CHAPTER 3

Overview of the SIPs and SSC

This chapter provides an overview of the release history, and feature and Management Information Base (MIB) support for the Cisco 7600 SIP-200, Cisco 7600 SIP-400, Cisco 7600 SIP-600, and Cisco 7600 SSC-400.

This chapter includes the following sections:

Release History

Note For release history information about the introduction of SPA support on the SIPs, refer to the corresponding "Overview" chapters in the SPA technology sections of this document. In addition, features specific to certain SPA technologies are documented in the corresponding SPA sections of this document.

Release	Modification
12.2(33)SXI	Support for the Cisco 7600 SIP-600 was restored. Support for Asymmetric Carrier Delay was introduced on the Cisco 7600 SIP-200 and Cisco 7600 SIP-400.

12.2(33)SXH	Support for the Cisco 7600 SIP-600 was removed. Support for the following features was introduced on the Cisco 7600 SIP-200: • BCP over dMLPPP • MPLS over RBE • Multi-VC to VLAN scalability • QoS Support on Bridging Features • Software-based dMLPPP • Software-based dMLFR Support for the following features was introduced on the Cisco 7600 SIP-400: • Ethernet Over MPLS (EoMPLS) VC Scaling • Ingress/Egress COS Classification with Ingress Policing per VLAN or EoMPLS VC • Hierarchical VPLS (H-VPLS) with MPLS Edge • VPLS Multiple VCs per Spoke • Hierarchical QoS Support for Ethernet Over MPLS (EoMPLS) VCs • QoS Support on Bridging Features • Lawful Intercept
12.2(18)SXF	Support for the following SIP hardware was introduced on the Cisco 7600 series router and Catalyst 6500 series switch: • Cisco 7600 SIP-600 Support for the following features were introduced on the Cisco 7600 SIP-200: • Software-based MLPPP • Software-based MLFR Support for the following features were introduced on the Cisco 7600 SIP-400: • Policing by committed information rate (CIR) percentage • QoS matching on class of service (CoS)—2-Port Gigabit Ethernet SPA only.
12.2(18)SXE2	Support for the SPA services card (SSC) was introduced on the Cisco 7600 series router and Catalyst 6500 series switch: • Cisco 7600 SSC-400
12.2(18)SXE	Support for the following SPA interface processor (SIP) hardware was introduced on the Cisco 7600 series router and Catalyst 6500 series switch: • Cisco 7600 SIP-200 • Cisco 7600 SIP-400

Supported SIP Features

The Cisco 7600 SIP-200, Cisco 7600 SIP-400, and Cisco 7600 SIP-600 are high-performance, feature-rich SPA interface processors that function as carrier cards for shared port adapters (SPAs) on the Catalyst 6500 Series switch. These SIPs are supported on the Cisco 7600 series router and Catalyst 6500 series switch, and are compatible with one or more platform-independent SPAs. For more information on SPA compatibility, see the "SIP, SSC, and SPA Compatibility" section on page 2-3.

The Catalyst 6500 series switch can provide edge aggregation services, and the SIPs provide a cost-effective solution for customers seeking moderate- to high-port density and line rate services:

- The Cisco 7600 SIP-200 provides WAN edge aggregation through lower-speed and low-density SPAs for network environments requiring regional office connectivity to headquarters, or collapsed LAN/WAN deployment.
- The Cisco 7600 SIP-400 provides higher-speed, high-density link aggregation for network environments requiring leased line and metro aggregation.
- The Cisco 7600 SIP-600 provides a high-speed interface for WANs and metro aggregation.

Note Support for the Cisco 7600 SIP-600 was removed in Cisco IOS Release 12.2(33)SXH and restored in Cisco IOS Release 12.2(33)SXI and later releases.

Note The Cisco 7600 SIP-600 should not be used in the same chassis with an IPsec VPN SPA.

This section provides a list of some of the primary features supported by the SIP hardware and software. For feature compatibility information by SIP and SPA combination, and information about configuring these features, see Chapter 4, "Configuring the SIPs and SSC."

Cisco 7600 SIP-200 Features

- Field-programmable device (FPD) upgrade support

  The Cisco 7600 SIP-200 supports the standard FPD upgrade methods for the Catalyst 6500 Series switch. For more information about FPD support, see Chapter 31, "Upgrading Field-Programmable Devices."

Cisco 7600 SIP-200 High Availability Features

- Automatic protection switching (APS)—ATM and POS SPAs
- Online insertion and removal (OIR) of the SIP and SPAs
- Nonstop Forwarding (NSF)
- Stateful switchover (SSO)

Cisco 7600 SIP-200 ATM Features

- Aggregate Weighted Random Early Detection (WRED)
- ATM Adaptation Layer 5 (AAL5) Subnetwork Access Protocol (SNAP)

- AAL5 over Multiprotocol Label Switching (MPLS)
- ATM virtual circuit (VC) bundles
- RFC 1483, *Multiprotocol Encapsulation over ATM Adaptation Layer 5,* Multipoint Bridging (MPB) on the 2-Port and 4-Port OC-3c/STM-1 ATM SPA
- VC bundle Class of Service (CoS) precedence mapping

For a comprehensive list of supported and unsupported ATM features, SIP-dependent features, and restrictions see Chapter 6, "Overview of the ATM SPAs."

Cisco 7600 SIP-200 Frame Relay Features

For additional Frame Relay features, see also the MPLS and Quality of Service (QoS) feature sections.

Note Based on your link configuration, Multilink PPP (MLPPP) and Multilink Frame Relay (MLFR) are either software-based on the Cisco 7600 SIP-200, or hardware-based on the 8-Port Channelized T1/E1 SPA and 2-Port and 4-Port Channelized T3 SPAs. For more information, see the corresponding configuration chapters for the SIPs and the serial SPAs.

- Distributed Multilink Frame Relay (dMLFR) (FRF.16)
- Distributed Link Fragmentation and Interleaving (dLFI) over Multilink PPP (MLPPP)
- dLFI with FRF.12
- Frame Relay over MPLS (FRoMPLS)
- Frame Relay VC bundles
- Frame Relay switching
- RFC 1490, *Multiprotocol Interconnect over Frame Relay*, Multipoint Bridging (MPB) on the 2-Port and 4-Port Clear Channel T3/E3 SPA, 2-Port and 4-Port Channelized T3 SPA, and the 8-Port Channelized T1/E1 SPA
- VC bundle Class of Service (CoS) precedence mapping

Cisco 7600 SIP-200 MPLS Features

- Explicit null
- Label disposition
- Label imposition
- Label swapping
- QoS tunneling
- Virtual private network (VPN) routing/forwarding (VRF) instance description
- MLPPP with MPLS on VPN
- Any Transport over MPLS (AToM) support, including:
  - ATM over MPLS (ATMoMPLS)—AAL5 VC mode
  - Ethernet over MPLS (EoMPLS)—(Single cell relay) VC mode
  - Frame Relay over MPLS (FRoMPLS)

  - High-Level Data Link Control (HDLC) over MPLS (HDLCoMPLS)
  - PPP over MPLS (PPPoMPLS)
- Hierarchical QoS for EoMPLS VCs

Beginning in Cisco IOS Release 12.2(33)SXH, the Cisco 7600 SIP-200 adds the following MPLS feature support:

- MPLS over RBE—ATM SPAs only

Cisco 7600 SIP-200 MPLS Classification

- Default copy of IP precedence to MPLS experimental (EXP) bit
- Match on MPLS EXP bit using Modular QoS CLI (MQC)

Cisco 7600 SIP-200 MPLS Congestion Management

- Low latency queueing (LLQ)
- Class-based weighted fair queueing (CBWFQ)

Cisco 7600 SIP-200 MPLS Encapsulations

- ATM AAL5 SNAP
- Frame Relay
- HDLC
- MLPPP
- PPP

Cisco 7600 SIP-200 MPLS Marking

- Set MPLS EXP bit using MQC

Cisco 7600 SIP-200 MPLS Traffic Shaping

- Traffic shaping using MQC

Cisco 7600 SIP-200 Multiservice Features

- Compressed Real-Time Protocol (cRTP)—Supported on the Cisco 7600 SIP-200 with the 8-Port Channelized T1/E1 SPA, 2-Port and 4-Port Channelized T3 SPA, and 2-Port and 4-Port Clear Channel T3/E3 SPA
- FRF.11

Cisco 7600 SIP-200 QoS Features

This section provides a list of the Quality of Service (QoS) features that are supported by the Cisco 7600 SIP-200.

Cisco 7600 SIP-200 ATM SPA QoS Implementation

For the 2-Port and 4-Port OC-3c/STM-1 ATM SPA, the following applies:

- In the ingress direction, all Quality of Service (QoS) features are supported by the Cisco 7600 SIP-200.
- In the egress direction:
  - All queueing based features (such as class-based weighted fair queueing [CBWFQ], and ATM per-VC WFQ) are implemented on the Segmentation and Reassembly (SAR) processor on the SPA.
  - Policing is implemented on the SIP.
  - Class queue shaping is not supported.

Cisco 7600 SIP-200 Packet Marking

- IP precedence
- Differentiated Services Code Point (DSCP)
- Class-based marking
- ATM cell loss priority (CLP) to EXP marking/Type of Service (ToS)/DSCP
- Frame relay discard eligibility (DE) to EXP marking/ToS/DSCP

Cisco 7600 SIP-200 Policing and Dropping

- Aggregate
- Dual rate
- Hierarchical
- DSCP Markdown
- Policing—Precedence, DSCP marking
- Policing—EXP marking
- Explicit Drop in Class
- Matching packet length

Cisco 7600 SIP-200 Classification Into a Queue

- MPLS EXP
- ACL number
- Configurable queue size
- Network-based application recognition (NBAR)/dSTILE

Cisco 7600 SIP-200 Congestion Management

- Weighted fair queueing (WFQ)
- Class-based weighted fair queueing (CBWFQ)
- Per-VC CBWFQ
- Allocation, DSCP, EXP and precedence matching
- LLQ or priority queueing (strict priority only)
- Configurable LLQ burst size

Cisco 7600 SIP-200 Congestion Avoidance

- Random early detection (RED)
- Weighted random early detection (WRED)
- Diffserv-compliant WRED
- Aggregate WRED—ATM SPAs only

Cisco 7600 SIP-200 Shaping

- Generic traffic shaping (GTS)/Distributed traffic shaping (DTS)
- Hierarchical service policy with GTS
- Hierarchical traffic shaping FR
- Hierarchical traffic shaping FR adaptive to FECN, BECN (Cisco 7600 SIP-200 only)
- Hierarchical traffic shaping for PPP and HDLC
- Ingress shaping
- Egress shaping

Note Egress shaping is not supported on the Cisco 7600 SIP-200 for the 2-Port and 4-Port OC-3c/STM-1 ATM SPA.

- Shaping by percentage

Cisco 7600 SIP-200 Other QoS Features

- Hierarchical QoS for EoMPLS VCs
- QoS with MLPPP

Beginning in Cisco IOS Release 12.2(33)SXH, the Cisco 7600 SIP-200 adds the following QoS feature support:

- QoS Support on Bridging Features

Cisco 7600 SIP-200 Fragmentation Features

- dLFI with ATM
- dLFI over MLPPP
- FRF.12

Cisco 7600 SIP-200 Layer 2 Protocols and Encapsulation

- AAL5 Network Layer protocol ID (NLPID)
- AAL5 SNAP
- Cisco Frame Relay
- IETF Frame Relay
- Frame Relay two-octet header
- Frame Relay BECN/FECN
- Frame Relay PVC
- Frame Relay UNI
- HDLC
- MLPPP
- PPP

Cisco 7600 SIP-200 Layer 2 Interworking

- ATM VC trunk emulation
- Bridged and routed RFC 1483, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*
- RFC 1483, *Multiprotocol Encapsulation over ATM Adaptation Layer 5,* Multipoint Bridging (MPB) on the 2-Port and 4-Port OC-3c/STM-1 ATM SPA
- RFC 1490, *Multiprotocol Interconnect over Frame Relay*, Multipoint Bridging (MPB) on the 2-Port and 4-Port Clear Channel T3/E3 SPA, 2-Port and 4-Port Channelized T3 SPA, and the 8-Port Channelized T1/E1 SPA
- Bridging of Routed Encapsulations (BRE)
- Routed bridged encapsulation (RBE)

Note RBE is not supported when using the Intermediate System-to-Intermediate System (IS-IS) routing protocol.

- RFC 3518, *Point-to-Point Protocol (PPP) Bridging Control Protocol (BCP)* on the 2-Port and 4-Port Clear Channel T3/E3 SPA, 2-Port and 4-Port Channelized T3 SPA, and the 8-Port Channelized T1/E1 SPA

Beginning in Cisco IOS Release 12.2(33)SXH, the Cisco 7600 SIP-200 adds the following Layer 2 interworking feature support:

- BCP Support Over MLPPP
- Multi-VC to VLAN scalability
- QoS Support on Bridging

Cisco 7600 SIP-400 Features

- FPD upgrade support

  The Cisco 7600 SIP-400 supports the standard FPD upgrade methods for the Catalyst 6500 Series switch. For more information about FPD support, see Chapter 31, "Upgrading Field-Programmable Devices."

Cisco 7600 SIP-400 High Availability Features

- Automatic protection switching (APS)—ATM and POS SPAs
- Online insertion and removal (OIR) of the SIP and SPAs
- Stateful switchover (SSO)

Cisco 7600 SIP-400 MPLS Features

Note For the Cisco 7600 SIP-400, the following MPLS features are implemented on the Supervisor Engine 720 PFC3B and Supervisor Engine 720 PFC3BXL: Label imposition, label swapping, label disposition, explicit null, default copy of IP precedence to EXP bit classification, and QoS tunneling. For more information about the requirements for Policy Feature Cards (PFCs) on the Catalyst 6500 Series switch, refer to the For more information about the requirements for Policy Feature Cards (PFCs) on the Catalyst 6500 Series switch, refer to the *Release Notes for Cisco IOS Release 12.2(33)SXH and Later Releases* at the following URL: http://www.cisco.com/en/US/docs/switches/lan/catalyst6500/ios/12.2SX/release/notes/ol_14271.html#wp2561312

- VRF description
- Any Transport over MPLS (AToM) support, including:
  - ATMoMPLS—AAL0 mode (single cell relay only)
  - ATMoMPLS—AAL5 mode
  - EoMPLS—Port mode
  - EoMPLS—VLAN mode
  - FRoMPLS—DLCI mode

Beginning in Cisco IOS Release 12.2(33)SXH, the Cisco 7600 SIP-400 adds the following MPLS feature support:

- Ingress/Egress COS Classification with Ingress Policing per VLAN or EoMPLS VC
- Hierarchical VPLS (H-VPLS) with MPLS Edge
- VPLS Multiple VCs per Spoke
- Hierarchical QoS Support for Ethernet Over MPLS (EoMPLS) VCs

Cisco 7600 SIP-400 MPLS Congestion Management

- LLQ
- CBWFQ

Cisco 7600 SIP-400 MPLS Encapsulations

- ATM AAL5 SNAP
- Ethernet/802.1q
- Frame Relay
- HDLC
- Generic Routing Encapsulation (GRE)—2-Port Gigabit Ethernet SPA only
- PPP

Cisco 7600 SIP-400 MPLS Marking

- Set MPLS EXP bits at tag imposition using MQC (**set mpls-experiment** command)—Input IP interface
- Set MPLS EXP bits on topmost label (set EXP topmost) using MQC (**set mpls-experiment topmost** command)—Input and output MPLS interface
- Mapping Ethernet 802.1q priority bits to MPLS EXP bits for EoMPLS

Cisco 7600 SIP-400 QoS Features

This section provides a list of the Quality of Service (QoS) features that are supported by the Cisco 7600 SIP-400.

Cisco 7600 SIP-400 Packet Marking

- IP precedence (**set ip precedence** command)—Input and output
- DSCP (**set dscp** command)—Input and output
- Class-based marking
- DE to EXP marking/ToS/DSCP
- CLP to EXP marking/ToS/DSCP
- Ethernet 802.1q priority bits to EXP marking (EoMPLS)

Cisco 7600 SIP-400 Policing and Dropping

- Dual rate
- Hierarchical
- Dual-rate policer with three-color marker
- Policing—Percent
- Policing—Precedence, DSCP marking
- Policing—EXP marking
- Policing—Set ATM CLP, FR DE
- Policing—Set MPLS EXP bits on topmost label (set EXP topmost)
- Explicit Drop in Class

Cisco 7600 SIP-400 Classification Into a Queue

- Access control lists (IPv4 and IPv6)
  - Access group (**match access-group** command)—Input and output
  - Address (IPv6 compress mode only)
  - Name
  - Number
  - Source and destination port
  - TCP flag (IPv4 only)
- ATM CLP (**match atm clp** command)—Input ATM interface
- Configurable queue size
- CoS (**match cos** command)—Input and output dot1q tagged frames for 2-Port Gigabit Ethernet SPA only
- Frame Relay DE (**match fr-de** command)—Input Frame Relay interface
- IP DSCP (**match dscp** command)—Input and output
- IP precedence (**match ip precedence** command)—Input and output
- MPLS EXP (**match mpls experimental** command)—Input and output MPLS interface
- Multiple matches per class map (up to 8)

Beginning in Cisco IOS Release 12.2(33)SXH, the Cisco 7600 SIP-400 adds the following QoS classification feature support:

- Ingress/Egress COS Classification with Ingress Policing per VLAN or EoMPLS VC

Cisco 7600 SIP-400 Congestion Management

- CBWFQ
- Per-VC CBWFQ
- DSCP, EXP and Precedence matching
- LLQ or priority queueing (strict priority only)

Cisco 7600 SIP-400 Congestion Avoidance

- RED
- WRED
- Diffserv-compliant WRED
- Aggregate WRED—ATM SPAs only

Cisco 7600 SIP-400 Shaping

- Hierarchical traffic shaping using class-default (not supported for user-defined class)
- Hierarchical traffic shaping FR
- Hierarchical traffic shaping for PPP and HDLC
- Egress shaping

Cisco 7600 SIP-400 Fragmentation Features

- dLFI with ATM

Cisco 7600 SIP-400 Layer 2 Protocols and Encapsulation

- PPP
- AAL5 SNAP
- HDLC
- Cisco Frame Relay
- IETF Frame Relay
- Frame Relay two-octet header
- Frame Relay BECN/FECN
- Frame Relay PVC
- Frame Relay UNI

Cisco 7600 SIP-400 Layer 2 Interworking

- Bridged and routed RFC 1483, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*
- RFC 3518, *Point-to-Point Protocol (PPP) Bridging Control Protocol (BCP)* on the 2-Port and 4-Port Clear Channel T3/E3 SPA, 2-Port and 4-Port Channelized T3 SPA, and the 8-Port Channelized T1/E1 SPA

Beginning in Cisco IOS Release 12.2(33)SXH, the Cisco 7600 SIP-400 adds the following Layer 2 interworking feature support:

- QoS Support on Bridging Feature

Cisco 7600 SIP-600 Features

Note Support for the Cisco 7600 SIP-600 was removed in Cisco IOS Release 12.2(33)SXH and restored in Cisco IOS Release 12.2(33)SXI and later releases.

Note The Cisco 7600 SIP-600 should not be used in the same chassis with an IPsec VPN SPA.

- FPD upgrade support

  The Cisco 7600 SIP-600 supports the standard FPD upgrade methods for the Catalyst 6500 Series switch. For more information about FPD support, see Chapter 31, “Upgrading Field-Programmable Devices.”
- Layer 2 switch port
- EtherChannel and Link Aggregate Control Protocol (IEEE 802.3ad)
- Control Plane Policing (CPP)

Cisco 7600 SIP-600 High Availability Features

- Automatic protection switching (APS)
- Online insertion and removal (OIR) of the SIP and SPAs
- Nonstop Forwarding (NSF)
- Stateful switchover (SSO)

Cisco 7600 SIP-600 MPLS Features

- Unicast switching, with specific support for up to six label push operations, one label pop operation (2 label pop operation in case of Explicit Null), or one label swap with up to five label push operations, at each MPLS switch node.
- Support for Explicit Null label to preserve CoS information when forwarding packets from provider (P) to provider edge (PE) switches.
- Support for Implicit Null label to request that penultimate hop switch forward IP packets without labels to the switch at the end of the label switch path (LSP).
- VRF
- Traffic engineering
- Any Transport over MPLS (AToM) support—EoMPLS only
  - PFC-based (No MAC address learning)
  - SIP-based (MAC address learning, requires SIP as uplink)
  - Up to 4000 EoMPLS VCs per system
- Virtual Private LAN Service (VPLS) support, including:
  - H-VPLS on MPLS edge—H-VPLS with MPLS edge requires either an OSM module or Cisco 7600 SIP-600 in both the downlink (facing UPE) and uplink (MPLS core). For more information about configuring H-VPLS, see Chapter 10, “Configuring the Fast Ethernet and Gigabit Ethernet SPAs.”
  - H-VPLS with QinQ edge—Requires Cisco 7600 SIP-600 in the uplink, and any LAN port or Cisco 7600 SIP-600 on the downlink.
  - Up to 4000 VPLS domains
  - Up to 60 VPLS peers per domain
  - Up to 30,000 pseudo-wires, used in any combination of domains and peers up to the 4000-domain or 60-peer maximums. For example, support of up to 4000 domains with 7 peers or up to 60 peers in 500 domains.
- MPLS Operations and Maintenance (OAM) support, including:
  - LSP ping and traceroute
  - Virtual Circuit Connection Verification (VCCV)

Cisco 7600 SIP-600 Layer 2 Protocols and Encapsulation

- HDLC (Cisco Systems)
- PPP
- PPP over SONET/SDH

- Layer 2 Gigabit Ethernet support, including:
  - IEEE 802.3z 1000 Mbps Gigabit Ethernet
  - IEEE 802.3ab 1000BaseT Gigabit Ethernet
  - IEEE 802.3ae 10 Gbps Ethernet (1-Port 10-Gigabit Ethernet SPA only)
  - Jumbo frame (up to 9216 bytes)
  - ARPA, IEEE 802.3 SAP, IEEE 802.3 SNAP, QinQ
  - IEEE 802.1q VLANs
  - Autonegotiation support including IEEE 802.3 flow control and pause frames
  - Gigabit Ethernet Channel (GEC)
  - IEEE 802.3ad link aggregation
  - Address Resolution Protocol (ARP)/Reverse ARP (RARP
  - Hot Standby Router Protocol (HSRP)
  - Virtual Router Redundancy Protocol (VRRP)

Cisco 7600 SIP-600 QoS Features

This section provides a list of the Quality of Service (QoS) features that are supported by the Cisco 7600 SIP-600.

- MQC

Cisco 7600 SIP-600 Marking

- IP precedence (**set ip precedence** command)
- DSCP (**set dscp** command)
- MPLS EXP (**match mpls experimental** command)

Note Mapping 802.1p CoS values to MPLS EXP bits is supported using EoMPLS only.

Cisco 7600 SIP-600 Policing and Dropping

- Input policing on a per-port and per-VLAN basis

Cisco 7600 SIP-600 Classification Into a Queue

- Input and output ACLs on a per-port and per-VLAN basis
- Input VLAN (**match input vlan** command)
- IP DSCP (**match dscp** command)
- IP precedence (**match ip precedence** command)
- MPLS EXP (**match mpls experimental** command)
- QoS group (**match qos-group** command)
- VLAN (**match vlan** command)

Cisco 7600 SIP-600 Congestion Management

- CBWFQ
- LLQ

Cisco 7600 SIP-600 Congestion Avoidance

- WRED

Cisco 7600 SIP-600 Shaping

- Output shaping on a per-port and per-VLAN basis
- Output hierarchical traffic shaping—Two levels of shaping on an interface, subinterface, or group of subinterfaces

Supported SSC Features

The Cisco 7600 SSC-400 is a streamlined services card that provides a very high bandwidth data path between the Catalyst 6500 Series switch platform backplane and the high-speed interconnects on the IPsec VPN SPA.

For more information about the features and configuration supported by the IPsec VPN SPA with the Cisco 7600 SSC-400, see the related chapters in the IPsec VPN Shared Port Adapter section of this book.

Cisco 7600 SSC-400 Features

- Support of up to two IPsec VPN SPAs per slot
- Online insertion and removal (OIR) of the SSC and SPAs

Restrictions

This section documents unsupported features and feature restrictions for the SIPs and SSC on the Catalyst 6500 Series switch.

Cisco 7600 SIP-200 Restrictions

As of Cisco IOS Release 12.2(18)SXE, the Cisco 7600 SIP-200 has the following restrictions:

- The Cisco 7600 SIP-200 is not supported with a Supervisor Engine 1, Supervisor Engine 1A, Supervisor Engine 2, or Supervisor Engine 720A.
- A maximum number of 200 PVCs or SVCs using Link Fragmentation and Interleaving (LFI) is supported for all ATM SPAs (or other ATM modules) in a Catalyst 6500 Series switch.
- The following features are not supported:
  - Reliable PPP (RFC 1663, *PPP Reliable Transmission*)
  - Layer 2 Tunneling Protocol (L2TP) version 2

  - L2TP version 3
  - X.25, Link Access Procedure, Balanced (LAPB)
  - ATM LAN Emulation (LANE)
  - PPP over Ethernet (PPPoE)
  - STAC Compression
  - Legacy Priority Queueing and Custom Queueing
  - dLFI over Frame Relay (dLFIoFR)
  - dLFI with MPLS
- AToM (ATMoMPLS, FRoMPLS, HDLCoMPLS, and PPPoMPLs) on a SPA requires a Cisco 7600 SIP-200, FlexWAN, Enhanced FlexWAN, or OSM PXF interface as the core-facing interface.
- AToM (ATMoMPLS, FRoMPLS) on SIP-200 also are supported with a Cisco 7600 SIP-400 as the core-facing interface.

Cisco 7600 SIP-400 Restrictions

As of Cisco IOS Release 12.2(18)SXE, the Cisco 7600 SIP-400 has the following restrictions:

- The Cisco 7600 SIP-400 is not supported with a Supervisor Engine 1, Supervisor Engine 1A, or Supervisor Engine 2. It is also not supported with a Supervisor Engine 720 PFC3A, or in PFC3A mode.

  For more information about the requirements for Policy Feature Cards (PFCs) on the Catalyst 6500 Series switch, refer to the *Release Notes for Cisco IOS Release 12.2(33)SXH and Later Releases* at the following URL: http://www.cisco.com/en/US/docs/switches/lan/catalyst6500/ios/12.2SX/release/notes/ol_14271.html#wp2561312
- The Cisco 7600 SIP-400 is not supported with PFC-2 based systems.
- A maximum number of 200 PVCs or SVCs using Link Fragmentation and Interleaving (LFI) is supported for all ATM SPAs (or other ATM modules) in a Catalyst 6500 Series switch.
- For AToM in releases prior to Cisco IOS Release 12.2(33)SXH, the Cisco 7600 SIP-400 does not support the following features when it is located in the data path. This means you should not configure the following features if the SIP is facing the customer edge (CE) or the MPLS core:
  - HDLCoMPLS
  - PPPoMPLS
  - Virtual Private LAN Service (VPLS)
- For AToM beginning in Cisco IOS Release 12.2(33)SXH, the Cisco 7600 SIP-400 supports the following features on CE-facing interfaces:
  - HDLCoMPLS
  - PPPoMPLS
  - Virtual Private LAN Service (VPLS)
- The Cisco 7600 SIP-400 supports EoMPLS with directly connected provider edge (PE) devices when the Cisco 7600 SIP-400 is on the MPLS core side of the network.

- The Cisco 7600 SIP-400 does not support the ability to enable or disable tunneling of Layer 2 packets, such as for the VLAN Trunking Protocol (VTP), Cisco Discovery Protocol (CDP), and bridge protocol data unit (BPDU). The Cisco 7600 SIP-400 tunnels BPDUs, and always blocks VTP and CDP packets from the tunnel.
- In ATMoMPLS AAL5 and cell mode, the Cisco 7600 SIP-400 supports non-matching VPIs/VCIs between PEs if the Cisco 7600 SIP-400 is on both sides of the network.
- The Cisco 7600 SIP-400 supports matching on FR-DE to set MPLS-EXP for FRoMPLS.
- The Cisco 7600 SIP-400 supports use of the **xconnect** command to configure AToM circuits for all AToM connection types except ATMoMPLS. For ATMoMPLS, you must use the **mpls l2 transport route** command.
- The Cisco 7600 SIP-400 supports local switching for Frame Relay and ATM interfaces.
- The Cisco 7600 SIP-400 does not support the following QoS classification features with AToM:
  - Matching on data-link connection identifier (DLCI) is unsupported.
  - Matching on virtual LAN (VLAN) is unsupported.
  - Matching on class of service (CoS) is unsupported is unsupported in Cisco IOS Release 12.2(18)SXE and Cisco IOS Release 12.2(18)SXE2 only. Beginning in Cisco IOS Release 12.2(18)SXF, it is supported with the 2-Port Gigabit Ethernet SPA.
  - Matching on input interface is unsupported.
  - Matching on packet length is unsupported.
  - Matching on media access control (MAC) address is unsupported.
  - Matching on protocol type, including Border Gateway Protocol (BGP), is unsupported.
- The Cisco 7600 SIP-400 does not support the following QoS classification features using MQC:
  - ACL IPv6 full address
  - ACL IPv6 TCP flags
  - Class map (**match class-map** command)
  - COS inner (**match cos inner** command)—Supported beginning in Cisco IOS Release 12.2(33)SXH on 2-Port Gigabit Ethernet SPA input and output interfaces and with bridging features.
  - Destination sensitive services (DSS)
  - Discard class (**match discard-class** command)
  - Frame Relay DLCI (**match fr-dlci** command)
  - Input interface (**match input-interface** command)
  - Input VLAN (**match input vlan** command)—Supported beginning in Cisco IOS Release 12.2(33)SXH on output interfaces only.
  - IP RTP (**match ip rtp** command)
  - IPv4 and IPv6 ToS
  - MAC address (**match mac** command)
  - Match protocol (**match protocol** command)—Support IP only
  - Packet length (**match packet length** command)
  - QoS group (**match qos-group** command)
  - Source and destination autonomous system (AS) (**match as** command)

  - Source and destination Border Gateway Protocol (BGP) community (**match bgp-community** command)
  - VLAN (**match vlan** command)
  - VLAN inner (**match vlan inner** command)—Supported beginning in Cisco IOS Release 12.2(33)SXH on input and output interfaces and with bridging features.
- The Cisco 7600 SIP-400 does not support the following QoS marking features:
  - CoS (**set cos** command)
  - CoS inner (**set cos inner** command)
- The Cisco 7600 SIP-400 does not support the following QoS marking features using MQC:
  - QoS group (**set qos-group** command)
  - Next-hop (**set next-hop** command)
  - Discard class (**set discard-class** command)
  - Table (**set table** command)
- The Cisco 7600 SIP-400 does not support the following QoS queueing actions using MQC:
  - Flow-based queueing
  - Adaptive shaping
- The Cisco 7600 SIP-400 does not support the following QoS policing feature:
  - Policing by Committed Information Rate (CIR) percentage (**police cir percent** command)—Supported as of Cisco IOS Release 12.2(18)SXF
- The Cisco 7600 SIP-400 does not support the following Frame Relay features:
  - Matching on DLCI is unsupported
  - Bridging encapsulation is unsupported
  - Multicast on multipoint interfaces is unsupported
  - FRF.5 is unsupported
  - FRF.8 is unsupported
  - FRF.12 fragmentation is unsupported
  - FRF.16 multilink support of four-octet extended addressing on an SVC is unsupported
  - NNI is unsupported
  - PVC bundling is unsupported
  - PPP over Frame Relay is unsupported
- The Cisco 7600 SIP-400 does not support RFC 1483, *Multiprotocol Encapsulation over ATM Adaptation Layer 5,* Multipoint Bridging (MPB). However, point-to-point bridging is supported.
- As of Cisco IOS Release 12.2(18)SXF, when using the Cisco 7600 SIP-400 with the 2-Port Gigabit Ethernet SPA or the 1-Port OC-48c/STM-16 ATM SPA, consider the following oversubscription guidelines:
  - The Cisco 7600 SIP-400 only supports installation of one 1-Port OC-48c/STM-16 ATM SPA without any other SPAs installed in the SIP.
  - The Cisco 7600 SIP-400 supports installation of up to two 2-Port Gigabit Ethernet SPAs without any other SPAs installed in the SIP.

  - The Cisco 7600 SIP-400 supports installation of any combination of OC-3 or OC-12 POS or ATM SPAs, up to a combined ingress bandwidth of OC-48 rates.
  - The Cisco 7600 SIP-400 supports installation of any combination of OC-3 or OC-12 POS or ATM SPAs up to a combined ingress bandwidth of OC-24 rates, when installed with a single 2-Port Gigabit Ethernet SPA.
- QinQ (the ability to map a single 802.1Q tag or a random double tag combination into a VPLS instance, a Layer 3 MPLS VPN, or an EoMPLS VC) is not supported.
- Cisco Discovery Protocol (CDP) is disabled by default on the 2-Port Gigabit Ethernet SPA interfaces and subinterfaces on the Cisco 7600 SIP-400.

Cisco 7600 SIP-600 Restrictions

Note Support for the Cisco 7600 SIP-600 was removed in Cisco IOS Release 12.2(33)SXH and restored in Cisco IOS Release 12.2(33)SXI and later releases.

As of Cisco IOS Release 12.2(18)SXF, the Cisco 7600 SIP-600 has the following restrictions:

- The Cisco 7600 SIP-600 is not supported by the Supervisor Engine 32. The Cisco 7600 SIP-600 is supported by the Supervisor Engine 720 PFC3B and Supervisor Engine 720 PFC3BXL. It is not supported with a Supervisor Engine 720 PFC3A or in PFC3A mode.

  For more information about the requirements for Policy Feature Cards (PFCs) on the Catalyst 6500 Series switch, refer to the *Release Notes for Cisco IOS Release 12.2(33)SXH and Later Releases* at the following URL: http://www.cisco.com/en/US/docs/switches/lan/catalyst6500/ios/12.2SX/release/notes/ol_14271.html#wp2561312
- The Cisco 7600 SIP-600 supports installation of only a single SPA in the first subslot.
- Removal of one type of SPA and reinsertion of a different type of SPA during OIR causes a reload of the Cisco 7600 SIP-600.
- QinQ (the ability to map a single 802.1Q tag or a random double tag combination into a VPLS instance, a Layer 3 MPLS VPN, or an EoMPLS VC) is not supported.
- H-VPLS with MPLS edge requires either an OSM module or Cisco 7600 SIP-600 in both the downlink (facing UPE) and uplink (MPLS core).
- Output policing is not supported.
- On any Cisco 7600 SIP-600 Ethernet port subinterface using VLANs, a unique VLAN ID must be assigned. This VLAN ID cannot be in use by any other interface on the Catalyst 6500 Series switch.

Note The Cisco 7600 SIP-600 should not be used in the same chassis with an IPsec VPN SPA.

Cisco 7600 SSC-400 Restrictions

As of Cisco IOS Release 12.2(18)SXE2, the Cisco 7600 SSC-400 has the following restrictions:

- The Cisco 7600 SSC-400 is only supported by the Supervisor Engine 720 (MSFC3 and PFC3).

For more information about the requirements for Policy Feature Cards (PFCs) on the Catalyst 6500 Series switch, refer to the For more information about the requirements for Policy Feature Cards (PFCs) on the Catalyst 6500 Series switch, refer to the *Release Notes for Cisco IOS Release 12.2(33)SXH and Later Releases* at the following URL: http://www.cisco.com/en/US/docs/switches/lan/catalyst6500/ios/12.2SX/release/notes/ol_14271.html#wp2561312

- The Cisco 7600 SSC-400 only supports two IPsec VPN SPAs.

As of Cisco IOS Release 12.2(18)SXF, the Cisco 7600 SSC-400 has the following restrictions:

- The Cisco 7600 SSC-400 is not supported by the Supervisor Engine 32. The Cisco 7600 SSC-400 is only supported by the Supervisor Engine 720 (MSFC3 and PFC3).

  For more information about the requirements for Policy Feature Cards (PFCs) on the Catalyst 6500 Series switch, refer to the For more information about the requirements for Policy Feature Cards (PFCs) on the Catalyst 6500 Series switch, refer to the *Release Notes for Cisco IOS Release 12.2(33)SXH and Later Releases* at the following URL: http://www.cisco.com/en/US/docs/switches/lan/catalyst6500/ios/12.2SX/release/notes/ol_14271.html#wp2561312

- The Cisco 7600 SSC-400 only supports two IPsec VPN SPAs.

Supported MIBs

The following MIBs are supported in Cisco IOS Release 12.2(18)SXE and later for the Cisco 7600 SIP-200 on a Catalyst 6500 Series switch:

- CISCO-ENTITY-ASSET-MIB
- CISCO-ENTITY-EXT-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- ENTITY-MIB
- OLD-CISCO-CHASSIS-MIB

The following MIBs are supported in Cisco IOS Release 12.2(18)SXE and later for the Cisco 7600 SIP-400 on a Catalyst 6500 Series switch:

- ATM-ACCOUNTING-INFORMATION-MIB (RFC 2512)
- ATM-MIB (RFC 2515)
- ATM-SOFT-PVC-MIB
- ATM-TC-MIB
- ATM-TRACE-MIB
- CISCO-AAL5-MIB
- CISCO-ATM-CONN-MIB
- CISCO-ATM-RM-MIB
- CISCO-ATM TRAFFIC-MIB
- CISCO-CLASS-BASED-QOS-MIB
- CISCO-ENTITY-ASSET-MIB

- CISCO-ENTITY-EXT-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- ENTITY-MIB
- IF-MIB
- OLD-CISCO-CHASSIS-MIB
- SONET MIB (RFC 2558)

The following MIBs are supported in Cisco IOS Release 12.2(18)SXF and later for the Cisco 7600 SIP-600 on a Catalyst 6500 Series switch:

- CISCO-ENTITY-ASSET-MIB
- CISCO-ENTITY-EXT-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- ENTITY-MIB
- OLD-CISCO-CHASSIS-MIB

The following MIBs are supported in Cisco IOS Release 12.2(18)SXE2 and later for the Cisco 7600 SSC-400 on a Catalyst 6500 Series switch:

- CISCO-ENTITY-ASSET-MIB
- CISCO-ENTITY-EXT-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- ENTITY-MIB
- OLD-CISCO-CHASSIS-MIB

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

http://tools.cisco.com/ITDIT/MIBS/servlet/index

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://tools.cisco.com/RPF/register/register.do

Displaying the SIP and SSC Hardware Type

To verify the SIP or SSC hardware type that is installed in your Catalyst 6500 Series switch, you can use the **show module** command. There are other commands on the Catalyst 6500 Series switch that also provide SIP hardware information, such as the **show idprom** command and **show diagbus** command.

Table 3-1 shows the hardware description that appears in the **show module** and **show idprom** command output for each type of SIP that is supported on the Catalyst 6500 Series switch.

Table 3-1 SIP Hardware Descriptions in show Commands

SIP	Description in show module and show idprom Commands
Cisco 7600 SIP-200	4-subslot SPA Interface Processor-200 / 7600-SIP-200
Cisco 7600 SIP-400	4-subslot SPA Interface Processor-400 / 7600-SIP-400
Cisco 7600 SIP-600	1-subslot SPA Interface Processor-600 / 7600-SIP-600
Cisco 7600 SSC-400	2-subslot Services SPA Carrier-400 / 7600-SSC-400

Example of the show module Command

The following example shows output from the **show module** command on the Catalyst 6500 Series switch with a Cisco 7600 SIP-400 installed in slot 13:

```
Router# show module 13
Mod Ports Card Type                                Model              Serial No.
--- ----- ---------------------------------------- ------------------ -----------

 13    0  4-subslot SPA Interface Processor-400  7600-SIP-400       JAB0851042X

Mod MAC addresses                       Hw    Fw           Sw           Status
--- ----------------------------------- ------ ------------ ------------ -------
 13  00e0.aabb.cc00 to 00e0.aabb.cc3f   0.525 12.2(PP_SPL_ 12.2(PP_SPL_ Ok

Mod Online Diag Status
--- -------------------
 13 Pass
```

Example of the show idprom Command

The following example shows sample output for a Cisco 7600 SIP-200 installed in slot 4 of the switch:

```
Router# show idprom module 4
IDPROM for module #4
  (FRU is '4-subslot SPA Interface Processor-200')
  OEM String = 'Cisco Systems'
  Product Number = '7600-SIP-200'
  Serial Number = 'SAD0738006Y'
  Manufacturing Assembly Number = '73-8272-03'
  Manufacturing Assembly Revision = '03'
  Hardware Revision = 0.333
  Current supplied (+) or consumed (-) = -4.77A
```