Cisco IOS Software Configuration for the Two-Port OC-192c/STM-64c Packet over SONET Line Card for the Cisco 12000 Series Routers

Product Numbers: 2OC192/POS-IR-SC, 2OC192/POS-VSR-MTP, 2OC192/POS-SR-SC, 2OC192/POS-LR-SC

This document provides a summary of Cisco IOS features for the Two-port OC-192c/STM-64c Packet over SONET line card. Throughout this publication, this line card is referred to as the 2-port OC-192c/STM-64c POS line card, or as the line card. For physical installation and initial interface configuration information, see the document *Cisco 12000 Series Router POS Line Card Installation and Configuration* at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/core/cis12000/linecard/lc_pos/16412pos.htm

Feature History

Release	Modification
12.0(27)S1	The 2-port OC-192c/STM-64c POS Line Card is introduced.[1]

1. There are no Cisco IOS commands or show command output introduced in Cisco IOS Release 12.0(27)S1 specific to the linecard.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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Software Feature Summary

Th e 2-port OC-192c/STM-64c POS line card operates at a clock speed of 20 gigabits per second (Gbps) and is fully interoperable with all earlier releases of the Cisco 12000 Series line cards.

The dedicated layer 3 forwarding engine (Engine 6) supports an IP version 4 and Multiprotocol label switching (IP/MPLS) feature set, which includes advanced quality of service (QoS), accounting (sampled NetFlow), security and traffic control, and committed access rate (CAR).

Supported features include:

- Extended ACLs— More than 32,000 entries on both ingress and egress with filtering on source or destination IP addresses and transport protocols.
- Hardware support for more than one million IP prefixes and up to 256,000 multicast groups. for VPN and multicast applications
- Rate-limiting, classification, and bandwidth management using Committed Access Rate (CAR), which allows service providers to control access to internal network resources, provides protection against denial of service attacks, and delivers tiered services such as “pay-as-you-grow” bandwidth usage models.
- Precedence marking (packet coloring), which allows the class of service (CoS) field in IP or the EXP field in MPLS to be marked to the specified QoS for different classes of service.
- Weighted Random Early Detection (WRED) congestion control/query management, which allows selective discard of low-priority flows before dropping packets from higher-priority flows
- Modified Deficit Round Robin (MDRR) with low-latency queuing, which provides class-based packet queuing that controls the packet dequeuing process to guarantee transit latency for differentiated flows.
- Traffic shaping, which helps service providers build tiered service models by absorbing “bursty” traffic in both the ingress and egress directions, to present smooth flows to both internal network resources and customer networks
- Link bundling, which enables load sharing over multiple links

Layer 1 and 2 Encapsulation Protocols

The 2-port OC-192c/STM-64c POS line card supports a maximum transmission unit (MTU) of up to 9188 bytes. POS channel is supported with up to eight interfaces in hardware.

- Packet over SONET (POS)
- Synchronous Digital Hierarchy (SDH)
- High-Level Data Link Control protocol (HDLC)
- IETF RFC 1490, Frame Relay encapsulation
- RFC 1619/2615, Point-to-Point Protocol (PPP) over SONET/SDH
- RFC 1662, PPP in High-Level Data Link Control (HDLC)-like framing

- RFC 2615, PPP over SONET/SDH

Note There is no subinterface support for HDLC, PPP, and Frame Relay

Routing and Switching Protocols

- :Border Gateway Protocol Version 4 (BGPv4)
- Open Shortest Path First (OSPF)
- Intermediate System-to-Intermediate System (IS-IS)
- Enhanced Interior Gateway Routing Protocol (EIGP)
- Routing Information Protocol (RIP)
- Distributed Forwarding Information Base
- IP switching
- Cisco Discovery Protocol (CDP)
- Internet Message Protocol
- Routing with Resource Reservation (RRR)

Multicast Protocols

The 2-port OC-192c/STM-64c POS line card provides multicast forwarding with support for source and shared distribution trees and the following protocols:

- Protocol Independent Multicast dense mode (PIM-DM)
- PIM sparse mode (PIM-SM)
- Internet Group Management Protocol Versions 1 and 2 (IGMPv1/v2)
- Cisco Group Management Protocol
- Multicast GP
- Multicast Source Discovery Protocol (MSDP)
- Any Transport over MPLS (AToM)
- CSC
- IAS
- MPLS
- VPNs
- Traffic engineering using RRR
- IP load balancing with per-flow path selection for up to eight paths

Rate Limiting

- Input CAR supports 32K-rule/port based on protocol type, IP TOS or TAG CoS, VLAN Priority, ACL classification.
- Output CAR supports 32K-rule/port based on protocol type, IP TOS or TAG CoS, ACL classification.
- Input/Output CAR conform and exceed actions: transmit, drop, set precedence and transmit.
- Output rate pacing per Class of Service queue and per port, based on single leaky bucket counters.
- Input 32K-rule CAR applied to CPU destined traffic with priority mapping.

Precedence Mapping

- Supports port-based 8-bit TOS, TAG CoS, VLAN priority, to 3-bit priority, precedence mapping (that is, 0->1, 1->4, 7->3) before rate limiting on input.
- Support similar precedence mapping on output before rate limiting or queueing.

Rx Side Queueing

- Supports virtual output queuing (8 CoS x 16 output ports x 16 linecards for unicast and 8 CoS queues for multicast).
- Supports flexible mapping of packets into CoS queues based on precedence.
- Supports 8 CoS queues for CPU traffic.
- Prioritized, selective access to memory resources for CPU bound traffic, enabling memory reservation for CPU bound traffic.
- Supports RED/WRED and MDRR (fair mode and low-latency mode).
- Supports two-priority backpressure from to-fabric interface.

Tx Side Queueing

- Supports 8 unicast CoS queues per port.
- H/W support per CoS, per output port, per linecard queue backpressure.
- Supports 8 CoS queues for CPU traffic.
- Prioritized, selective access to memory resources for CPU bound traffic, enabling memory reservation for CPU bound traffic.
- Supports RED/WRED and MDRR (fair mode and low-latency mode).
- Supports output rate pacing per port and per CoS queue.

Multicast

Full hardware multicast support:

- No packet replication on source line card.
- Isolation of unicast and multicast traffic in separate queues on source line card to prevent head-of-line-blocking.
- Fabric based replication to destination line card(s). A single packet copy reaches each destination line card.
- Further packet duplication in the Tx side queuing module, with control of overall bandwidth usage split between unicast and multicast traffic.

Routing

- Supports for IPv4 unicast and multicast forwarding, and MPLS unicast forwarding, with IP to MPLS and MPLS to IP translation.
- Improved scalability of IP/MPLS forwarding lookup, using 256MB of external DRAM (32 MB lookup entries).
- Improved adjacency lookup, supported by internal DRAM. Up to 128 Kb adjacencies supported.
- Improved memory efficiency of IP multicast lookup.
- Supports bi-directional PIM for multicast.
- Support Reverse Path Forwarding (RPF) check for IP unicast traffic.
- Supports IP and MPLS load balancing (16 next hops) at flow and packet level.
- Supports adjacency bundling based on IP TOS or MPLS CoS.
- Supports independent routing table per input port, per unicast/multicast and per IP/MPLS.

MPLS and MPLS Class of Service

- MPLS label processing:
  - Six labels maximum can be pushed per tagged packet (one of which is a replace if the packet is a tagged packet)
  - Two labels maximum can be popped per packet.
  - Forwarding for tagged packets based upon the IP header only be provided for tagged packets with a tag stack of depth one.
- Supports CoS by applying features to MPLS CoS field:
  - Precedence mapping based on the label
  - Rate limiting on the label precedence field
    - Queue selection based on label precedence field
    - Minimal hardware only support for MPLS multicasting
- AToM support (L2 over MPLS)
  - HDLC over MPLS : label imposition and disposition support
  - PPP over MPLS : label disposition support
  - Ethernet over MPLS : label disposition support

  - ATM over MPLS : label disposition support, with no sequence number checking
  - Frame Relay over MPLS : label disposition support, with no sequence number checking
- No per label queues

Statistics and Accounting

- Byte and packet counting per ingress port for IP and MPLS packets
- Byte and packet counting per ingress port for IP and MPLS ToS bits
- Packet counting for MDRR and WRED functions
- Packet and byte counting for CAR feature
- Counting per ingress port for IP prefixes and Cisco Express Forwarding adjacencies
- Source and destination based BGP Policy Accounting (Destination Sensitive Billing)
- MPLS-aware Sampled Netflow (ingress and egress)

Additional References

The following sections provide references related to the features of the 2-port OC-192c/STM-64c POS line card .

Related Documents

Related Topics	Document Title
List of Cisco IOS features specific to the Cisco 12000 Series Router	*Cisco IOS Release 12.0S Features for Cisco 12000 Series Internet Router* http://www.cisco.com/univercd/cc/td/doc/product/core/cis12000/12_0s/index.htm
Cumulative list of features added to Cisco IOS 12.0 (S) release	*Cross-Platform Release Notes for Cisco IOS Release 12.0 S, Part 2: New Features and Important Notes* http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/relnote/xprn120s/120snewf.htm
Physical installation and diagnostic procedures for the 2-port OC-192c/STM-64c POS line card .	*2-Port OC-192c/STM-64c and 8-Port OC-48c/STM-16c Packet over SONET Line Card Installation and Configuration* http://cisco.com1/univercd/cc/td/doc/product/core/cis12000/linecard/lc_pos/16025pos.htm

Related Topics (continued)	Document Title (continued)
ACLs, EACLs and Turbo ACLs	*Implementing Access Lists on Cisco 12000 Series Internet Routers* http://www.cisco.com/en/US/products/hw/routers/ps167/products_tech_note09186a008015a057.shtml *Access List Performance Improvements for Cisco 12000 Gigabit Switch Routers* http://www.cisco.com/univercd/cc/tdSupports/doc/product/software/ios120/120newft/120limit/120s/120s10/hw_acl.htm *Turbo Access Control Lists* http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120s/120s6/turboacl.htm
APS and SONET commands: complete command syntax, command mode, defaults, usage guidelines, and examples	*Cisco IOS Interface Command Reference, Release 12.0*
APS and SONET configuration	*Cisco IOS Interface Configuration Guide, Release 12.0*
APS on the Cisco 7500 and Cisco 12000 series routers	*Automatic Protection Switching of Packet-over-SONET Circuits feature document, Release 11.2 P* http://www.cisco.com/univercd/cc/td/doc/product/software/ios112/ios112p/gsr/posapsgs.htm
Configuring Multilink PPP	*Configuring Media-Independent PPP and Multilink PPP* http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/dial_c/dcppp.htm
Committed Access Rate (CAR)	*Committed Access Rate* http://www.cisco.com/univercd/cc/td/doc/product/software/ios111/cc111/car.htm
Modular Quality of Service (MQC)	*Modular Quality of Service Command-Line Interface* http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120xe/120xe5/mqc/mcli.htm
MPLS Quality of Service feature module	*MPLS Quality of Service (QoS)* http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120s/120s22/fs22cos.htm
MPLS Traffic Engineering feature module	*MPLS Traffic Engineering (TE)—Link and Node Protection, with RSVP Hellos Support Feature Overview* http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120s/120s23/fs_frrnd.htm
Sampled Netflow feature module	*Sampled NetFlow* http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120s/120s11/12s_sanf.htm
Weighted Random Early Detection (WRED)	*Weighted Random Early Detection on the Cisco 12000 Series Router* http://www.cisco.com/univercd/cc/td/doc/product/software/ios112/ios112p/gsr/wred_gs.htm

MIBs

MIBs	MIBs Link
• All MIBs support both the EuropeanSDH and the USA SONET standards – SONET (RFC 2558) – DS1 (RFC 1406) – DS3 (RFC 1407)	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml