



Configuring Channelized SPAs

This chapter provides information about configuring the channelized shared port adapters (SPAs) on the Cisco 10000 series router. This chapter includes the following sections:

- [Configuration Tasks, page 9-1](#)
- [Verifying the Interface Configuration, page 9-20](#)
- [Configuration Examples, page 9-20](#)

For information about managing your system images and configuration files, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide, Release 12.2* and *Cisco IOS Configuration Fundamentals Command Reference, Release 12.2* publications.

For more information about the commands in this chapter, see [Chapter 12, “SIP and SPA Commands,”](#) which documents new and modified commands. Also refer to the related Cisco IOS Release 12.2 software command reference and master index publications.

Configuration Tasks

The first step in a channelized interface configuration is to configure the SONET controller. All SONET-related configurations of a SONET-based physical port are grouped under the command-line interface (CLI) SONET controller configuration command mode prompt (config-controller). When the SONET controller configuration is complete, use interface configuration mode to configure the POS interfaces.

The following tasks are available for configuring channelized interfaces:

- [Specifying the Interface Address, page 9-2](#)
- [Configuring a SONET Controller, page 9-2](#)
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Specifying the Interface Address

The channelized SPAs on the Cisco 10000 series router use an addressing format that specifies the physical location of the SIP, SPA, and interface. The corresponding interface names are automatically generated, and the interface address format used depends on the mode of operation for each line card, as described in [Table 9-1](#).

Table 9-1 Interface Address Format

Interface	Mode	Interface Address Format
Serial	t3	<code>interface serial slot/subslot/port.ds3 number</code>
	ct3	<code>interface serial slot/subslot/port.ds3 number/t1 number:channel-group</code>
	vt-15	<code>interface serial slot/subslot/port.sts1 number/vtg vtg number/t1 number:channel-group</code>
POS		<code>interface pos slot/subslot/port:start-sts1 number</code>

In the interface address format:

- *slot*—Specifies the slot number in the Cisco 10000 series router where the SIP is installed.
- *subslot*—Specifies the secondary slot of the SIP where the SPA is installed.
- *port*—Specifies the number of the individual interface port on a SPA.
- *vtg number*—Specifies the virtual tributary group (vtg) number.
- *t1 number*—Specifies the T1 controller channel.
- *channel group number*—Specifies the ID number to identify the channel group.

For more information about the installation of SIPs and SPAs on the Cisco 10000 series router, refer to the *Cisco 10000 Series Router SIP and SPA Hardware Installation Guide*.

Configuring a SONET Controller

To configure SONET controllers, follow the steps listed.

SUMMARY STEPS

1. **configure terminal**
2. **controller sonet slot/subslot/port**
3. **framing sonet**
4. **clock source {internal | line}**
5. **loopback {local | network}**
6. **ais-shut**
7. **alarm-report {all | b1-tca | lais | lrdi | pais | plop | pplm | prdi | sd-ber }**

8. **aps**
9. **description**
10. **overhead** {j0 | s1s0} *byte-value*
11. **shutdown**
12. **sts-1** {*number*} or **sts-1** {*number-range*} **pos**
13. **threshold**
14. **mode** {ct3 | t3 | vt-15}
15. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>configure terminal</code> Example: Router# <code>configure terminal</code>	Enters global configuration mode.
Step 2	<code>controller sonet slot/subslot/port</code> Example: Router(config)# <code>controller sonet 3/1/1</code>	Selects the controller. Enters controller configuration mode.
Step 3	<code>framing sonet</code> Example: Router(config-controller)# <code>framing sonet</code>	(Optional) Specifies SONET framing (default).
Step 4	<code>clock source {internal line}</code> Example: Router(config-controller)# <code>clock source internal</code>	(Optional) Configures the SONET port transmit clock source. <ul style="list-style-type: none"> • internal—Sets the internal clock. Use this option when two routers are connected back-to-back or over fiber for which no clocking is available. • line—Sets the clock to be recovered from the line (default). Use this option whenever clocking is derived from the network.
Step 5	<code>loopback {local network}</code> Example: Router(config-controller)# <code>loopback local</code>	(Optional) Configures the SONET controller for loopback. <ul style="list-style-type: none"> • local—Loops data from the transmit path to the receive path. • network—Loops data received on the external port to the transmit path and back out the external port. <p>The default is no loopback.</p>

	Command or Action	Purpose
Step 6	ais-shut Example: Router(config-controller)# ais-shut	(Optional) Sends an alarm indication signal (AIS) when controller is shut down.
Step 7	alarm-report {all b1-tca lais lrldi pais plop pplm prdi sd-ber } Example: Router(config-controller)# alarm-report all	Enables reporting for all or selected alarms. <ul style="list-style-type: none"> • b1-tca—Sends bit error rate (BER) threshold crossing alerts for B1. • lais—Sends line alarm indication signal. • lrldi—Sends line remote defect indication signal. • pais—Sends path alarm indication signal. • plop—Send loss of pointer failure signal for a path. • pplm—Sends path payload mismatch indication • prdi—Sends path remote defect indication signal. • sd-ber—Sets Signal Degrade BER threshold.
Step 8	aps Example: Router(config-controller)# aps	Modifies automatic protection switching (APS) parameters.
Step 9	description Example: Router(config-controller)# description	Sets a controller-specific description.
Step 10	overhead {j0 s1s0} <i>byte-value</i> Example: Router(config-controller)# overhead s1s0	(Optional) Sets the overhead bytes. <ul style="list-style-type: none"> • j0—Sets the j0 overhead bytes to transmit a number from 0 to 255 or to expect to receive a number from 0 to 255. • s1s0—Sets the s1s0 bits of H1 to a number between from 0 to 3 or to ignore the s1s0 overhead bit.
Step 11	shutdown Example: Router(config-controller)# shutdown	Shuts down the SONET controller.
Step 12	sts-1 {number} or sts-1 {number-range} pos Example: Router(config-controller)# sts-1 1-3 pos	Specifies the SONET Synchronous Transport Signal (STS) level. Enters STS-1 path configuration mode.

	Command or Action	Purpose
Step 13	<code>threshold</code> Example: Router(config-controller)# <code>threshold</code>	Sets bits error rate (BER) threshold values.
Step 14	<code>mode {ct3 t3 vt-15}</code> Example: Router(config-crtlr-sts1)# <code>mode ct3</code>	Specifies the mode of operation for the STS level. <ul style="list-style-type: none"> ct3—Specifies that the STS level carries a DS3 signal divided into 28 VT1.5s (multiplexed asynchronously). t3—Specifies that the STS level carries an unchannelized T3 signal. vt-15—Specifies that the STS level is divided into 28 VTI.5s (low-order virtual concatenation), each carrying one T1. This is the default mode.
Step 15	<code>end</code> Example: Router(config-crtlr-sts1)# <code>end</code>	Ends controller-level configuration.

Configuring the POS Interface

To configure a basic POS configuration, follow the steps listed.

Default Settings for POS Interface Configurations

Table 9-2 shows the default interface settings when an interface is enabled on a POS SPA.

Table 9-2 POS SPA and SIP Default Interface Settings

Parameter	Configuration File Entry	Default Settings
Keepalive	keepalive [disable] no keepalive [disable]	keepalive 10 seconds
Encapsulation	encapsulation [hdlc ppp frame-relay]	hdlc
Maximum transmission unit (MTU)	mtu <i>bytes</i>	4474 bytes
Cyclic redundancy check (CRC)	crc [16 32]	32

SUMMARY STEPS

1. **configure terminal**
2. **controller sonet** *slot/subslot/port*
3. **sts-1** {*number-range*} **pos**
4. **exit**

5. **interface pos** *slot/subslot/port:channel#*
6. **encapsulation** [**hdlc** | **ppp** | **frame-relay**]
7. **keepalive** [*seconds* | **disable**]
8. **no shutdown**
9. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 2	controller sonet <i>slot/subslot/port</i> Example: Router(config)# controller sonet 3/1/1	Selects the controller. Enters controller configuration mode.
Step 3	sts-1 { <i>number-range</i> } pos Example: Router(config-controller)# sts-1 1-3 pos	Specifies the SONET Synchronous Transport Signal (STS) level. Enters STS-1 path configuration mode.
Step 4	exit	Exits STS-1 path configuration mode.
Step 5	interface pos <i>slot/subslot/port:channel#</i> Example: Router(config)# interface pos 3/1/1:1	Specifies the POS interface. Enters interface configuration mode. <ul style="list-style-type: none"> • <i>slot/subslot/port:channel#</i>—Specifies the port and channel to configure.
Step 6	encapsulation [hdlc ppp frame-relay] Example: Router(config-if)# encapsulation hdlc	Specifies the encapsulation type. The default type is hdlc.
Step 7	keepalive [<i>seconds</i> disable] Example: Router(config-if)# keepalive 10	Configures the keepalive value, in seconds.
Step 8	no shutdown Example: Router(config-if)# no shutdown	Enables the interface.
Step 9	end Example: Router(config-if)# end	Ends interface-level configuration.

Configuring T3 Links Under SONET Framing

To configure T3 links, follow the steps listed.

SUMMARY STEPS

1. **configure terminal**
2. **controller sonet** *slot/subslot/port*
3. **framing sonet**
4. **sts-1** {*number*}
5. **mode t3**
6. **bert pattern** [0s | 1s | 2^15 | 2^20 | 2^23 | alt-0-1] **interval** {duration of bert [1-14400] minutes}
7. **mdl string** {*eic* | *fic* | *generator* | *lic* | *pfi* | *port* | *unit*}
8. **mdl transmit** {*path* | *idle-signal* | *test-signal*}
9. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 2	controller sonet <i>slot/subslot/port</i> Example: Router(config)# controller sonet 3/1/1	Selects the controller. Enters controller configuration mode.
Step 3	framing sonet Example: Router(config-controller)# framing sonet	(Optional) Specifies SONET framing (default).
Step 4	sts-1 <i>number</i> Example: Router(config-controller)# sts-1 3	Specifies the SONET Synchronous Transport Signal (STS) level. Enters STS-1 path configuration mode.
Step 5	mode t3 Example: Router(config-crtlr-sts1)# mode t3	Specifies T3 as the mode of operation for the STS-1.

	Command or Action	Purpose
Step 6	<pre>bert pattern [0s 1s 2^15 2^20 2^23 alt-0-1] interval {duration of bert [1-14400] minutes}</pre> <p>Example: Router(config-crtlr-sts1)# bert pattern 2^20 interval 20</p>	Optional) Configures bit error rate testing (BERT).
Step 7	<pre>[no] t3 mdl string {eic fic generator lic pfi port unit}</pre> <p>Example: Router(config-crtlr-sts1)# t3 mdl string eic</p>	(Optional) Specifies the maintenance data link (MDL) messages. <ul style="list-style-type: none"> • eic—equipment ID code • fic—frame ID code • generator—generator number in MDL test signal • lic—location ID code • pfi—facility ID code in MDL path message • port—port number in MDL idle string message • unit—unit code The default is no mdl string.
Step 8	<pre>t3 mdl transmit {path idle-signal test-signal}</pre> <p>Example: Router(config-crtlr-sts1)# t3 mdl transmit path</p>	Enables MDL message transmission.
Step 9	<pre>end</pre> <p>Example: Router(config-crtlr-sts1)# end</p>	Ends controller-level configuration.

Configuring the Unchannelized and Subrate DS3 Serial Interface

To configure unchannelized or subrate DS3 serial interfaces, follow the steps listed.

SUMMARY STEPS

1. **configure terminal**
2. **interface serial *slot/subslot/port.ds3***
3. **framing {c-bit | m13}**
4. **t3 loopback {local | network | remote [*line* | *payload*]}**
5. **dsu [*bandwidth seconds* | *mode* | *remote {accept | fullrate}*]**
6. **encapsulation [*hdlc* | *ppp* | *frame-relay*]**
7. **cablelength *feet***
8. **[no] keepalive**
9. **ip address *ip-address mask* [*secondary*]**

10. `no shutdown`
11. `end`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>configure terminal</code> Example: Router# <code>configure terminal</code>	Enters global configuration mode.
Step 2	<code>interface serial slot/subslot/port.ds3</code> Example: Router(config-if)# <code>interface serial 1/0/0.1</code>	Specifies the serial port to configure and enters configuration mode.
Step 3	<code>framing {c-bit m13}</code> Example: Router(config-if)# <code>framing c-bit</code>	Specifies the framing. <ul style="list-style-type: none"> • c-bit—Uses C-bit framing as the T3 framing type. This is the default framing type. • m13—Uses M23 framing as the T3 framing type.
Step 4	<code>t3 loopback {local network remote {line payload}}</code> Example: Router(config-if)# <code>loopback local</code>	Loops the entire T3 (all 28 T1 channels) on the channelized T3 interface. <ul style="list-style-type: none"> • local (Optional)—Loops the data back toward the router and sends an AIS signal out toward the network. • network (Optional)—Loops the data toward the network at the T1 framer. • remote (Optional)—Sends a far-end alarm control (FEAC) request to the remote end requesting that it enter into a network line loopback. For Remote Loopback Line and Remote Loopback Payload, FEAC requests are only possible when the T3 is configured for C-bit framing. The type of framing used is determined by the equipment to which you are connecting.
Step 5	<code>dsu [bandwidth seconds mode remote {accept fullrate}]</code> Example: Router(config-if)# <code>dsu bandwidth 16000</code>	Sets data service unit (DSU) configuration for bandwidth and mode of operation. <ul style="list-style-type: none"> • bandwidth—Specifies the DSU substrate bandwidth in kilobits of seconds. The maximum bandwidth allowed is 44210 kbps. • mode—Specifies the bandwidth interoperability mode for T3 interfaces. • remote—Accepts incoming remote requests to reset the DSU bandwidth. Sets far-end DSU to its fullrate bandwidth.

	Command or Action	Purpose
Step 6	<code>encapsulation [hdlc ppp frame-relay]</code> Example: Router(config-if)# <code>encapsulation frame-relay</code>	Specifies the encapsulation type.
Step 7	<code>cablelength feet</code> Example: Router(config-if)# <code>cablelength 240</code>	(Optional) Specifies the cable length. The default length is 224 feet.
Step 8	<code>[no] keepalive</code> Example: Router(config-if)# <code>keepalive</code>	Turns keepalive messages on or off.
Step 9	<code>ip address ip-address mask [secondary]</code> Example: Router(config-if)# <code>ip address 172.18.189.38 255.255.255.224</code>	Assigns an IP address and subnet mask to the interface.
Step 10	<code>no shutdown</code> Example: Router(config-if)# <code>no shutdown</code>	Enables the interface.
Step 11	<code>end</code> Example: Router(config-if)# <code>end</code>	Ends interface-level configuration.

Configuring CT3 Links Under SONET Framing

To select ct3 as the STS-1 mode of operation before you configure the T1 lines, follow the steps listed.

SUMMARY STEPS

1. `configure terminal`
2. `controller sonet slot/subslot/port`
3. `framing sonet`
4. `sts-1 {number}`
5. `mode ct3`
6. `t1 {number (1-28)} channel-group {number(0-23)} timeslots 1-24`
7. `t1 {number} framing {esf | sf}`
8. `t3 framing [auto-detect | c-bit | m23]`
9. `t1 {number} loopback {local | network | remote {line | payload}}`
10. `end`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>configure terminal</code> Example: Router# <code>configure terminal</code>	Enters global configuration mode.
Step 2	<code>controller sonet slot/subslot/port</code> Example: Router# <code>controller sonet 3/1/1</code>	Selects the controller. Enters controller configuration mode.
Step 3	<code>framing sonet</code> Example: Router(config-controller)# <code>framing sonet</code>	(Optional) Specifies SONET framing (default).
Step 4	<code>sts-1 {number}</code> Example: Router(config-controller)# <code>sts-1 1</code>	Specifies the SONET Synchronous Transport Signal (STS) level. Enters STS-1 path configuration mode.
Step 5	<code>mode ct3</code> Example: Router(config-crtlr-sts1)# <code>mode ct3</code>	Specifies ct3 as the mode of operation for the STS-1 level. In ct3 mode, the STS-1 level carries a DS3 signal divided into 28 T1s (multiplexed asynchronously).
Step 6	<code>t1 {number (1-28)} channel-group {number(0-23)} timeslots timeslot list</code> Example: Router(config-crtlr-sts1)# <code>t1 1 channel-group 1 timeslots 1-24</code>	Configures the list of timeslots on the T1 controller. Specifies the timeslots (DS0s) to include in this channel group. The valid timeslots are 1 to 24 for T1.
Step 7	<code>t1 {number} framing {esf sf}</code> Example: Router(config-crtlr-sts1)# <code>t1 1 framing esf</code>	Specifies the T1 framing format. The default is extended super frame (ESF).
Step 8	<code>t3 framing [auto-detect c-bit m23]</code> Example: Router(config-crtlr-sts1)# <code>t3 framing auto-detect</code>	Specifies the framing type for the T3 link. <ul style="list-style-type: none"> • auto-detect—The T3 detects the framing type it receives from the far-end equipment. It is the default framing type. • c-bit—Uses C-bit framing as the T3 framing type. • m23—Uses M23 framing as the T3 framing type.

	Command or Action	Purpose
Step 9	<pre>t1 {number} loopback {local network remote {line payload}}</pre> <p>Example: Router(config-crtlr-sts1)# t1 1 loopback local</p>	<p>Loops the entire T1 (all 28 T1 channels) on the channelized T3 interface.</p> <ul style="list-style-type: none"> • local (Optional)—Loops the data back toward the router and sends an AIS signal out toward the network. • network (Optional)—Loops the data toward the network at the T1 framer. • remote (Optional)—Sends a far-end alarm control (FEAC) request to the remote end requesting that it enter into a network line loopback. FEAC requests are only possible when the T3 is configured for C-bit framing. The type of framing used is determined by the equipment to which you are connecting.
Step 10	<pre>end</pre> <p>Example: Router(config-controller)# end</p>	<p>Ends controller-level configuration.</p>

Configuring VT1.5 Links Under SONET Framing

To select VT1.5 as the STS-1 mode of operation before you configure the T1 links, follow the steps listed.

SUMMARY STEPS

1. **configure terminal**
2. **controller sonet slot/subslot/port**
3. **framing sonet**
4. **sts-1 {number}**
5. **mode vt-15**
6. **vtg vtg-number t1 number bert channel-group channel-group-number pattern [0s | 1-in-8 | 1s | 2^11 | 2^15 | 2^20-O153 | 2^20-QRSS | 2^23 | 3-in-24 | alt-0-1] interval {duration of bert [1-14400]minutes}**
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>configure terminal</code> Example: Router# <code>configure terminal</code>	Enters global configuration mode.
Step 2	<code>controller sonet slot/subslot/port</code> Example: Router# <code>controller sonet 3/1/1</code>	Selects the controller. Enters controller configuration mode.
Step 3	<code>framing sonet</code> Example: Router(config-controller)# <code>framing sonet</code>	(Optional) Specifies SONET framing (default).
Step 4	<code>sts-1 {number}</code> Example: Router(config-controller)# <code>sts-1 1</code>	Specifies the SONET Synchronous Transport Signal (STS) level. Enters STS-1 path configuration mode.
Step 5	<code>mode vt-15</code> Example: Router(config-crtlr-sts1)# <code>mode vt-15</code>	Specifies VT1.5 as the mode of operation. This is the default mode.
Step 6	<code>vtg {vtg-number} t1 {number} bert channel-group {channel-group-number} pattern [0s 1-in-8 1s 2^11 2^15 2^20-0153 2^20-QRSS 2^23 3-in-24 alt-0-1] interval {duration of bert [1-14400]minutes}</code> Example: Router(config-crtlr-sts1)# <code>vtg 1 t1 1 bert channel-group 1 pattern 2^11 interval 1</code>	(Optional) Configures bit error rate testing (BERT) on a channel group. Note Data cannot flow on the T3 path while BERT is in progress. During BERT, the T3 path is reported in alarm state. The T3 path is restored when BERT terminates.
Step 7	<code>end</code> Example: Router(config-controller)# <code>end</code>	Ends controller-level configuration.

Configuring the T1 Lines

To configure the T1 link after you select ct3 as the STS-1 mode of operation, follow the steps listed.

SUMMARY STEPS

1. `configure terminal`
2. `controller sonet slot/subslot/port`
3. `framing sonet`

4. **sts-1** {number}
5. **mode ct3**
6. **t1 channel clock source** {line | internal}
7. **t1 channel channel-group** channel-group-number **timeslots** timeslot-list [speed {56 | 64}]
8. **t1 channel framing** {esf | sf [hdlc-idle {0x7E | 0xFF}]}
9. **exit**
10. **interface serial** slot/subslot/port **sts-1** number/T1-channel:channel-group-number
11. **ip address** ip-address mask [secondary]
12. **no shutdown**
13. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 2	controller sonet slot/subslot/port Example: Router(config)# controller sonet 3/1/1	Selects the controller. Enters controller configuration mode.
Step 3	framing sonet Example: Router(config-controller)# framing sonet	(Optional) Specifies SONET framing (default).
Step 4	sts-1 {number} Example: Router(config-controller)# sts-1 3	Specifies the SONET Synchronous Transport Signal (STS) level. Enters STS-1 path configuration mode.
Step 5	mode ct3 Example: Router(config-crtlr-sts1)# mode ct3	Specifies that the STS level carries a DS3 signal divided into 28 T1s (multiplexed asynchronously).
Step 6	t1 channel clock source {line internal} Example: Router(config-crtlr-sts1)# t1 0 clock source internal	Configures the clock source for the T1 link. <ul style="list-style-type: none"> • line—Specifies that the T1/E1 link uses the recovered clock from the line. • internal—Specifies that the T1/E1 link uses the internal clock from the interface.

	Command or Action	Purpose
Step 7	<pre>t1 number channel-group channel-group-number timeslots timeslot-list [speed {56 64}]</pre> <p>Example: Router(config-crtlr-sts1)# t1 0 channel-group 10 timeslots 10-24 speed 64</p>	<p>Configures a list of timeslots for voice channels on a T1 controller.</p> <ul style="list-style-type: none"> <i>number</i>—Specifies the T1 controller channel. channel-group channel-group-number—ID number to identify the channel group. Valid range is 0 to 31. timeslots timeslot-list—Specifies the timeslots (DS0s) to include in this channel group. The valid timeslots are 1 to 24 for T1; 1 to 15 and 17 to 31 for E1. speed {56 64}—Specifies the speed of the underlying DS0s. The valid values are 56 kbps for T1 and 64 kbps for E1.
Step 8	<pre>t1 channel framing {esf sf [hdlc-idle{0x7E 0xFF}]}</pre> <p>Example: Router(config-crtlr-sts1)# t1 0 framing sf</p>	<p>Specifies the T1 frame format.</p> <p>If you do not specify the t1 framing command, the extended super frame (ESF) default is used.</p>
Step 9	<pre>exit</pre> <p>Example: Router(config-crtlr-sts1)# exit</p>	<p>Exits STS-1 path configuration mode.</p>
Step 10	<pre>interface serial slot/subslot/port sts1-number/T1-channel:channel-group-number</pre> <p>Example: Router(config-controller)# interface serial 1/0/0 1 1:0</p>	<p>Selects the interface and configures the channel group.</p>
Step 11	<pre>ip address ip-address mask [secondary]</pre> <p>Example: Router(config-if)# ip address 172.18.189.38 255.255.255.224</p>	<p>Assigns an IP address and subnet mask to the interface.</p>
Step 12	<pre>no shutdown</pre> <p>Example: Router(config-if)# no shutdown</p>	<p>Enables the interface.</p>
Step 13	<pre>end</pre> <p>Example: Router(config-controller)# end</p>	<p>Ends controller-level configuration.</p>

Configuring the T1 Links in VT1.5 Mapping

To configure the T1 links under VT1.5 mapping, follow the steps listed.

SUMMARY STEPS

1. **configure terminal**
2. **controller sonet** *slot/subslot/port*
3. **framing sonet**
4. **sts-1** {*number* }
5. **vtg** *vtg-number t1 number channel-group channel-group-number timeslots timeslot-list [speed {56 | 64}]*
6. **vtg** *vtg-number t1 number framing {esf | sf [0x7E | 0xFF]}*
7. **vtg** *vtg-number t1 number clock source {internal | line}*
8. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 2	controller sonet <i>slot/subslot/port</i> Example: Router(config)# controller sonet 3/1/1	Selects the controller. Enters controller configuration mode.
Step 3	framing sonet Example: Router(config-controller)# framing sonet	(Optional) Specifies SONET framing (default).
Step 4	sts-1 { <i>number</i> } Example: Router(config-controller)# sts-1 1	Specifies the SONET Synchronous Transport Signal (STS) level. Enters STS-1 path configuration mode.

	Command or Action	Purpose
Step 5	<pre>vtg vtg-number t1 number channel-group channel-group-number timeslots timeslot-list [speed {56 64}]</pre> <p>Example: Router(config-crtlr-sts1)# vtg 1 t1 channel-group 0 timeslots 1-24</p>	<p>Creates a logical channel group on a T1 line.</p> <ul style="list-style-type: none"> • <i>vtg-number</i>—Specifies the virtual tributary group (vtg) number. Valid range is 1 to 7. • <i>number</i>—Specifies the T1 controller channel. • channel-group <i>channel-group-number</i>—ID number to identify the channel group. Valid range is 0 to 31. • timeslots <i>timeslot-list</i>—Specifies the timeslots (DS0s) to include in this channel group. The valid timeslots are 1 to 24 for T1; 1 to 15 and 17 to 31 for E1. • speed {56 64}—Specifies the speed of the underlying DS0s: 56 kbps for T1 or 64 kbps for E1.
Step 6	<pre>vtg vtg-number t1 number framing {esf sf [0x7E 0xFF]}</pre> <p>Example: Router(config-crtlr-sts1)# vtg 1 t1 1 framing esf</p>	<p>Specifies the T1 framing format. The default is extended super frame (ESF).</p>
Step 7	<pre>vtg vtg-number t1 number clock source {internal line}</pre> <p>Example: Router(config-crtlr-sts1)# vtg 1 t1 1 clock source line</p>	<p>Sets the internal or line (network) clock source. Use the no form of the command to unprovision the link.</p>
Step 8	<pre>end</pre> <p>Example: Router(config-controller)# end</p>	<p>Ends controller-level configuration.</p>

Configuring Multirouter APS

The Automatic Protection Switching (APS) mechanism uses a protect interface in the SONET network as the backup for a working interface. When the working interface fails, the protect interface quickly assumes its traffic load. In a multirouter environment, this feature allows the protect SONET interface to reside in a different router from the working SONET interface.

The OC-12 SPA on a Cisco 10000 series router supports the 1+1 architecture, a mechanism wherein the protect interface is paired with a working interface. The connection may be bidirectional and revertive or nonrevertive.

For more information, refer to the *Multirouter APS on the Cisco 10000 Series* feature guide of the Cisco IOS Software Release 12.0S publication at the following URL:

http://www.cisco.com/en/US/docs/ios/12_0s/feature/guide/12s_apsm.html

To configure the working and protect SONET interfaces on different routers to enable multirouter APS, follow the steps listed.

SUMMARY STEPS

1. **configure terminal**
2. **controller sonet** *slot/subslot/port*
3. **aps group** *group-number*
4. **aps working** *channel number*
5. **aps timer** {*hello timer in seconds*} {*hold timer in seconds* }
6. Repeat Step 1 to Step 3 on the second router for the protect interface, substituting appropriate parameters.
7. **aps protect** *channel ip-address*
8. **aps timer** {*hello timer in seconds*} {*hold timer in seconds*} {*hello fail revert timer in seconds* }
9. **aps revert** {*revert timer in seconds*}
10. **end**

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 2	controller sonet <i>slot/subslot/port</i> Example: Router(config)# controller sonet 3/1/1	Selects the controller. Enters controller configuration mode.
Step 3	aps group <i>group-number</i> Example: Router(config-controller)# aps group 1	Permits more than one APS protect and working group to be supported on a router.
Step 4	aps working <i>channel-number</i> Example: Router(config-controller)# aps working 1	Configures the interface as a working interface. The channel number for an APS working group is always 1.
Step 5	aps timer [<i>hello timer in seconds</i>] [<i>hold timer in seconds</i>] Example: Router(config-controller)# aps timer 1 3	Configures Protect Group Protocol (PGP) timers on the working interface. The default for the hello time is 1 second and the default for the hold time is 3 seconds. Note If the timers are not configured on the working interface, it adopts the timer values configured on the protect interface.

	Command	Purpose
Step 6	Repeat Step 1 to Step 3.	Repeat Step 1 to Step 3 on the second router to configure the protect interface. Substitute appropriate slot numbers, interface types, and interface numbers. <ul style="list-style-type: none"> After Step 3 is configured for the protect interface, proceed to Step 7.
Step 7	aps protect <i>channel ip-address</i> Example: Router(config-controller)# aps protect 1 10.7.7.7	Configures the protect interface. The channel for the APS protect group is always 1. The <i>ip-address</i> argument specifies the IP address of the PGP interface on the peer router that has the working interface.
Step 8	aps timer [<i>hello timer in seconds</i>] [<i>hold timer in seconds</i>] [<i>hello fail revert timer in seconds</i>] Example: Router(config-controller)# aps timer 1 3 120	Configures Protect Group Protocol (PGP) timers on the protect interface. The default for the hello time is 1 second, the default for the hold time is 3 seconds, and the default for the hello fail revert time is 120 seconds.
Step 9	aps revert [<i>revert timer in seconds</i>] Example: Router(config-controller)# aps protect 1 10.7.7.7	Configures the revert timer on the protect interface.
Step 10	end Example: Router(config-controller)# end	Ends controller-level configuration.

Configuring Network Timing

To configure network timing on the interface, follow the steps listed.

SUMMARY STEPS

1. **configure terminal**
2. **network-clock select** *clock source priority: 1-6 controller sonet slot/subslot/port*
3. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>configure terminal</code> Example: Router# <code>configure terminal</code>	Enters global configuration mode.
Step 2	<code>network-clock select clock source priority: 1-6</code> <code>controller sonet slot/subslot/port</code> Example: Router(config)# <code>network-clock select 1 controller sonet 3/1/1</code>	Sets a priority for the clock source for the interface. The priority is used to select a primary source and one or more secondary sources, in case of clock failure. 1 denotes highest priority.
Step 3	<code>end</code> Example: Router(config)# <code>end</code>	Exits from global configuration mode.

Configuring Multiclass Multilink PPP

This feature provides the ability to fragment packets of various priorities into multiple classes, allowing high-priority packets to be sent between fragments of lower priorities. For information on Multiclass Multilink PPP, refer to the *Multi-Class MLP Support on Cisco 10000 PRE3/PRE4* feature guide.

Verifying the Interface Configuration

Besides using the `show running-configuration` command to display your Cisco 10000 series router configuration settings, you can use the `show interfaces pos` and the `show controllers pos` commands to get detailed information on a per-port basis for your channelized SPA.

Configuration Examples

This section includes the following configuration examples:

- [Configuring Basic POS—Example, page 9-20](#)
- [Configuring T1s in VT1.5 Mode—Example, page 9-21](#)
- [Configuring T1 Links in Channelized DS3 Mode—Example, page 9-21](#)
- [Configuring T3 Links in Unchannelized DS3 Mode—Example, page 9-21](#)

Configuring Basic POS—Example

POS and T3 interface provisioning have two levels of configuration:

- Controller-level configuration

- Interface-level configuration

The following example shows these levels of configuration:

```
Router# configure terminal
Router(config)# controller sonet 5/1/1
Router(config-controller)# sts 1 - 3 pos
Router(config-controller)# end

Router# configure terminal
Router(config-if)# interface POS 5/1/1:1
Router(config-if)# ipv4 address 172.18.189.38 255.255.255.224
Router(config-if)# encapsulation hdlc
Router(config-if)# crc 32
Router(config-if)# keepalive 10
Router(config-if)# no shutdown
Router(config-if)# end
```

Configuring T1s in VT1.5 Mode—Example

The following example shows how to configure four T1s for VT1.5 operation:

```
Router(config)# controller sonet 5/1/0
Router(config-controller)# sts-1 2
Router(config-ctrlr-sts1)# vtg 1 T1 1 channel-group 2 timeslots 1-24
Router(config-ctrlr-sts1)# vtg 1 T1 1 clock source internal
Router(config-ctrlr-sts1)# vtg 1 T1 1 framing esf
Router(config-ctrlr-sts1)# vtg 1 T1 1 loopback local
Router(config-ctrlr-sts1)# exit
```

Configuring T1 Links in Channelized DS3 Mode—Example

The following example shows how to configure a channelized DS3 interface:

```
Router(config)# controller sonet 5/0/0
Router(config-controller)# sts 1
Router(config-ctrlr-sts1)# mode ct3
Router(config-ctrlr-sts1)# t1 1 channel-group 1 timeslots 1-24
Router(config-ctrlr-sts1)# t1 1 framing esf
Router(config-ctrlr-sts1)# t1 1 loopback network line
Router(config-ctrlr-sts1)# t1 1 clock source line
Router(config-ctrlr-sts1)# exit
```

Configuring T3 Links in Unchannelized DS3 Mode—Example

The following example shows how to configure an unchannelized DS3 interface:

```
Router# configure terminal
Router(config)# controller sonet 5/1/0
Router(config-controller)# sts 3
Router(config-ctrlr-sts1)# mode t3
Router(config-ctrlr-sts1)# end
Router# configure terminal
Router(config)# interface serial 5/1/0.3
Router(config-if)# clock source line
Router(config-if)# encapsulation hdlc
Router(config-if)# framing c-bit
Router(config-if)# dsu bandwidth 1200
Router(config-if)# loopback network line
```

```
Router(config-if)# ip address 10.10.10.2 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# end
```