



Support for IUA with SCTP for Cisco Access Servers

This document describes support for the ISDN User Adaptation Layer (IUA) with Stream Control Transmission Protocol (SCTP) for the Cisco AS5x00 network access servers (NASs) and the Cisco 2420, Cisco 2600 series, and Cisco 3600 series using Cisco IOS Release 12.2(15)T. This feature is to be used as an alternative to the existing IP-based User Datagram Protocol (UDP)-to-Reliable Link Manager (RLM) transport between the Cisco PGW2200 and Cisco gateways.

This feature supports the Internet Engineering Task Force (IETF) Signaling Transport (Sigtran) standard, IUA with SCTP, to act as the call signaling IP transport mechanism in a Voice Gateway solution. SCTP and IUA are used for Signaling System 7 (SS7) Interconnect solutions, which allows required flexibility in connecting Inter-Machine Trunks (IMTs) from more than one public switched telephone network (PSTN) switch (multiple trunk groups) to the Cisco AS5x00 series gateways, the Cisco 2460, Cisco 2600 series, and Cisco 3600 series. This feature also allows you to interconnect with multiple carriers on high-capacity Cisco AS5x00 gateways for load balancing and redundancy.



Note

This feature does not support the Cisco 2600XM or Cisco 2691.

The IUA and SCTP protocols provide the following:

- Trunk groups are defined on a T1/E1 interface basis.
- All DS0 bearer channels in a specific T1/E1 interface are included in the same trunk group and cannot be split into different trunk groups.
- Multiple T1/E1 interfaces on the same gateway can be provisioned in a single trunk group or split into multiple trunk groups. The maximum number of trunk groups that a platform can support is equal to the maximum number of T1/E1 interfaces that the platform can configure.

Feature Specifications for the Support for IUA with SCTP for Cisco Access Servers Feature

Feature History

| Release | Modification |
|-----------|------------------------------|
| 12.2(15)T | This feature was introduced. |

Supported Platforms

Cisco 2600 series and Cisco 3600 series; Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms.

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 the Support for IUA with SCTP for Cisco Access Servers Feature

You must have Cisco IOS Release 12.2(15)T or later installed and running on your system.

For additional information about IUA with SCTP configuration on the Cisco Media Gateway Controller (MGC), refer to the following feature documents:

- [PRI Backhaul Using the Stream Control Transmission Protocol and the ISDN Q.921 User Adaptation Layer](#), Cisco IOS Release 12.2(11)T1
- [Stream Control Transmission Protocol \(SCTP\), Release 2](#), Cisco IOS Release 12.2(8)T
- [Support for IUA with SCTP](#)

Restrictions

- RLM transport and SCTP transport cannot operate concurrently on the Gateway Access Server (GW). Either one or the other can be configured, but not both at the same time.
- Q.931 PRI backhaul is not supported on the Cisco PGW2200. For more information about the Cisco PGW2200, refer to the [Support for IUA with SCTP](#) document on Cisco.com.

Information About the Support for IUA with SCTP for Cisco Access Servers Feature

To help you configure the Support for IUA with SCTP for Cisco Access Servers feature, you should understand the following concepts:

- [SCTP](#), page 3
- [IUA](#), page 5
- [Multiple Non-Facility Associated Signaling](#), page 5
- [IUA and SCTP with the Cisco PGW2200](#), page 7

SCTP

SCTP allows you to terminate multiple switches and trunk groups on a gateway to add scalability. Adding trunk groups does not require more memory or processing resources because SCTP supports multiple streams in a single SCTP association. SCTP is a reliable transport protocol for message-oriented communications; SCTP is specifically designed to support PSTN signaling messages over IP networks.

SCTP allows you to configure at least one trunk group per T1 or E1 interface available on a given platform. For example, a gateway platform with four T1 or E1 interfaces can control four unique trunk groups per device. Certain platforms, such as the Cisco AS5800 and Cisco AS5850, can deliver the individual T1 or E1 trunk groups over a high-speed interface, such as T3, which operates at 45 Mbps. [Table 1](#) lists the number of trunk groups supported per gateway platform.

Table 1 SS7 Interconnect for Voice Gateway Solutions Supported Trunk Groups per Gateway¹

| Platform | Supported Trunk Groups | Comments |
|------------------|------------------------|---|
| Cisco AS5300 | 4 | Verify both T1 and E1 cards. |
| Cisco AS5350 | 8 | Verify both T1 and E1 cards. Also, verify with Integrated SLT option. Refer to the <i>Integrated Signaling Link Terminal</i> , Cisco IOS Release 12.2(11)T feature document. |
| Cisco AS5350 CT3 | 28 | CT3 DS-3 card. Also, verify with Integrated SLT option. |
| Cisco AS5400 | 16 | Verify both T1 and E1 cards. Also, verify with Integrated SLT option. |
| Cisco AS5400 CT3 | 28 | CT3 DS-3 card. Also, verify with Integrated SLT option. |
| Cisco AS5850 | 112 | Verify E1 cards and CT3 DS-3 cards. Note T1 ports are only available when you use the CT3 cards. The 112 supported trunk groups are only available when you use the CT3 card. |

1. There is no degradation or change in the number of circuit identification codes (CICs) supported on any of the gateways listed.

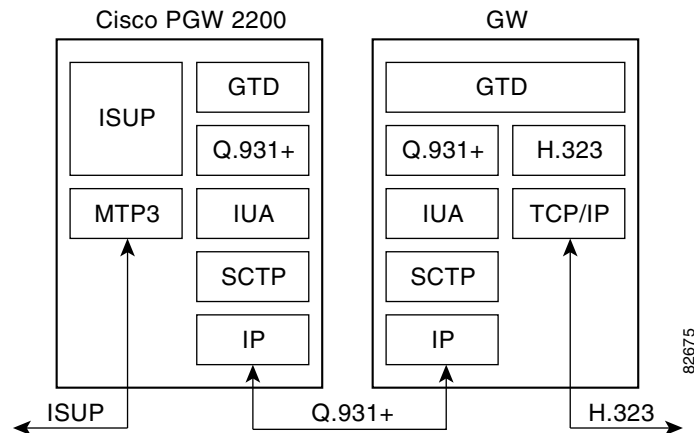
In a typical network topology, there is only one SCTP association configured between a signaling controller and a gateway. Multiple IP addresses on either side can be designated to the same association for the purpose of link redundancy, or multihoming. On a gateway, signaling messages for all trunk groups are carried over on the same SCTP association to the same signaling controller. Trunk groups on a gateway can also be controlled through different signaling controllers. In such cases, multiple associations can be configured on a gateway and directed to different signaling controllers.

SCTP is based on RFC2960 and offers the following support:

- Multiple streams per SCTP association
- Ordered and unordered delivery
- Multihoming (link redundancy)
- User-data segmentation and bundling
- Protection against masquerade, fraud, and repudiation
- Congestion control
- Path maximum transmission unit (MTU) discovery—Explicit Congestion Notification (ECN) capable
- Generic interface to support non-signaling applications

Figure 1 shows the IUA with SCTP transport stack supported by this feature.

Figure 1 IUA with SCTP Transport Stack



IUA

IUA is the adaptation layer that makes SCTP services available to Q.921 services users, such as Q.931, Q Signaling (QSIG), and National ISDN-2 with Cisco extensions (Cisco NI2+). IUA supports the standard [inter-layer primitives](#) provided by Q.921. As a result, an upper layer protocol (ULP) that typically used Q.921 services can be easily migrated to IUA.

IUA service points are represented to the upper-layer protocol as application servers (ASs). Each AS is bound to an SCTP local endpoint managed by an SCTP instance. A remote signaling controller is known as an application server process (ASP). An ASP is connected to the local endpoint through a single SCTP association.

To use IUA services, the AS and ASP should be made available, and a trunk group must be bound to an AS for its Layer 2 server. For more information, see the configuration tasks in the [“How to Configure the Support for IUA with SCTP for Cisco Access Servers Feature”](#) section on page 7.

Multiple Non-Facility Associated Signaling

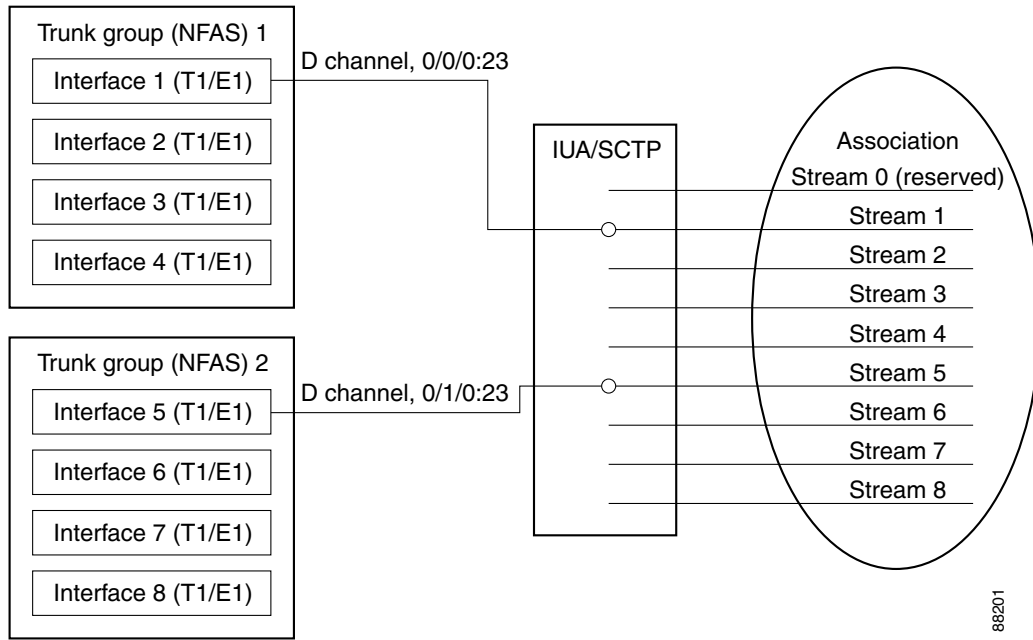
If all interfaces on a gateway are controlled through a single signaling controller, all interfaces are bound to the same AS. On a gateway, trunk groups are defined as Non-Facility Associated Signaling (NFAS) groups. An NFAS group is a group of ISDN PRI trunks with a single dedicated D channel. In a Voice Gateway solution, the D channel in a trunk group is symbolic because SS7 is used as the signaling mechanism. The D channels defined for each NFAS group are actually DS0 bearer channels for voice or modem calls. Therefore, each NFAS has a corresponding D channel for which it is allocated.

A symbolic D channel interface is dedicated to a trunk group. Each D channel interface is bound to an AS and a dedicated stream is associated with this interface. Thus, the NFAS group identification can be recovered on each side of the SCTP association through this two-stage mapping as long as both sides share the same configuration information. The multiplexing of multiple trunk groups through a single association is accomplished this way, for example.

The SCTP stream is a logical identification of the grouping of messages and consumes little additional memory and processing power. Each association can support as many as 65,355 streams.

Figure 2 shows the mapping between the trunk group, D channel interface, and SCTP stream.

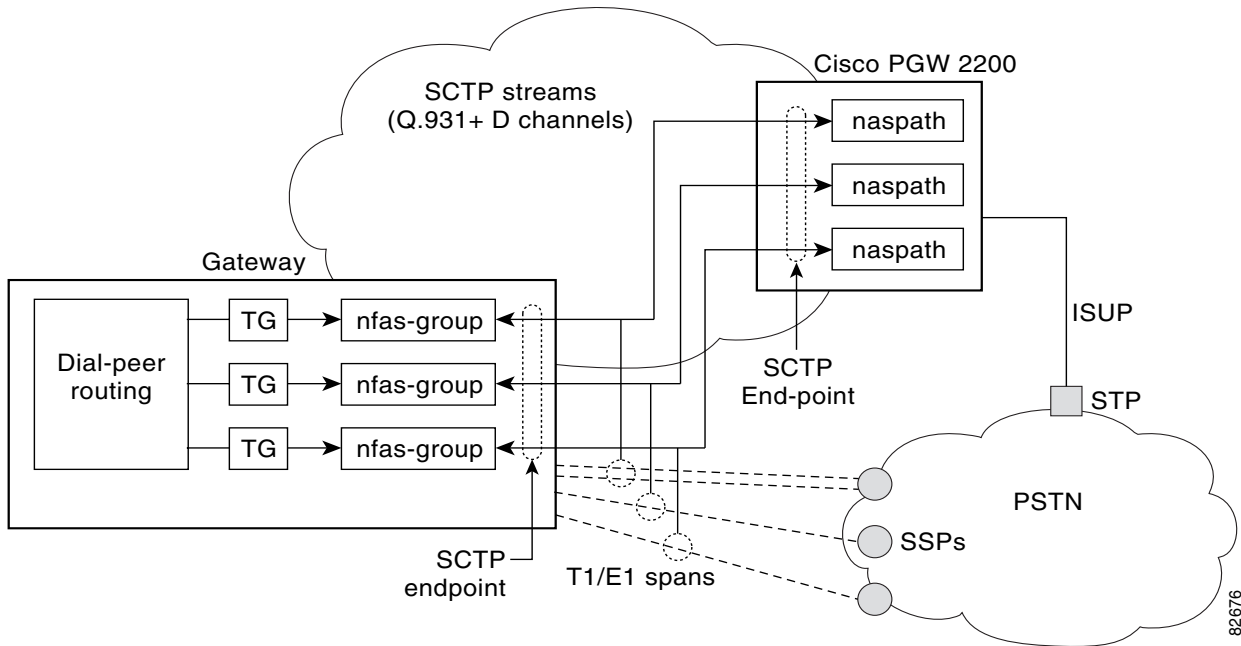
Figure 2 Mapping Between Trunk Group, Interface, and Stream



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Figure 3 shows the NFAS group and SCTP association.

Figure 3 NFAS Group and SCTP Association



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See the “Creating NFAS Groups and Binding NFAS Groups to the Application Server” section on page 13.

IUA and SCTP with the Cisco PGW2200

This feature enables support of the IUA transport protocol using SCTP on the Cisco PGW2200. The Cisco PGW2200 can now use IUA to communicate with Cisco access servers.

IUA and SCTP on the Cisco PGW2200 provides the following:

- Uses the SIGTRAN standard IUA to communicate with Cisco access servers.
- Eliminates the scaling limitations in previous releases of Cisco MGC software for the number of NFAS-groups allowed per RLM.
- Supports upgrading from RLM-based communication to IUA-based communication without losing stable active calls.
- RLM-based communication is still supported. However, since this is a new functionality, the backward compatibility of the SCTP-based transports is not applicable.
- IUA interface can be used with Cisco access servers that support NAS and Digital Private Network Signaling System (DPNSS) signaling
- Introduces IUA and SCTP operational measurements.

For more information about IUA and SCTP on the Cisco PGW2200, refer to the [Support for IUA with SCTP](#) feature document on Cisco.com

How to Configure the Support for IUA with SCTP for Cisco Access Servers Feature

This section contains the following procedures:

- [Configuring IUA, page 7](#)
- [Configuring SCTP, page 10](#)
- [Creating NFAS Groups and Binding NFAS Groups to the Application Server, page 13](#)
- [Migrating from RLM to IUA with SCTP, page 14](#)
- [Modifying a PRI Group on an MGC, page 17](#)
- [Troubleshooting Tips, page 18](#) (optional)

Configuring IUA

An AS and the ASP should be configured first to allow an NI2+ to be bound to the IUA transport layer protocol. The AS is a logical representation of the SCTP local endpoint. The local endpoint can have more than one IP address but must use the same port number.

To configure IUA, you must create the AS and the ASP by using the following commands.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **iua**

4. **as** *as-name* {*localip1* [*localip2*]} [**local-sctp-port**]
5. **asp** *asp-name as as-name* {*remoteip1* [*remoteip2*]} [**remote-sctp-port**]
6. **asp** *asp-name sctp-keepalive* *remote-ip-address* *number*
7. **asp** *asp-name ip-precedence* *remote-ip-address* *number*
8. **as** *as-name fail-over-timer* *time*

| | Command or Action | Purpose |
|--------|--|--|
| Step 1 | enable Example: Router> enable | Enables higher privilege levels, such as privileged EXEC mode. <ul style="list-style-type: none">Enter your password if prompted. |
| Step 2 | configure { terminal } Example: Router# configure terminal | Enters global configuration mode. |
| Step 3 | iua Example: Router(config)# iua | Enters IUA configuration mode and specifies backhaul using SCTP. There are no arguments for this command. |
| Step 4 | as <i>as-name</i> { <i>localip1</i> [<i>localip2</i>]} [local-sctp-port] Example: Router(config-ia)# as as5400-3 10.1.2.34 10.1.2.35 2577 | Defines an application server (AS) on a gateway. <ul style="list-style-type: none">For the no form of the command, all the ASPs in this AS have to be removed first before the AS can be unconfigured. |
| Step 5 | asp <i>asp-name as as-name</i> { <i>remoteip</i> [<i>remoteip2</i>]} [remote-sctp-port] Example: Router(config-ia)# asp asp1 as as5400-3 10.4.8.68 10.4.9.68 2577 | Defines an application server process (ASP). To disable, use the no form of this command. Note This command establishes SCTP associations. There can be only a maximum of three ASPs configured per AS. |
| Step 6 | asp <i>asp-name sctp-keepalive</i> <i>remote-ip-address</i> <i>number</i> Example: Router(config-ia)# asp asp1 sctp-keepalive 10.1.2.234 1000 | (Optional) IP address to enable and disable keep alives and control SCTP keepalives on destination IP addresses. |

| Command or Action | Purpose |
|---|--|
| <p>Step 7</p> <pre>asp asp-name ip-precedence remote-ip-address number</pre> <p>Example:</p> <pre>Router(config-iua)# asp aspl ip-precedence 10.1.2.345 7</pre> | <p>(Optional) IP precedence level for protocol data units (PDUs). To disable, use the no form of this command.</p> <ul style="list-style-type: none"> The IUA precedence value can be configured from 0 to 7 for a given IP address. Within IUA, the upper three bits representing the IP precedence in the type of service (ToS) byte (used in the IP header) are set based on what you input before passing down the value to SCTP. In turn, SCTP passes the ToS byte value to IP. The default value is 0 for normal IP precedence handling. <p>Note The no form of the command results in precedence bits not being explicitly set by SCTP. The default is to set all bits in the ToS field to zero by SCTP.</p> |
| <p>Step 8</p> <pre>as as-name fail-over-timer time</pre> <p>Example:</p> <pre>Router(config-iua)# as as5400-3 fail-over 10000</pre> | <p>(Optional) Changes the failover timer value (1 to 10 seconds) in milliseconds. Valid values range from 1000 to 10000 ms. Default is 4000 ms.</p> <ul style="list-style-type: none"> Find the failover timer value by examining the show iua as all command output. If the failover timer is not set, it assumes its default value of 4000 msec. Once you have set the failover timer to a value, you can return it to its default of 4000 msec by using the no form of this command. The <i>as-name</i> argument specifies the name of this AS. The <i>time</i> argument can be any value from 2000 to 10000 milliseconds. IUA waits for this amount of time for one ASP to take over from another ASP during failover. |
| <p>Step 9</p> <pre>exit</pre> <p>Example:</p> <pre>Router(config-iua)# exit</pre> | <p>Exits IUA configuration mode and completes IUA configuration.</p> |

Configuring SCTP

To configure the SCTP T1 initiation timer, use the following commands.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **iua**
4. **as** *as-name* {*localip1* [*localip2*]} [**local-sctp-port**]
5. **as** *as-name* **fail-over-timer** *time*
6. **as** *as-name* **sctp-startup-rtx** *number*
7. **as** *as-name* **sctp-streams** *number*
8. **as** *as-name* **sctp-t1init** *number*
9. **asp** *asp-name* **as** *as-name* *ip-address*
10. **asp** *asp-name* **ip-precedence** *remote-ip-address* *number*
11. **asp** *asp-name* **as** *as-name* {*remoteip* [*remoteip2*]} [**remote-sctp-port**]
12. **asp** *asp-name* **sctp-keepalive** *remote-ip-address* *number*
13. **asp** *asp-name* **sctp-max-association** *ip-address* *number*
14. **asp** *asp-name* **sctp-path-retransmission** *ip-address* *number*
15. **asp** *asp-name* **sctp-t3-timeout** *ip-address* *number*
16. **end**

DETAILED STEPS

| | Command or Action | Purpose |
|--------|---|---|
| Step 1 | enable Example: Router> enable | Enables higher privilege levels, such as privileged EXEC mode. • Enter your password if prompted. |
| Step 2 | configure { terminal } Example: Router# configure terminal | Enters global configuration mode. |
| Step 3 | iua Example: Router(config)# iua | Enters IUA configuration mode and specifies backhaul using SCTP. There are no arguments for this command. |

| | Command or Action | Purpose |
|--------|--|---|
| Step 4 | <p>as <i>as-name</i> {<i>localip1</i> [<i>localip2</i>]} [local-sctp-port]</p> <p>Example: Router(config-iua)# as as5400-3 10.1.2.34 10.1.2.35 2577</p> | <p>Defines an application server (AS) on a gateway.</p> <ul style="list-style-type: none"> For the no form of the command, all the ASPs in this AS have to be removed first before the AS can be unconfigured. |
| Step 5 | <p>as <i>as-name</i> fail-over-timer <i>time</i></p> <p>Example: Router(config-iua)# as as5400-3 fail-over 10000</p> | <p>(Optional) Changes the failover timer value (1 to 10 seconds) in milliseconds. Valid values range from 1000 to 10000 msec. Default is 4000 msec.</p> <ul style="list-style-type: none"> Find the failover timer value by examining the show iua as all command output. If the failover timer is not set, it assumes its default value of 4000 msec. Once you have set the failover timer to a value, you can return it to its default of 4000 msec by using the no form of this command. |
| Step 6 | <p>as <i>as-name</i> sctp-startup-rtx <i>number</i></p> <p>Example: Router(config-iua)# as as5400-3 sctp-startup-rtx 8</p> | <p>Configures the SCTP maximum startup retransmission timer.</p> <ul style="list-style-type: none"> The <i>number</i> argument represents the startup retransmission interval. Valid values range from 2 to 20. The default value is 8. |
| Step 7 | <p>as <i>as-name</i> sctp-streams <i>number</i></p> <p>Example: Router(config-iua)# as as5400-3 sctp-streams 56</p> | <p>Configures the number of SCTP streams for this AS.</p> <ul style="list-style-type: none"> The <i>number</i> argument specifies the number of SCTP streams for the association. Valid values range from 1 to 56. While the gateway command-line interface (CLI) help information presents a valid value range of 2 to 57, the actual valid range is from 2 to the maximum value, which is the number of controllers plus one on that GW and NAS. If a number higher than that is attempted, the system assumes the default value, which is the maximum number of controllers plus one. <p>Note The default value of the SCTP streams is determined by the hardware you have installed. If you set this value to something other than the default, you must always add one to the number of D channel interfaces you want to use concurrently. See the Usage Guidelines section in the as command reference for more information about SCTP streams.</p> |
| Step 8 | <p>as <i>as-name</i> sctp-tlinit <i>number</i></p> <p>Example: Router(config-iua)# as as1 sctp-tlinit 1000</p> | <p>Configures the SCTP T1 initiation timer.</p> <ul style="list-style-type: none"> Valid value for the <i>number</i> argument ranges from 1000 to 60000 ms. The default value is 1000 ms. |

| | Command or Action | Purpose |
|---------|--|--|
| Step 9 | <p>asp <i>asp-name</i> as <i>as-name</i> <i>ip-address</i></p> <p>Example: Router(config-iaa)# asp asp1 as as1 10.4.8.68 10.4.9.68</p> | Creates an ASP and specifies to which AS this ASP belongs. |
| Step 10 | <p>asp <i>asp-name</i> ip-precedence <i>remote-ip-address</i> <i>number</i></p> <p>Example: Router(config-iaa)# asp asp1 ip-precedence 10.1.2.345 7</p> | <p>Specifies the IP precedence level for protocol data units (PDUs). To disable, use the no form of this command.</p> <ul style="list-style-type: none"> The IUA precedence value can be configured from 0 to 7 for a given IP address. Within IUA, the upper three bits representing the IP precedence in the type of service (ToS) byte (used in the IP header) are set based on what you input before passing down the value to SCTP. In turn, SCTP passes the ToS byte value to IP. The default value is 0 for normal IP precedence handling. <p>Note The no form of the command results in precedence bits not being explicitly set by SCTP. The default is for SCTP to set all bits in the ToS field to zero.</p> |
| Step 11 | <p>asp <i>asp-name</i> as <i>as-name</i> [<i>remoteip</i> [<i>remoteip2</i>]] [remote-sctp-port]</p> <p>Example: Router(config-iaa)# asp asp1 as as5400-3 10.4.8.68 10.4.9.68 2577</p> | <p>Defines an application server process (ASP).</p> <p>Note This command establishes SCTP associations. There can be only a maximum of three ASPs configured per AS.</p> |
| Step 12 | <p>asp <i>asp-name</i> sctp-keepalive <i>remote-ip-address</i> <i>number</i></p> <p>Example: Router(config-iaa)# asp asp1 sctp-keepalive 10.1.2.234 1000</p> | (Optional) Specifies the IP address to enable and disable keep alives and control SCTP keepalives on destination IP addresses. |
| Step 13 | <p>asp <i>asp-name</i> sctp-max-association <i>ip-address</i> <i>number</i></p> <p>Example: Router(config-iaa)# asp asp1 sctp-max-association 10.10.10.10 20</p> | <p>Sets the maximum association retransmissions for this ASP.</p> <ul style="list-style-type: none"> Maximum association retransmission range for the <i>number</i> argument is from 2 to 20. The default value is 3. You can also use the default value of maximum retransmission associations for this ASP. |
| Step 14 | <p>asp <i>asp-name</i> sctp-path-retransmission <i>ip-address</i> <i>number</i></p> <p>Example: Router(config-iaa)# asp asp1 sctp-path-retransmission 10.10.10.10 2</p> | <p>Sets the SCTP path retransmissions for this ASP.</p> <ul style="list-style-type: none"> Valid path retransmission values for the <i>number</i> argument are from 2 to 10, or you can use the default value of maximum path retransmissions for this address. |

| | Command or Action | Purpose |
|---------|--|---|
| Step 15 | <pre>asp asp-name sctp-t3-timeout ip-address number</pre> <p>Example: Router(config-iaa)# asp asp1 sctp-t3-timeout 10.10.10.10 60000 </p> | Sets the SCTP T3 retransmission timeout for this ASP. <ul style="list-style-type: none"> Valid timeout values for the <i>number</i> argument are from 300 to 60000 ms, or you can use the default value of T for this address. |
| Step 16 | <pre>end</pre> <p>Example: Router(config-iaa-sctp)# end </p> | Exits IUA-SCTP configuration mode and completes the configuration. |

Creating NFAS Groups and Binding NFAS Groups to the Application Server

Use the procedure in this section to configure two T1 interfaces into two NFAS groups, or trunk groups, that are served by the same AS with two different SCTP streams (ASPs). These steps allow you to configure the NFAS primary D channel and bind the D channel to an IUA AS.



Note

The steps for configuring the T1/E1 interface remain the same as the steps using RLM, but multiple NFAS groups can now be defined to support multiple trunk groups. All the interfaces in an NFAS are treated as one trunk group.

SUMMARY STEPS

- enable
- configure terminal
- controller t1 1/0/0
- pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group *number* iua *as-name*
- exit
- controller t1 1/0/1
- pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group *number* iua *as-name*
- exit

| | Command or Action | Purpose |
|--------|--|---|
| Step 1 | <pre>enable</pre> <p>Example: Router> enable </p> | Enables higher privilege levels, such as privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted. |
| Step 2 | <pre>configure terminal</pre> <p>Example: Router# configure terminal </p> | Enters global configuration mode. |

| | Command or Action | Purpose |
|--------|---|--|
| Step 3 | <code>controller t1 1/0/0</code> Example: Router(config)# controller t1 1/0/0 | Enters controller configuration mode on the first T1 controller. |
| Step 4 | <code>pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group number iua as-name</code> Example: Router(config-controller)# pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group 1 iua as-1 | Configures the NFAS primary D channel on one channelized T1 controller, and binds the D channel to an IUA AS. <ul style="list-style-type: none"> The <i>as-name</i> must match the name of an AS set up during IUA configuration. See the “Configuring IUA” section on page 7 for more information. You can choose any timeslot other than 24 to be the virtual container for the D channel parameters for ISDN. |
| Step 5 | <code>exit</code> Example: Router(config-controller)# exit | Exits controller configuration mode on the first controller. |
| Step 6 | <code>controller t1 1/0/1</code> Example: Router# controller t1 1/0/1 | Enters controller configuration mode on the second T1 controller. |
| Step 7 | <code>pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group number iua as-name</code> Example: Router(config-controller)# pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group 1 iua as-1 | Configures the NFAS primary D channel on another channelized T1 controller, and binds the D channel to an IUA AS. <ul style="list-style-type: none"> The <i>as-name</i> must match the name of an AS set up during IUA configuration. See the “Configuring IUA” section on page 7 for more information. |
| Step 8 | <code>exit</code> Example: Router(config-if)# exit | Returns to global configuration mode and completes the configuration. |

Migrating from RLM to IUA with SCTP

To migrate from RLM to IUA with SCTP, you must perform the following tasks in privileged EXEC mode. You must link to IUA instead of RLM.

Restrictions

The following changes have been made between RLM and IUA with SCTP:

- AS and ASP configuration lines must precede the controller configuration lines in the configuration text file.
- RLM group configuration must be removed from the D channel configuration.

- For the D channel, the **interface serial** commands are now replaced by **interface D channel** commands.
- The **isdn bind** commands must be removed from the D channel. The binding of the NFAS groups now takes place when you use the **pri-group** commands for IUA with SCTP.

See the “[Migrating from RLM to IUA for SCTP Example](#)” section on page 24 for more information about this migration task.

SUMMARY STEPS

1. **enable**
2. **copy run tftp**
3. **Link IUA**
4. **copy tftp start**
5. **reload**

DETAILED STEPS

| | Command or Action | Purpose |
|--------|--|---|
| Step 1 | enable Example: Router> enable | Enables higher privilege levels, such as privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted. |
| Step 2 | copy run tftp Example: Router# copy run tftp | Copies the running configuration to a TFTP server. Make a backup copy of the running configuration. <ul style="list-style-type: none"> • Enter the IP address when prompted. • Enter the destination filename when prompted. Note Make all edits to the configuration text file that you have copied over to your TFTP server. Some TFTP servers might require that the name of the file that you intend to copy over is already existing and has write permissions on the TFTP server onto which you are copying. |
| Step 3 | For RLM, remove the “ isdn rlm-group 1 ” line shown in bold. Example: <pre>interface Serial3/0:1:23 no ip address isdn switch-type primary-ni isdn incoming-voice modem isdn T321 30000 isdn T303 20000 isdn T200 2000 isdn rlm-group 1 isdn negotiate-bchan resend-setup isdn bchan-number-order ascending no cdp enable</pre> | Links IUA instead of RLM by removing the “ isdn rlm-group 1 ” line from the interface serial output. |

| | Command or Action | Purpose |
|---------------|--|--|
| Step 4 | copy tftp start Example: Router# copy tftp start | Copies the new configuration to the startup configuration. |
| Step 5 | reload Example: Router# reload | Reloads the router. |

Modifying a PRI Group on an MGC

Before you can modify a PRI group on an MGC, you must first shut down the D channel beginning in global configuration mode.

Restrictions

The **isdn bind** commands must be removed from the D channel. The binding of the NFAS groups now takes place when you use the **pri-group** commands for IUA with SCTP. See the [“Modifying a PRI Group on an MGC Example”](#) section on page 25.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface Dchannel3/0:1**
4. **shutdown**
5. **exit**

DETAILED STEPS

| | Command or Action | Purpose |
|--------|--|---|
| Step 1 | enable Example: Router> enable | Enables higher privilege levels, such as privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted. |
| Step 2 | configure terminal Example: Router# configure terminal | Enters global configuration mode. |
| Step 3 | interface Dchannel3/0:1 Example: Router(config)# interface Dchannel3/0:1 | Enters interface configuration mode and selects the D channel that will be shut down. This is the format used for IUA. |
| Step 4 | shutdown Example: Router(config-if)# shutdown | Shuts down the selected D channel. |
| Step 5 | exit Example: Router(config-if)# exit | Exits interface configuration mode and completes the task. |

Troubleshooting Tips

- Enter the **show iua as** command to display the current state of the active AS. This command also shows the PRI interfaces configured on the AS.
- Enter the **show iua asp** command to display the current state of the active ASP. This command also shows information about the SCTP association being used by this ASP.
- Enter the **show isdn status** command to display the current state of the serial interface.
- Enter the **debug iua as** command to display debug messages for the IUA AS when an ISDN backhaul connection is initially established.
- Enter the **debug iua asp** command to display debug messages for the IUA ASP when an ISDN backhaul connection is initially established.

Configuration Examples for Support for IUA with SCTP for Cisco Access Servers

This section contains the following configuration examples:

- [AS and ASP Example Configuration, page 18](#)
- [Creating a Trunk Group and Binding the Trunk Group to an AS Example, page 23](#)
- [SCTP Configuration Example, page 23](#)
- [Migrating from RLM to IUA for SCTP Example, page 24](#)
- [Modifying a PRI Group on an MGC Example, page 25](#)

AS and ASP Example Configuration

The following is an example of an AS configuration on a gateway:

```
as as5400-3 10.4.8.69 10.4.9.69 2577
```

In the configuration above, an AS named as5400-3 is configured to use two local IP addresses and a port number of 2577. IP address values that are set apply to all IP addresses of the ASP.

The following configuration example defines a remote signaling controller *asp1* at two IP addresses for the AS named as5400-3. The remote SCTP port number is 2577:

```
Router(config-ia)# as as5400-3 10.4.8.69 10.4.9.69 2477
```

```
Router(config-ia)# asp asp1 as as5400-3 10.4.8.68 10.4.9.68 2577
```

Multiple ASPs can be defined for a single AS for the purpose of redundancy, but only one ASP can be active. The other ASP is inactive and only becomes active after fail-over.

In the Cisco MGC solution, a signaling controller is always the client that initiates the association with a gateway. During the initiation phase, you can request outbound and inbound stream numbers, but the gateway only allows a number that is at least one digit higher than the number of interfaces (T1/E1) allowed for the platform.

The number of streams to assign to a given association is implementation dependent. During the initialization of the IUA association, you need to specify the total number of streams that can be used. Each D channel is associated with a specific stream within the association. With multiple trunk group support, every interface can potentially be a separate D channel.

At startup, the IUA code checks for all the possible T1, E1, or T3 interfaces and sets the total number of inbound and outbound streams supported accordingly. In most cases, there is only a need for one association between the GW and the MGC. For the rare case that you are configuring multiple AS associations to various MGCs, the overhead from the unused streams would have minimal impact. The NFAS D channels are configured for one or more interfaces, where each interface is assigned a unique stream ID.

The total number of streams for the association needs to include an additional stream for the SCTP management messages. So during startup the IUA code adds one to the total number of interfaces (streams) found.

You have the option to manually configure the number of streams per association. In the backhaul scenario, if the number of D channel links is limited to one, allowing the number of streams to be configurable avoids the unnecessary allocation of streams in an association that will never be used. For multiple associations between a GW and multiple MGCs, the configuration utility is useful in providing only the necessary number of streams per association. The overhead from the streams allocated but not used in the association is negligible.

If the number of streams is manually configured through the CLI, the IUA code cannot distinguish between a startup event, which automatically sets the streams to the number of interfaces, or if the value is set manually during runtime. If you are configuring the number of SCTP streams manually, you must add one plus the number of interfaces using the **sctp-streams** keyword with the **as** command. Otherwise, IUA needs to always add one for the management stream, and the total number of streams increments by one after every reload.

When you set the SCTP stream with the CLI, you cannot change the inbound and outbound stream support once the association is established with SCTP. The value takes effect when you first remove the IUA AS configuration and then configure it back as the same AS or a new one. The other option is to reload the router.

The following is an example of an AS configuration on a gateway. The configuration shows that an AS named *as5400-3* is configured to use two local IP addresses and a port number of 2577:

```
Router(config-iaa)# as as5400-3 10.1.2.34 10.1.2.35 2577
```

The following example sets the failover time (in milliseconds) between 1 and 10 seconds. Entering a value of 1000 would equal one second. Entering a value of 10000 would equal 10 seconds. In this example, the failover timer has been set to 10 seconds:

```
Router(config-iaa)# as as5400-3 fail-over 10000
```

The following example specifies the number of SCTP streams for this association. In this example, 57 is the maximum number of SCTP streams allowed:

```
Router(config-iaa)# as as5400-3 sctp-streams 57
```

The following example sets the SCTP maximum startup retransmission interval. In this example, 20 is the maximum interval allowed:

```
Router(config-iaa)# as as5400-3 sctp-startup 20
```

The following example sets the SCTP T1 initiation timer in milliseconds. In this example, 60000 is the maximum time allowed:

```
Router(config-iaa)# as as5400-3 sctp-t1init 60000
```

The following example specifies the IP address to enable and disable keepalives:

```
Router(config-iaa)# asp asp1 sctp-keepalive 10.1.2.34
```

The following example specifies the keepalive interval in milliseconds. Valid values range from 1000 to 60000. In this example, the maximum value of 60000 ms is used:

```
Router(config-iaa)# asp asp1 sctp-keepalive 10.10.10.10 60000
```

The following example specifies the IP address for the SCTP maximum association and the maximum association value. Valid values range from 2 to 20. The default is 20, which is the maximum value allowed:

```
Router(config-iaa)# asp asp1 sctp-max-association 10.10.10.10 20
```

The following example specifies the IP address for the SCTP path retransmission and the maximum path retransmission value. Valid values range from 2 to 10. The default is 10, which is the maximum value allowed:

```
Router(config-iaa)# asp asp1 sctp-path-retransmissions 10.10.10.10 10
```

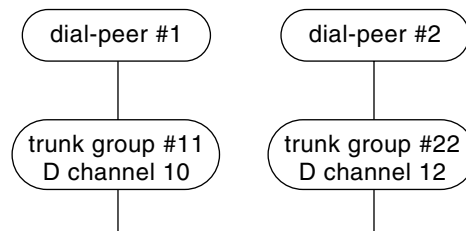
The following examples specifies the IP address for SCTP T3 timeout and specifies the T3 timeout value in milliseconds. Valid timeout values range from 300 to 60000. Default is 60000, which is the maximum timeout value allowed:

```
Router(config-iaa)# asp asp1 sctp-t3-timeout 10.10.10.10 60000
```

The following example configuration is described below. [Figure 4](#) shows the configuration in diagram form.

```
Router(config-iaa)# as as5300-17 10.0.0.07 10.1.1.17 2097
Router(config-iaa)# asp pgwa AS as5300-17 10.0.0.00 10.1.1.10 2097
Router(config-iaa)# asp pgwb AS as5300-17 10.0.0.06 10.1.1.16 2097
```

- Configures an IUA AS (Cisco AS5300-17) with two local IP addresses (10.0.0.07 and 10.1.1.17) and local port 2097.
- IUA AS Cisco AS5300-17 is connected by two SCTP associations (ASP PGW A and ASP PGW B) to two hot-standby Cisco PGW2200s (Cisco PGW2200 PGW A and Cisco PGW2200 PGW B). Cisco PGW2200 PGW A has remote IP addresses 10.0.0.00 and 10.1.1.10, and Cisco PGW2200 PGW B has remote IP addresses 10.0.0.06 and 10.1.1.16.
- Two NFAS groups (nfas-group 1 and nfas-group 2), which are both bound to IUA AS as5300-17.
- Two trunk groups (trunk-group 11 and trunk-group 22)—Trunk-group 11 is bound to interface Dchannel0 and trunk-group 22 is bound to interface Dchannel2.
- Two outgoing POTS dial-peers (dial-peer 1 and dial-peer 2)—dial-peer 1 points to trunk-group 11, and dial-peer 2 points to trunk-group 22.

Figure 4 Specific ASP Example Configuration

The following sample is how the output from the above configuration would look:

```

iua
  AS as5300-17 10.0.0.07 10.1.1.17 2097
  ASP pgwa AS as5300-17 10.0.0.00 10.1.1.10 2097
  ASP pgwb AS as5300-17 10.0.0.06 10.1.1.16 2097
!
!
controller E1 0
  framing NO-CRC4
  clock source line primary
  pri-group timeslots 1-31 nfas-d primary nfas-int 0 nfas-group 1 iua as5300-17
!
controller E1 1
  framing NO-CRC4
  clock source line secondary 1
  pri-group timeslots 1-31 nfas-d none nfas-int 1 nfas-group 1
!
controller E1 2
  framing NO-CRC4
  pri-group timeslots 1-31 nfas-d primary nfas-int 0 nfas-group 2 iua as5300-17
!
controller E1 3
  framing NO-CRC4
  pri-group timeslots 1-31 nfas-d none nfas-int 1 nfas-group 2
!
!
interface Ethernet0
  description the ip is 10.0.0.06 for interface e0
  ip address 10.0.0.06 255.255.255.0
  no ip route-cache
  no ip mroute-cache
!

```

```
interface FastEthernet0
  description the primary ip is 10.1.1.16 for interface f0
  ip address 10.1.1.10 255.255.255.0
  no ip route-cache
  no ip mroute-cache
  duplex auto
  speed auto
!
interface Dchannel0
  no ip address
  trunk-group 11
  isdn timer t309 100
  isdn timer t321 30000
  isdn incoming-voice modem
  isdn T303 20000
  isdn negotiate-bchan resend-setup
  no cdp enable
!
interface Dchannel2
  no ip address
  trunk-group 22
  isdn timer t309 100
  isdn timer t321 30000
  isdn incoming-voice modem
  isdn T303 20000
  isdn negotiate-bchan resend-setup
  no cdp enable
!
trunk group 11
!
trunk group 22
!
dial-peer voice 1 pots
  incoming called-number
  destination-pattern 997001
  direct-inward-dial
  trunk-group 11
  forward-digits all
!
dial-peer voice 2 pots
  incoming called-number
  destination-pattern 997002
  direct-inward-dial
  trunk-group 22
  forward-digits all
!
```

Creating a Trunk Group and Binding the Trunk Group to an AS Example

You can configure the NFAS primary D channel on one channelized T1 controller, and bind the D channel to an IUA AS by using the **pri-group (pri-slt)** command.

This example uses the Cisco AS5400 and applies to T1, which has 24 timeslots and is used mainly in North America and Japan. You can choose any timeslot other than 24 to be the virtual container for the D channel parameters for ISDN.

```
Router(config-controller)# pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group 1 iua as5400-4-1
```

The following example applies to E1, which has 32 timeslots and is used by the rest of the world. You can choose any timeslot other than 32 to be the virtual container for the D channel parameters for ISDN.

```
Router(config-controller)# pri-group timeslots 1-31 nfas-d primary nfas-int 0 nfas-group 1 iua as5400-4-1
```

SCTP Configuration Example

You can implicitly configure the number of streams in SCTP by specifying only the serial interfaces that are configured to use IUA. The number of streams is bound to the actual number of interfaces supporting IUA. To support Cisco MGC solutions, you can configure any number of streams for each NFAS D channel, up to the total number of interfaces available in a given GW. For platforms using the PRI backhaul with SCTP and the ISDN Q.921 User Adaptation Layer (UAL), such as the Cisco 3660, you can configure the number of streams to match the number of PRIs that are actually backhauled to the Telcordia session manager.

The following example sets the failover time (in milliseconds) between 1 and 10 seconds. Entering a value of 1000 would equal one second. Entering a value of 10000 would equal 10 seconds. In this example, the failover timer has been set to 10 seconds. The default value is 4000 msec. Once you have set the failover timer to a value, you can return it to its default of 4000 msec by using the **no** form of this command.

```
Router(config-ia)# as as5400-3 fail-over 10000
```

The following example sets the SCTP maximum startup retransmission interval. Valid values are from 2 to 20:

```
Router(config-ia)# as as1 sctp-startup-rtx 20
```

The following example specifies the number of SCTP streams for an association. Valid values are from 1 to 56:

```
Router(config-ia)# as as1 sctp-streams 56
```

The following example sets the SCTP T1 initiation timer in milliseconds. Valid values are from 1000 to 60000:

```
Router(config-ia)# as as1 sctp-t1init 60000
```

Migrating from RLM to IUA for SCTP Example

The following changes have been made between RLM and IUA with SCTP. Use the examples in this section to help you with your configuration:

- The D channel **interface serial** commands are now replaced by **interface D channel** commands.

For RLM, the following format was used:

```
interface Serial3/0:1:23
```



Note The :23 in the RLM example above, which typically corresponds with T1 configuration (:15 for E1 configuration), is no longer used.

For IUA, the following format is used:

```
interface Dchannel3/0:1
```

- The RLM group configuration must be removed from the D channel configuration.

For RLM, remove the “**isdn rlm-group 1**” line shown in bold:

```
interface Serial3/0:1:23
no ip address
isdn switch-type primary-ni
isdn incoming-voice modem
isdn T321 30000
isdn T303 20000
isdn T200 2000
isdn rlm-group 1
isdn negotiate-bchan resend-setup
isdn bchan-number-order ascending
no cdp enable
```

For IUA, use the following format:

```
interface Dchannel3/0:1
no ip address
isdn timer t309 100
isdn timer t321 30000
isdn incoming-voice modem
isdn T303 20000
no isdn send-status-enquiry
isdn negotiate-bchan resend-setup
isdn bchan-number-order ascending
no cdp enable
```

Modifying a PRI Group on an MGC Example

To modify a PRI group on an MGC using this feature, the **isdn bind** commands must be removed from the D channel. The binding of the NFAS groups now takes place when you use the **pri-group** commands for IUA with SCTP.

Use the following examples to help you with your configuration:

- Controller configuration for primary span in an NFAS group for RLM. You can choose any timeslot other than 24 to be the virtual container for the D channel parameters for ISDN:

```
controller T1 3/0:1
  framing esf
  pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group 1
```

- Controller configuration for primary span in an NFAS group for IUA:

```
controller T1 3/0:1
  framing esf
  pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group 1 iua as-1
```

Additional References

The following sections provide additional references related to the Support for IUA with SCTP for Cisco Access Servers feature:

- [Related Documents, page 26](#)
- [Standards, page 26](#)
- [MIBs, page 26](#)
- [RFCs, page 27](#)
- [Technical Assistance, page 27](#)

Related Documents

| Related Topic | Document Title |
|--|--|
| Cisco IOS commands to support voice, video, and fax applications | Cisco IOS Voice, Video, and Fax Command Reference, Release 12.2 T |
| How to configure your Cisco router or access server to support voice, video, and fax applications | Cisco IOS Voice, Video, and Fax Configuration Guide, Release 12.2T |
| Install and configure the Cisco MGC | Cisco Media Gateway Controller Software Release 9 Installation and Configuration Guide |
| Cisco MGC software Release 9 informational events, alarms, and log messages. | Cisco Media Gateway Controller Software Release 9 Messages Reference Guide |
| Cisco MGC software Release 9 Man-Machine Language (MML) commands | Cisco Media Gateway Controller Software Release 9 MML Command Reference |
| Operating, maintaining, and troubleshooting the core elements of the MGC node | Cisco Media Gateway Controller Software Release 9 Operations, Maintenance, and Troubleshooting Guide |
| Provisioning the Cisco MGC | Cisco Media Gateway Controller Software Release 9 Provisioning Guide |
| Cisco SLT information | Cisco Signaling Link Terminal index page |
| Distributed system that provides SS7 connectivity for Voice-over-IP (VoIP) gateways by using the Cisco PGW 2200. | Cisco SS7 Interconnect for Voice Gateways Solution, Release 2.0 |
| IP Transfer Point (ITP) information | IP Transfer Point (ITP), Cisco IOS Release 12.2(2)MB |
| PRI/Q.921 signaling backhaul | PRI Backhaul Using the Stream Control Transmission Protocol and the ISDN Q.921 User Adaptation Layer |
| SCTP feature information | Stream Control Transmission Protocol (SCTP), Release 2 |
| IUA with SCTP information | Support for IUA with SCTP |

Standards

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

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 obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml |

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>

RFCs

| RFCs ¹ | Title |
|-----------------------------|---|
| RFC3057 (IUA) ² | <i>RFC3057, ISDN Q.921-User Adaptation Layer</i> |
| RFC2960 (SCTP) ² | <i>RFC2960, Stream Control Transmission Protocol (SCTP)</i> |

1. Not all supported RFCs are listed.
2. CRC32 is the checksum supported.

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

This section documents new and modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.2 T command reference publications.

New Commands

- [pri-group \(pri-slt\)](#)
- [sctp](#)

Modified Commands

- [as](#)
- [asp](#)
- [debug iua as](#)

- [debug iua asp](#)
- [iua](#)
- [show ip sctp association parameters](#)
- [show isdn](#)
- [show iua as](#)
- [show iua asp](#)

as

To define an application server (AS) for backhaul, use the **as** command in IUA configuration mode. To disable, use the **no** form of this command.



Note

All of the ASPs in an AS must be removed before an AS can be unconfigured.

```
as as-name {localip1 [localip2]} [local-sctp-port] [fail-over-timer] [sctp-startup-rtx]
[sctp-streams] [sctp-t1init]
```

```
no as as-name
```

Syntax Description

| | |
|-------------------------|---|
| <i>as-name</i> | Defines the protocol name (only ISDN is supported). |
| <i>localip1</i> | <ul style="list-style-type: none"> Defines the local IP address(es) for all the ASPs in a particular AS. The <i>localip</i> argument specifies the local IP addresses for all the ASPs in this AS. You can specify up to three local IP addresses. (Note that SCTP has built-in support for multi-homed machines). |
| <i>localip2</i> | (Optional) Defines the local IP address(es) for all the ASPs in a particular AS. |
| local-sctp-port | (Optional) Defines a specific local Simple Control Transmission Protocol (SCTP) port rather than an ISDN Q.921 User Adaptation Layer (IUA) well-known port. |
| fail-over-timer | (Optional) Configures the failover timer for a particular AS. |
| sctp-startup-rtx | (Optional) Configures the SCTP maximum startup retransmission timer. |
| sctp-streams | (Optional) Configures the number of SCTP streams for a particular AS. |
| sctp-t1init | (Optional) Configures the SCTP T1 initiation timer. |

Defaults

No AS is defined.

Command Modes

IUA configuration

Command History

| Release | Modification |
|------------|---|
| 12.2(4)T | This command was introduced. |
| 12.2(11)T | This command was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5300 platform. |
| 12.2(13)T1 | This command was implemented on the Cisco AS5850. |
| 12.2(15)T | This command was integrated into Cisco IOS Release 12.2(15)T and implemented on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Usage Guidelines

A maximum of two local IP addresses can be specified. (Note that SCTP has built-in support for multihomed machines.)

The default value of the SCTP streams is determined by the hardware that you have installed. The value of the failover timer is found in the `show iua as all` command output.

The number of streams to assign to a given association is implementation dependent. During the initialization of the IUA association, you need to specify the total number of streams that can be used. Each D channel is associated with a specific stream within the association. With multiple trunk group support, every interface can potentially be a separate D channel.

At startup, the IUA code checks for all the possible T1, E1, or T3 interfaces and sets the total number of inbound and outbound streams supported accordingly. In most cases, there is only a need for one association between the gateway (GW) and the Media Gateway Controller (MGC). For the rare case that you are configuring multiple AS associations to various MGCs, the overhead from the unused streams would have minimal impact. The NFAS D channels are configured for one or more interfaces, where each interface is assigned a unique stream ID.

The total number of streams for the association needs to include an additional stream for the SCTP management messages. So during startup, the IUA code adds one to the total number of interfaces (streams) found.

You have the option to manually configure the number of streams per association. In the backhaul scenario, if the number of D channel links is limited to one, allowing the number of streams to be configurable avoids the unnecessary allocation of streams in an association that will never be used. For multiple associations between a GW and multiple MGCs, the configuration utility is useful in providing only the necessary number of streams per association. The overhead from the streams allocated but not used in the association is negligible.

If the number of streams is manually configured through the CLI, the IUA code cannot distinguish between a startup event, which automatically sets the streams to the number of interfaces, or if the value is set manually during runtime. If you are configuring the number of SCTP streams manually, you must add one plus the number of interfaces using the `sctp-streams` keyword. Otherwise, IUA needs to always add one for the management stream, and the total number of streams increments by one after every reload.

When you set the SCTP stream with the CLI, you cannot change the inbound and outbound stream support once the association is established with SCTP. The value takes effect when you first remove the IUA AS configuration and then configure it back as the same AS or a new one. The other option is to reload the router.

Additional keywords for this command are as follows:

- **fail-over-timer**—Sets the failover time (in milliseconds) between 1 and 10 seconds. Valid values range from 1000 to 10000 ms.
- **sctp-startup-rtx**—Sets the SCTP maximum startup retransmission interval. Valid values range from 2 to 20.
- **sctp-streams**—Sets the number of SCTP streams. Valid values range from 2 to 57.
- **sctp-t1init**—Sets the SCTP T1 init timer in milliseconds. Valid values range from 1000 to 60000 ms.

Examples

An AS and the application server process (ASP) should be configured first to allow a National ISDN-2 with Cisco extensions (NI2+) to be bound to this transport layer protocol. The AS is a logical representation of the SCTP local endpoint. The local endpoint can have more than one IP address but must use the same port number.

The following is an example of an AS configuration on a gateway. The configuration shows that an AS named as5400-3 is configured to use two local IP addresses and a port number of 2577:

```
Router(config-ia)# as as5400-3 10.1.2.34 10.1.2.35 2577
```

The following output shows that the AS (as1) is defined for backhaul:

```
AS as1 10.21.0.2 9900
```

Related Commands

| Command | Description |
|---------------------|------------------------------|
| asp | Defines an ASP for backhaul. |

asp

To define an application server process (ASP) for backhaul, use the **asp** command in IUA configuration mode. To disable the ASP, use the **no** form of this command.


Note

All of the ASPs in an application server (AS) must be removed before an AS can be unconfigured.

```
asp asp-name as as-name [remoteip1 [remoteip2]] [remote-sctp-port] [ip-precedence
  [sctp-keepalives] [sctp-max-associations] [sctp-path-retransmissions] [sctp-t3-timeout]
```

```
no asp asp-name
```

Syntax Description

| | |
|----------------------------------|---|
| <i>asp-name</i> | Names the current ASP. |
| as | Application server to which the ASP belongs. |
| <i>as-name</i> | Name of the application server to which the ASP belongs. |
| <i>remoteip1</i> | Remote IP address for this Simple Control Transmission Protocol (SCTP) association. |
| <i>remoteip2</i> | Designates the remote IP address for this SCTP association. |
| remote-sctp-port | Connects to a remote SCTP port rather than the IUA well-known port. |
| ip-precedence | (Optional) Sets IP Precedence bits for protocol data units (PDUs). <ul style="list-style-type: none"> IP precedence is expressed in the type of service (ToS) field of the show ip sctp association parameters output. The default type of service (ToS) value is 0. Valid precedence values range from 0 to 7. You can also use the default IP precedence value for this address by choosing the default option. |
| sctp-keepalives | (Optional) Modifies the keepalive behavior of an IP address in a particular ASP. <ul style="list-style-type: none"> Valid keepalive interval values range from 1000 to 60000. The default value is 500 ms (see the show ip sctp association parameters output under heartbeats). |
| sctp-max-associations | (Optional) Sets the SCTP maximum association retransmissions for a particular ASP. Valid values range from 2 to 20. The default is 3. |
| sctp-path-retransmissions | (Optional) Sets the SCTP path retransmissions for a particular ASP. Valid values range from 2 to 10. The default is 10. |
| sctp-t3-timeout | (Optional) Sets the SCTP T3 retransmission timeout for a particular ASP. The default value is 900 ms. Valid timeout values range from 300 to 60000. Default is 60000. |

Defaults

No ASP is defined.

Command Modes

IUA configuration

Command History

| Release | Modification |
|------------|---|
| 12.2(4)T | This command was introduced. |
| 12.2(8)T | This command was integrated into Cisco IOS Release 12.2(8)T and support was added for the Cisco AS5300. |
| 12.2(11)T1 | This command was implemented on the Cisco AS5850. |
| 12.2(15)T | This command was implemented on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; and Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Usage Guidelines

This command establishes SCTP associations. There can be only a maximum of three ASPs configured per AS. IP precedence is expressed in the ToS field of [show ip sctp association parameters](#) output. The default ToS value is 0.

You can configure the precedence value in IUA in the range of 0 to 7 for a given IP address. Within IUA, the upper three bits representing the IP precedence in the ToS byte (used in the IP header) is set based on the user input before passing down the value to SCTP. In turn, SCTP passes the ToS byte value to IP. The default value is 0 for “normal” IP precedence handling.

The *asp-name* argument specifies the name of this ASP. The **ip-precedence** keyword sets the precedence and ToS field. The *remote-ip-address* argument specifies the IP address of the remote end-point (the address of MGC, for example). The *number* argument can be any IP precedence bits in the range 1 to 255.

When you use the **sctp-keepalives** keyword, the *number* argument specifies the keepalive interval (in milliseconds) when an IP address has been selected. Valid values range from 1000 to 6000 ms. Keepalives are enabled by default.

The **no** form of the command results in precedence bits not being explicitly set by SCTP.

In the case of a hot-standby Cisco PGW2200 pair, there is usually one ASP active and another in the INACTIVE state. The ASP_UP message is used to bring the ASP state on the GW to the INACTIVE state, followed by the ASPTM message, ASP_ACTIVE to ready the IUA link for data exchange. (Eventually the QPTM Establish Request message actually initiates the start of the D channel for the given interface.) In the event that the GW detects a failure on the active ASP, it can send a NTFY message to the standby ASP to request that it become active.

Examples

An ASP is a local representation of an SCTP association because it specifies a remote endpoint that will be in communication with an AS local endpoint. An ASP is defined for a given AS. For example, the following configuration defines a remote signaling controller *asp-name* at two IP addresses for AS as1. The remote SCTP port number is 2577:

```
Router(config-ia) as as1 10.4.8.69, 10.4.9.69 2477
Router(config-ia) asp asp1 as as1 10.4.8.68 10.4.9.68 2577
```

Multiple ASPs can be defined for a single AS for the purpose of redundancy, but only one ASP can be active. The ASPs are inactive and only become active after fail-over.

In the Cisco Media Gateway Controller (MGC) solution, a signaling controller is always the client that initiates the association with a gateway. During the initiation phase, you can request outbound and inbound stream numbers, but the gateway only allows a number that is at least one digit higher than the number of interfaces (T1/E1) allowed for the platform.

The following example specifies the IP precedence level on the specified IP address. This example uses IP precedence level 7, which is the maximum level allowed:

```
Router(config-iua)# asp asp1 ip-precedence 10.1.2.345 7
```

The following example specifies the IP address to enable and disable keepalives:

```
Router(config-iua)# asp asp1 sctp-keepalive 10.1.2.34
```

The following example specifies the keepalive interval in milliseconds. In this example, the maximum value of 60000 ms is used:

```
Router(config-iua)# asp asp1 sctp-keepalive 10.10.10.10 60000
```

The following example specifies the IP address for the SCTP maximum association and the maximum association value. In this example, a maximum value of 20 is used:

```
Router(config-iua)# asp asp1 sctp-max-association 10.10.10.10 20
```

The following example specifies the IP address for the SCTP path retransmission and the maximum path retransmission value. In this example, a maximum value of 20 is used:

```
Router(config-iua)# asp asp1 sctp-path-retransmissions 10.10.10.10 10
```

The following example specifies the IP address for SCTP T3 timeout and specifies the T3 timeout value in milliseconds. In this example, the maximum value of 60000 is used:

```
Router(config-iua)# asp asp1 sctp-t3-timeout 10.10.10.10 60000
```

Related Commands

| Command | Description |
|--------------------|--|
| as | Defines an application server (AS) for backhaul. |

debug iua as

To display debug messages for the ISDN User Adaptation Layer (IUA) application server (AS), use the **debug iua as** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

```
debug iua as {user | state} {all | name as-name}
```

```
no debug iua as
```

Syntax Description

| | |
|----------------------------|--|
| user | Application program interfaces (APIs) usage and events between the ISDN layer and IUA. |
| state | AS state transitions. |
| all | Enables debug for all the configured AS. |
| name <i>as-name</i> | Name of the AS. |

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

| Release | Modification |
|-----------|---|
| 12.2(4)T | This command was introduced. |
| 12.2(15)T | This command was integrated into Cisco IOS Release 12.2(15)T on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; and Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Examples

The following example shows debug output when an ISDN backhaul connection is initially established. The output shows that state debugging is turned on for all ASs and that the AS is active.

```
Router# debug iua as state all

IUA :state debug turned ON for ALL AS

00:11:52:IUA:AS as1 number of ASPs up is 1
00:11:57:IUA:AS as1 xstation AS-Up --> AS-Active, cause - ASP asp1
```

Related Commands

| Command | Description |
|-------------------------------|--|
| debug iua asp | Displays debug messages for the IUA application server process (ASP) |

debug iua asp

To display debug messages for the ISDN User Adaptation Layer (IUA) application server process (ASP), use the **debug iua asp** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

```
debug iua asp {pak | peer-msg | sctp-sig | state} {all | name asp-name}
```

```
no debug iua as
```

Syntax Description

| | |
|-----------------------------|--|
| pak | All packets. |
| peer-msg | IUA peer-to-peer messages. |
| sctp-sig | Signals sent by the Stream Control Transmission Protocol (SCTP) layer. |
| state | ASP state transition. |
| all | All configured ASPs. |
| name <i>asp-name</i> | Name of the ASP. |

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

| Release | Modification |
|-----------|---|
| 12.2(4)T | This command was introduced. |
| 12.2(15)T | This command was integrated into Cisco IOS Release 12.2(15)T on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; and Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Examples

The following example shows debug output when an ISDN backhaul connection is initially established. The output shows that peer message debugging is turned on for all DSPs and that the ASP is active.

```
Router# debug iua asp peer-msg all
```

```
IUA :peer message debug turned ON for ALL ASPs
```

```
Router#
```

```
00:04:58:IUA :recieved ASP_UP message on ASP asp1
```

```
00:04:58:IUA:ASP asp1 xsition ASP-Down --> ASP-Up , cause - rcv peer  
msg
```

```
ASP-UP
```

```
00:04:58:IUA:sending ACK of type 0x304 to asp asp1
```

```
00:05:03:IUA:rcv ASP_ACTIVE message for ASP asp1
```

```
00:05:03:IUA:ASP asp1 xsition ASP-Up --> ASP-Active, cause - rcv peer  
msg
```

```
ASP-Active
```

Related Commands

| Command | Description |
|------------------------------|---|
| debug iua as | Displays debug messages for the IUA AS. |

iua

To specify backhaul using Stream Control Transmission Protocol (SCTP) and to enter IDSN User Adaptation Layer (IUA) configuration mode, use the **iua** command in terminal configuration mode.

iua

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes Terminal configuration

| Command History | Release | Modification |
|-----------------|-----------|--|
| | 12.2(4)T | This command was introduced. |
| | 12.2(8)T | This command was integrated into Cisco IOS Release 12.2(8)T and implemented on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 7200 series. Support for the Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 is not included in this release. |
| | 12.2(11)T | This command was implemented on the Cisco AS5300 and Cisco AS5850. |
| | 12.2(15)T | This command was implemented on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; and Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Usage Guidelines You must first enter IUA configuration mode to access SCTP configuration mode. First enter IUA configuration mode by using the example below and then enter the **sctp** command at the Router(config-iua)# prompt to bring up SCTP configuration mode. See the **sctp** command.

Examples The following example shows how to enter iua configuration mode:

```
Router# configure terminal
```

```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
Router(config)# iua
```

```
Router(config-iua)#
```

The following example shows how to configure the failover-timer by setting the failover time (in milliseconds) to 1 second for a particular AS:

```
Router(config-iua)# as as5400-3 fail-over-timer 1000
```

The following example configures the number of SCTP streams for this AS to 57, which is the maximum value allowed:

```
Router(config-iua)# as as5400-3 sctp-streams 57
```

Related Commands

| Command | Description |
|---|--|
| isdn bind-13 iua-backhaul | ISDN backhaul using SCTP for an interface. |
| show iua as | Information about the current condition of an AS. |
| show iua asp | Information about the current condition of an ASP. |

pri-group (pri-slt)

To specify an ISDN PRI on a channelized T1 or E1 controller, use the **pri-group (pri-slt)** command in controller configuration mode. To remove the ISDN PRI configuration, use the **no** form of this command.

```
pri-group [timeslots timeslot-range [nfas_d [backup | none | primary [nfas_int number]]
  [nfas-group number [iua as-name]]]
```

```
no pri-group
```

Syntax Description

| | |
|--|---|
| timeslots <i>timeslot-range</i> | A single range of timeslot values in the PRI group. For T1, the allowable range is from 1 to 23. For E1, the allowable range is from 1 to 31. |
| nfas_d | Operation of the D channel timeslot. |
| backup | (Optional) Operation of the D channel timeslot on this controller is the NFAS D backup. |
| none | (Optional) D channel timeslot is used as an additional B channel. |
| primary | D channel timeslot on this controller is NFAS D. |
| nfas_int <i>range</i> | Provisioned NFAS interface value. Valid values range from 0 to 32. |
| nfas-group <i>number</i> | NFAS group and the NFAS group number. Valid values range from 0 to 31. |
| iua <i>as-name</i> | Binds NFAS group to the ISDN User Adaptation Layer (IUA) application server (AS). |

Defaults

No ISDN-PRI group is configured.

Command Modes

Controller configuration

Command History

| Release | Modification |
|-----------|---|
| 12.2(11)T | This command was introduced. |
| 12.2(15)T | This command was implemented on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; and Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Usage Guidelines

This command provides another way to bind a D channel to a specific IUA AS. This option allows the RLM group to be configured at the pri-group level instead of in the D channel configuration. For example, a typical configuration would look like the following:

```
controller t1 1/0/0
  pri-group timeslots 1-24 nfas_d pri nfas_int 0 nfas_group 1 iua asname
```

Before you enter this command, you must specify an ISDN-PRI switch type and an E1 or T1 controller.

When configuring NFAS, use this extended version of the **pri-group** command to specify the following values for the associated channelized T1 controllers configured for ISDN:

- The range of PRI timeslots to be under the control of the D channel (timeslot 24).
- The function to be performed by timeslot 24 (primary D channel, backup, or none); the latter specifies its use as a B channel.
- The group identifier number for the interface under the control of a particular D channel.

The **iua** keyword is used to bind an NFAS group to the IUA AS.

When binding the D channel to an IUA AS, the *as-name* must match the name of an AS set up during IUA configuration.

Before you can modify a PRI group on a Media Gateway Controller (MGC), you must first shut down the D channel.

The following shows how to shut down the D channel:

```
Router# configure terminal

Enter configuration commands, one per line.  End with CNTL/Z.

Router(config)# interface Dchannel13/0:1
Router(config-if)# shutdown
```

Examples

The following example configures the NFAS primary D channel on one channelized T1 controller, and binds the D channel to an IUA AS. This example uses the Cisco AS5400 and applies to T1, which has 24 timeslots and is used mainly in North America and Japan:

```
Router(config-controller)# pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group 1 iua as5400-4-1
```

The following example applies to E1, which has 32 timeslots and is used by the rest of the world:

```
Router(config-controller)# pri-group timeslots 1-31 nfas-d primary nfas-int 0 nfas-group 1 iua as5400-4-1
```

The following example configures ISDN-PRI on all time slots of controller E1 on a Cisco 2600 series router:

```
Router(config)# controller E1 4/1
Router(config-controller)# pri-group timeslots 1-7,16
```

In the following example, the **rlm-timeslot** keyword automatically creates interface serial 4/7:11 (4/7:0:11 if you are using the CT3 card) for the D channel object on a Cisco AS5350. You can choose any timeslot other than 24 to be the virtual container for the D channel parameters for ISDN.

```
Router(config-controller)# pri-group timeslots 1-23 nfas-d primary nfas-int 0 nfas-group 0 rlm-timeslot 3
```

Related Commands

| Command | Description |
|-------------------------|--|
| isdn switch-type | Configures the Cisco 2600 series router PRI interface to support QSIG signaling. |

sctp

To enter the Stream Control Transmission Protocol (SCTP) configuration, use the **sctp** command in IDSN User Adaptation Layer (IUA) configuration mode. To disable, use the **no** form of this command.

```
sctp [[t1-init milliseconds][t3-rtx-min seconds][t3-rtx-max milliseconds][startup-rtx
number][assoc-rtx number][path-rtx number]]
```

```
no sctp
```

Syntax Description

| | |
|---------------------------------------|--|
| t1-init <i>milliseconds</i> | Timer T1 initiation value in milliseconds. Valid values are from 1000 to 60000. The t1-init configurable option applies only during the creation of an SCTP instance. |
| t3-rtx-min <i>seconds</i> | Timer T3 retransmission minimum timeout in seconds. Valid values are from 1 to 300. |
| t3-rtx-max <i>milliseconds</i> | Timer T3 retransmission maximum timeout in milliseconds. Valid values are from 1000 to 60000. |
| startup-rtx <i>number</i> | Maximum startup retransmissions. The startup-rtx configurable option applies only during the creation of an SCTP instance. Valid values are from 2 to 20. |
| assoc-rtx <i>number</i> | Maximum association retransmissions. Valid values are from 2 to 20. |
| path-rtx <i>number</i> | Maximum path retransmissions. Valid values are from 2 to 20. |

Defaults

No default behavior or values.

Command Modes

IUA configuration

Command History

| Release | Modification |
|-----------------------------|---|
| Cisco IOS Release 12.2(15)T | This command was implemented on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; and Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Usage Guidelines

To enter SCTP configuration commands, you must first enter IUA configuration mode and then enter **sctp** at the Router(*config-iaa*)# prompt to enter SCTP configuration mode.

Examples

The following example shows how to enter IUA configuration mode:

```
Router# configure terminal
```

Enter configuration commands, one per line. End with CNTL/Z.

```
Router(config)# iaa
Router(config-iaa)#
```

The following is an example of how to set failover time (in milliseconds) between 1 and 10 seconds as part of SCTP configuration of the T1 initiation timer. This example uses the lowest failover timer value allowed (1 second):

```
Router(config-iaa)# as as5400-3 fail-over 1000
```

The following is an example of how to set SCTP maximum startup retransmission interval. This example uses the maximum startup retransmission interval value allowed:

```
Router(config-iaa)# as as5400-3 sctp-startup 20
```

The following is an example of how to configure the number of SCTP streams for this AS. This example uses the maximum SCTP streams allowed:

```
Router(config-iaa)# as as5400-3 sctp-streams 57
```

The following is an example of how to configure the SCTP T1 initiation timer (in milliseconds). This example uses the maximum timer value allowed:

```
Router(config-iaa)# as as5400-3 sctp-t1init 60000
```

Related Commands

| Command | Description |
|-------------------------------------|--|
| pri-group (pri-slt) | ISDN PRI on a channelized T1 or E1 controller. |

show ip sctp association parameters

To display the parameters configured for the association defined by association ID, use the **show ip sctp association parameters** command in privileged EXEC mode.

```
show ip sctp association parameters [assoc-id]
```

| | | |
|---------------------------|-----------------|--|
| Syntax Description | <i>assoc-id</i> | (Optional) Association identifier. Shows the associated ID statistics for the Stream Control Transmission Protocol (SCTP) association. |
|---------------------------|-----------------|--|

| | |
|----------------------|-----------------|
| Command Modes | Privileged EXEC |
|----------------------|-----------------|

| Command History | Release | Modification |
|------------------------|----------------|---|
| | 12.2(2)MB | This command was introduced as part of the show ip sctp command. |
| | 12.2(2)T | This command was introduced as the show ip sctp association parameters command. |
| | 12.2(4)T | This command was integrated into Cisco IOS release 12.2(4)T. |
| | 12.2(8)T | Three new output fields were added to this command: Outstanding bytes, per destination address; Round trip time (RTT), per destination address; and Smoothed round trip time (SRTT), per destination address. |
| | 12.2(11)T | This command was implemented on the Cisco AS5300 and Cisco AS5850. |
| | 12.2(15)T | This command was implemented on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; and Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Usage Guidelines

This command provides information to determine the stability of SCTP associations, dynamically calculated statistics about destinations, values to assess network congestion. This command also displays parameter values for the specified association.

This command requires an association identifier. Association identifiers can be obtained from the output of the **show ip sctp association list** command.

There are many parameters that are defined for each association. Some are configured parameters, and others are calculated. There are three main groupings of parameters displayed by this command:

- Association configuration parameters
- Destination address parameters
- Association boundary parameters

The association configuration section displays information similar to that in the **show ip sctp association list** command, including association identifiers, state, and local and remote port and address information. The current primary destination is also displayed.

Examples

The following sample output shows the IP SCTP association parameters for association 0:

```

Router# show ip sctp association parameters 0

** SCTP Association Parameters **

AssocID: 0 Context: 0 InstanceID: 1
Assoc state: ESTABLISHED Uptime: 19:05:57.425
Local port: 8181
Local addresses: 10.1.0.3 10.2.0.3

Remote port: 8181
Primary dest addr: 10.5.0.4
Effective primary dest addr: 10.5.0.4
Destination addresses:

10.5.0.4: State: ACTIVE
Heartbeats: Enabled Timeout: 30000 ms
RTO/RTT/SRTT: 1000/16/38 ms TOS: 0 MTU: 1500
cwnd: 5364 ssthresh: 3000 outstand: 768
Num retrans: 0 Max retrans: 5 Num times failed: 0

10.6.0.4: State: ACTIVE
Heartbeats: Enabled Timeout: 30000 ms
RTO/RTT/SRTT: 1000/4/7 ms TOS: 0 MTU: 1500
cwnd: 3960 ssthresh: 3000 outstand: 0
Num retrans: 0 Max retrans: 5 Num times failed: 0

Local vertag: 9A245CD4 Remote vertag: 2A08D122
Num inbound streams: 10 outbound streams: 10
Max assoc retrans: 5 Max init retrans: 8
CumSack timeout: 200 ms Bundle timeout: 100 ms
Min RTO: 1000 ms Max RTO: 60000 ms
LocalRwnd: 18000 Low: 13455 RemoteRwnd: 15252 Low: 13161
Congest levels: 0 current level: 0 high mark: 325

```

Table 2 describes significant fields shown in this output.

Table 2 *show ip sctp association parameters Field Descriptions*

| Field | Description |
|-----------------------------|--|
| AssocID | SCTP association identifier. |
| Context | Internal upper-layer handle. |
| InstanceID | SCTP association instance identifier. |
| Assoc state | SCTP association state, which can be ESTABLISHED, CLOSED, COOKIE-WAIT, and COOKIE-ECHOED. |
| Uptime | Duration of time for which the association has been active. |
| Local port | Port number for the local SCTP endpoint. |
| Local addresses | IP addresses for the local SCTP endpoint. |
| Remote port | Port number for the remote SCTP endpoint. |
| Primary dest addr | Primary destination address. |
| Effective primary dest addr | Current primary destination address. |
| Heartbeats | Status of heartbeats. |
| Timeout | Heartbeat timeout. |
| RTO/RTT/SRTT | Retransmission timeout, round trip time, and smoothed round trip time, calculated from network feedback. |
| TOS | IP precedence setting. |

Table 2 *show ip sctp association parameters Field Descriptions (continued)*

| Field | Description |
|--|--|
| MTU | Maximum transmission unit size, in bytes, that a particular interface can handle. |
| cwnd | Congestion window value calculated from network feedback. The amount of data that can be outstanding in the network for that particular destination. |
| ssthresh | Slow-start threshold value calculated from network feedback. |
| outstand | Number of outstanding bytes. |
| Num retrans | Current number of times that data has been retransmitted to that address. |
| Max retrans | Maximum number of times that data has been retransmitted to that address. |
| Num times failed | Number of times that the address has been marked as failed. |
| Local vertag, Remote vertag | Verification tags (vertags). Tags are chosen during association initialization and do not change. |
| Num inbound streams, Num outbound streams | Maximum inbound and outbound streams. This number does not change. |
| Max assoc retrans | Maximum association retransmit limit. Number of times that any particular chunk may be retransmitted before a declaration that the association failed, which indicates that the chunk could not be delivered on any address. |
| Max init retrans | Maximum initial retransmit limit. Number of times that the chunks for initialization may be retransmitted before declaring that the attempt to establish the association failed. |
| CumSack timeout | Cumulative selective acknowledge (SACK) timeout. The maximum time that a SACK may be delayed while attempting to bundle together with data chunks. |
| Bundle timeout | Maximum time that data chunks may be delayed while attempting to bundle with other data chunks. |
| Min RTO, Max RTO | Minimum and maximum retransmit timeout values allowed for the association. |
| LocalRwnd, RemoteRwnd | Local and remote receive windows. |
| Congest levels: current level, high mark | Current congestion level and highest number of packets queued. |

Related Commands

| Command | Description |
|--|--|
| clear ip sctp statistics | Clears statistics counts for SCTP. |
| debug ip sctp api | Reports SCTP diagnostic information and messages. |
| show ip sctp association list | Displays a list of all current SCTP associations. |
| show ip sctp association statistics | Displays the current statistics for the association defined by the association identifier. |
| show ip sctp errors | Error counts logged by SCTP. |
| show ip sctp instances | All currently defined SCTP instances. |

| Command | Description |
|--------------------------------|---|
| show ip sctp statistics | Statistics counts for Sctp. |
| show iua as | Current condition of an application server. |
| show iua asp | Current condition of an application server process. |

show isdn

To display the information about memory, Layer 2 and Layer 3 timers, and the status of PRI channels, use the **show isdn** command in privileged EXEC mode.

```
show isdn { active [dsl | serial-number] | history [dsl | serial-number] | memory | service [dsl | serial-number] | status [dsl | serial-number] | timers [dsl | serial-number]} 
```

Syntax Description

| | |
|--|--|
| active [<i>dsl</i> <i>serial-number</i>] | Displays current call information of all ISDN interfaces or, optionally, a specific digital subscriber line (DSL) or a specific ISDN PRI interface (created and configured as a serial interface). Values of <i>dsl</i> range from 0 to 15. Information displayed includes the called number, the remote node name, the seconds of connect time, the seconds of connect time remaining, the seconds idle, and Advice of Charge (AOC) charging time units used during the call. |
| history [<i>dsl</i> <i>serial-number</i>] | Displays historic and current call information of all ISDN interfaces or, optionally, a specific DSL or a specific ISDN PRI interface (created and configured as a serial interface). Values of <i>dsl</i> range from 0 to 15. Information displayed includes the called number, the remote node name, the seconds of connect time, the seconds of connect time remaining, the seconds idle, and AOC charging time units used during the call. |
| memory | Displays ISDN memory pool statistics. This keyword is for use by technical development staff only. |
| service [<i>dsl</i> <i>serial-number</i>] | Displays the service status of all ISDN interfaces or, optionally, a specific DSL or a specific ISDN PRI interface (created and configured as a serial interface). Values for <i>dsl</i> range from 0 to 15. |
| status [<i>dsl</i> <i>serial-number</i>] | Displays the status of all ISDN interfaces or, optionally, a specific DSL or a specific ISDN PRI interface (created and configured as a serial interface). Values for <i>dsl</i> range from 0 to 15. |
| timers [<i>dsl</i> <i>serial-number</i>] | Displays the values of Layer 2 and Layer 3 timers for all ISDN interfaces or, optionally, a specific DSL or a specific ISDN PRI interface (created and configured as a serial interface). Values of <i>dsl</i> range from 0 to 15. |

Command Modes

Privileged EXEC

Command History

| Release | Modification |
|-----------|---|
| 11.1 | This command was introduced. |
| 12.2(15)T | This command was implemented on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; and Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Usage Guidelines

Use the **show isdn status** command to check the serial interface.

Examples

The following is sample output from the **show isdn active** command:

```
Router# show isdn active

-----
                          ISDN ACTIVE CALLS
-----
History Table MaxLength = 320 entries
History Retain Timer = 15 Minutes
-----
Call Calling   Called      Duration  Remote   Time until  Recorded Charges
Type Number   Number      Seconds   Name     Disconnect  Units/Currency
-----
Out           9876543222  Active(10) idacom    11        u(E)
Out           9876543210  Active(34) idacom 115     5         u(D)
-----
```

The following is sample output from the **show isdn history** command:

```
Router# show isdn history

-----
                          ISDN CALL HISTORY
-----
History Table MaxLength = 320 entries
History Retain Timer = 15 Minutes
-----
Call Calling   Called      Duration  Remote   Time until  Recorded Charges
Type Number   Number      Seconds   Name     Disconnect  Units/Currency
-----
Out           47887654    240      blackcanary  5         u(D)
In    67893      90        delorean
Out           56745678    Active(90) blackcanary  240      13        u(D)
-----
```

[Table 3](#) describes the fields in the **show isdn active** and **show isdn history** output displays.

Table 3 *show isdn active and show isdn history Field Descriptions*

| Field | Description |
|---------------------------------|--|
| History Table MaxLength | Maximum number of entries that can be retained in the Call History table. |
| History Retain Timer | Maximum number of seconds any entry can be retained in the Call History table. |
| Call Type | Type of call: incoming or outgoing. |
| Calling Number | For incoming calls, the number from which the call was received. |
| Called Number | For outgoing calls, the number to which the call was placed. |
| Duration Seconds | Number of seconds the call lasted. Indicates whether the call is still active, and how many seconds it has lasted so far. |
| Remote Name | Name of the host placing the call or the host called. |
| Time until Disconnect | Number of seconds before the call is configured to disconnect because of the static idle timer for the map class or the interface. |
| Recorded Charges Units/Currency | For outgoing calls, number of ISDN AOC charging units used or the currency cost of the call. |

The following output shows PRI configured on a T1 controller:

```

Router# show isdn service

PRI Channel Statistics:
ISDN Dc0 SC, Channel [1-31]
Configured Isdn Interface (dsl) 0
Channel State (0=Idle 1=Proposed 2=Busy 3=Reserved 4=Restart 5=Maint_Pend)
Channel : 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
State   : 2 2 2 2 2 2 2 2 2 0 0 0 0 2 2 2 2 2 2 2 2 2 2 2 0 0
Service State (0=Inservice 1=Maint 2=Outofservice)
Channel : 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
State   : 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Channel blocked? (0=No 1=Yes)
Channel : 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
         : 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

```

Table 4 describes the fields in the **show isdn service** output display.

Table 4 show isdn service Field Descriptions

| Field | Description |
|---|---|
| Channel (1-31) | Channel range “1-31” is a standard format for both T1 and E1 outputs, but the state value shown identifies whether the channel is used. |
| Configured ISDN Interface (dsl 0) | Digital signal link (DSL) value is 0. |
| State (0=Idle 1=Propose 2=Busy 3=Reserved 4=Restart 5=Maint-Pend) | Current state of each channel. Channels 24 to 31 are marked as reserved when the output is from T1. |
| Channel (1-31) Service State (0=Inservice 1=Maint 2=Outofservice) | Service state assigned to each channel. Channel 24 is marked as out of service. ¹ |

1. If channel 24 (marked as out of service) is configured as the NFAS primary D channel, NFAS will roll over to the backup D channel if one is configured. If channel 24 is a B channel, it will not accept calls.

The following is sample output from the **show isdn status** command on the Cisco AS5300 with one active call. Changes in the output are shown in bold. Use this command to check the serial interface.

```

Router# show isdn status

Global ISDN Switchtype = primary-ni
ISDN Serial0:23 interface      iua as5300-7-1
  Transport Link Status:
    ACTIVE
    dsl 0, interface ISDN Switchtype = primary-ni :Primary D channel of nfas group 1
    L2 Protocol = IUA  L3 Protocol(s) = Q.931
  Layer 1 Status:
    ACTIVE
  Layer 2 Status:Not Applicable
  Layer 3 Status:
    0 Active Layer 3 Call(s)
  Active dsl 0 CCBS = 0
  The Free Channel Mask: 0x80FFFFFF
  Number of L2 Discards = 0, L2 Session ID = 1
ISDN Serial1:23 interface      iua as5300-7-2
  Transport Link Status:
  ...

```

Table 5 describes important fields in the **show isdn status** output display.

Table 5 *show isdn status Field Descriptions*

| Field | Description |
|---|---|
| Transport Link Status | Shows ACTIVE or INACTIVE. New field from merge with Cisco Signaling Link Terminal (SLT) code. |
| Layer 1 Status | |
| ACTIVE | Status of ISDN Layer 1. |
| Layer 2 Status | |
| TEI = 65, State = MULTIPLE_FRAME_ESTABLISHED | Status of ISDN Layer 2. Not applicable |
| Layer 3 Status | |
| 0 Active Layer 3 Call(s) | Number of active calls. |

The following is sample output from the **show isdn timers**:

```
Router# show isdn timers

ISDN BRI0 Timers (dsl 0) Switchtype = basic-net3
  ISDN Layer 2 values
    K   = 1   outstanding I-frames
    N200 = 3   max number of retransmits
    N202 = 2   max number of retransmits of TEI ID Request
    T200 = 1   seconds
    T202 = 2   seconds
    T203 = 10  seconds
  ISDN Layer 3 values
    T303 = 4   seconds
    T305 = 30  seconds
    T308 = 4   seconds
    T309 = 0   seconds
    T310 = 40  seconds
    T313 = 4   seconds
    T316 = 0   seconds
    T318 = 4   seconds
    T319 = 4   seconds
```

[Table 6](#) displays some typical values of the timers shown in this command display. The values of the timers depend on the switch type and typically are used only for homologation purposes.

Refer to Q.921 and Q.931 specifications for detailed technical definitions of the Layer 2 and Layer 3 timers.

Table 6 *show isdn timers Typical Timer Values*

| Field | Typical Value |
|------------------------------------|---------------|
| ISDN Layer 2 values: | |
| K = x outstanding I-frames | 1 |
| N200 = x max number of retransmits | 3 |
| T200 = x seconds | 1 |
| T202 = x seconds | 2 |
| T203 = x seconds | 10 |

Table 6 *show isdn timers Typical Timer Values*

| Field | Typical Value |
|-----------------------------|---------------|
| ISDN Layer 2 values: | |
| ISDN Layer 3 values: | |
| T303 = x seconds | 4 |
| T305 = x seconds | 30 |
| T308 = x seconds | 4 |
| T309 = x seconds | 0 |
| T310 = x seconds | 40 |
| T313 = x seconds | 4 |
| T316 = x seconds | 0 |
| T318 = x seconds | 4 |
| T319 = x seconds | 4 |

Related Commands

| Command | Description |
|--|---|
| clear ip sctp statistics | Clears statistics counts for Stream Control Transmission Protocol (SCTP). |
| show ip sctp association list | Displays a list of all current SCTP associations. |
| show ip sctp association parameters | Displays the parameters configured for the association defined by the association ID. |
| show ip sctp association statistics | Displays the current statistics for the association defined by the association ID. |
| show ip sctp errors | Displays error counts logged by SCTP. |
| show ip sctp instances | Displays the currently defined SCTP instances. |
| show ip sctp statistics | Displays the overall statistics counts for SCTP. |
| show iua as | Displays information about the current condition of an AS. |
| show iua asp | Displays information about the current condition of an ASP. |

show iua as

To show information about the current condition of an application server (AS), use the **show iua as** command in privileged EXEC mode.

```
show iua as {all | name as-name}
```

Syntax Description

| | |
|----------------------------|---|
| all | Displays information about all configured ASs. |
| name <i>as-name</i> | Name of a particular AS. Displays information about just that AS. |

Command Modes

Privileged EXEC

Command History

| Release | Modification |
|-----------|---|
| 12.2(4)T | This command was introduced. |
| 12.2(15)T | This command was implemented on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; and Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Usage Guidelines

Use the **show iua as all** command to find the failover timer value. You will need to know the failover timer value currently set before you use the **as *as-name* fail-over-timer** command to set the failover timer value to fit your application.

Examples

The following typical output for **show iua as all** shows that the current state of the AS (as1) is active and that there are four PRI interfaces configured to use this AS:

```
Router# show iua as all

Name of AS :as1
  Total num of ASPs configured :2
    asp1
    asp2
  Current state : ACTIVE
  Active ASP :asp1
  Number of ASPs up :1
  Fail-Over time : 4000 milliseconds
  Local address list : 10.1.2.345 10.2.3.456
  Local port:2139
  Interface IDs registered with this AS
    Interface ID
    0 (Dchannel0)
    3 (Dchannel3)
    2 (Dchannel2)
    1 (Dchannel1)
```

[Table 7](#) describes the fields shown in the display.

Table 7 show iua as all Field Descriptions

| Field | Description |
|---|---|
| Name of AS: 1 | Name of the AS. |
| Total num of ASPs configured :2 asp1 asp2 | Total number of application server processes (ASPs) configured. |
| Current state: ACTIVE | The possible states are ACTIVE, INACTIVE, and DOWN. |
| Active ASP :asp1 | Shows the active ASP. |
| Number of ASPs up :1 | If two ASPs are up, then the one that is not active is in standby mode. |
| Fail-Over time : 4000 milliseconds | Default is 4000 milliseconds, though the value can also be configured through the CLI under AS. |
| Local address list : 10.1.2.345 10.2.3.456 | Configured by the user. |
| Local port:2139 | Configured by the user. |
| Interface IDs registered with this AS Interface id 0 (Dchannel0) 3 (Dchannel3) 2 (Dchannel2) 1 (Dchannel1) | The D channels that are bound to this AS. |

Related Commands

| Command | Description |
|--|--|
| clear ip sctp statistics | Clears statistics counts for Stream Control Transmission Protocol (SCTP). |
| show ip sctp association list | Displays a list of all current SCTP associations. |
| show ip sctp association parameters | Displays the parameters configured for the association defined by the association ID. |
| show ip sctp association statistics | Displays the current statistics for the association defined by the association ID. |
| show ip sctp errors | Displays error counts logged by SCTP. |
| show ip sctp instances | Displays the currently defined SCTP instances. |
| show ip sctp statistics | Displays the overall statistics counts for SCTP. |
| show isdn | Displays information about memory, Layer 2 and Layer 3 timers, and the status of PRI channels. |
| show iua asp | Displays information about the current condition of an ASP. |

show iua asp

To provide information about the current condition of an application server process (ASP), use the **show iua asp** privileged EXEC command.

```
show iua asp {all | name asp-name}
```

Syntax Description

| | |
|-----------------------------|---|
| all | Displays information about all configured ASPs. |
| name <i>asp-name</i> | Name of a particular ASP. Displays information about just that ASP. |

Command Modes

Privileged EXEC

Command History

| Release | Modification |
|-----------|---|
| 12.2(4)T | This command was introduced. |
| 12.2(8)T | This command was integrated into Cisco IOS Release 12.2(8)T. Support for the Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 is not included in this release. |
| 12.2(11)T | This command was implemented on the Cisco AS5300. |
| 12.2(15)T | This command was implemented on the Cisco 2420, Cisco 2600 series, and Cisco 3600 series; and Cisco AS5300, Cisco AS5350, Cisco AS5400, and Cisco AS5850 network access server (NAS) platforms. |

Usage Guidelines

This command establishes Stream Control Transmission Protocol (SCTP) associations. There can only be a maximum of two ASPs configured per AS.

Examples

The following typical output for the **show iua asp all** command shows that the current state of the ASP (asp1) is active. This command also gives information about the SCTP association being used by this ASP.

```
Router# show iua asp all

Name of ASP :asp1
Current State of ASP:ASP-Active
Current state of underlying SCTP Association IUA_ASSOC_ESTAB , assoc id 0
SCTP Association information :
    Local Receive window :9000
    Remote Receive window :9000
    Primary Dest address requested by IUA 10.11.2.33
    Effective Primary Dest address 10.11.2.33
Remote address list :10.22.3.44
Remote Port :9900
Statistics :
    Invalid SCTP signals Total :0 Since last 0
    SCTP Send failures :0
```

[Table 8](#) describes the fields shown in the display.

Table 8 *show iua asp all Field Descriptions*

| Field | Description |
|---|---|
| Name of ASP: 1 | Name of the application server process (ASP). |
| Current State of ASP: ASP-Active | The possible states are ACTIVE, INACTIVE, and DOWN. |
| Current state of underlying SCTP Association IUA_ASSOC_ESTAB , assoc id 0 | States used for underlying SCTP association: IUA_ASSOC_ESTAB (association established) or IUA_ASSOC_INIT (association not established...attempting to initiate). |
| SCTP Association information : Local Receive window :9000 Remote Receive window :9000 | Configured by the user. |
| Primary Dest address requested by IUA 10.11.2.33 | The IP address through which the current link is established. |
| Remote address list :10.22.3.44 Remote Port :9900 | Configured by the user. |
| Statistics : Invalid SCTP signals Total :0 Since last 0 SCTP Send failures :0 | Information useful for seeing if errors are happening with the SCTP connection. |

Related Commands

| Command | Description |
|---|---|
| clear ip sctp statistics | Clears statistics counts for Sctp. |
| show ip sctp association list | Displays a list of all current Sctp associations. |
| show ip sctp association parameters | Displays the parameters configured for the association defined by the association ID. |
| show ip sctp association statistics | Displays the current statistics for the association defined by the association ID. |
| show ip sctp errors | Displays error counts logged by Sctp. |
| show ip sctp instances | Displays the currently defined Sctp instances. |
| show ip sctp statistics | Displays the overall statistics counts for Sctp. |
| show iua as | Displays information about the current condition of an AS. |

Glossary

API—application program interface. The means by which an application program talks to communications software. Standardized APIs allow application programs to be developed independently of the underlying method of communication. A set of standard software interrupts, calls, and data formats that computer application programs use to initiate contact with other devices (for example, network services, mainframe communications programs, or other program-to-program communications). Typically, APIs make it easier for software developers to create the links that an application needs to communicate with the operating system or with the network.

AS—application server.

ASP—application server process .

CIC—circuit identification code.

DPC—destination point code.

DPNSS—Digital Private Network Signaling System

ECN—Explicit Congestion Notification

GW—Gateway Access Server (for example Cisco AS5850).

IETF—Internet Engineering Task Force. Task force consisting of more than 80 working groups responsible for developing Internet standards.

IMT—Inter-Machine Trunk.

IUA—ISDN Q.921 User Adaptation Layer.

LAN—local-area network.

MGC—Media Gateway Controller (for example Cisco PGW2200).

MTU—maximum transmission unit.

NFAS—Non-Facility Associated Signaling.

NI2+—National ISDN-2 with Cisco extensions.

OPC—own point code. Point code of the Cisco PGW2200 signaling controller.

PDU—protocol data unit. OSI term for packet.

POTS—plain old telephone service.

PSTN—public switched telephone network. General term referring to the variety of telephone networks and services in place worldwide. Sometimes called POTS.

RLM—Redundant Link Manager.

QSIG—Q (point of the ISDN model) Signaling. Signaling standard. Common channel signaling protocol based on ISDN Q.931 standards and used by many digital PBXs.

SCTP—Simple Control Transmission Protocol.

SG—signaling gateway.

SIG—signaling transport protocol stack including SCTP, IUA, and Q.931 signaling.

sigtran—IETF Signaling Transport (Sigtran) standard, including SCTP and IUA.

SS7—Signaling System 7. Standard CCS system used with BISDN and ISDN. Developed by Bellcore.

ToS—type of service.

UAL—user adaptation layer.

UDP—User Datagram Protocol.

ULP—upper layer protocol.

VoIP—Voice over IP.

**Note**

Refer to the [Internetworking Terms and Acronyms](#) for terms not included in this glossary.
