Troubleshooting the Fast Ethernet SPA and Gigabit Ethernet SPA

This chapter describes techniques that you can use to troubleshoot the operation of your Fast Ethernet and Gigabit Ethernet SPAs.

It includes the following sections:

The first section provides information about basic interface troubleshooting. If you are having a problem with your SPA, use the steps in the "Performing Basic Interface Troubleshooting" section to begin your investigation of a possible interface configuration problem.

To perform more advanced troubleshooting, see the other sections in this chapter.

General Troubleshooting Information

This section describes general information for troubleshooting MSCs and SPAs. It includes the following sections:

Interpreting Console Error Messages

To view the explanations and recommended actions for Cisco 7304 routers error messages, including messages related to Cisco 7304 routers MSCs and SPAs, refer to the following documents:

• *System Error Messages for Cisco 7304 Routers* (for error messages on Early Deployment trains)

• *System Error Messages for Cisco IOS Release 12.2 S* (for error messages in Release 12.2 S)

System error messages are organized in the documentation according to the particular system facility that produces the messages. The MSC and SPA error messages use the following facility names:

- Cisco 7304 MSC-100—MSC100_SPA_CC
- 4-Port 10/100 Fast Ethernet SPA—SPA_ETHER
- 2-Port 10/100/1000 Gigabit Ethernet SPA—SPA_ETHER

Using debug Commands

Along with the other **debug** commands supported on the Cisco 7304 routers, you can obtain specific debug information for SPAs on the Cisco 7304 routers using the **debug hw-module subslot** privileged exec command.

The **debug hw-module subslot** command is intended for use by Cisco Systems technical support personnel. For more information about the **debug hw-module subslot** command, see Chapter 18, "Command Reference."

Caution Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use **debug** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff. Moreover, it is best to use **debug** commands during periods of lower network traffic and fewer users. Debugging during these periods decreases the likelihood that increased **debug** command processing overhead will affect system use.

For information about other **debug** commands supported on the Cisco 7304 routers, refer to the *Cisco IOS Debug Command Reference, Release 12.2* and any related feature documents for Cisco IOS Release 12.2 S.

Using test Commands

The SPAs on the Cisco 7304 routers also implement certain **test** commands.

Caution The **test hw-module subslot** commands are not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. This command can produce unexpected operation of your SPA.

For more information about the **test hw-module subslot** commands, see Chapter 18, "Command Reference"

Using show Commands

There are several **show** commands that you can use to monitor and troubleshoot the MSCs and SPAs on the Cisco 7304 routers. This chapter describes using the **show interfaces** and **show controllers** commands to perform troubleshooting of your SPA.

For more information about **show** commands to verify and monitor MSCs and SPAs, see the following chapters of this guide:

- Chapter 5, "Overview of the Fast Ethernet SPA and Gigabit Ethernet SPA"
- Chapter 8, "Command Summary for Fast Ethernet and Gigabit Ethernet SPAs"
- Chapter 18, "Command Reference"

Performing Basic Interface Troubleshooting

You can perform most of the basic interface troubleshooting using the **show interfaces fastethernet** or **show interfaces gigabitethernet** command and examining several areas of the output to determine how the interface is operating.

The following example shows output from the **show interfaces fastethernet** command with some of the significant areas of the output to observe shown in bold:

```
Router# show interfaces fastethernet 2/1/1
FastEthernet2/1/1 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
  MTU 9216 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:22, output 00:00:02, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     5 packets input, 320 bytes
     Received 1 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog
     0 input packets with dribble condition detected
     8 packets output, 529 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 babbles, 0 late collision, 0 deferred
     2 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

To verify that your interface is operating properly, complete the steps in Table 7-1:

Table 7-1 Basic Interface Troubleshooting Steps

	Action	Example
Step 1	From global configuration mode, enter the **show interfaces fastethernet** or **show interfaces gigabitethernet** command.	`Router# show interfaces fastethernet 2/1/1`
Step 2	Verify that the interface is up.	`Router# show interfaces fastethernet 2/1/1` `FastEthernet2/1/1 is up, line protocol is up`
Step 3	Verify that the line protocol is up.	`Router# show interfaces fastethernet 2/1/1` `FastEthernet2/1/1 is up, line protocol is up`

Step 4	Verify that the interface duplex mode matches the remote interface configuration.	The following example shows that the local interface is currently operating in full-duplex mode:
		`Router# show interfaces fastethernet 2/1/1`
		`[text omitted]`
		
		`  Keepalive set (10 sec)`
		`  Full-duplex, 100Mb/s, 100BaseTX/FX`

Step 5	Verify that the interface speed matches the speed on the remote interface.	The following example shows that the local interface is currently operating at 100 Mbps:
		`Router# show interfaces fastethernet 2/1/1`
		`.`
		`.`
		`.`
		`  Keepalive set (10 sec)`
		`  Full-duplex, 100Mb/s, 100BaseTX/FX`
		`.`
		`.`
		`.`

Step 6	Observe the output hang status on the interface.	`Router# show interfaces fastethernet 2/1/1`
		`.`
		`.`
		`.`
		`  ARP type: ARPA, ARP Timeout 04:00:00`
		`  Last input 00:00:22, output 00:00:02, output hang never`
		`.`
		`.`
		`.`

Step 7	Observe the CRC counter.	`Router# show interfaces fastethernet 2/1/1`
		`.`
		`.`
		`.`
		`     5 minute output rate 0 bits/sec, 0 packets/sec`
		`     5 packets input, 320 bytes`
		`     Received 1 broadcasts (0 IP multicast)`
		`     0 runts, 0 giants, 0 throttles`
		`     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored`
		`.`
		`.`
		`.`

Table 7-1 Basic Interface Troubleshooting Steps (continued)

	Action	Example

Step 8	Observe the late collision counter.	`Router# show interfaces fastethernet 2/1/1`
		`.`
		`.`
		`.`
		`0 input packets with dribble condition detected`
		`8 packets output, 529 bytes, 0 underruns`
		`0 output errors, 0 collisions, 2 interface resets`
		`0 babbles, 0 late collision, 0 deferred`
		`.`
		`.`
		`.`

Step 9	Observe the carrier signal counters.	`Router# show interfaces fastethernet 2/1/1`
		`.`
		`.`
		`.`
		`0 output errors, 0 collisions, 2 interface resets`
		`0 babbles, 0 late collision, 0 deferred`
		`2 lost carrier, 0 no carrier`
		`.`
		`.`
		`.`

For more information about the verification steps in and possible responses to correct detected problems, see the following sections:

- Verifying the Interface Is Up, page 7-5
- Verifying the Line Protocol Is Up, page 7-6
- Verifying the Duplex Mode, page 7-6
- Verifying the Speed Mode, page 7-6
- Verifying Output Hang Status, page 7-6
- Verifying the CRC Counter, page 7-7
- Verifying Late Collisions, page 7-7
- Verifying the Carrier Signal, page 7-7

Verifying the Interface Is Up

In the output from the **show interfaces fastethernet** or **show interfaces gigabitethernet** command command, verify that the interface is up. If the interface is down, perform the following corrective actions:

- If the interface is *administratively down*, use the **no shutdown** interface configuration command to enable the interface.
- Be sure that the cable is fully connected.
- Verify that the cable is not bent or damaged. If the cable is bent or damaged, the signal will be degraded.

- Verify that a hardware failure has not occurred. Observe the LEDs and use the **show controllers** or **show hw-module subslot** commands to determine if a failure has occurred. See the other troubleshooting sections of this chapter, and refer to the *Cisco 7304 Router Modular Services Card and Shared Port Adapter Hardware Installation Guide*. If the hardware has failed, replace the SPA or cable as necessary.

Verifying the Line Protocol Is Up

In the output from the **show interfaces fastethernet** or **show interfaces gigabitethernet** command, verify that the line protocol is up. If the line protocol is down, the line protocol software processes have determined that the line is unusable.

Perform the following corrective actions:

- Replace the cable.
- Check the local and remote interface for misconfiguration.
- Verify that a hardware failure has not occurred. Observe the LEDs and use the **show controllers** or **show hw-module subslot** commands to determine if a failure has occurred. See the other troubleshooting sections of this chapter, and refer to the *Cisco 7304 Router Modular Services Card and Shared Port Adapter Hardware Installation Guide*. If the hardware has failed, replace the SPA as necessary.

Verifying the Duplex Mode

In the output from the **show interfaces fastethernet** or **show interfaces gigabitethernet** command, verify the current duplex mode of the local interface.

The local interface duplex mode configuration should match the remote interface configuration. Confirm that the duplex settings are the same on both ends of the connection.

Enabling autonegotiation for the duplex mode can avoid configuration mismatches. To enable autonegotiation for the duplex mode, use the **duplex auto** interface configuration command.

Verifying the Speed Mode

In the output from the **show interfaces fastethernet** or **show interfaces gigabitethernet** command, verify the current speed of the local interface.

The local interface speed should match the remote interface configuration. Confirm that the speed settings are the same on both ends of the connection.

Enabling autonegotiation for the interface speed can avoid configuration mismatches. To enable autonegotiation for the speed, use the **speed auto** interface configuration command.

Verifying Output Hang Status

In the output from the **show interfaces fastethernet** or **show interfaces gigabitethernet** command, observe the value of the output hang field.

The output hang provides the number of hours, minutes, and seconds since the last reset caused by a lengthy transmission. When the number of hours the field exceeds 24 hours, the number of days and hours is shown. If the field overflows, asterisks are printed. The field shows a value of *never* if no output hangs have occurred.

Verifying the CRC Counter

In the output from the **show interfaces fastethernet** or **show interfaces gigabitethernet** command, observe the value of the CRC counter. Excessive noise will cause high CRC errors accompanied by a low number of collisions.

Perform the following corrective actions if you encounter high CRC errors:

- Check the cables for damage.
- Verify that the correct cables are being used for the SPA interface.

Verifying Late Collisions

In the output from the **show interfaces fastethernet** or **show interfaces gigabitethernet** command command, observe the value of the late collision counter.

Perform the following corrective actions if you encounter late collisions on the interface:

- Verify that the duplex mode on the local and remote interface match. Late collisions occur when there is a duplex mode mismatch.
- Verify the length of the Ethernet cables. Late collisions result from cables that are too long.

Verifying the Carrier Signal

In the output from the **show interfaces fastethernet** or **show interfaces gigabitethernet** command command, observe the value of the carrier signal counters. The lost carrier counter shows the number of times that the carrier was lost during transmission. The no carrier counter shows the number of times that the carrier was not present during transmission.

Carrier signal resets can occur when an interface is in loopback mode or shut down.

Perform the following corrective actions if you observe the carrier signal counter incrementing outside of these conditions:

- Check the interface for a malfunction.
- Check for a cable problem.

Using the show controllers Command to Troubleshoot Problems

To display diagnostic information and verify the performance of the hardware devices on a SPA on the Cisco 7304 routers, you can use the **show controllers** and **show hw-module subslot** privileged EXEC commands.

The following is an example of the **show controllers fastethernet** command output for the 4-Port 10/100 Fast Ethernet SPA:

```
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
  Promiscuous mode is off, VLAN filtering is enabled
  MDI crossover status: MDI
  Auto-negotiation configuration and status:
    Auto-negotiation is enabled and is completed
    Speed/duplex is resolved to 100 Mbps, full duplex
    Advertised capabilities: 10M/HD 10M/FD 100M/HD 100M/FD
    Partner capabilities: 10M/HD 10M/FD 100M/HD 100M/FD
MAC counters:
  Input: packets = 15, bytes = 1776
         FIFO full/reset removed = 0, error drop = 0
  Output: packets = 18, bytes = 2622
          FIFO full/reset removed = 0, error drop = 0
  Total pause frames: transmitted = 0, received = 0
FPGA counters:
  Input: Total (good & bad) packets: 15, TCAM drops: 4
         Satisfy (host-backpressure) drops: 0, CRC drops: 0
         PL3 RERRs: 0
  Output: EOP (SPI4) errors: 0
SPA carrier card counters:
  Input: packets = 11, bytes = 1476, drops = 0
  Output: packets = 18, bytes = 2550, drops = 0
  Egress flow control status: XON
  Per bay counters:
  General errors: input = 0, output = 0
  SPI4 errors: ingress dip4 = 0, egress dip2 = 0
MAC destination address filtering table:
  Table entries: Total = 512, Used = 4, Available = 508
  Index MAC destination address       Mask
  ----- ----------------------  --------------
  1     0007.0ed3.ba80          ffff.ffff.ffff
  2     ffff.ffff.ffff          ffff.ffff.ffff
  3     0100.0000.0000          0100.0000.0000
  4     0100.0ccc.cccc          ffff.ffff.ffff
VLAN filtering table:
  Number of VLANs configured on this interface = 0
  Table entries: Total = 1024, Used = 2, Available = 1022
  Index  VLAN identifier  Enabled  Tunnel
  -----  ---------------  -------  ------
  1           0             No      No
  2           0             Yes     No
Platform details:
  PXF tif number: 0x10
```

Table 7-2 describes the significant fields of the **show controllers fastethernet** and **show controllers gigabitethernet** command that might require further action during troubleshooting.

Table 7-2 Significant Output Fields in show controllers Command for Troubleshooting

Output Field	Problem Description	Recommended Action
FPGA counters: Satisfy (host-backpressure) drops	Indicates back pressure from the Route Processor (RP), possibly due to higher bandwidth line cards on the router.	Use the **show c7300** and **show pxf accounting** commands to obtain more information. See the "Troubleshooting Oversubscription" section on page 7-9.
SPA carrier card counters: SPI4 errors: ingress dip4, egress dip2	Indicates 4-bit and 2-bit Diagonal Interleaved Parity (DIP) errors in the ingress direction on the SPI4 path from the field-programmable gate array FPGA to the SIP.	Unless these errors reach a certain threshold, no action is required. If the errors occur more than 25 times within 10 milliseconds, then the SPA automatically deactivates and reactivates itself. Error messages are logged on the console indicating the source of the error and the status of the recovery. If the errors persist, you might need to perform OIR of the SPA. See the "Understanding SPA Automatic Recovery" section on page 7-11.

Troubleshooting Oversubscription

When the "Satisfy (host-backpressure) drops" counter increments in the output of the **show controllers fastethernet** and **show controllers gigabitethernet** command, it indicates oversubscription on the RP.

To troubleshoot further, perform the following steps:

Step 1 Use the **show c7300** command to verify whether you have exceeded the maximum allowed aggregate throughput for any line cards or interfaces.

The following output shows an example of exceeding the aggregate throughput for the SPAs on a Cisco 7304 router with an NSE-100:

```
Router# show c7300
Slot      Card Type           Status          Insertion time
----      ---------           ------          --------------
0,1       NSE100              Active          00:45:29 ago
2         7304-MSC-100        Active          00:44:36 ago
3         7304-MSC-100        Active          00:44:36 ago
4         7304-MSC-100        Active          00:44:36 ago
5         7304-MSC-100        Active          00:14:39 ago

The FPGA versions for the cards listed above are current

Shared Port Adapter information:
Slot/Subslot  SPA Type            Status          Insertion time
------------  --------            ------          --------------
2/0           SPA-2GE-7304        ok              00:44:36 ago
2/1           SPA-2GE-7304        ok              00:44:36 ago
3/0           SPA-2GE-7304        ok              00:44:35 ago
3/1           not present         missing         never
4/0           SPA-2GE-7304        ok              00:44:35 ago
4/1           SPA-2GE-7304        ok              00:44:35 ago
```

```
5/0           SPA-4FE-7304        ok              00:14:36 ago
5/1           SPA-2GE-7304        ok              00:14:36 ago

%NOTE: Line cards present violate configuration guidelines for this NSE.

Maximum allowed aggregate throughput of the line cards
for a system with this NSE is 3200000 kbps
Maximum throughput for line cards in system
Slot      Card Type           Throughput (kbps)
----      ---------           -----------------
0,1       NSE100              0
2         7304-MSC-100        4000000
3         7304-MSC-100        2000000
4         7304-MSC-100        4000000
5         7304-MSC-100        2000000

Maximum throughput for SPAs in the system
Slot/Subslot  SPA Type            Throughput (kbps)
------------  --------            -----------------
2/0           SPA-2GE-7304        2000000
2/1           SPA-2GE-7304        2000000
3/0           SPA-2GE-7304        2000000
4/0           SPA-2GE-7304        2000000
4/1           SPA-2GE-7304        2000000
5/0           SPA-4FE-7304        0
5/1           SPA-2GE-7304        2000000

Network IO Interrupt Throttling:
 throttle count=1, timer count=1
 active=0, configured=1
 netint usec=3999, netint mask usec=200
```

Step 2 To verify oversubscription on the NSE-100, use the **show pxf accounting** and **show pxf interface** commands.

Note For Parallel Express Forwarding (PXF) information for SPA interfaces on the 4-Port 10/100 Fast Ethernet SPA, you can use the **show pxf interface fastethernet** *slot/subslot/port* version of the command.

Step 3 To verify oversubscription on the NPE-G100, use the **show interfaces** command.

Understanding SPA Automatic Recovery

When the 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA and encounters thresholds for certain types of errors and identifies a fatal error, the SPA initiates an automatic recovery process.

You do not need to take any action unless the error counters reach a certain threshold, and multiple attempts for automatic recovery by the SPA fail.

The 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA might perform automatic recovery for the following types of errors:

- SPI4 TX/RX out of frame
- SPI4 TX train valid
- SPI4 TX DIP4
- SPI4 RX DIP2

Note These SPA error counters do not appear in the **show controllers fastethernet** and **show controllers gigabitethernet** command output until at least one SPI4 error occurs.

When Automatic Recovery Occurs

If the SPI4 errors occur more than 25 times within 10 milliseconds, the SPA automatically deactivates and reactivates itself. Error messages are logged on the console indicating the source of the error and the status of the recovery.

If Automatic Recovery Fails

If the SPA attempts automatic recovery more than five times in an hour, then the SPA deactivates itself and remains deactivated.

To troubleshoot automatic recovery failure for a SPA, perform the following steps:

Step 1 Use the **show c7300** command to verify the status of the SPA. The status is shown as “failed” if the SPA has been powered off due to five consecutive failures, as shown in the following example:

```
Router# show c7300
.
.
.
The FPGA versions for the cards listed above are current

Shared Port Adapter information:
Slot/Subslot  SPA Type            Status          Insertion time
------------  --------            ------          --------------
.
.
.
3/0           SPA-4FE-7304        failed          00:00:08 ago
.
.
.
```

Step 2 If you verify that automatic recovery has failed, perform OIR of the SPA. For information about performing an OIR, see the "Preparing for Online Insertion and Removal of a SPA" section on page 7-14.

Step 3 If reseating the SPA after OIR does not resolve the problem, replace the SPA hardware.

Configuring the Interface for Internal Loopback

Loopback support is useful for testing the interface without connectivity to the network, or for diagnosing equipment malfunctions between the interface and a device. The 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA supports both an internal and an external loopback mode. The external loopback mode requires the use of a loopback cable and implements a loopback through the transceiver on the SPA.

You can also configure an internal loopback without the use of a loopback cable that implements a loopback at the PHY device internally on a Fast Ethernet interface and Gigabit Ethernet interface port, or at the MAC device internally on a Gigabit Ethernet interface port. By default, loopback is disabled.

Configuring the Interface for Internal Loopback at the PHY Device

Note Before you enable internal loopback at the PHY device, you must disable autonegotiation on the interface. For more information, see the "Disabling Autonegotiation on RJ-45 Interfaces Configuration Example" section on page 6-22 or the "Disabling Autonegotiation on Fiber Interfaces Configuration Example" section on page 6-23.

To enable internal loopback at the PHY device for an interface on a SPA, use the following commands beginning in interface configuration mode:

	Command or Action	Purpose
Step 1	Router(config-if)# **speed 100**	Forces the interface to operate at 100 Mbps.
	or	or
	Router(config-if)# **speed 10**	Forces the interface to operate at 10 Mbps only.
		Note When a value for the **speed** command (other than **auto**) is configured with a value for the **duplex** command (other than **auto**), the values are said to be *forced*. These values are not advertised and autonegotiation is disabled.
Step 2	Router(config-if)# **duplex full**	Forces the interface to operate in full-duplex mode only.
	or	or
	Router(config-if)# **duplex half**	Forces the interface to operate in half-duplex mode only.
Step 3	Router(config-if)# **loopback**	Enables an interface for internal loopback at the PHY device on the 4-Port 10/100 Fast Ethernet SPA.
	or	or
	Router(config-if)# **loopback driver**	Enables an interface for internal loopback at the PHY device on the 2-Port 10/100/1000 Gigabit Ethernet SPA.

Configuring the Interface for Internal Loopback at the MAC Device

To enable internal loopback at the MAC device for an interface on a SPA, use the following commands beginning in interface configuration mode:

Command	Purpose
Router(config-if)# **loopback mac**	Enables an interface for internal loopback at the MAC device on the 2-Port 10/100/1000 Gigabit Ethernet SPA.

Verifying Loopback Status

To verify whether loopback is enabled on an interface port on a SPA, use the **show interfaces fastethernet** or **show interfaces gigabitethernet** privileged EXEC command and observe the value shown in the "loopback" field.

The following example shows that loopback is disabled for interface port 0 (the first port) on the SPA installed in the top (0) subslot of the MSC that is located in slot 4 of the Cisco 7304 router:

```
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
  MTU 9216 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
.
.
.
```

Using the Cisco IOS Event Tracer to Troubleshoot Problems

Note This feature is intended for use as a software diagnostic tool and should be configured only under the direction of a Cisco Technical Assistance Center (TAC) representative.

The Event Tracer feature provides a binary trace facility for troubleshooting Cisco IOS software. This feature gives Cisco service representatives additional insight into the operation of the Cisco IOS software and can be useful in helping to diagnose problems in the unlikely event of an operating system malfunction or, in the case of redundant systems, route processor switchover.

Event tracing works by reading informational messages from specific Cisco IOS software subsystem components that have been preprogrammed to work with event tracing, and by logging messages from those components into system memory. Trace messages stored in memory can be displayed on the screen or saved to a file for later analysis.

The SPAs currently support the "spa" component to trace SPA OIR-related events.

For more information about using the Event Tracer feature, refer to the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120s/120s18/evnttrcr.htm

Preparing for Online Insertion and Removal of a SPA

The Cisco 7304 routers supports online insertion and removal (OIR) of the MSC, in addition to each of the SPAs. Therefore, you can remove an MSC with its SPAs still intact, or you can remove a SPA independently from the MSC, leaving the MSC installed in the router.

This means that an MSC can remain installed in the router with one SPA remaining active, while you remove another SPA from one of the MSC subslots. If you are not planning to immediately replace a SPA into the MSC, then be sure to install a SPA blank filler plate in the subslot. The MSC should always be fully installed with either functional SPAs or blank filler plates.