APS Support on Cisco AS5850 STM-1 Interfaces

This feature provides SONET automatic protection switching (APS) on Cisco AS5850 STM-1 interfaces. SONET APS—also referred to as SDH multiplex section protection (MSP)—refers to the mechanism of providing fault tolerance through fiber cable redundancy in SONET/SDH networks. When the working fiber fails, the protect fiber quickly assumes its traffic load. Some command-line interface (CLI) commands are available to provide a measure of manual intervention in the APS switching process.

Feature History for the APS Support on Cisco AS5850 STM-1 Interfaces Feature

Release	Modification
12.3(11)T	This feature was introduced on the Cisco AS5850.

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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Prerequisites for APS Support on Cisco AS5850 STM-1 Interfaces

This feature assumes familiarity with the ITU-T G.841 *Types and characteristics of SDH network protection architectures* standard.

Information About APS Support on Cisco AS5850 STM-1 Interfaces

To configure SONET APS on the STM-1 card, you should understand the following concepts.

- SONET APS Using an STM-1 Card, page 2
- Benefits of SONET APS Using an STM-1 Card, page 3

SONET APS Using an STM-1 Card

SONET APS provides the ability to switch fiber cable interfaces—referred to in this feature as ports—on an STM-1 card in a Cisco AS5850. The ability to switch from one SONET port to another SONET port in response to a fiber cut or module failure, signal failure, signal degradation, or manual intervention provides redundancy.

The protection mechanism used for this feature has a linear 1+1 architecture as described in the ITU-T G.841 standard and the Bellcore publication *GR-253-CORE, SONET Transport Systems; Common Generic Criteria, Section 5.3*. The connection may be bidirectional or unidirectional.

In the 1+1 architecture, a protect port is paired with each working port. Normally, the protect and working ports are connected to a SONET ADM (add/drop multiplexer), which sends the same signal payload to the working and protect ports. Figure 1 shows an APS configuration with the working and protect fibers terminating in SONET ports on the STM-1 card in a Cisco AS5850.

Figure 1   APS Configuration
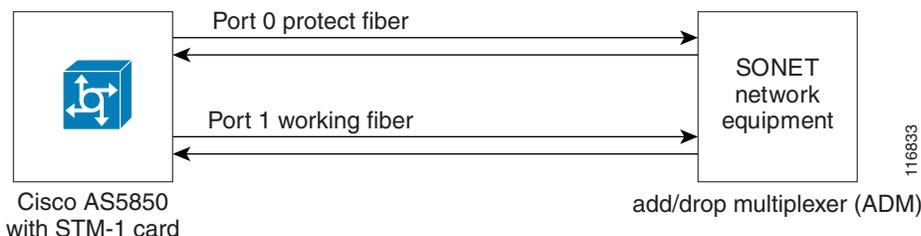
When SONET APS is configured and a failure is detected on the working fiber, or when switch commands are entered through the command-line interface (CLI), the software switches the traffic to the protect fiber. The software also monitors the health of the protect fiber when APS is enabled and informs the user of any problems. When the protect fiber problem is resolved, normal APS operation is resumed.

Benefits of SONET APS Using an STM-1 Card

The STM-1 card is generally deployed by medium to large service providers who have a need for a larger DS0 capacity. The main benefits of using the STM-1 card over E1 interfaces are an initial lower cost of deployment compared to deploying 63 E1 interfaces, a lower recurring monthly charge, and lower maintenance cost because only one cable is required between the Main Distribution Facility (MDF) and the Cisco AS5850 instead of 63 cables. Service providers who carry voice data do expect to have more protection on an STM-1 port than on an E1 port because the STM-1 port supports a high density of DS0s (1953). Network reliability could be severely impacted if 1953 connections are lost at the same time. SONET APS can provide the fiber protection and network resiliency expected by the service providers. The existing media gateways that support STM-1 already provide APS protection.

How to Configure APS Support on Cisco AS5850 STM-1 Interfaces

This section contains the following tasks:

Configuring APS Support on the Cisco AS5850

Perform this task to enable and configure APS on SONET ports on an STM-1 trunk card.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller sonet** *slot*/*port*
4. **main-fiber port** {**0** | **1**}
5. **aps protect**
6. **b2 sd-ber** *rate*
7. **b2 sf-ber** *rate*
8. **aps unidirectional**
9. **end**
10. **show controllers sonet** *slot*/*port*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters global configuration mode.
Step 3	**controller sonet** *slot*/*port* **Example:** Router(config)# controller sonet 1/0	Configures a SONET controller and enters controller configuration mode. • Use the *slot* argument to specify the slot number in which the STM-1 card resides. • The *port* argument is always 0 because only one port on the STM-1 card can be configured.
Step 4	**main-fiber port** {**0**	**1**} **Example:** Router(config-controller)# main-fiber port 1	(Optional) Specifies the working port to use for the optical link connection on the SDH/STM-1 trunk card on a Cisco AS5850. The default is port 0. • We recommend that port 1 be configured as the working port. • The other port on the STM-1 card is configured automatically as the protect port when APS is enabled. • After APS is enabled, you cannot change the main-fiber (working) port until you disable APS.
Step 5	**aps protect** **Example:** Router(config-controller)# aps protect	Enables APS on the current working SONET port. • By default, the bidirectional mode is enabled.
Step 6	**b2 sd-ber** *rate* **Example:** Router(config-controller)# b2 sd-ber 7	Sets the signal degrade bit error rate (BER) threshold values. • Use this command to configure the threshold for degradation of quality of signal with b2 errors. • The rate value can be in the range from 3 to 9. A higher number represents better quality, and a value of 3 represents lower quality.
Step 7	**b2 sf-ber** *rate* **Example:** Router(config-controller)# b2 sf-ber 4	Sets the signal failure BER threshold values. • Use this command to configure the threshold for failure of quality of signal with b2 errors. • The rate value can be in the range from 3 to 9. A higher number represents better quality, and a value of 3 represents lower quality.

	Command or Action	Purpose

Step 8	`aps unidirectional`
	
	Example:
	`Router(config-controller)# aps unidirectional`
		Configures APS to operate in unidirectional mode.
		
		• To return to bidirectional mode, use the **no** form of this command.

Step 9	`end`
	
	Example:
	`Router(config-controller)# end`
		Exits controller configuration mode and returns to privileged EXEC mode.

Step 10	`show controllers sonet` *slot*/*port* **Example:** `Router# show controllers sonet 1/0`	Displays information about SONET controllers. • Only partial syntax is displayed here. For more details, see the **show controllers sonet** command in the *Cisco IOS Interface and Hardware Component Command Reference*, Release 12.3 T.

Examples

The following example shows partial output from the **show controllers sonet** command.

```
Router# show controllers sonet 1/0

SONET 1/0 is up.
  Applique type is Channelized Sonet/SDH
  Clock Source is Line, AUG mapping is AU4.
  MSP 1+1 bi-directional enabled
  Protection fiber (Port 0), No Alarm, traffic in-use
  Working fiber (Port 1), No Alarm, traffic not in-use
  Local request: No Request
  Remote request: No Request

Medium info:
  Type: SDH, Line Coding: NRZ, Line Type: Short SM
.
.
.
```

Troubleshooting Tips

• Use the **show controllers sonet** command and look for any alarms or local and remote request information.

• Check that the ADM is sourcing the SONET clocking.

Issuing APS Switch Commands Using CLI

Perform this task to issue one or more of the optional APS switch commands when the working fiber is active but you want to switch to the protect fiber. The APS switch commands allow a measure of manual intervention in the APS process.

APS Switching Priority Levels

Each APS switch command has a priority level compared to the other APS switch commands and the signal status of the working and protect fibers. Table 1 shows the priority requests from the highest (lockout) to the lowest (manual). The actual decision-based activity performed by the software is quite complex; details are provided in the ITU-T G.841 *Types and characteristics of SDH network protection architectures* standard.

Table 1   APS Priority Request

Priority	Priority Request
1	Lockout of protect port
2	Forced switch
3	Signal failure—low priority
4	Signal degradation—low priority
5	Manual switch

SUMMARY STEPS

1. **enable**

2. **aps manual sonet** *slot*/*port* **from** {**protection** | **working**}

3. **aps force sonet** *slot*/*port* **from** {**protection** | **working**}

4. **aps lockout sonet** *slot*/*port*

5. **aps clear sonet** *slot*/*port*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`aps manual sonet` *slot*/*port* `from` {`protection` | `working`} **Example:** `Router# aps manual sonet 1/0 from working`	(Optional) Issues an APS manual request to switch from one port to the alternate port. • Use the **from protection** keywords to switch from the active protect fiber to the working fiber unless an equal or higher switching priority exists. • Use the **from working** keywords to switch from the active working fiber to the protect fiber unless an equal or higher switching priority exists.

	Command or Action	Purpose

Step 3	`aps force sonet` *slot*`/`*port* `from {protection | working}`
	
	Example:
	`Router# aps force sonet 1/0 from working`
		(Optional) Issues an APS force request to switch from one port to the alternate port.
		
		• Use the **from protection** keywords to switch from the active protect fiber to the working fiber unless an equal or higher switching priority exists.
		
		• Use the **from working** keywords to switch from the active working fiber to the protect fiber unless an equal or higher switching priority exists.

Step 4	`aps lockout sonet` *slot*`/`*port* **Example:** `Router# aps lockout sonet 1/0`	(Optional) Issues an APS lockout of protection request. • Use this command to deny the working fiber access to the protect fiber unless an equal switching priority exists. • Lockout is defined as the highest APS request priority level. • If the protect fiber is active, this command switches the traffic to the working fiber.
Step 5	`aps clear sonet` *slot*`/`*port* **Example:** `Router# aps clear sonet 1/0`	(Optional) Removes any APS priority requests configured for the specified port using the **aps lockout sonet**, **aps force sonet**, or **aps manual sonet** commands.

Configuration Examples for APS Support on Cisco AS5850 STM-1 Interfaces

This section contains the following configuration example:

Configuring APS Support and APS Switch Commands on the Cisco AS5850: Example

In the following example, SONET APS parameters are configured, and APS is enabled on port 1 of an STM-1 card in a Cisco AS5850. A manual APS switching request is configured, and partial output for the **show controllers sonet** command is displayed.

```
Router# configure terminal
Router (config)# controller sonet 1/0
Router (config-controller)# main-fiber port 1
Router (config-controller)# aps protect
Router (config-controller)# b2 sd-ber 7
Router (config-controller)# b2 sf-ber 4
Router (config-controller)# aps unidirectional
Router (config-controller)# end
Router# aps manual sonet 1/0 from working
```

```
        Router# show controllers sonet

      SONET 1/0 is up.
        Applique type is Channelized Sonet/SDH
        Clock Source is Line, AUG mapping is AU4.
        MSP 1+1 bi-directional enabled
        Protection fiber (Port 0), No Alarm, traffic in-use
        Working fiber (Port 1), No Alarm, traffic not in-use
        Local request: Manual Switch/Working
        Remote request: No request
      .
      .
      .
```

Where to Go Next

For more details about the Cisco AS5850, visit the Cisco AS5850 Universal Gateway Introduction page under the Products and Service section on www.cisco.com.

Additional References

The following sections provide references related to the APS Support on Cisco AS5850 STM-1 Interfaces feature.

Related Documents

Related Topic	Document Title
Hardware and configuration information for the SDH/STM-1 trunk card	The " SDH/STM-1 Trunk Card" chapter of the *Cisco AS5850 Universal Gateway Card Guide*
APS and SONET commands: complete command syntax, command mode, defaults, usage guidelines, and examples	*Cisco IOS Interface and Hardware Component Command Reference,* Release 12.3 T
APS and SONET configuration	*Cisco IOS Interface and Hardware Component Configuration Guide,* Release 12.3

Standards

Standards	Title
Bellcore SONET linear 1+1 architecture	*GR-253-CORE, SONET Transport Systems; Common Generic Criteria, Section 5.3*
ITU-T G.841	*Types and characteristics of SDH network protection architectures*

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	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

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

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

Command Reference

The following new and modified commands are pertinent to this feature. To see the command pages for these commands and other commands used with this feature, go to the *Cisco IOS Master Commands List*, Release 12.4, at http://www.cisco.com/univercd/cc/td/doc/product/software/ios124/124mindx/124index.htm.

- **aps clear sonet**
- **aps force sonet**
- **aps lockout sonet**
- **aps manual sonet**
- **aps protect (SONET)**
- **aps unidirectional**
- **show controllers sonet**