Chapter 3

Hardware Capabilities and Routing Engine Protocol Queue Assignments

This chapter discusses the hardware capabilities and limitations relevant to JUNOS class of service (CoS) and provides a detailed mapping of Routing Engine-sourced traffic and queue assignments.

These topics are discussed in the following sections:

- Hardware Capabilities and Limitations on page 29
- Routing Engine Protocol Queue Assignments on page 33

Hardware Capabilities and Limitations

Juniper Networks J-series, T-series, M320, and other M-series platforms with enhanced Flexible PIC Concentrators (FPCs) have more CoS capabilities than M-series platforms that use other FPC models. Table 6 on page 30 lists the differences.

To determine whether your M-series routing platform is equipped with an enhanced FPC, issue the show chassis hardware command. The presence of an enhanced FPC is designated by the E-FPC description in the output.

user@host> **show chassis hardware**

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Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                31959             M7i
Midplane         REV 02   710-008761   CA0209            M7i Midplane
Power Supply 0   Rev 04   740-008537   PD10272           AC Power Supply
Routing Engine   REV 01   740-008846   1000396803        RE-5.0
CFEB             REV 02   750-009492   CA0166            Internet Processor IIv1
FPC 0                                                   E-FPC
  PIC 0          REV 04   750-003163   HJ6416            1x G/E, 1000 BASE-SX
  PIC 1          REV 04   750-003163   HJ6423            1x G/E, 1000 BASE-SX
  PIC 2          REV 04   750-003163   HJ6421            1x G/E, 1000 BASE-SX
  PIC 3          REV 02   750-003163   HJ0425            1x G/E, 1000 BASE-SX
FPC 1                                                   E-FPC
  PIC 2          REV 01   750-009487   HM2275            ASP - Integrated
  PIC 3          REV 01   750-009098   CA0142            2x F/E, 100 BASE-TX
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J-series Services Routers do not use FPCs. Instead, they use Physical Interface Modules (PIMs), which are architecturally like FPCs but functionally like Physical Interface Cards (PICs). Both PIMs and PICs provide the interfaces to the routing platforms.

In Table 6, the information in the column titled "M320 and T-series FPCs" is valid for all M320 and T-series FPCs, including Enhanced II FPCs.

Table 6: CoS Hardware Capabilities and Limitations (1 of 4)

Feature	J-series PIMs	M-series FPC	M-series Enhanced FPCs	M320 and T-series FPCs	Comments
Classifiers					
Maximum number per FPC, PIC, or PIM	64	1	8	64	For M-series FPCs, the one-classifier limit includes the default IP precedence classifier. If you create a new classifier and apply it to an interface, the new classifier does not override the default classifier for other interfaces on the same FPC. In general, the first classifier associated with a logical interface is used. The default classifier can be replaced only when a single interface is associated with the default classifier. For more information, see Table 14 on page 51.
dscp	Yes	No	Yes	Yes	On all platforms, you cannot configure IP precedence and DiffServ code point (DSCP) classifiers on a single logical interface, because both apply to IPv4 packets. For more information, see Table 14 on page 51.
dscp-ipv6	Yes	No	Yes	Yes	For T-series platforms, you can apply separate classifiers for IPv4 and IPv6 packets per logical interface. For M-series enhanced FPCs, you cannot apply separate classifiers for IPv4 and IPv6 packets. Classifier assignment works as follows: ■ If you assign a DSCP classifier only, IPv4 and IPv6 packets are classified using the DSCP classifier. ■ If you assign an IP precedence classifier only, IPv4 and IPv6 packets are classified using the IP precedence classifier. The lower three bits of the DSCP field are ignored because IP precedence mapping requires the upper three bits only. ■ If you assign either the DSCP or the IP precedence classifier in conjunction with the DSCP IPv6 classifier, the commit fails. ■ If you assign a DSCP IPv6 classifier only, IPv4 and IPv6 packets are classified using the DSCP IPv6 classifier, but the commit displays a warning message. For more information, see Table 14 on page 51.
ieee-802.1p	Yes	No	Yes	Yes	On M-series enhanced FPCs and T-series platforms, if you associate an IEEE 802.1p classifier with a logical interface, you cannot associate any other classifier with that logical interface. For more information, see Table 14 on page 51. For most PICs, if you apply an IEEE 802.1p classifier to a logical interface, you cannot apply non-IEEE classifiers on other logical interfaces on the same physical interface. This restriction does not apply to Gigabit Ethernet IQ2 PICs.

Table 6: CoS Hardware Capabilities and Limitations (2 of 4)

Feature	J-series PIMs	M-series FPC	M-series Enhanced FPCs	M320 and T-series FPCs	Comments
inet-precedence	Yes	Yes	Yes	Yes	On all platforms, you cannot assign IP precedence and DSCP classifiers to a single logical interface, because both apply to IPv4 packets. For more information, see Table 14 on page 51.
mpls-exp	Yes	Yes	Yes	Yes	For M-series FPCs, only the default MPLS EXP classifier is supported; the default MPLS EXP classifier takes the EXP bits 1 and 2 as the output queue number.
Loss priorities based on the Frame Relay DE bit	Yes	No	No	No	
Drop Profiles					
Maximum number per FPC, PIC, or PIM	32	2	16	32	
Per queue	Yes	No	Yes	Yes	
Per loss priority	Yes	Yes	Yes	Yes	
Per Transmission Control Protocol (TCP) bit	Yes	No	Yes	Yes	
Policing					
Adaptive shaping for Frame Relay traffic	Yes	No	No	No	
Traffic policing	Yes	Yes	Yes	Yes	
Two-rate tricolor marking (TCM)	No	No	No	Yes	Allows you to configure up to four loss priorities. Two-rate TCM is supported on T-series platforms with Enhanced II FPCs and the T640 platform with Enhanced Scaling FPC4. For more information, see "Configuring Two-Rate Tricolor or Four-Color Marking" on page 165.
Virtual channels	Yes	No	No	No	
Queuing					
Priority	Yes	No	Yes	Yes	Support for the medium-low and medium-high queuing priority mappings varies by FPC type. For more information, see Table 23 on page 133.
Per-queue output statistics	Yes	No	Yes	Yes	Per-queue output statistics are shown in the output of the show interfaces queue command.

Table 6: CoS Hardware Capabilities and Limitations (3 of 4)

Feature	J-series PIMs	M-series FPC	M-series Enhanced FPCs	M320 and T-series FPCs	Comments
Rewrite Markers					
Maximum number per FPC, PIC, or PIM	64	None	None	64	
dscp	Yes	No	Yes	Yes	For J-series PIMs, M-series Enhanced FPC, and M320 and T-series FPCs, bits 0 through 5 are rewritten, and bits 6 through 7 are preserved. For M320 and T-series FPCs, you must decode the loss priority using the firewall filter before you can use loss priority to select the rewrite CoS value. For more information, see "Setting the PLP on T320 and M320 Platforms" on page 57. For M320 and T-series FPCs, Adaptive Services PIC link services IQ interfaces (lsq-) do not support DSCP rewrite markers.
dscp-ipv6	Yes	No	Yes	Yes	For J-series PIMs, M-series Enhanced FPC, and M320 and T-series FPCs, bits 0 through 5 are rewritten, and bits 6 through 7 are preserved. For M320 and T-series FPCs, you must decode the loss priority using the firewall filter before you can use loss priority to select the rewrite CoS value. For more information, see "Setting the PLP on T320 and M320 Platforms" on page 57. For M320 and T-series FPCs, Adaptive Services PIC link services IQ interfaces (lsq-) do not support DSCP rewrite markers.
frame-relay-de	Yes	No	No	No	
ieee-802.1	Yes	No	Yes	Yes	For M-series enhanced FPCs and T-series FPCs, fixed rewrite loss priority determines the value for bit 0; queue number (forwarding class) determines bits 1 and 2.
inet-precedence	Yes	Yes	Yes	Yes	For J-series PIMs, bits 0 through 2 are rewritten, and bits 3 through 7 are preserved. For M-series FPC, bits 0 through 2 are rewritten, and bits 3 through 7 are preserved. For M-series Enhanced FPC and M320 and T-series FPCs, bits 0 through 2 are rewritten, bits 3 through 5 are cleared, and bits 6 through 7 are preserved. For M320 and T-series FPCs, you must decode the loss priority using the firewall filter before you can use loss priority to select the rewrite CoS value. For more information, see "Setting the PLP on T320 and M320 Platforms" on page 57.

Table 6: CoS Hardware Capabilities and Limitations (4 of 4)

Feature	J-series PIMs	M-series FPC	M-series Enhanced FPCs	M320 and T-series FPCs	Comments
mpls-exp	Yes	Yes	Yes	Yes	For M320 and T-series FPCs, you must decode the loss priority using the firewall filter before you can use loss priority to select the rewrite CoS value. For more information, see "Setting the PLP on T320 and M320 Platforms" on page 57. For M-series FPCs, fixed rewrite loss priority determines the value for bit 0; queue number (forwarding class) determines bits 1 and 2.

Routing Engine Protocol Queue Assignments

Table 7 lists how Routing Engine-sourced traffic is mapped to output queues. The follow caveats apply to Table 7:

- For all packets sent to queue 3 over a VLAN-tagged interface, the software sets the 802.1p bit to 110.
- For IPv4 and IPv6 packets, the software copies the IP type-of-service (ToS) value into the 802.1p field independent of which queue the packets are sent out.
- For MPLS packets, the software copies the EXP bits into the 802.1p field.

Table 7: Routing Engine Protocol Queue Assignments (1 of 2)

Routing Engine Protocol	Queue Assignment
Cisco High-Level Data Link Control (HDLC)	Queue 3
Point-to-Point Protocol (PPP)	Queue 3
Frame Relay Local Management Interface (LMI)	Queue 3
Frame Relay Asyncronization permanent virtual circuit (PVC)/data link connection identifier (DLCI) status messages	Queue 3
Multilink Frame Relay Link Integrity Protocol (LIP)	Queue 3
ATM Operation, Administration, and Maintenance (OAM)	Queue 3
Intermediate System-to-Intermediate System (IS-IS) Open Systems Interconnection (OSI)	Queue 3
Open Shortest Path First (OSPF) protocol data unit (PDU)	Queue 3
Distance Vector Multicast Routing Protocol (DVMRP)	Queue 3
Link Aggregation Control Protocol (LACP)	Queue 3

Table 7: Routing Engine Protocol Queue Assignments (2 of 2)

Routing Engine Protocol	Queue Assignment
IP version 6 (IPv6) Neighbor Solicitation	Queue 3
IPv6 Neighbor Advertisement	Queue 3
IPv6 Router Advertisement	Queue 0
Protocol Independent Multicast (PIM)	Queue 3
Routing Information Protocol (RIP)	Queue 3
Multicast listener discovery (MLD)	Queue 0
Resource Reservation Protocol (RSVP)	Queue 3
Label Distribution Protocol (LDP) User Datagram Protocol (UDP) hello	Queue 3
LDP keepalive and Session data	Queue 0
LDP TCP Retransmission	Queue 3
Border Gateway Protocol (BGP)	Queue 0
BGP TCP Retransmission	Queue 3
Multicast Source Discovery Protocol (MSDP)	Queue 0
MSDP TCP Retransmission	Queue 3
Bidirectional Forwarding Detection (BFD) protocol	Queue 3
Virtual Router Redundancy Protocol (VRRP)	Queue 0
Internet Group Management Protocol (IGMP) query	Queue 3
IGMP Report	Queue 0
Simple Network Management Protocol (SNMP)	Queue 0
Telnet	Queue 0
FTP	Queue 0
SSH	Queue 0
xnm-clear-test	Queue 0
xnm-ssl	Queue 0
Link Services (LS) PIC	If link fragmentation and interleaving (LFI) is enabled, all routing protocol packets larger then 128 bytes are transmitted from queue 0. This ensures that VoIP traffic is not affected. Fragmentation is supported on queue 0 only.
Adaptive Services PIC	TCP tickle (keepalive packets for idle session generated with stateful firewall to probe idle TCP sessions) are sent from queue 0.
Real-time performance monitoring (RPM) probe packets	Queue 3