01.txt, *IPv6-to-IPv6 Network Address Translation (NAT66)*

The following RFCs do not define standards, but provide information about NAT. The IETF classifies them variously as “Best Current Practice,” “Historic” or “Informational.”

- RFC 1631, *The IP Network Address Translator (NAT)*
- RFC 2663, *IP Network Address Translator (NAT) Terminology and Considerations*
- RFC 2766, *Network Address Translation - Protocol Translation (NAT-PT)*
- RFC 2993, *Architectural Implications of NAT*
- RFC 3022, *Traditional IP Network Address Translator (Traditional NAT)*
- RFC 4787, *Network Address Translation (NAT) Behavioral Requirements for Unicast UDP*
- RFC 5382, *NAT Behavioral Requirements for TCP*
- RFC 5508, *NAT Behavioral Requirements for ICMP*

Related Documentation

- Services PIC and DPC Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported RPM Standard

On routers equipped with one or more Adaptive Services PICs (both standalone and integrated versions) or Multiservices PICs or DPCs, the Junos OS substantially supports real-time performance monitoring (RPM), and provides MIB support with extensions in substantial support of RFC 2925, *Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations*.

Related Documentation

- Services PIC and DPC Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported Voice Services Standards

On routers equipped with one or more Adaptive Services PICs (both standalone and integrated versions) or Multiservices PICs or DPCs, the Junos OS substantially supports the following following RFCs, which define standards for technologies used with voice services.

- RFC 2508, *Compressing IP/UDP/RTP Headers for Low-Speed Serial Links*
- RFC 2509, *IP Header Compression over PPP*

Related Documentation

- Services PIC and DPC Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

CHAPTER 9

VPLS and VPN Standards

Supported Carrier-of-Carriers and Interprovider VPN Standards

The Junos OS substantially supports the following RFCs and Internet draft, which define standards for carrier-of-carriers and interprovider virtual private networks (VPNs).

- RFC 3107, *Carrying Label Information in BGP-4*
- RFC 4364, *BGP/MPLS IP Virtual Private Networks (VPNs)*
- Internet draft draft-marques-ppvpn-ibgp-00.txt, *RFC2547bis networks using internal BGP as PE-CE protocol*

Related Documentation

- Supported Layer 2 Circuit Standards on page 28
- Supported Layer 2 VPN Standard on page 29
- Supported Layer 3 VPN Standards on page 58
- Supported Multicast VPN Standards on page 59
- Supported VPLS Standards on page 59
- Supported BGP Standards on page 41
- Accessing Standards Documents on the Internet on page 3

Supported Layer 2 VPN Standard

The Junos OS substantially supports Internet draft draft-kompella-ppvpn-l2vpn-03.txt, *Layer 2 VPNs Over Tunnels*.

Related Documentation

- Supported Carrier-of-Carriers and Interprovider VPN Standards on page 57
- Supported Layer 2 Circuit Standards on page 28

- Supported Layer 3 VPN Standards on page 58
- Supported Multicast VPN Standards on page 59
- Supported VPLS Standards on page 59
- Accessing Standards Documents on the Internet on page 3

Supported Layer 3 VPN Standards

The Junos OS substantially supports the following RFCs, which define standards for Layer 3 virtual private networks (VPNs).

- RFC 2283, *Multiprotocol Extensions for BGP-4*
- RFC 2685, *Virtual Private Networks Identifier*
- RFC 2858, *Multiprotocol Extensions for BGP-4*
- RFC 4364, *BGP/MPLS IP Virtual Private Networks (VPNs)*
- RFC 4379, *Detecting Multi-Protocol* [sic] *Label Switched (MPLS) Data Plane Failures*

  The traceroute functionality is supported only on transit routers.
- RFC 4576, *Using a Link State Advertisement (LSA) Options Bit to Prevent Looping in BGP/MPLS IP Virtual Private Networks (VPNs)*
- RFC 4577, *OSPF as the Provider/Customer Edge Protocol for BGP/MPLS IP Virtual Private Networks (VPNs)*
- RFC 4659, *BGP-MPLS IP Virtual Private Network (VPN) Extension for IPv6 VPN*
- RFC 4684, *Constrained Route Distribution for Border Gateway Protocol/MultiProtocol* [sic] *Label Switching (BGP/MPLS) Internet Protocol (IP) Virtual Private Networks (VPNs)*

The following RFC does not define a standard, but provides information about technology related to Layer 3 VPNs. The IETF classifies it as a "Best Current Practice."

- RFC 1918, *Address Allocation for Private Internets*

Related Documentation

- Supported Carrier-of-Carriers and Interprovider VPN Standards on page 57
- Supported Layer 2 Circuit Standards on page 28
- Supported Layer 2 VPN Standard on page 29
- Supported Multicast VPN Standards on page 59
- Supported VPLS Standards on page 59
- Supported MPLS Standards on page 33
- Supported BGP Standards on page 41
- OSPF Features in the Junos OS
- Accessing Standards Documents on the Internet on page 3

Supported Multicast VPN Standards

The Junos OS substantially supports the following Internet drafts, which define standards for multicast virtual private networks (VPNs).

- Internet draft draft-ietf-l3vpn-2547bis-mcast-10.txt, *Multicast in MPLS/BGP IP VPNs*
- Internet draft draft-ietf-l3vpn-2547bis-mcast-bgp-08.txt, *BGP Encodings and Procedures for Multicast in MPLS/BGP IP VPNs*

Related Documentation

- Supported Carrier-of-Carriers and Interprovider VPN Standards on page 57
- Supported Layer 2 Circuit Standards on page 28
- Supported Layer 2 VPN Standard on page 29
- Supported Layer 3 VPN Standards on page 58
- Supported VPLS Standards on page 59
- Supported MPLS Standards on page 33
- Supported BGP Standards on page 41
- Accessing Standards Documents on the Internet on page 3

Supported VPLS Standards

The Junos OS substantially supports the following following RFCs, which define standards for virtual private LAN service (VPLS).

- 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*

  FEC 128, FEC 129, control bit **0**, the Ethernet pseudowire type **0x0005**, and the Ethernet tagged mode pseudowire type **0x0004** are supported.

Related Documentation

- Supported Carrier-of-Carriers and Interprovider VPN Standards on page 57
- Supported Layer 2 Circuit Standards on page 28
- Supported Layer 2 VPN Standard on page 29
- Supported Layer 3 VPN Standards on page 58
- Supported Multicast VPN Standards on page 59
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PART 3

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