
# Overview of the Fast Ethernet SPA and Gigabit Ethernet SPA

This chapter provides an overview of the release history, and feature and Management Information Base (MIB) support for the Cisco 7304 MSC-100 with the 4-Port 10/100 Fast Ethernet SPA, and the 2-Port 10/100/1000 Gigabit Ethernet SPA.

This chapter includes the following sections:



## Release History

Table 5-1 provides the release and modification history for Ethernet SPA-related features and enhancements on the Cisco 7304 router.

***Table 5-1 Release History for Ethernet SPAs***

| Release | Modification |
|---|---|
| Cisco IOS Release 12.2(20)S3 | The Stateful Switchover/Non-Stop Forwarding feature was introduced for the MSC-100 and the available SPAs. |
| Cisco IOS Release 12.2(20)S2 | Support for the following hardware was introduced on the Cisco 7304 router:<br>• Cisco 7304 Modular Services Card 100 (Cisco 7304 MSC-100)<br>• 4-Port 10/100 Fast Ethernet SPA (SPA-4FE-7304)<br>• 2-Port 10/100/1000 Gigabit Ethernet SPA (SPA-2GE-7304) |

# Supported Features

This section provides a list of some of the primary features supported with the MSC and SPA hardware and software.

## 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA Features

The following is a list of some of the significant hardware and software features supported by both the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA:

- Autonegotiation of speed, duplex, and IEEE 802.3x flow control (pause frames) when using both copper (RJ45) and fiber (SFP) media types. In copper mode, 10/100/1000 speeds and full/half duplex are advertised during autonegotiation. In fiber mode, only 1000-Mbps speed and full duplex are advertised. The Ethernet pause frame capability is also advertised.
- IEEE 802.3x flow control and asymmetric flow control
- Local (internal) and external loopback
- Auto-sensing of straight-through and Medium Dependent Interface Crossover (MDIX) cables
- Jumbo frames (up to 9216 bytes), plus Layer 2 header bytes
- Frame padding for frames smaller than minimum packet size (64 bytes)
- 2048 total MAC destination address entries per SPA, with the following number of entries supported per interface:
  - For the 4-Port 10/100 Fast Ethernet SPA—512 MAC destination addresses per interface
  - For the 2-Port 10/100/1000 Gigabit Ethernet SPA—1024 MAC destination addresses per interface
- 4096 total VLAN entries per SPA, with the following number of entries supported per interface:
  - For the 4-Port 10/100 Fast Ethernet SPA—1024 VLANs per interface
  - For the 2-Port 10/100/1000 Gigabit Ethernet SPA—2048 VLANs per interface
- Command-line interface (CLI)-controlled OIR independent of the MSC-100, or with the MSC-100
- Per interface port counters for policy drops, oversubscription drops, cyclic redundancy check (CRC) error drops, packet sizes, unicast, multicast, and broadcast packets
- Parity and cyclic redundancy check (CRC) detection for application-specific integrated circuit (ASIC) and discrete memory errors
- Field Programmable Gate Array (FPGA) upgrade support

  For more information about FPGA support, see Chapter 16, “Upgrading Field-Programmable Devices.”

# Restrictions

As of Cisco IOS Release 12.2(20)S2, the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA do not support the following features:

- EtherChannel—802.1AD link aggregation
- Ethernet Automatic Protection Switching (APS)
- Inter-Switch Link (ISL) encapsulation
- Universal Transport Interface (UTI)

# Supported MIBs

The following MIBs are supported in Cisco IOS Release 12.2(20)S2 for the 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router:

- CISCO-ENTITY-ALARM-MIB
- CISCO-CLASS-BASED-QOS-MIB
- CISCO-ENVMON-MIB (For NPEs, NSEs, line cards, and MSCs only)
- CISCO-ENTITY-ASSET-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- CISCO-ENTITY-SENSOR-MIB
- ENTITY-MIB
- ETHERLIKE-MIB
- IF-MIB
- RMON-MIB
- MPLS-LDP-MIB
- MPLS-LSR-MIB
- MPLS-TE-MIB
- MPLS-VPN-MIB

For more information about MIB support on the Cisco 7304 router, refer to the *Cisco 7304 Router MIB Specifications Guide* found at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/core/cis7300/7304mibs/

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:

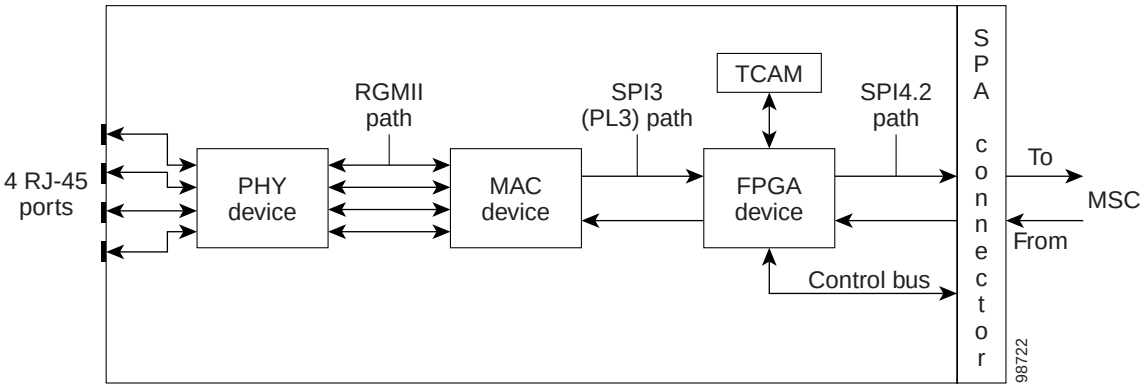
http://www.cisco.com/register

# SPA Architecture

This section provides an overview of the architecture of the 4-Port 10/100 Fast Ethernet SPA and describes the path of a packet in the ingress and egress directions. Some of these areas of the architecture are referenced in the SPA software and can be helpful to understand when troubleshooting or interpreting some of the SPA CLI and **show** command output.

Figure 5-1 identifies some of the hardware devices that are part of the 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA architecture. The figure shows the four RJ-45 ports that are supported by the Fast Ethernet SPA only.

***Figure 5-1 4-Port 10/100 Fast Ethernet SPA Architecture***




Every incoming and outgoing packet on the 4-Port 10/100 Fast Ethernet SPA goes through the physical (PHY), Media Access Control (MAC), and field-programmable gate array (FPGA) devices.

## Path of a Packet in the Ingress Direction

The following steps describe the path of an ingress packet through the 4-Port 10/100 Fast Ethernet SPA:

1. The PHY device receives incoming frames on a per-port basis from one of the four RJ-45 interface connectors.
2. The PHY device processes the frame and sends it over the RGMII path to the MAC device.
3. The MAC device receives the frame into a per-port first-in, first-out (FIFO) receive buffer and performs MAC-level processing of the frame. The CRC is not removed from the frame by the MAC device.
4. After validating received frames, the MAC device forwards the frames to the FPGA device.
5. The FPGA device receives the frame into a per-port FIFO receive buffer.

6. The FPGA device performs filtering based on whether or not the interface is operating in promiscuous mode. If the interface is operating in promiscuous mode, no filtering occurs and the FPGA device passes all frames for further processing.

   If the interface is not operating in promiscuous mode, then the FPGA device performs two Ternary Content Addressable Memory (TCAM) table lookups to filter the received frame based on the MAC destination address and virtual LAN (VLAN) identifier. The allowable MAC destination addresses and VLAN IDs are based on the supported router configuration.

   For more information about TCAM processing, see the "TCAM Filtering" section on page 5-5.

7. When the frame passes the TCAM filter processing, the FPGA strips the Layer 2 CRC and forwards the frame over the SPI4.2 path to the MSC.
8. The Cisco 7304 MSC-100 receives the frame and stores it in a per-port receive buffer. Once the MSC receives the entire frame, it is sent to the network services engine (NSE) or network processor engine (NPE) for further processing.

# Path of a Packet in the Egress Direction

The following steps describe the path of an egress packet from the Cisco 7304 MSC-100 through the 4-Port 10/100 Fast Ethernet SPA:

1. The Cisco 7304 MSC-100 receives frames from the NSE or NPE, strips the egress link header and stores the frames in a per-port transmit buffer.
2. After the Cisco 7304 MSC-100 receives a complete frame, it forwards the frame to the SPA FPGA device in interleaved mode.
3. The FPGA device pads the frame (as required), adds the Layer 2 CRC, and sends the frame to the MAC device.
4. The MAC device receives the frame into a per-port first-in, first-out (FIFO) transmit buffer and performs MAC-level processing of the frame.
5. After the MAC device receives a complete frame, it forwards the frame to the PHY device.
6. The PHY device encodes and serializes the frame and transmits the frame through the physical interface (one of the four RJ-45 interface connectors for the 4-Port 10/100 Fast Ethernet SPA).

# TCAM Filtering

The 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA support two TCAM regions per interface. One region is for MAC destination address filtering (2048 total entries, with 512 entries per interface on the Fast Ethernet SPA and 1024 entries per interface on the Gigabit Ethernet SPA), and the other is for VLAN ID filtering (4096 total entries, with 1024 entries per interface on the Fast Ethernet SPA and 2048 entries per interface on the Gigabit Ethernet SPA). Filtering is enabled by default when the interface is not operating in promiscuous mode. If the interface is operating in promiscuous mode, or if the TCAM table is full, then no filtering occurs. Otherwise, enabling and disabling of filtering is not user-configurable.

The TCAM entries support permit filtering only. For example, if a MAC destination address is not in the TCAM table for the interface, the frame is dropped. The MAC destination address entries are added to the TCAM for such things as multicast addresses of routing protocols. Unicast addresses do not typically appear in the table. By default when the router reloads, three destination addresses are added to the TCAM table: the local interface address, the Ethernet broadcast address, and the Ethernet multicast address.

For VLAN filtering, two default VLAN ID 0 entries always appear in the table and represent the local interface port for handling of promiscuous mode and non-VLAN packets. Additional VLAN IDs appear in the table based on your interface configuration.

To display the status of the TCAM tables on an interface, use the **show controllers fastethernet** command or **show controllers gigabitethernet** command.

# Displaying the SPA Hardware Type

To verify the SPA hardware type that is installed in your Cisco 7304 router, you can use the **show interfaces** command or the **show controllers** command. There are several other commands on the Cisco 7304 router that also provide SPA hardware information, including the **show c7300** and the **show diag** commands. For more information about these commands, see Chapter 18, "Command Reference."

Table 5-2 shows the hardware description that appears in the **show** command output for each type of SPA that is supported on the Cisco 7304 router.

***Table 5-2 SPA Hardware Descriptions in show Commands***

| SPA | Description in show interfaces and show controllers commands |
|---|---|
| 4-Port 10/100 Fast Ethernet SPA | Hardware is SPA-4FE-7304 |
| 2-Port 10/100/1000 Gigabit Ethernet SPA | Hardware is SPA-2GE-7304 |

# Example of the show interfaces Command

The following example shows output from the **show interfaces fastethernet** command on a Cisco 7304 router with a 4-Port 10/100 Fast Ethernet SPA installed in slot 4:

```
Router# show interfaces fastethernet 4/0/0
FastEthernet4/0/0 is up, line protocol is up
  Hardware is SPA-4FE-7304, address is 00b0.64ff.5d80 (bia 00b0.64ff.5d80)
  Internet address is 192.168.50.1/24
.
.
.
```

# Example of the show controllers Command

The following example shows output from the **show controllers fastethernet** command on a Cisco 7304 router with a 4-Port 10/100 Fast Ethernet SPA installed in slot 4:

```
Router# show controllers fastethernet 4/0/0
Interface FastEthernet4/0/0
  Hardware is SPA-4FE-7304
  Connection mode is auto-negotiation
  Interface state is up, link is up
  Configuration is Auto Speed, Auto Duplex
  Selected media-type is RJ45
.
.
.
```