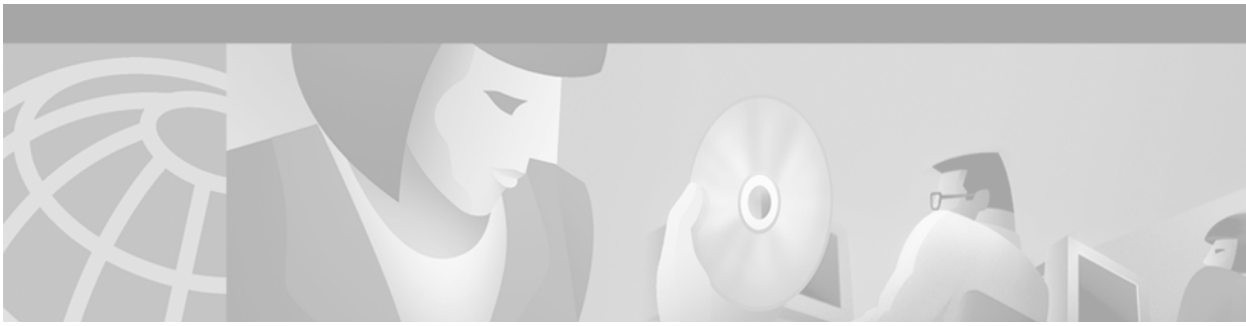


Cisco Service Assurance Agent Commands

This chapter describes the commands used to monitor network performance using Cisco Service Assurance Agent (SAA) in Cisco IOS Release 12.2.

For SAA configuration tasks and examples, see the "Network Monitoring Using Cisco Service Assurance Agent" chapter in the *Cisco IOS Configuration Fundamentals Configuration Guide, Release 12.2*.

buckets-of-history-kept

To set the number of history buckets that are kept during the operation lifetime of the SAA, use the **buckets-of-history-kept** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

buckets-of-history-kept *size*

no buckets-of-history-kept

Syntax Description

size	Number of history buckets kept during the lifetime of the operation. The default is 50 buckets.

Defaults

50 buckets

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

History collection and statistics capturing is enabled for the following SAA operations: ICMP Echo, SNA Echo, ICMP PathEcho, UDP Echo, TcpConnect, DNS, and DLSW. History collection is not supported for HTTP and Jitter (UDP+) operations.

By default, history is not collected. When a problem arises where history is useful (for example, a large number of timeouts are occurring), you can configure the **lives-of-history-kept** SAA RTR configuration command to collect history. You can optionally adjust the **buckets-of-history-kept**, **filter-for-history**, and **samples-of-history-kept** SAA RTR configuration commands.

When the number of buckets reaches the size specified, no further history for this life is stored.

Note Collecting history increases the RAM usage. Only collect history when you think there is a problem in the network. For general network response time information, use the statistics gathering feature of SAA.

If history is collected, each bucket contains one or more history entries from the operation. When the operation type is **pathEcho**, an entry is created for each hop along the path that the operation takes to reach its destination. The type of entry stored in the history table is controlled by the **filter-for-history** SAA RTR configuration command. The total number of entries stored in the history table is controlled by the combination of **samples-of-history-kept**, **buckets-of-history-kept**, and **lives-of-history-kept** SAA RTR configuration commands.

Each time the SAA starts an operation, a new bucket is created until the number of history buckets matches the specified size or the operation's lifetime expires. History buckets do not wrap. The operation's lifetime is defined by the **rtr schedule** global configuration command. The operation starts an SAA operation based on the seconds specified by the **frequency** SAA RTR configuration command.

Examples

The following example configures operation 1 to keep 25 history buckets during the lifetime of the operation lifetime:

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.161.21
Router(config-rtr)# buckets-of-history-kept 25
Router(config-rtr)# lives-of-history-kept 1
```

Related Commands

Command	Description
filter-for-history	Defines the type of information kept in the history table for the SA Agent operation.
lives-of-history-kept	Sets the number of lives maintained in the history table for the SA Agent operation.
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
rtr schedule	Configures the time parameters for an SAA operation.
samples-of-history-kept	Sets the number of entries kept in the history table per bucket for the SA Agent operation.

data-pattern

To specify the data pattern in an SAA udpEcho operation to test for data corruption, use the **data pattern** SAA RTR configuration mode command. To remove the data pattern specification, use the **no** form of this command.

data-pattern *hex-pattern*

no data-pattern *hex-pattern*

Syntax Description

hex-pattern	Hexadecimal sting to use for monitoring the specified operation.

Defaults

The default *hex-pattern* is ABCD.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.1(1)T	This command was introduced.

Usage Guidelines

The **data-pattern** command allows users to specify a alphanumeric character string to verify that operation payload does not get corrupted in either direction (source-to-destination (SD) or destination-to-source (DS)).

For Cisco IOS Release 12.2, the **data-pattern** command is applicable to the udpEcho operation only. This command also applies to the Frame Relay operation in 12.2(1)T and later T releases.

Examples

The following example specifies 1234ABCD5678 as the data pattern:

```
Router(config)# rtr 1
Router(config-rtr)# type udpEcho dest-ipaddr 10.0.54.205 dest-port 101
Router(config-rtr)# data-pattern 1234ABCD5678
```

Related Commands

Command	Description
show rtr configuration	Displays configuration values including all defaults for all SAA operations or the specified operation.
show rtr collection-statistics	Displays statistical errors for all SAA operations or the specified operation.

distributions-of-statistics-kept

To set the number of statistic distributions kept per hop during the lifetime operation of the SAA, use the **distributions-of-statistics-kept** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

distributions-of-statistics-kept *size*

no distributions-of-statistics-kept

Syntax Description

size	Number of statistic distributions kept per hop. The default is 1 distribution.

Defaults

1 distribution

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

In most situations, you do not need to change the statistic distribution size for the SAA. Only change the size when distributions are needed (for example, when performing statistical modeling of your network).

Note Increasing the distributions also increases the RAM usage. The total number of statistics distributions captured will be: the value of **distributions-of-statistics-kept** times the value of **hops-of-statistics-kept** times the value of **paths-of-statistics-kept** times the value of **hours-of-statistics-kept**.

When the number of distributions reaches the size specified, no further distribution information is stored.

Examples

The following example sets the distribution to 5 and the distribution interval to 10 ms. This setting means that the first distribution will contain statistics from 0 to 9 ms, the second distribution will contain statistics from 10 to 19 ms, the third distribution will contain statistics from 20 to 29 ms, the fourth distribution will contain statistics from 30 to 39 ms, and the fifth distribution will contain statistics from 40 ms to infinity.

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.161.21
Router(config-rtr)# distributions-of-statistics-kept 5
Router(config-rtr)# statistics-distribution-interval 10
```

Related Commands

Command	Description
hops-of-statistics-kept	Sets the number of hops for which statistics are maintained per path for the SAA operation.
hours-of-statistics-kept	Sets the number of hours for which statistics are maintained for the SAA operation.
paths-of-statistics-kept	Sets the number of paths for which statistics are maintained per hour for the SAA operation.
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
statistics-distribution-interval	Sets the time interval for each statistics distribution kept for the SA Agent.

filter-for-history

To define the type of information kept in the history table for an SAA operation, use the **filter-for-history** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

filter-for-history {**none** | **all** | **overThreshold** | **failures**}

no filter-for-history {**none** | **all** | **overThreshold** | **failures**}

Syntax Description

none	No history kept. This is the default.
all	All operation operations attempted are kept in the history table.
overThreshold	Only packets that are over the threshold are kept in the history table.
failures	Only packets that fail for any reason are kept in the history table.

Defaults

No SAA history is kept for an operation.

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Use the **filter-for-history** command to control what gets stored in the history table for the SAA. To control how much history gets saved in the history table, use the **lives-of-history-kept**, **buckets-of-history-kept**, and the **samples-of-history-kept** SAA RTR configuration commands.

An operation can collect history and capture statistics. By default, history is not collected. When a problem arises where history is useful (for example, a large number of timeouts are occurring), you can configure the **lives-of-history-kept** command to collect history.

Note Collecting history increases the RAM usage. Only collect history when you think there is a problem. For general network response time information, use statistics.

Examples

In the following example, only operation packets that fail are kept in the history table:

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.161.21
Router(config-rtr)# lives-of-history-kept 1
Router(config-rtr)# filter-for-history failures
```

Related Commands

Command	Description
buckets-of-history-kept	Sets the number of history buckets that are kept during the lifetime of the SAA.
lives-of-history-kept	Sets the number of lives maintained in the history table for the SAA operation.
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
samples-of-history-kept	Sets the number of entries kept in the history table per bucket for the SAA operation.

frequency

To set the rate at which a specified SAA operation is sent into the network, use the **frequency** SAA RTR configuration command. To return to the default value, use the no form of this command.

frequency *seconds*

no frequency

Syntax Description

seconds	Number of seconds between the SAA probe operations.

Defaults

60 seconds

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

If an individual SAA operational probe takes longer to execute than the specified frequency value, a statistics counter called “busy” is incremented rather than sending a second probe.

Note We recommend that you do not set the frequency value to less than 60 seconds for the following reasons: It is not needed when keeping statistics (the default), and it can slow down the WAN because of the potential overhead that numerous operations can cause.

The value specified for the **frequency** command cannot be less than the value specified for the **timeout** SAA RTR configuration command.

Examples

The following example configures SAA IP/ICMP Echo operation 1 to send a probe every 90 seconds:

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.1.176
Router(config-rtr)# frequency 90
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
timeout	Sets the amount of time the SAA operation waits for a response from its request packet.

hops-of-statistics-kept

To set the number of hops for which statistics are maintained per path for the SAA operation, use the **hops-of-statistics-kept** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

hops-of-statistics-kept *size*

no hops-of-statistics-kept

Syntax Description

size	Number of hops for which statistics are maintained per path. The default is 16 hops for type **pathEcho** and 1 hop for type **echo**.

Defaults

16 hops for type **pathEcho**

1 hop for type **echo**

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

One hop is the passage of a timed packet from this router to another network device. The other network device is assumed to be a device along the path to the destination (including the destination) when the operation type is **pathEcho**, or just the destination when the type is **echo**.

When the number of hops reaches the size specified, no further hop information is stored.

Examples

The following example monitors the statistics of operation 2 for only 10 hops:

```
Router(config)# rtr 2
Router(config-rtr)# type pathecho protocol ipIcmpEcho 172.16.1.177
Router(config-rtr)# hops-of-statistics-kept 10
```

Related Commands

Command	Description
distributions-of-statistics-kept	Sets the number of statistic distributions kept per hop during the lifetime of the SAA.
hours-of-statistics-kept	Sets the number of hours for which statistics are maintained for the SAA operation.
paths-of-statistics-kept	Sets the number of paths for which statistics are maintained per hour for the SAA operation.

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
statistics-distribution-interval	Sets the time interval for each statistics distribution kept for the SAA.

http-raw-request

To explicitly specify the options for a GET request for an SAA HTTP operation, use the **http-raw-request** command in SAA RTR configuration mode.

http-raw-request

Syntax Description

This command has no arguments or keywords.

Defaults

None.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

Using the **http-raw-request** command puts you in HTTP Raw Request configuration mode, indicated by the (config-rtr-http) router prompt.

The **http-raw-request** command should follow the **type http operation raw** command. Use the raw-request option when you wish to explicitly specify the content of an HTTP request. Use HTTP 1.0 commands in HTTP Raw Request configuration mode.

The SAA will specify the content of an HTTP request for you if you use the **type http operation get** command. SA Agent will send the HTTP request, receive the reply, and report RTT statistics (including the size of the page returned).

Examples

In the following example, SAA operation 6 is created and configured as an HTTP operation. The HTTP **GET** command is explicitly specified:

```
Router(config)# rtr 6
Router(config-rtr)# type http operation raw url http://www.cisco.com
Router(config-rtr)# http-raw-request
Router(config-rtr-http)# GET /index.html HTTP/1.0\r\n
Router(config-rtr-http)# \r\n
Router(config-rtr-http)# exit
Router(config)# rtr schedule 6 start-time now
```

Related Commands

Command	Description
type http	Configures an HTTP SAA operation.

hours-of-statistics-kept

To set the number of hours for which statistics are maintained for the SAA operation, use the **hours-of-statistics-kept** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

hours-of-statistics-kept *hours*

no hours-of-statistics-kept

Syntax Description

hours	Number of hours that the router maintains statistics. The default is 2 hours.

Defaults

2 hours

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

When the number of hours exceeds the specified value, the statistics table wraps (that is, the oldest information is replaced by newer information).

This command sets the amount of time statistics are kept for use by the **show rtr collection-statistics** command and **show rtr distribution** command.

Examples

The following example maintains 3 hours of statistics for SAA operation 2:

```
Router(config)# rtr 2
Router(config-rtr)# type pathecho protocol ipIcmpEcho 172.16.1.177
Router(config-rtr)# hours-of-statistics-kept 3
```

Related Commands

Command	Description
distributions-of-statistics-kept	Sets the number of statistic distributions kept per hop during the lifetime of the SAA.
hops-of-statistics-kept	Sets the number of hops for which statistics are maintained per path for the SAA operation.
paths-of-statistics-kept	Sets the number of paths for which statistics are maintained per hour for the SAA operation.
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
statistics-distribution-interval	Sets the time interval for each statistic distribution kept for the SA Agent.

lives-of-history-kept

To set the number of lives maintained in the history table for the SAA operation, use the **lives-of-history-kept** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

lives-of-history-kept *lives*

no lives-of-history-kept

Syntax Description

lives	Number of lives maintained in the history table for the operation. If you specify **0** lives, history is not collected for the operation.

Defaults

0 lives

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

The number of lives you can specify is dependent on the type of operation you are configuring. Use the **lives-of-history-kept ?** command to determine the available options.

The default value of 0 lives means that history is not collected for the operation.

To disable history collection, use **no lives-of-history-kept** command rather than the **filter-for-history none** SAA RTR configuration command. The **no lives-of-history-kept** command disables history collection before an operation is attempted, while the **filter-for-history** command causes the SAA to check for history inclusion after the operation attempt is made.

When the number of lives exceeds the specified value, the history table wraps (that is, the oldest information is replaced by newer information).

When an operation makes a transition from pending to active, a life starts. When the life of an operation ends, the operation makes a transition from active to pending.

Examples

The following example maintains the history for 5 lives of operation 1:

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.1.176
Router(config-rtr)# lives-of-history-kept 5
```

Related Commands

Command	Description
buckets-of-history-kept	Sets the number of history buckets that are kept during the lifetime of the SAA.
filter-for-history	Defines the type of information kept in the history table for the SAA operation.
rtr	Enters SAA RTR configuration mode.
samples-of-history-kept	Sets the number of entries kept in the history table per bucket for the SA Agent operation.

lsr-path

To define a loose source routing (LSR) path for a Cisco SAA IP echo operation, use the **lsr-path** SAA RTR configuration command. To remove the definition, use the **no** form of this command.

lsr-path {*hostname* | *ip-address*} [{*hostname* | *ip-address*} ...]

no lsr-path

Syntax Description

{*hostname* | *ip-address*}	Hostname or IP address of the first hop in the LSR path.
[{*hostname* | *ip-address*} ...]	(Optional) Indicates that you can continue specifying host destinations until you specify the final host target. Each hostname or ip-address specified indicates another hop on the path. The maximum number of hops you can specify is eight. Do not enter the dots (...).

Defaults

LSR path is disabled.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

The maximum number of hops available is eight when an LSR path is configured.

Examples

In the following example, the LSR path is defined for SAA echo operation 1. The target destination for the operation is at 172.16.1.176. The first hop on the LSR path is 172.18.4.149. The second hop on the LSR path is 172.18.16.155.

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.1.176
Router(config-rtr)# lsr-path 172.18.4.149 172.18.26.155
```

Related Commands

Command	Description
rtr	Specifies an identification for an SAA operation and enters SAA RTR configuration mode.

owner

To configure the Simple Network Management Protocol (SNMP) owner of an SAA operation, use the **owner** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

owner *text*

no owner

Syntax Description

text	Name of the SNMP owner from 0 to 255 ASCII characters. The default is none.

Defaults

No owner is specified.

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

The owner name contains one or more of the following: ASCII form of the network management station's transport address, network management station name (that is, the domain name), and network management personnel's name, location, or phone number. In some cases, the agent itself will be the owner of the operation. In these cases, the name can begin with "agent."

Examples

The following example sets the owner of operation 1 to 172.16.1.189 cwb.cisco.com John Doe RTP 555-1212:

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.1.176
Router(config-rtr)# owner 172.16.1.189 cwb.cisco.com John Doe RTP 555-1212
```

Related Commands

Command	Description
rtr	Enters SAA RTR configuration mode.

paths-of-statistics-kept

To set the number of paths for which statistics are maintained per hour for the SAA operation, use the **paths-of-statistics-kept** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

paths-of-statistics-kept *size*

no paths-of-statistics-kept

Syntax Description

size	Number of paths for which statistics are maintained per hour. The default is 5 paths for **type pathEcho** and 1 path for **type echo**.

Defaults

5 paths for **type pathEcho**

1 path for **type echo**

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

A path is the route the request packet of the operation takes through the network to get to its destination. The operation may take a different path to reach its destination for each SAA operation.

When the number of paths reaches the size specified, no further path information is stored.

Examples

The following example maintains statistics for only 3 paths for operation 2:

```
Router(config)# rtr 2
Router(config-rtr)# type pathEcho protocol ipIcmpEcho 172.16.1.177
Router(config-rtr)# paths-of-statistics-kept 3
```

Related Commands

Command	Description
distributions-of-statistics-kept	Sets the number of statistic distributions kept per hop during the lifetime of the SA.
hops-of-statistics-kept	Sets the number of hops for which statistics are maintained per path for the SAA operation.
hours-of-statistics-kept	Sets the number of hours for which statistics are maintained for the SAA operation.

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
statistics-distribution-interval	Sets the time interval for each statistics distribution kept for the SAA.

request-data-size

To set the protocol data size in the payload of the SAA operation's request packet, use the **request-data-size** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

request-data-size *byte*

no request-data-size

Syntax Description

byte	Size of the protocol data in the payload of the request packet of the operation. Range is 0 to the maximum of the protocol. The default is 1 byte.

Defaults

1 byte

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

When the protocol name has the suffix "appl," the packet uses both a request and respond data size (see the **response-data-size** SAA RTR configuration command), and the data size is 12 bytes smaller than the normal payload size (this 12 bytes is the ARR Header used to control send and data response sizes).

Examples

The following example sets the request packet size to 40 bytes for operation 3:

```
Router(config)# rtr 3
Router(config-rtr)# type echo protocol snalu0echoappl cwbc0a
Router(config-rtr)# request-data-size 40
```

Related Commands

Command	Description
response-data-size	Sets the protocol data size in the payload of the SAA operation's response packet.
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

response-data-size

To set the protocol data size in the payload of an SAA operation's response packet, use the **response-data-size** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

response-data-size *byte*

no response-data-size

Syntax Description

byte	Size of the protocol data in the payload in the operation's response packet. For "appl" protocols, the default is 0 bytes. For all others, the default is the same value as the **request-data-size**.

Defaults

0 bytes

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

The **response-data-size** command is only applicable for the following operations:

- type echo protocol snaLU0EchoAppl
- type echo protocol snaLU2EchoAppl
- type pathEcho protocol snaLU0EchoAppl
- type pathEcho protocol snaLU2EchoAppl

Note that these protocols are defined with the **type** command that end in "appl" (for example, **snalu0echoappl**). When the protocol ends in "appl," the response data size is 12 bytes smaller than normal payload size.

Examples

The following example configures the response packet size of snaLU0 Echo operation 3 to 1440 bytes:

```
Router(config)# rtr 3
Router(config-rtr)# type echo protocol snalu0echoappl cwbc0a
Router(config-rtr)# response-data-size 1440
```

Related Commands

Command	Description
request-data-size	Sets the protocol data size in the payload of the SAA operation's request packet.
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

rtr

To begin configuring an SAA operation by entering SAA RTR configuration mode, use the **rtr** command in global configuration mode. To remove all configuration information for an operation, including the schedule of the operation, reaction configuration, and reaction triggers, use the **no** form of this command.

rtr *op-number*

no rtr *op-number*

Syntax Description

op-number	Operation number used for the identification of the SAA operation you wish to configure.

Defaults

None

Command Modes

Global configuration

Command History

Release	Modification
11.2	This command was introduced.
12.2(11)T	The maximum number of operations was increased from 500 to 2000.

Usage Guidelines

The **rtr** command is used to configure Cisco Service Assurance Agent (SAA) operations. Use this command to specify an identification number for the operation you are about to configure. After you enter this command, you will enter the SAA RTR configuration mode, indicated by the `(config-rtr)` router prompt. The "Related Commands" table lists the commands you can use in SAA RTR configuration mode.

For detailed information on the configuration of the Cisco SAA feature, see the "Network Monitoring Using Cisco Service Assurance Agent" chapter in the *Cisco IOS Configuration Fundamentals Configuration Guide, Release 12.2*.

SAA allows a maximum of 500 operations.

Debugging is supported only on the first 32 operation numbers.

After you configure a operation, you must schedule the operation. For information on scheduling a operation, refer to the **rtr schedule** global configuration command. You can also optionally set reaction triggers for the operation. For information on reaction triggers, refer to the **rtr reaction-configuration** and **rtr reaction-trigger** global configuration commands.

Note After you schedule an operation with the **rtr schedule** global configuration command, you cannot modify the configuration of the operation. To modify the configuration of the operation after it is scheduled, use the **no rtr** command. You can now reenter the operation's configuration with the **rtr** command.

To display the current configuration settings of the operation, use the **show rtr configuration** EXEC command.

Examples

In the following example, operation 1 is configured to perform end-to-end response time operations using an SNA LU Type 0 connection with the host name cwbc0a. Only the **type** SAA RTR configuration command is required; all others are optional.

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol snalu0echoappl cwbc0a
Router(config-rtr)# request-data-size 40
Router(config-rtr)# response-data-size 1440
Router(config-rtr)# exit
Router(config)#
```

Note If operation 1 already existed and it has not been scheduled, you are placed into SAA RTR configuration command mode. If the operation already exists and has been scheduled, this command will fail.

Related Commands

Command	Description
buckets-of-history-kept	Sets the number of history buckets that are kept during an SAA operation's lifetime.
distributions-of-statistics-kept	Sets the number of statistic distributions kept per hop during an SAA operation's lifetime.
filter-for-history	Defines the types of information to be kept in the history table for SAA operations.
frequency	Sets the frequency at which the operation should execute.
hops-of-statistics-kept	Sets the number of hops for which statistics are maintained per path for the SAA operation.
hours-of-statistics-kept	Sets the number of hours for which statistics are maintained for SAA operations.
lives-of-history-kept	Sets the number of lives maintained in the history table for an SAA operation.
lsr path	Specifies the path on which to measure the ICMP Echo response time.
owner	Configures the SNMP owner of an SAA operation.
paths-of-statistics-kept	Sets the number of paths for which statistics are maintained per hour for an SAA operation.
request-data-size	Sets the protocol data size in the payload of an operation's request packet.
response-data-size	Sets the protocol data size in the payload of an operation's response packet.
samples-of-history-kept	Sets the number of entries kept in the history table for an SAA operation.
statistics-distribution-interval	Sets the time interval for each statistical distribution.
tag	Logically links SAA operations together in a group.

Command	Description
threshold	Sets the rising threshold (hysteresis) that generates a reaction event and stores history information for the probe.
timeout	Sets the amount of time an SAA operation waits for a response from its request packet.
tos	Defines the IP type of service for request packets of SAA operations.
type dlsw	Configures an SAA DLSw operation.
type tcpConnect	Defines an SAA TCP Connect operation.
verify-data	Checks each SAA operation response for corruption.

rtr key-chain

To enable SAA control message authentication and specify an MD5 key chain, use the **rtr key-chain** global configuration command. To remove control message authentication, use the **no** form of this command.

rtr key-chain *name*

no rtr key-chain

Syntax Description

name	Name of MD5 key chain.

Defaults

None

Command Modes

Global configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

The authentication configuration on the SAA collector and SAA Responder must be the same. Both sides must configure the same key chain or both sides must not use authentication.

Examples

In the following example, the SAA control message uses MD5 authentication, and the key chain name is CSAA:

```
Router(config)# rtr key-chain csaa
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

rtr low-memory

To specify how much unused memory must be available to allow SAA configuration, use the **rtr low-memory** global configuration command. To remove the type configuration for the operation, use the **no** form of this command.

rtr low-memory *value*

no rtr low-memory

Syntax Description

value	Specifies amount of memory, in bytes, that must be available to configure SAA (RTR). The range is from 0 to the maximum amount of free memory bytes available.

Defaults

The default *value* is 25 percent of the memory available on the system.

Command Modes

Global configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

The **rtr low-memory** command allows the user to specify the amount of memory that the SAA can use. If the amount of available free memory falls below the value specified in the **rtr low-memory** command, then the SAA will not allow new operations to be configured. If this command is not used, the default low-memory value is 25 percent. This means that if 75 percent of system memory has been utilized you will not be able to configure any SAA characteristics.

The value of the **rtr low-memory** command should not exceed the amount of free memory available on the system. To determine the amount of free memory available on the system, use the **show memory** EXEC command.

Examples

In the following example, the router is configured so that no less than 2 MB of memory will be free for RTR configuration:

```
Router(config)# rtr low-memory 2000000
```

Related Commands

Command	Description
rtr	Specifies an identification number for an operation and enters SAA RTR configuration mode.
show memory	Displays statistics about memory, including memory-free pool statistics.

rtr reaction-configuration

To configure certain actions to occur based on events under the control of the SAA, use the **rtr reaction-configuration** global configuration command. To return to the default values of the operation, use the **no** form of this command.

rtr reaction-configuration *operation-number* [**verify-error-enable**] [**connection-loss-enable**] [**timeout-enable**] [**threshold-falling** *milliseconds*] [**threshold-type** *option*] [**action-type** *option*]

no rtr reaction-configuration *operation-number*

Syntax Description

operation-number	Number of the SAA operation to configure.
verify-error-enable	(Optional) Enables error verification. The default is disabled.
connection-loss-enable	(Optional) Enables checking for connection loss in connection-oriented protocols. Disabled by default.
timeout-enable	(Optional) Enables checking for response time reporting operation timeouts based on the timeout value configured for the operation with the **timeout** SAA RTR configuration command. The default is disabled.
threshold-falling *milliseconds*	(Optional) Sets the falling threshold (standard RMON-type hysteresis mechanism) in milliseconds. When the falling threshold is met, generate a resolution reaction event. The rising of the operation over threshold is set with the **threshold** SAA RTR configuration command. The default value is 3000 ms.
threshold-type *option*	(Optional) Specify the algorithm used by the SAA to calculate over and falling threshold violations. The value for *option* can be one of the following keywords: • **never**—Do not calculate threshold violations (the default). • **immediate**—When the response time exceeds the rising over threshold or drops below the falling threshold, immediately perform the action defined by **action-type**. • **consecutive** [*occurrences*]—When the response time exceeds the rising threshold consecutively five times or drops below the falling threshold consecutively five times, perform the action defined by **action-type**. Optionally specify the number of consecutive occurrences. The default is 5. • **xofy** [*x-value y-value*]—When the response time exceeds the rising threshold five out of the last five times or drops below the falling threshold five out of the last five times, perform the action defined by **action-type**. Optionally specify the number of violations that must occur and the number that must occur within a specified number. The default is 5 for both x-value and y-value.

	• **average** [*attempts*]—When the average of the last five response times exceeds the rising threshold or when the average of the last five response times drops below the falling threshold, perform the action defined by **action-type**. Optionally specify the number of operations to average. The default is the average of the last five response time operations. For example: if the threshold of the operation is 5000 ms and the last three attempts results of the operation are 6000, 6000, and 5000 ms, the average would be 6000 + 6000 + 5000=17000/3 > 5000, thus violating the 5000-ms threshold.
action-type *option*	(Optional) Specify what action or combination of actions the operation performs when you configure **connection-loss-enable** or **timeout-enable**, or threshold events occur. For the **action-type** to occur for threshold events, the **threshold-type** must be defined to anything other than **never**. Option can be one of the following keywords: • **none**—No action is taken. • **trapOnly**—Send an SNMP trap on both over and falling threshold violations. • **nmvtOnly**—Send an SNA NMVT Alert on over threshold violation and an SNA NMVT Resolution on falling threshold violations. • **triggerOnly**—Have one or more target operation's operational state make the transition from "pending" to "active" on over (and falling) threshold violations. The target operations are defined with the **rtr reaction-trigger** command. A target operation will continue until its life expires as specified by the target operation's life value configured with the **rtr schedule** global configuration command. A triggered target operation must finish its life before it can be triggered again. • **trapAndNmvt**—Send a combination of **trapOnly** and **nmvtOnly**. • **trapAndTrigger**—Send a combination of **trapOnly** and **triggerOnly**. • **nmvtAndTrigger**—Send a combination of **nmvtOnly** and **triggerOnly**. • **trapNmvtAndTrigger**—Send a combination of **trapOnly**, **nmvtOnly**, and **triggerOnly**.

Defaults

No reactions are generated.

Error verification is disabled.

Connection loss is disabled.

Checking the timeout is disabled.

The falling threshold value is 3000 ms.

The algorithm threshold is **never**.

Command Modes

Global configuration

Command History

Release	Modification
11.2	This command was introduced.
12.1(1)T	The **verify-error-enable** optional keyword was added.

Usage Guidelines

Triggers are used for diagnostics purposes and are not used in normal operation.

You can use triggers to assist you in determining where delays are happening in the network when excessive delays are being seen on an end-to-end basis.

The reaction applies only to attempts to the target (that is, attempts to any hops along the path in **pathEcho** do not generate reactions).

Note Keywords are not case sensitive and are shown in mixed case for readability only.

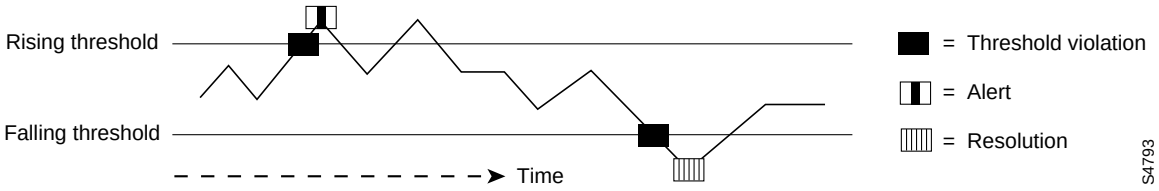
Examples

In the following example, operation 19 sends an SNMP trap when there is an over or falling threshold violation:

```
Router(config)# rtr reaction-configuration 19 threshold-type immediate action-type
trapOnly
```

Figure 2 shows that an alert (rising trap) would be issued immediately when the response time exceeds the rising threshold and a resolution (falling trap) would be issued immediately when the response time drops below the falling threshold.

Figure 2 Example of Rising and Falling Thresholds



Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
rtr reaction-trigger	Defines a second SAA operation to make the transition from a pending state to an active state when one of the trigger action-type options are defined with the **rtr reaction-configuration** global configuration command.
threshold	Sets the rising threshold (hysteresis) that generates a reaction event and stores history information for the SAA operation.
timeout	Sets the amount of time the SAA operation waits for a response from its request packet.

rtr reaction-trigger

To define a second SAA operation to make the transition from a pending state to an active state when one of the trigger action-type options are defined with the **rtr reaction-configuration** global configuration command, use the **rtr reaction-trigger** global configuration command. To remove the trigger combination, use the **no** form of this command.

rtr reaction-trigger *operation-number target-operation*

no rtr reaction-trigger *operation*

Syntax Description

operation-number	Number of the operation in the active state that has the **action-type** set with the **rtr reaction-configuration** global configuration command.
target-operation	Number of the operation in the pending state that is waiting to be triggered with the **rtr** global configuration command.

Defaults

No trigger combination is defined.

Command Modes

Global configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Triggers are usually used for diagnostics purposes and are not used in normal operation.

Examples

In the following example, the state of operation 1 is changed from pending state to active state when **action-type** of operation 2 occurs:

```
Router(config)# rtr reaction-trigger 2 1
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
rtr reaction-configuration	Configures certain actions to occur based on events under the control of the SAA.
rtr schedule	Configures the time parameters for an SAA operation.

rtr reset

To perform a shutdown and restart of the SAA, use the **rtr reset** global configuration command.

rtr reset

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

Global configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Caution Use the **rtr reset** command only in extreme situations such as the incorrect configuration of a number of operations.

The **rtr reset** command stops all operations, clears SAA RTR configuration information, and returns the SAA feature to the startup condition. This command does not reread the SAA RTR configuration stored in startup-config in NVRAM. You must retype the configuration or perform a **config memory** command.

Examples

The following example resets the SAA feature:

```
Router(config)# rtr reset
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

rtr responder

To enable the SAA Responder feature, use the **rtr responder** global configuration command. To disable the SAA Responder, use the **no** form of this command.

rtr responder [**type** {**udpEcho** | **tcpConnect**} [**ipaddress** *ipaddr*] **port** *port*]

no rtr responder [**type** {**udpEcho** | **tcpConnect**} [**ipaddress** *ipaddr*] **port** *port*]

Syntax Description

type udpEcho	(Optional) Specifies that the responder will accept and return udpEcho operation packets. **Note** You should use **type udpEcho** keyword combination for Jitter (UDP Echo +) operations as well.
type tcpConnect	(Optional) Specifies that the responder will accept and return tcpConnect operation packets.
ipaddress *ipaddr*	(Optional) Specifies the IP address that the operation will be received at.
port *port*	(Optional) Specifies the port number that the operation will be received on.

Defaults

None

Command Modes

Global configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.
12.1(1)T	The **type**, **ipaddr**, and **port** keywords were added.

Usage Guidelines

This command is used on the destination device for SAA operations to enable UPD Echo, TCP Connect, and Jitter (UDP+) operations on non-native interfaces.

The **type**, **ipaddr**, and **port** keywords enable the SAA Responder to respond to probe packets without receiving Control Protocol packets. The applicable protocols are Jitter, udpEcho, and tcpConnect. However, note that if you use these keywords, packet loss statistics will not be able to be generated for the operation, because the Responder will not be able to determine the order of the received packets.

Examples

The following example enables the SAA Responder:

```
Router(config)# rtr responder
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

rtr restart

To restart an SAA operation, use the **rtr restart** global configuration command.

rtr restart *operation-number*

Syntax Description

operation-number	Number of the SAA operation to restart. SAA allows a maximum of 500 operations.

Defaults

No default behavior or values.

Command Modes

Global configuration.

Command History

Release	Modification
12.1(1)T	This command was introduced.

Usage Guidelines

To restart an operation, the operation should be in an "active" state (as defined in the **rtr reaction-configuration** command).

SAA allows a maximum of 500 operations.

This command does not have a no form.

Examples

The following example restarts operation 12:

```
Router(config)# rtr restart 12
```

rtr schedule

To configure the time parameters for an SAA operation, use the **rtr schedule** global configuration command. To stop the operation and place it in the default state (**pending**), use the **no** form of this command.

rtr schedule *operation-number* [**life** {**forever** | *seconds*}] [**start-time** {*hh*:*mm*[:*ss*] [*month day* | *day month*] | **pending** | **now** | **after** *hh*:*mm*::*ss*}] [**ageout** *seconds*]

no rtr schedule *operation-number*

Syntax Description

operation-number	(Required) Number of the SAA operation to schedule.
life *seconds*	(Optional) Number of seconds the operation actively collects information. The default is 3600 seconds (one hour).
life forever	(Optional) Schedules the operation to run indefinitely.
start-time	(Optional) Time when the operation starts collecting information. If the **start-time** is not specified, no information is collected until the **start-time** is configured or a trigger occurs that performs a **start-time now**.
start-time *hh*:*mm*[:*ss*]	(Optional) Specifies an absolute start time using hour, minute, and (optionally) second. Use the 24-hour clock notation. For example, **start-time 01:02** means "start at 1:02 a.m.," and **start-time 13:01:30** means "start at 1:01 p.m. and 30 seconds." The current day is implied unless you specify a *month* and *day*.
month	(Optional) Name of the month to start the operation in. If month is not specified, the current month is used. Use of this argument requires that a day be specified as well. You can specify the month with the full english name, or using the first three letters of the month.
day	(Optional) Number of the day (in the range 1 to 31) to start the operation on. If a day is not specified, the current day is used. Use of this argument requires that a month be specified as well.
start-time pending	(Optional) No information is collected. This is the default value.
start-time now	(Optional) Indicates that the operation should start immediately.
start-time after *hh*:*mm*:*ss*	(Optional) Indicates that the operation should start *hh* hours, *mm* minutes, and *ss* seconds after this command was entered.
ageout *seconds*	(Optional) Number of seconds to keep the operation in memory when it is not actively collecting information. The default is 0 seconds (never ages out).

Defaults

The operation is placed in a **pending** state (that is, the operation is enabled but not actively collecting information).

Command Modes

Global configuration

Command History

Release	Modification
11.2	This command was introduced.
12.1(1)T	The **after** and **forever** keywords were added.

Usage Guidelines

After you schedule the operation with the **rtr schedule** command, you cannot change the configuration of the operation. To change the configuration of the operation, use the **no** form of the **rtr** global configuration command and reenter the configuration information.

If the operation is in a pending state, you can define the conditions under which the operation makes the transition from pending to active with the **rtr reaction-trigger** and **rtr reaction-configuration** global configuration commands. When the operation is in an active state, it immediately begins collecting information.

The following time line shows the age-out process of the operation:

```
W----------------------X----------------------Y----------------------Z
```

where:

- W is the time the operation was configured with the **rtr** global configuration command.
- X is the start time or start of life of the operation (that is, when the operation became “active”).
- Y is the end of life as configured with the **rtr schedule** global configuration command (life seconds have counted down to zero).
- Z is the age out of the operation.

Age out starts counting down at W and Y, is suspended between X and Y, and is reset to its configured size at Y.

It is possible for the operation to age out before it executes (that is, Z can occur before X). To ensure that this does not happen, the difference between the operation’s configuration time and start time (X and W) must be less than the age-out seconds.

Note The total RAM required to hold the history and statistics tables is allocated at this time. This is to prevent router memory problems when the router gets heavily loaded and to lower the amount of overhead the feature causes on a router when it is active.

Examples

In the following example, operation 25 begins actively collecting data at 3:00 p.m. on April 5. This operation will age out after 12 hours of inactivity, which can be before it starts or after it has finished with its life. When this operation ages out, all configuration information for the operation is removed (that is, the configuration information is no longer in the running-config in RAM).

```
Router(config)# rtr schedule 25 life 43200 start-time 15:00 apr 5 ageout 43200
```

In the following example, operation 1 begins collecting data after a 5 minute delay:

```
Router(config)# rtr schedule 1 start after 00:05:00
```

In the following example, operation 3 begins collecting data immediately and is scheduled to run indefinitely:

```
Router(config)# rtr schedule 3 start-time now life forever
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
rtr reaction-configuration	Configures certain actions to occur based on events under the control of the SAA.
rtr reaction-trigger	Defines a second SAA operation to make the transition from a pending state to an active state when one of the trigger action-type options is defined with the **rtr reaction-configuration** global configuration command.

samples-of-history-kept

To set the number of entries kept in the history table per bucket for the SAA operation, use the **samples-of-history-kept** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

samples-of-history-kept *samples*

no samples-of-history-kept

Syntax Description

samples	Number of entries kept in the history table per bucket. The default is 16 entries for **type pathEcho** and 1 entry for **type echo**.

Defaults

16 entries for **type pathEcho**

1 entry for **type echo**

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Use the **samples-of-history-kept** command to control how many entries are saved in the history table. To control the type of information that gets saved in the history table, use the **filter-for-history** command. To set how many buckets get created in the history table, use the **buckets-of-history-kept** command.

An operation can collect history and capture statistics. By default, history is not collected. When a problem arises where history is useful (for example, a large number of timeouts are occurring), you can configure the **lives-of-history-kept** SAA RTR configuration command to collect history.

Note Collecting history increases the usage of RAM. Only collect history when you think there is a problem. For general network response time information, use statistics.

Examples

In the following example, ten entries are kept in the history table for each of the lives of operation 3:

```
Router(config)# rtr 1
Router(config-rtr)# type pathecho protocol ipIcmpEcho 172.16.1.176
Router(config-rtr)# lives-of-history-kept 3
Router(config-rtr)# samples-of-history-kept 10
```

Related Commands

Command	Description
buckets-of-history-kept	Sets the number of history buckets that are kept during the lifetime of the SAA.
filter-for-history	Defines the type of information kept in the history table for the SAA operation.
lives-of-history-kept	Sets the number of lives maintained in the history table for the SAA operation.
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

show rtr application

To display global information about the SAA feature, use the **show rtr application** EXEC command.

show rtr application [**tabular** | **full**]

Syntax Description

tabular	(Optional) Displays information in a column format reducing the number of screens required to display the information.
full	(Optional) Displays all information using identifiers next to each displayed value. This is the default.

Defaults

Full format

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Use the **show rtr application** command to display information such as supported operation types and supported protocols.

Examples

The following is sample output from the **show rtr application** command in full format:

```
router#show rtr application

         Response Time Reporter
Version: 2.2.0 Round Trip Time MIB
Max Packet Data Size (ARR and Data): 16384
Time of Last Change in Whole RTR: 03:34:44.000 UTC Sun Feb 11 2001
System Max Number of Entries: 500

Number of Entries configured:5
    Number of active Entries:5
   Number of pending Entries:0
  Number of inactive Entries:0
         Supported Operation Types
Type of Operation to Perform:  echo
Type of Operation to Perform:  pathEcho
Type of Operation to Perform:  udpEcho
Type of Operation to Perform:  tcpConnect
Type of Operation to Perform:  http
Type of Operation to Perform:  dns
Type of Operation to Perform:  jitter
Type of Operation to Perform:  dlsw
Type of Operation to Perform:  dhcp
Type of Operation to Perform:  ftp
```

```
        Supported Protocols
Protocol Type: ipIcmpEcho
Protocol Type: ipUdpEchoAppl
Protocol Type: snaRUEcho
Protocol Type: snaLU0EchoAppl
Protocol Type: snaLU2EchoAppl
Protocol Type: ipTcpConn
Protocol Type: httpAppl
Protocol Type: dnsAppl
Protocol Type: jitterAppl
Protocol Type: dlsw
Protocol Type: dhcp
Protocol Type: ftpAppl

Number of configurable probe is 490
```

Related Commands

Command	Description
show rtr configuration	Displays configuration values including all defaults for all SAA operations or the specified operation.

show rtr authentication

To display SAA RTR authentication information, use the **show rtr authentication** EXEC command.

show rtr authentication

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

Use the **show rtr authentication** command to display information such as supported operation types and supported protocols.

Examples

The following is sample output from the **show rtr application** command:

```
Router# show rtr authentication

RTR control message uses MD5 authentication, key chain name is: rtr
```

Related Commands

Command	Description
show rtr configuration	Displays configuration values for RTR operations (probes).

show rtr collection-statistics

Note Effective with Cisco IOS Release 12.3(14)T, the **show rtr collection-statistics** command is replaced by the **show ip sla monitor collection-statistics** command. See the **show ip sla monitor collection-statistics** command for more information.

To display statistical errors for all Cisco IOS IP Service Level Agreements (IP SLAs) operations or a specified operation, use the **show rtr collection-statistics** command in EXEC mode.

show rtr collection-statistics [*operation-number*]

Syntax Description

operation-number	(Optional) Number of the IP SLAs operation to display.

Defaults

Shows statistics for the past two hours.

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.0(5)T	The output for this command was expanded to show information for Jitter operations.
12.1	The **tabular** and **full** keywords were removed.
12.1(1)T	The output for this command was expanded to show information for the FTP operation type and for One Way Delay Jitter operations.
12.2(8)T, 12.2(8)S	Output for “NumOfJitterSamples” was added (CSCdv30022).
12.2(11)T	The SAA Engine II was implemented. The maximum number of operations was increased from 500 to 2000.
12.3(4)T	Output (MOS and ICPIF scores) for the Jitter (codec) operation type was added.
12.3(7)T	Decimal granularity for MOS scores was added.
12.3(14)T	This command was replaced by the **show ip sla monitor collection-statistics** command.

Usage Guidelines

Use the **show rtr collection-statistics** command to display information such as the number of failed operations and the failure reason. You can also use the **show rtr distribution-statistics** and **show rtr totals-statistics** commands to display additional statistical information.

This command shows information collected over the past two hours, unless you specify a different amount of time using the **hours-of-statistics-kept** command.

For One Way Delay Jitter operations, the clocks on each device must be synchronized using NTP (or GPS systems). If the clocks are not synchronized, one way measurements are discarded. (If the sum of the source to destination (SD) and the destination to source (DS) values is not within 10 percent of the round trip time, the one way measurement values are assumed to be faulty, and are discarded.)

Note This command does not support the IP SLAs ICMP path jitter operation.

Examples

The following shows sample output from the **show rtr collection-statistics** command in full format.

```
Router# show rtr collection-statistics 1

        Collected Statistics
Entry Number: 1
Start Time Index: *17:15:41.000 UTC Thu May 16 1996
Path Index: 1
Hop in Path Index: 1
Number of Failed Operations due to a Disconnect: 0
Number of Failed Operations due to a Timeout: 0
Number of Failed Operations due to a Busy: 0
Number of Failed Operations due to a No Connection: 0
Number of Failed Operations due to an Internal Error: 0
Number of Failed Operations due to a Sequence Error: 0
Number of Failed Operations due to a Verify Error: 0
Target Address: 172.16.1.176
```

Output for HTTP Operations

The following example shows output from the show rtr collection-statistics command when the specified operation is an HTTP operation:

```
Router# show rtr collection-statistics 2

        Collected Statistics

Entry Number:2
HTTP URL:http://172.20.150.200
Start Time:*00:01:16.000 UTC Mon Nov 1 2003

             Comps:1              RTTMin:343
             OvrTh:0              RTTMax:343
        DNSTimeOut:0              RTTSum:343
        TCPTimeOut:0             RTTSum2:117649
        TraTimeOut:0              DNSRTT:0
          DNSError:0           TCPConRTT:13
         HTTPError:0            TransRTT:330
          IntError:0            MesgSize:1771
            Busies:0
```

Output for Jitter Operations

The following is sample output from the **show rtr collection-statistics** command, where operation 2 is a Jitter operation that includes One Way statistcis:

```
Router# show rtr collection-statistics

Collected Statistics

Entry Number: 2
```

```
Target Address: 5.0.0.1, Port Number:99
Start Time: 11:12:03.000 UTC Thu Jul 1 1999
RTT Values:
NumOfRTT: 600  RTTSum: 3789  RTTSum2: 138665
Packet Loss Values:
PacketLossSD: 0  PacketLossDS: 0
PacketOutOfSequence: 0  PacketMIA: 0  PacketLateArrival: 0
InternalError: 0  Busies: 0
Jitter Values:
MinOfPositivesSD: 1   MaxOfPositivesSD: 2
NumOfPositivesSD: 26  SumOfPositivesSD: 31   Sum2PositivesSD: 41
MinOfNegativesSD: 1   MaxOfNegativesSD: 4
NumOfNegativesSD: 56  SumOfNegativesSD: 73   Sum2NegativesSD: 133
MinOfPositivesDS: 1   MaxOfPositivesDS: 338
NumOfPositivesDS: 58  SumOfPositivesDS: 409  Sum2PositivesDS: 114347
MinOfNegativesDS: 1   MaxOfNegativesDS: 338
NumOfNegativesDS: 48  SumOfNegativesDS: 396  Sum2NegativesDS: 114332
One Way Values:
NumOfOW: 440
OWMinSD: 2  OWMaxSD: 6    OWSumSD: 1273  OWSum2SD: 4021
OWMinDS: 2  OWMaxDS: 341  OWSumDS: 1643  OWSum2DS: 120295
```

The values shown indicate the aggregated values for the current hour. RTT stands for Round-Trip-Time. SD stands for Source-to-Destination. DS stands for Destination-to-Source. OW stands for One Way. Table 128 describes the significant fields shown in this output.

Output for Jitter (codec) Operations

The following is sample output from the **show rtr collection-statistics** command, where operation 10 is a Jitter (codec) operation:

```
Router# show rtr collection-statistics 10
Entry number: 10
Start Time Index: 13:18:49.904 PST Mon Jun 24 2002
Number of successful operations: 2
Number of operations over threshold: 0
Number of failed operations due to a Disconnect: 0
Number of failed operations due to a Timeout: 0
Number of failed operations due to a Busy: 0
Number of failed operations due to a No Connection: 0
Number of failed operations due to an Internal Error: 0
Number of failed operations due to a Sequence Error: 0
Number of failed operations due to a Verify Error: 0
Voice Scores:
MinOfICPIF: 0   MaxOfICPIF: 0   MinOfMOS: 0     MaxOfMOS: 0
RTT Values:
NumOfRTT: 122   RTTAvg: 2       RTTMin: 2       RTTMax: 3
RTTSum: 247     RTTSum2: 503
Packet Loss Values:
PacketLossSD: 0 PacketLossDS: 0
PacketOutOfSequence: 0  PacketMIA: 0    PacketLateArrival: 0
InternalError: 0        Busies: 0       PacketSkipped: 78  <<<<<============
Jitter Values:
MinOfPositivesSD: 1     MaxOfPositivesSD: 1
NumOfPositivesSD: 9     SumOfPositivesSD: 9     Sum2PositivesSD: 9
MinOfNegativesSD: 1     MaxOfNegativesSD: 1
NumOfNegativesSD: 8     SumOfNegativesSD: 8     Sum2NegativesSD: 8
MinOfPositivesDS: 1     MaxOfPositivesDS: 1
NumOfPositivesDS: 6     SumOfPositivesDS: 6     Sum2PositivesDS: 6
MinOfNegativesDS: 1     MaxOfNegativesDS: 1
NumOfNegativesDS: 7     SumOfNegativesDS: 7     Sum2NegativesDS: 7
Interarrival jitterout: 0       Interarrival jitterin: 0
One Way Values:
```

```
NumOfOW: 0
OWMinSD: 0       OWMaxSD: 0       OWSumSD: 0       OWSum2SD: 0
OWMinDS: 0       OWMaxDS: 0       OWSumDS: 0       OWSum2DS: 0
```

Table 128 show rtr collection-statistics Field Descriptions

Field	Description
Voice Scores:	Indicates that Voice over IP statistics appear on the following lines. Voice score data is computed when the operation type is configured as **type jitter (codec)**.
ICPIF	The Calculated Planning Impairment Factor (ICPIF) value for the operation. The ICPIF value is computed by IP SLAs using the formula *Icpif = Io + Iq + Idte + Idd + Ie – A*, where • the values for *Io*, *Iq*, and *Idte* are set to zero, • the value *Idd* is computed based on the measured one way delay, • the value *Ie* is computed based on the measured packet loss, • and the value of A is specified by the user. ICPIF values are expressed in a typical range of 5 (very low impairment) to 55 (very high impairment). ICPIF values numerically less than 20 are generally considered “adequate.” **Note** This value is intended only for relative comparisons, and may not match ICPIF values generated using alternate methods.
MinOfICPIF:	The lowest (minimum) ICPIF value computed for the collected statistics.
MaxOfICPIF:	The highest (maximum) ICPIF value computed for the collected statistics.
Mos	The estimated Mean Opinion Score (Conversational Quality, Estimated) for the latest iteration of the operation. The MOS-CQE is computed by IP SLAs as a function of the ICPIF. MOS values are expressed as a number from 1 (1.00) to 5 (5.00), with 5 being the highest level of quality, and 1 being the lowest level of quality. A MOS value of 0 (zero) indicates that MOS data could not be generated for the operation.
MinOfMos:	The lowest (minimum) MOS value computed for the collected statistics.
MaxOfMos:	The highest (maximum) ICPIF value computed for the collected statistics.
RTT Values:	Indicates that Round-Trip-Time statistics appear on the following lines.
NumOfRTT	The number of successful round trips.
RTTSum	The sum of all successful round trip values (in milliseconds).
RTTSum2	The sum of squares of those round trip values (in milliseconds).
PacketLossSD	The number of packets lost from source to destination.

Table 128 show rtr collection-statistics Field Descriptions (continued)

Field	Description
PacketLossDS	The number of packets lost from destination to source.
PacketOutOfSequence	The number of packets returned out of order.
PacketMIA	The number of packets lost where the direction (SD/DS) cannot be determined.
PacketLateArrival	The number of packets that arrived after the timeout.
PacketSkipped	The number of packets that are not sent during the IP SLAs jitter operation.
InternalError	The number of times an operation could not be started due to other internal failures.
Busies	The number of times this operation could not be started because the previously scheduled run was not finished.
Jitter Values:	Indicates that Jitter statistics appear on the following lines. Jitter is inter-packet delay variance.
NumOfJitterSamples:	The number of jitter samples collected. This is the number of samples that are used to calculate the following jitter statitstics.
MinOfPositivesSD MaxOfPositivesSD	The minimum and maximum positive jitter values from source to destination, in milliseconds.
NumOfPositivesSD	The number of jitter values from source to destination that are positive (i.e., network latency increases for two consecutive test packets).
SumOfPositivesSD	The sum of those positive values (in milliseconds).
Sum2PositivesSD	The sum of squares of those positive values.
MinOfNegativesSD MaxOfNegativesSD	The minimum and maximum negative jitter values from source to destination. The absolute value is given.
NumOfNegativesSD	The number of jitter values from source to destination that are negative (i.e., network latency decreases for two consecutive test packets).
SumOfNegativesSD	The sum of those values.
Sum2NegativesSD	The sum of the squares of those values.
Interarrival jitterout:	The source to destination(SD) jitter value calculation, as defined in RFC 1889.
Interarrival jitterin:	The destination to souce (DS) jitter value calculation, as defined in RFC 1889.
One Way Values	Indicates that one way measurement statistics appear on the following lines. One Way (OW) Values are the amount of time it took the packet to travel from the source router to the target router (SD) or from the target router to the source router (DS).

Table 128 show rtr collection-statistics Field Descriptions (continued)

Field	Description
NumOfOW	Number of successful one way time measurements.
OWMinSD	Minimum time from the source to the destination.
OWMaxSD	Maximum time from the source to the destination.
OWSumSD	Sum of the OWMinSD and OWMaxSD values.
OWSum2SD	Sum of the squares of the OWMinSD and OWMaxSD values.

The DS values show the same information as above for Destination-to-Source Jitter values.

Related Commands

Command	Description
show ntp status	Displays the status of the Network Time Protocol configuration on your system.
show rtr configuration	Displays configuration values including all defaults for all IP SLAs operations or the specified operation.
show rtr distributions-statistics	Displays statistic distribution information (captured response times) for all IP SLAs operations or the specified operation.
show rtr totals-statistics	Displays the total statistical values (accumulation of error counts and completions) for all IP SLAs operations or the specified operation.

show rtr configuration

To display configuration values including all defaults for all SAA operations or the specified operation, use the **show rtr configuration** EXEC command.

show rtr configuration [*operation*] [**tabular** | **full**]

Syntax Description

operation	(Optional) Number of the SAA operation to display.
tabular	(Optional) Display information in a column format reducing the number of screens required to display the information.
full	(Optional) Display all information using identifiers next to each displayed value. This is the default.

Defaults

Full format for all operations

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.

Examples

The following is sample output from the **show rtr configuration** command in full format:

```
Router# show rtr configuration 1

        Complete Configuration Table (includes defaults)
Entry Number: 1
Owner: "Sample Owner"
Tag: "Sample Tag Group"
Type of Operation to Perform: echo
Reaction and History Threshold (milliseconds): 5000
Operation Frequency (seconds): 60
Operation Timeout (milliseconds): 5000
Verify Data: FALSE
Status of Entry (SNMP RowStatus): active
Protocol Type: ipIcmpEcho
Target Address: 172.16.1.176
Request Size (ARR data portion): 1
Response Size (ARR data portion): 1
Life (seconds): 3600
Next Start Time: Start Time already passed
Entry Ageout (seconds): 3600
Connection Loss Reaction Enabled: FALSE
Timeout Reaction Enabled: FALSE
Threshold Reaction Type: never
Threshold Falling (milliseconds): 3000
Threshold Count: 5
Threshold Count2: 5
Reaction Type: none
Number of Statistic Hours kept: 2
```

```
Number of Statistic Paths kept: 1
Number of Statistic Hops kept: 1
Number of Statistic Distribution Buckets kept: 1
Number of Statistic Distribution Intervals (milliseconds): 20
Number of History Lives kept: 0
Number of History Buckets kept: 50
Number of History Samples kept: 1
History Filter Type: none
```

The following example verifies the configuration of an HTTP operation:

```
router# show rtr configuration

        Complete Configuration Table (includes defaults)
Entry Number:3
Owner:Joe
Tag:AppleTree
Type of Operation to Perform:http
Reaction and History Threshold (milliseconds):5000
Operation Frequency (seconds):60
Operation Timeout (milliseconds):5000
Verify Data:FALSE
Status of Entry (SNMP RowStatus):active
Protocol Type:httpAppl
Target Address:
Source Address:0.0.0.0
Target Port:0
Source Port:0
Request Size (ARR data portion):1
Response Size (ARR data portion):1
Control Packets:enabled
Loose Source Routing:disabled
LSR Path:
Type of Service Parameters:0x0
HTTP Operation:get
HTTP Server Version:1.0
URL:http://www.cisco.com
Cache Control:enabled
Life (seconds):3600
Next Scheduled Start Time:Start Time already passed
Entry Ageout:never
Connection Loss Reaction Enabled:FALSE
Timeout Reaction Enabled:FALSE
Threshold Reaction Type:never
Threshold Falling (milliseconds):3000
Threshold Count:5
Threshold Count2:5
Reaction Type:none
Number of Statistic Hours kept:2
Number of Statistic Paths kept:1
Number of Statistic Hops kept:1
Number of Statistic Distribution Buckets kept:1
Statistic Distribution Interval (milliseconds):20
Number of History Lives kept:0
Number of History Buckets kept:15
Number of History Samples kept:1
History Filter Type:none
```

Related Commands

Command	Description
show rtr application	Displays global information about the SAA feature.
show rtr collection-statistics	Displays statistical errors for all SAA operations or the specified operation.
show rtr distributions-statistics	Displays statistic distribution information (captured response times) for all SAA operations or the specified operation.
show rtr history	Displays history collected for all SAA operations or the specified operation.
show rtr operational-state	Displays the operational state of all SAA operations or the specified operation.
show rtr reaction-trigger	Displays the reaction trigger information for all SAA operations or the specified operation.
show rtr totals-statistics	Displays the total statistical values (accumulation of error counts and completions) for all SAA operations or the specified operation.

show rtr distributions-statistics

To display statistic distribution information (captured response times) for all SAA operations or the specified operation, use the **show rtr distributions-statistics** EXEC command.

show rtr distributions-statistics [*operation*] [**tabular** | **full**]

Syntax Description

operation	(Optional) Number of the SAA operation to display.
tabular	(Optional) Displays information in a column format reducing the number of screens required to display the information. This is the default.
full	(Optional) Displays all information using identifiers next to each displayed value.

Defaults

Tabular format for all operations

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

The distributions statistics consist of the following:

- The sum of completion times (used to calculate the mean)
- The sum of the completions times squared (used to calculate standard deviation)
- The maximum and minimum completion time
- The number of completed attempts

You can also use the show rtr collection-statistics and **show rtr totals-statistics** commands to display additional statistical information.

Examples

The following is sample output from the **show rtr distributions-statistics** command in tabular format:

```
Router# show rtr distributions-statistics

        Captured Statistics
        Multiple Lines per Entry
Line 1
Entry    = Entry Number
StartT   = Start Time of Entry (hundredths of seconds)
Pth      = Path Index
Hop      = Hop in Path Index
Dst      = Time Distribution Index
Comps    = Operations Completed
OvrTh    = Operations Completed Over Thresholds
SumCmp   = Sum of Completion Times (milliseconds)
```

```
Line 2
SumCmp2L = Sum of Completion Times Squared Low 32 Bits (milliseconds)
SumCmp2H = Sum of Completion Times Squared High 32 Bits (milliseconds)
TMax     = Completion Time Maximum (milliseconds)
TMin     = Completion Time Minimum (milliseconds)
Entry StartT     Pth Hop Dst Comps      OvrTh      SumCmp
  SumCmp2L   SumCmp2H   TMax       TMin
1     17417068   1   1   1   2          0           128
   8192      0          64         64
```

Related Commands

Command	Description
show rtr collection-statistics	Displays statistical errors for all SAA operations or the specified operation.
show rtr configuration	Displays configuration values including all defaults for all SAA operations or the specified operation.
show rtr totals-statistics	Displays the total statistical values (accumulation of error counts and completions) for all SAA operations or the specified operation.

show rtr history

To display history collected for all SAA operations or for a specified operation, use the **show rtr history** EXEC command.

show rtr history [*operation-number*] [**tabular** | **full**]

Syntax Description

operation-number	(Optional) Displays history for only the specified operation.
tabular	(Optional) Displays information in a column format reducing the number of screens required to display the information. This is the default.
full	(Optional) Displays all information using identifiers next to each displayed value.

Defaults

Tabular format, history for all operations is displayed

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Table 129 lists the Response Return values used in the output of the **show rtr history** command. If the default (**tabular**) format is used, the Response Return description is displayed as a code in the Sense column. If the full format is used, the Response Return is displayed as indicated in the Description column.

Table 129 Response Return (Sense Column) Codes

Code	Description
1	Okay.
2	Disconnected.
3	Over threshold.
4	Timeout.
5	Busy.
6	Not connected.
7	Dropped.
8	Sequence error.
9	Verify error.
10	Application specific.

Examples

The following is sample output from the **show rtr history** command in tabular format:

```
Router# show rtr history

        Point by point History
          Multiple Lines per Entry
Line 1
Entry    = Entry Number
LifeI    = Life Index
BucketI  = Bucket Index
SampleI  = Sample Index
SampleT  = Sample Start Time
CompT    = Completion Time (milliseconds)
Sense    = Response Return Code
Line 2 has the Target Address
Entry LifeI      BucketI    SampleI    SampleT    CompT      Sense
2     1          1          1          17436548   16          1
  AB 45 A0 16
2     1          2          1          17436551   4           1
  AC 12 7  29
2     1          2          2          17436551   1           1
  AC 12 5  22
2     1          2          3          17436552   4           1
  AB 45 A7 22
2     1          2          4          17436552   4           1
  AB 45 A0 16
```

Related Commands

Command	Description
show rtr configuration	Displays configuration values including all defaults for all SAA operations or the specified operation.

show rtr operational-state

Note Effective with Cisco IOS Release 12.3(14)T, the **show rtr operational-state** command is replaced by the **show ip sla monitor statistics** command. See the **show ip sla monitor statistics** command for more information.

To display the operational state of all Cisco IOS IP Service Level Agreements (IP SLAs) operations or a specified operation, use the **show rtr operational-state** command in EXEC mode.

show rtr operational-state [*operation-number*]

Syntax Description

operation-number	(Optional) ID number of the IP SLAs operation to display.

Defaults

Displays output for all running IP SLAs operations.

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.0(5)T	Output for the Jitter operation type was added.
12.1	The **tabular** and **full** keywords were removed.
12.2(8)T	Output for “NumOfJitterSamples” was added (CSCdv30022).
12.2(8)S	Output for “NumOfJitterSamples” was added (CSCdv30022).
12.3(4)T	Output (MOS and ICPIF scores) for the Jitter (codec) operation type was added.
12.3(7)T	Decimal granularity for MOS scores was added.
12.3(14)T	This command was replaced by the **show ip sla monitor statistics** command.

Usage Guidelines

Use the **show rtr operational-state** command to display the current state of IP SLAs operations, including how much life the operation has left, whether the operation is active, and the completion time. The output will also include the monitoring data returned for the last (most recently completed) operation.

Examples

The following example shows basic sample output from the **show rtr operational-state** command:

```
Router# show rtr operational-state
        Current Operational State
Entry Number: 3
Modification Time: *22:15:43.000 UTC Sun Feb 11 2001
Diagnostics Text:
Last Time this Entry was Reset: Never
Number of Octets in use by this Entry: 1332
```

```
Number of Operations Attempted: 2
Current Seconds Left in Life: 3511
Operational State of Entry: active
Latest Completion Time (milliseconds): 544
Latest Operation Start Time: *22:16:43.000 UTC Sun Feb 11 2001
Latest Oper Sense: ok
Latest Sense Description: 200  OK
Total RTT: 544
DNS RTT: 12
TCP Connection RTT: 28
HTTP Transaction RTT: 504
HTTP Message Size: 9707
```

The following example shows sample output from the **show rtr operational-state** command when the specified operation is a Jitter (codec) operation:

```
Router# show rtr operational-state 1
Entry number: 1
Modification time: 13:18:38.012 PST Mon Jun 24 2002
Number of Octets Used by this Entry: 10392
Number of operations attempted: 2
Number of operations skipped: 0
Current seconds left in Life: Forever
Operational state of entry: Active
Last time this entry was reset: Never
Connection loss occurred: FALSE
Timeout occurred: FALSE
Over thresholds occurred: FALSE
Latest RTT (milliseconds): 2
Latest operation start time: *13:18:42.896 PST Mon Jun 24 2002
Latest operation return code: OK
Voice Scores:
ICPIF Value: 0  MOS score: 0
RTT Values:
NumOfRTT: 61    RTTAvg: 2       RTTMin: 2       RTTMax: 3
RTTSum: 123     RTTSum2: 249
Packet Loss Values:
PacketLossSD: 0 PacketLossDS: 0
PacketOutOfSequence: 0  PacketMIA: 0    PacketLateArrival: 0
InternalError: 0        Busies: 0       PacketSkipped: 39   <<<<<<===========
Jitter Values:
MinOfPositivesSD: 1     MaxOfPositivesSD: 1
NumOfPositivesSD: 1     SumOfPositivesSD: 1     Sum2PositivesSD: 1
MinOfNegativesSD: 1     MaxOfNegativesSD: 1
NumOfNegativesSD: 1     SumOfNegativesSD: 1     Sum2NegativesSD: 1
MinOfPositivesDS: 0     MaxOfPositivesDS: 0
NumOfPositivesDS: 0     SumOfPositivesDS: 0     Sum2PositivesDS: 0
MinOfNegativesDS: 0     MaxOfNegativesDS: 0
NumOfNegativesDS: 0     SumOfNegativesDS: 0     Sum2NegativesDS: 0
Interarrival jitterout: 0       Interarrival jitterin: 0
One Way Values:
NumOfOW: 0
OWMinSD: 0      OWMaxSD: 0      OWSumSD: 0      OWSum2SD: 0
OWMinDS: 0      OWMaxDS: 0      OWSumDS: 0      OWSum2DS: 0
```

The values shown indicate the values for the last IP SLAs operation. RTT stands for Round-Trip-Time. SD stands for Source-to-Destination. DS stands for Destination-to-Source. OW stands for One Way. The * symbol in front of the time stamps indicates the time is synchronized using NTP or SNTP. Table 130 describes the significant fields shown in this output.

Table 130 show rtr operational-state Field Descriptions

Field	Description
Voice Scores:	Indicates that Voice over IP statistics appear on the following lines. Voice score data is computed when the operation type is configured as **type jitter (codec)**.
ICPIF:	The Calculated Planning Impairment Factor (ICPIF) value for the latest iteration of the operation. The ICPIF value is computed by IP SLAs using the formula *Icpif = Io + Iq + Idte + Idd + Ie – A*, where • the values for *Io*, *Iq*, and *Idte* are set to zero, • the value *Idd* is computed based on the measured one way delay, • the value *Ie* is computed based on the measured packet loss, • and the value of A is specified by the user. ICPIF values are expressed in a typical range of 5 (very low impairment) to 55 (very high impairment). ICPIF values numerically less than 20 are generally considered "adequate." **Note** This value is intended only for relative comparisons, and may not match ICPIF values generated using alternate methods.
MOS:	The estimated Mean Opinion Score (Conversational Quality, Estimated) for the latest iteration of the operation. The MOS-CQE is computed by IP SLAs as a function of the ICPIF. MOS values are expressed as a number from 1 (1.00) to 5 (5.00), with 5 being the highest level of quality, and 1 being the lowest level of quality. A MOS value of 0 (zero) indicates that MOS data could not be generated for the operation.
RTT Values:	Indicates that Round-Trip-Time statistics appear on the following lines.
NumOfRTT	The number of successful round trips.
RTTSum	The sum of those round trip values (in milliseconds).
RTTSum2	The sum of squares of those round trip values (in milliseconds).
Packet Loss Values:	Indicates that Packet Loss statistics appear on the following lines.
PacketLossSD	The number of packets lost from source to destination.
PacketLossDS	The number of packets lost from destination to source.
PacketOutOfSequence	The number of packets returned out of order.
PacketMIA	The number of packets lost where the direction (SD or DS) cannot be determined (MIA: "missing in action").
PacketLateArrival	The number of packets that arrived after the timeout.
PacketSkipped	The number of packets that are not sent during the IP SLAs jitter operation.

Table 130 show rtr operational-state Field Descriptions (continued)

Field	Description
InternalError	The number of times an operation could not be started due to other internal failures.
Busies	The number of times this operation could not be started because the previously scheduled run was not finished.
Jitter Values:	Indicates that jitter operation statistics appear on the following lines. Jitter is inter-packet delay variance.
NumOfJitterSamples:	The number of jitter samples collected. This is the number of samples that are used to calculate the following jitter statitstics.
MinOfPositivesSD MaxOfPositivesSD	The minimum and maximum positive jitter values from source to destination, in milliseconds.
NumOfPositivesSD	The number of jitter values from source to destination that are positive (i.e., network latency increases for two consecutive test packets).
SumOfPositivesSD	The sum of those positive values (in milliseconds).
Sum2PositivesSD	The sum of squares of those positive values.
MinOfNegativesSD MaxOfNegativesSD	The minimum and maximum negative jitter values from source to destination. The absolute value is given.
NumOfNegativesSD	The number of jitter values from source to destination that are negative (i.e., network latency decreases for two consecutive test packets).
SumOfNegativesSD	The sum of those values.
Sum2NegativesSD	The sum of the squares of those values.
Interarrival jitterout:	The source to destination(SD) jitter value calculation, as defined in RFC 1889.
Interarrival jitterin:	The destination to souce (DS) jitter value calculation, as defined in RFC 1889.
One Way Values	Indicates that One Way measurement statistics appear on the following lines. One Way (OW) Values are the amount of time it took the packet to travel from the source router to the target router (SD) or from the target router to the source router (DS).
NumOfOW	Number of successful one way time measurements.
OWMinSD	Minimum time from the source to the destination.
OWMaxSD	Maximum time from the source to the destination.
OWSumSD	Sum of the OWMinSD and OWMaxSD values.
OWSum2SD	Sum of the squares of the OWMinSD and OWMaxSD values.

Related Commands

Command	Description
show rtr configuration	Displays configuration values including all defaults for all IP SLAs operations or the specified operation.

show rtr reaction-trigger

To display the reaction trigger information for all SAA operations or the specified operation, use the **show rtr reaction-trigger** EXEC command.

show rtr reaction-trigger [*operation-number*] [**tabular** | **full**]

Syntax Description

operation-number	(Optional) Number of the SAA operation to display.
tabular	(Optional) Display information in a column format reducing the number of screens required to display the information.
full	(Optional) Display all information using identifiers next to each displayed value. This is the default.

Defaults

Full format for all operations

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Use the **show rtr reaction-trigger** command to display the configuration status and operational state of target operations that will be triggered as defined with the **rtr reaction-configuration** global command.

Examples

The following is sample output from the **show rtr reaction-trigger** command in full format:

```
Router# show rtr reaction-trigger 1

        Reaction Table
Entry Number: 1
Target Entry Number: 2
Status of Entry (SNMP RowStatus): active
Operational State: pending
```

Related Commands

Command	Description
show rtr configuration	Displays configuration values including all defaults for all SAA operations or the specified operation.

show rtr responder

To display SAA RTR Responder information, use the **show rtr responder** EXEC command.

show rtr responder

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

Use the **show rtr responder** command to display information about recent sources of SAA control messages, such as who has sent recent control messages and who has sent invalid control messages.

Examples

The following is sample output from the **show rtr responder** command:

```
Router# show rtr responder

RTR Responder is: Enabled
Number of control message received: 19 Number of errors: 1
Recent sources:
            4.0.0.1 [19:11:49.035 UTC Sat Dec 2 1995]
            4.0.0.1 [19:10:49.023 UTC Sat Dec 2 1995]
            4.0.0.1 [19:09:48.707 UTC Sat Dec 2 1995]
            4.0.0.1 [19:08:48.687 UTC Sat Dec 2 1995]
            4.0.0.1 [19:07:48.671 UTC Sat Dec 2 1995]

Recent error sources:
            4.0.0.1 [19:10:49.023 UTC Sat Dec 2 1995] RTT_AUTH_FAIL
```

Related Commands

Command	Description
show rtr configuration	Displays configuration values for SAA operations.

show rtr totals-statistics

To display the total statistical values (accumulation of error counts and completions) for all SAA operations or the specified operation, use the **show rtr totals-statistics** EXEC command.

show rtr totals-statistics [*number*] [**tabular** | **full**]

Syntax Description

number	(Optional) Number of the SAA operation to display.
tabular	(Optional) Display information in a column format reducing the number of screens required to display the information.
full	(Optional) Display all information using identifiers next to each displayed value. This is the default.

Defaults

Full format for all operations

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

The total statistics consist of the following items:

- The operation number
- The start time of the current hour of statistics
- The age of the current hour of statistics
- The number of attempted operations

You can also use the **show rtr distributions-statistics** and **show rtr collection-statistics** commands to display additional statistical information.

Examples

The following is sample output from the **show rtr totals-statistics** command in full format:

```
Router# show rtr totals-statistics

        Statistic Totals
Entry Number: 1
Start Time Index: *17:15:41.000 UTC Thu May 16 1996
Age of Statistics Entry (hundredths of seconds): 48252
Number of Initiations: 10
```

Related Commands

Command	Description
show rtr collection-statistics	Displays statistical errors for all SAA operations or the specified operation.
show rtr configuration	Displays configuration values including all defaults for all SAA operations or the specified operation.
show rtr distributions-statistics	Displays statistic distribution information (captured response times) for all SAA operations or the specified operation.

statistics-distribution-interval

To set the time interval for each statistics distribution kept for the SAA, use the **statistics-distribution-interval** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

statistics-distribution-interval *milliseconds*

no statistics-distribution-interval

Syntax Description

milliseconds	Number of milliseconds (ms) used for each statistics distribution kept. The default is 20 ms.

Defaults

20 ms

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

In most situations, you do not need to change the statistical distribution interval or size. Only change the interval or size when distributions are needed, for example, when performing statistical modeling of your network. To set the statistical distributions size, use the **distributions-of-statistics-kept** SAA RTR configuration command.

Examples

In the following example, the distribution is set to five and the distribution interval is set to 10 ms. This means that the first distribution will contain statistics from 0 to 9 ms, the second distribution will contain statistics from 10 to 19 ms, the third distribution will contain statistics from 20 to 29 ms, the fourth distribution will contain statistics from 30 to 39 ms, and the fifth distribution will contain statistics from 40 ms to infinity.

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.28.161.21
Router(config-rtr)# distribution-of-statistics-kept 5
Router(config-rtr)# statistics-distribution-interval 10
```

Related Commands

Command	Description
distributions-of-statistics-kept	Sets the number of statistic distributions kept per hop during the SAA operation's lifetime.
hops-of-statistics-kept	Set the number of hops for which statistics are maintained per path for the SAA operation.

Command	Description
hours-of-statistics-kept	Sets the number of hours for which statistics are maintained for the SAA operation.
paths-of-statistics-kept	Sets the number of paths for which statistics are maintained per hour for the SAA operation.
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

tag

To create a user-specified identifier for an SAA operation, use the **tag** SAA RTR configuration command. To remove a tag from a operation, use the **no** form of this command.

tag *text*

no tag

Syntax Description

text	Name of a group that this operation belongs to. From 0 to 16 ASCII characters.

Defaults

No operations are tagged.

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

An operation tag is normally used to logically link operations in a group

Tags can be used to support automation (for example, by using the same tag for two different operations on two different routers echoing the same target).

Examples

In the following example, operation 1 is tagged with the label bluebell:

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.1.176
Router(config-rtr)# tag bluebell
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

threshold

To set the rising threshold (hysteresis) that generates a reaction event and stores history information for the SAA operation, use the **threshold** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

threshold *milliseconds*

no threshold

Syntax Description

milliseconds	Number of milliseconds required for a rising threshold to be declared. The default value is 5000 ms.

Defaults

5000 ms

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

The value specified for the **threshold** command must not exceed the value specified for the **timeout** SAA RTR configuration command.

The threshold value is used by the **rtr reaction-configuration** and **filter-for-history** commands.

Examples

In the following example, the threshold of operation 1 is set to 2500 ms:

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.1.176
Router(config-rtr)# threshold 2500
```

Related Commands

Command	Description
filter-for-history	Defines the type of information kept in the history table for the SAA operation.
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
rtr reaction-configuration	Configures certain actions to occur based on events under the control of the SAA.

timeout

To set the amount of time the SAA operation waits for a response from its request packet, use the **timeout** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

timeout *milliseconds*

no timeout

Syntax Description

milliseconds	Number of milliseconds (ms) the operation waits to receive a response from its request packet.

Defaults

The default timeout values vary by operation. Per the RTTMON-MIB, the defaults are:

DLSw+ (type dlsw) and FTP (type ftp) operations - 30000 ms

DNS (type dns) operations - 9 seconds
(as defined by multiplying the MAX_DNS_WAITTIME value by the MAXDNSTRIES value)

TCP Connection (type tcpConnect) and HTTP (type http) operations - 60 seconds
(as defined by multiplying the MAXALIVETRIES value by the MAXSYNTRYTICKS value)

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Use the **timeout** command to set how long the operation waits to receive a response, and use the **frequency** SAA RTR configuration command to set the rate at which the SAA starts an operation.

The value specified for the **timeout** command cannot be greater than the value specified for the **frequency** command.

Examples

In the following example, the timeout for the IP/ICMP Echo operation 1 is set for 2500 ms:

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.1.176
Router(config-rtr)# timeout 2500
```

Related Commands

Command	Description
frequency	Sets the rate at which the SAA operation starts a response time operation.
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

tos

To define a type of service (ToS) byte in the IP header of SAA operations, use the **tos** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

tos *number*

no tos

Syntax Description

number	Service type byte in the IP header. The range is 0 to 255. The default is 0.

Defaults

The default type-of-service value is 0.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

The type-of-service (ToS) value is an 8-bit field in IP headers. This field contains information such as precedence and TOS. This is useful for policy-routing as well as features like CAR (Committed Access Rate), where routers examine for TOS values.

When the type-of-service is defined for an operation, the SAA Responder will reflect the ToS value it recieves.

Examples

In the following example, SAA operation 1 is configured as an echo probe using the IP/ICMP Echo protocol and the destination IP address 172.16.1.175. The ToS value is set to 0x80.

```
Router(config)# rtr 1
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.1.176
Router(config-rtr)# tos 0x80
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

type dhcp

To configure a Dynamic Host Configuration Protocol SAA operation, use the **type dhcp** SAA RTR configuration command. To disable a DHCP SAA operation, use the **no** form of this command.

type dhcp [**source-ipaddr** *source-ipaddr*] [**dest-ipaddr** *dest-ipaddr*] [**option** *decimal-option* [**circuit-id** *circuit-id*] [**remote-id** *remote-id*] [**subnet-mask** *subnet-mask*]]

no type dhcp

Syntax Description

source-ipaddr *source-ipaddr*	(Optional) Source name or IP address.
dest-ipaddr *dest-ipaddr*	(Optional) Destination name or IP address.
option *decimal-option*	(Optional) Option number. The only currently valid value is 82. DHCP option 82 allows you to specify the circuit-id, remote-id, and/or the subnet-mask for the destination DHCP server.
circuit-id *circuit-id*	(Optional) Circuit ID in hexadecimal.
remote-id *remote-id*	(Optional) Remote ID in hexadecimal.
subnet-mask *subnet-mask*	(Optional) Subnet mask IP address. The default value is 255.255.255.0.

Defaults

The *subnet-mask* value is 255.255.255.0.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.1(1)T	The following keywords were added: • **source-ipaddr** • **dest-ipaddr** • **option 82**

Usage Guidelines

You must configure the type of operation before you can configure any of the other characteristics of the operation.

If the source IP address is configured, then packets will be sent with that source address.

You may configure the **ip dhcp-server** command to identify the DHCP server that the DHCP operation will measure.

If the target IP address is configured, then only that device will be measured.

If the **ip dhcp-server** command is not configured and the target IP address is not configured, then DHCP discover packets will be sent on every available IP interface.

Option 82 is called the Relay Agent Information option and is inserted by the DHCP relay agent when forwarding client-originated DHCP packets to a DHCP server. Servers recognizing the Relay Agent Information option may use the information to implement IP address or other parameter assignment policies. The DHCP Server echoes the option back verbatim to the relay agent in server-to-client replies, and the relay agent strips the option before forwarding the reply to the client.

The Relay Agent Information option is organized as a single DHCP option that contains one or more suboptions that convey information known by the relay agent. The initial sub-options are defined for a relay agent that is co-located in a public circuit access unit. These suboptions are as follows: a **circuit-id** for the incoming circuit, a **remote-id** which provides a trusted identifier for the remote high-speed modem, and a **subnet-mask** designation for the logical IP subnet from which the relay agent received the client DHCP packet.

If an odd number of characters are specified for the **circuit-id**, a zero will be added to the end of the string.

Examples

In the following example, SAA operation number 4 is configured as a DHCP operation enabled for DHCP server 172.16.20.3:

```
Router(config)# rtr 4
Router(config-rtr)# type dhcp option 82 circuit-id 10005A6F1234
Router(config-rtr)# exit
Router(config)# ip dhcp-server 172.16.20.3
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
ip dhcp-server	Specifies which DHCP servers to use on a network, and specifies the IP address of one or more DHCP servers available on the network.

type dlsw

To configure a data-link switching (DLSw) SAA operation, use the **type dlsw** SAA RTR configuration command. To remove the type configuration for the operation, use the **no** form of this command.

type dlsw peer-ipaddr *ipaddr*

no type dlsw peer-ipaddr *ipaddr*

Syntax Description

peer-ipaddr	Peer destination.
ipaddr	IP address.

Defaults

None.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

In order to configure a DLSw operation, the DLSw feature must be configured on the local and target routers.

You must configure the type of operation before you can configure any of the other characteristics of the operation.

The default for the optional characteristic **request-data-size** for a DLSw SAA operation is 0 bytes.

The default for the optional characteristic **timeout** for a DLSw SAA operation is 30 seconds.

Examples

In the following example, SAA operation number 4 is configured as a DLSw operation enabled for remote peer IP address 172.21.27.11. The data size is 15 bytes.

```
Router(config)# rtr 4
Router(config-rtr)# type dlsw peer-ipaddr 172.21.27.11
Router(config-rtr)# request-data-size 15
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
request-data-size	Sets the protocol data size in the payload of the SAA operation's request packet.
show dlsw peers	Displays DLSw peer information.

type dns

To configure a Domain Name System (DNS) SAA operation, use the **type dns** SAA RTR configuration command. To remove the type configuration for the operation, use the **no** form of this command.

type dns target-addr {*ip-address* | *hostname*} **name-server** *ip-address*

no type dns target-addr {*ip-address* | *hostname*} **name-server** *ip-address*

Syntax Description

target-addr {*ip-address* | *hostname*}	Target (destination) IP address or hostname.
name-server *ip-address*	IP address of the Domain Name Server.

Defaults

No default behavior or values.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

You must configure the type of operation before you can configure any of the other characteristics of the operation.

Examples

In the following example, SAA operation 7 is created and configured as a DNS operation using the target IP address 172.20.2.132:

```
Router(config)# rtr 7
Router(config-rtr)# type dns target-addr lethe name-server 172.20.2.132
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

type echo

To configure an SAA end-to-end echo response time probe operation, use the **type echo** SAA RTR configuration command. To remove the operation from the configuration, use the **no** form of this command.

type echo protocol *protocol-type target* [**source-ipaddr** *ip-address*]

no type echo protocol *protocol-type target* [**source-ipaddr** *ip-address*]

Syntax Description

protocol *protocol-type target*	Protocol used by the operation. The *protocol-type target* argument combination must take one of the following forms: • **ipIcmpEcho** {*ip-address* | *hostname*}—IP/ICMP Echo. Requires a destination IP address or IP host name. • **snaRUEcho** *sna-hostname*—SNA's SSCP Native Echo. Requires the host name defined for the SNA's PU connection to VTAM. • **snaLU0EchoAppl** *sna-hostname* [*sna-application*] [*sna-mode*]—SNA LU type 0 connection to Cisco's NSPECHO host application that requires the host name defined for the SNA's PU connection to VTAM. Optionally, specify the host application name (the default is NSPECHO) and SNA mode to access the application. • **snaLU2EchoAppl** *sna-hostname* [*sna-application*] [*sna-mode*]—SNA LU type 2 connection to Cisco's NSPECHO host application that requires the host name defined for the SNA's PU connection to VTAM. Optionally, specify the host application name (the default is NSPECHO) and SNA mode to access the application.
source-ipaddr *ipaddr*	(Optional) Specifies an IP address as the source for the operation.

Defaults

The default SNA host *sna-application* name for a SNA LU type echo is NSPEcho.
The default data size for a IP/ICMP echo operation is 28 bytes.

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.
12.0(5)T	The **source-ipaddr** *ipaddr* keyword/argument combination was added to support the specification of an IP source for the operation.

Usage Guidelines

Support of echo to a protocol and pathEcho to a protocol is dependent on the protocol type and implementation. In general most protocols support echo and few protocols support pathEcho.

Note Keywords are not case sensitive and are shown in mixed case for readability only.

Prior to sending a operation packet to the responder, the SAA sends a control message to the Responder to enable the destination port.

The default for the optional characteristic **request-data-size** for a ipIcmpEcho operation is 28 bytes. This is the payload portion of the Icmp packet, which makes a 64 byte IP packet.

Examples

In the following example, operation 10 is created and configured as an echo probe using the IP/ICMP Echo protocol and the destination IP address 172.16.1.175:

```
Router(config)# rtr 10
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.1.175
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
show rtr configuration	Displays configuration values for RTR operations.

type ftp

To configure an FTP operation, use the **type ftp** SAA RTR configuration command. To remove the type configuration for the operation, use the **no** form of this command.

type ftp operation get url *url* [**source-ipaddr** *source-ipaddr*] [**mode** {**passive** | **active**}]

no type ftp operation get url *url* [**source-ipaddr** *source-ipaddr*] [**mode** {**passive** | **active**}]

Syntax Description

operation get	Specifies an FTP GET operation. (Support for other FTP operation types may be added in future releases.)
url *url*	Location information for the file to retrieve.
source-ipaddr *source-ipaddr*	(Optional) Source address of the operation.
mode	(Optional) Specifies mode, either active or passive.
passive	FTP passive transfer mode. This mode is the default.
active	FTP active transfer mode.

Defaults

The default FTP transfer mode is passive.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.1(1)T	This command was introduced.

Usage Guidelines

GET is the only valid operation value. The URL must be in one of the following formats:

- ftp://user:password@host/filename
- ftp://host/filename

If the user and password keywords are not specified, the defaults are anonymous and test, respectively.

Examples

In the following example, an FTP operation is configured. Joe is the user and Young is the password. zxq is the host and test is the file name.

```
Router(config)# rtr 3
Router(config-rtr)# type ftp operation get ftp://joe:young@zxq/test
```

Related Commands

Command	Description
show rtr collection-statistics	Displays statistical errors for all SAA operations or the specified operation.
show rtr operational-state	Displays the operational state of all SAA operations or the specified operation.

type http

To configure a Hypertext Transfer Protocol (HTTP) SAA operation, use the **type http** SAA RTR configuration command. To remove the type configuration for the operation, use the **no** form of this command.

type http operation {**get | raw**} **url** *url* [**name-server** *ipaddress*] [**version** *version number*] [**source-ipaddr** {*name* | *ipaddr*}] [**source-port** *port number*] [**cache** {**enable | disable**}] [**proxy** *proxy-url*]

no type http operation {**get | raw**} **url** *url* [**name-server** *ipaddress*] [**version** *version number*] [**source-ipaddr** {*name* | *ipaddr*}] [**source-port** *port number*] [**cache** {**enable | disable**}] [**proxy** *proxy-url*]

Syntax Description

operation get	Specifies an HTTP GET operation.
operation raw	Specifies an HTTP RAW operation.
url *url*	Specifies the URL of destination HTTP server.
name-server	(Optional) Specifies name of destination Domain Name Server.
ipaddress	(Optional) IP address of Domain Name Server.
version	(Optional) Specifies version number.
version number	(Optional) Version number.
source-ipaddr	(Optional) Specifies source name or IP address.
name	Source name.
ipaddr	Source IP address.
source-port	(Optional) Specifies source port.
port number	(Optional) Source port number.
cache	(Optional) Enables or disables download of cached HTTP page.
enable	Enables downloads of cached HTTP page.
disable	Disables download of cached HTTP page.
proxy	(Optional) Proxy information.
proxy-url	(Optional) Proxy information or URL.

Defaults

No default behavior or values.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

You must configure the type of operation before you can configure any of the other characteristics of the operation.

Examples

HTTP GET operation

In this example operation 5 is created and configured as an HTTP GET operation. The destination URL is `http://www.cisco.com`.

```
Router(config)# rtr 5
Router(config-rtr)# type http operation get url http://www.cisco.com
Router(config-rtr)# exit
Router(config)# rtr schedule 5 start-time now
```

HTTP RAW operation using RAW submode

In this example operation 6 is created and configured as an HTTP RAW operation. To use the raw request commands, HTTP-RAW submode is entered using the **http-raw-request** command. The RTR HTTP-RAWsubmode is indicated by the `(config-rtr-http)` router prompt.

```
Router(config)# rtr 6
Router(config-rtr)# type http operation raw url http://www.cisco.com
Router(config-rtr)# http-raw-request
Router(config-rtr-http)# GET /index.html HTTP/1.0\r\n
Router(config-rtr-http)# \r\n
Router(config-rtr-http)# exit
Router(config)# rtr schedule 6 start-time now
```

HTTP RAW operation through a Proxy Server

In this example `http://www.proxy.cisco.com` is the proxy server and `http://www.yahoo.com` is the HTTP Server:

```
Router(config)# rtr 6
Router(config-rtr)# type http operation raw url http://www.proxy.cisco.com
Router(config-rtr)# http-raw-request
Router(config-rtr-http)# GET http://www.example.com HTTP/1.0\r\n
Router(config-rtr-http)# \r\n
Router(config-rtr-http)# exit
Router(config)# rtr schedule 6 start-time now
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.

type jitter

To configure a jitter SAA operation, use the **type jitter** SAA RTR configuration command. To disable a jitter operation, use the **no** form of this command.

type jitter dest-ipaddr {*name* | *ipaddr*} **dest-port** *port-number* [**source-ipaddr** {*name* | *ipaddr*}] [**source-port** *port-number*] [**control** {**enable** | **disable**}] [**num-packets** *number-of-packets*] [**interval** *inter-packet-interval*]

no type jitter dest-ipaddr {*name* | *ipaddr*} **dest-port** *port-number* [**source-ipaddr** {*name* | *ipaddr*}] [**source-port** *port-number*] [**control** {**enable** | **disable**}] [**num-packets** *number-of-packets*] [**interval** *inter-packet-interval*]

Syntax Description

dest-ipaddr	Destination for the operation.
name	Destination IP host name.
ipaddr	Destination IP address.
dest-port	Destination port.
port-number	Port number of the destination port.
source-ipaddr	(Optional) Source IP address.
name	IP host name.
ipaddr	IP address.
source-port	(Optional) Source port.
port-number	Port number of the source.
control	(Optional) Combined with the **enable** or **disable** keyword, enables or disables sending a control message to the destination port.
enable	Enables the SAA to send a control message to the destination port prior to sending a probe packet. This is the default value.
disable	Disables sending of control messages to the responder prior to sending a probe packet.
num-packets *number-of-packets*	(Optional) Number of packets, as specified by the number argument. The default value is 10.
interval *inter-packet-interval*	(Optional) Interpacket interval in milliseconds. The default value of the *inter-packet-interval* argument is 20 ms.

Defaults

The default for the optional characteristic **request-data-size** for a SAA Jitter operation is 32 bytes of UDP data.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

The **type jitter** command configures a UDP Plus SAA operation. The UDP Plus operation is a superset of the UDP echo operation. In addition to measuring UDP round trip time, the UDP Plus operation measures per-direction packet-loss and Jitter. Jitter is inter-packet delay variance. Packet loss is a critical element in SLAs, and Jitter statistics are useful for analyzing traffic in a VoIP network.

You must enable the SAA Responder on the target router before you can configure a Jitter operation. Prior to sending a operation packet to the responder, the SAA sends a control message to the SA Agent Responder to enable the destination port.

You must configure the type of operation before you can configure any of the other characteristics of the operation.

Examples

In the following example, operation 6 is created and configured as a UDP+ Jitter operation using the destination IP address 172.30.125.15, the destination port number 2000, 20 packets, and an interval of 20:

```
Router(config)# rtr 6
Router(config-rtr)# type jitter dest-ip 172.30.125.15 dest-port 2000 num-packets 20
interval 20
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
request-data-size	Sets the payload size for SAA operation requests.

type pathEcho

To configure an IP/ICMP Path Echo SAA operation, use the **type pathEcho** SAA RTR configuration command. To remove the operation from the configuration, use the **no** form of this command.

type pathEcho protocol ipIcmpEcho {*ip-address* | *ip-hostname*}

no type pathEcho protocol ipIcmpEcho {*ip-address* | *ip-hostname*}

Syntax Description

protocol ipIcmpEcho	Specifies an IP/ICMP Echo operation. This is currently the only protocol type supported for the SAA Path Echo operation.
ip-address	Specifies the IP address of the target device.
ip-hostname	Specifies the designated IP name of the target device.

Defaults

None

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Keywords are not case sensitive and are shown in mixed case for readability only.

Examples

In the following example, SAA operation 10 is created and configured as pathEcho probe using the IP/ICMP Echo protocol and the destination IP address 172.16.1.175:

```
Router(config)# rtr 10
Router(config-rtr)# type pathEcho protocol ipIcmpEcho 172.16.1.175
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
show rtr configuration	Displays configuration values for RTR operations (probes).

type tcpConnect

To define a tcpConnect probe, use the **type tcpConnect** SAA RTR configuration command. To remove the type configuration for the probe, use the **no** form of this command.

type tcpConnect dest-ipaddr {*name* | *ipaddr*} **dest-port** *port-number* [**source-ipaddr** {*name* | *ipaddr*} **source-port** *port-number*] [**control** {**enable** | **disable**}]

no type tcpConnect dest-ipaddr {*name* | *ipaddr*} **dest-port** *port-number*

Syntax Description

dest-ipaddr *name* | *ipaddr*	Destination of tcpConnect probe. *name* indicates IP host name. *ipaddr* indicates IP address.
dest-port *port-number*	Destination port number.
source-ipaddr *name* | *ipaddr*	(Optional) Source IP host name or IP address.
source-port *port-number*	(Optional) Port number of the source. When a port number is not specified, SAA picks the best IP address (nearest to the target) and available UDP port.
control	(Optional) Specifies that the SAA control protocol should be used when running this probe. The control protocol is required when the probe's target is a Cisco router that does not natively provide the service (TCP service in this case). Combined with the **enable** or **disable** keyword, enables or disables sending a control message to the destination port. The default is that the control protocol is enabled. When enabled, the SAA sends a control message to the SAA Responder (if available) to enable the destination port prior to sending a probe packet.
enable	Enables the SAA collector to send a control message to the destination port prior to sending a probe packet.
disable	Disables the SAA from sending a control message to the target prior to sending a probe packet.

Defaults

The control protocol is enabled.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

You must configure an SAA operation type before you can configure any of the other characteristics of the operation.

The Transmission Control Protocol (TCP) Connection operation is used to discover the time it takes to connect to the target device. This operation can be used to test virtual circuit availability or application availability. If the target is a Cisco router, then SA Agent makes a TCP connection to any port number specified by the user. If the destination is a non-Cisco IP host, then the user must specify a known target port number (for example, 21 for FTP, 23 for Telnet, or 80 for HTTP Server). This operation is useful in testing Telnet or HTTP connection times.

Examples

In the following example, SAA operation 11 is created and configured as a tcpConnect probe using the destination IP address 172.16.1.175, and the destination port 2400:

```
Router(config)# rtr 11
Router(config-rtr)# type tcpConnect dest-ipaddr 172.16.1.175 dest-port 2400
```

Related Commands

Command	Description
rtr	Specifies an SAA operation begins configuration for that operation.
show rtr configuration	Displays configuration values for SAA operations.

type udpEcho

To define a udpEcho probe, use the **type udpEcho** SAA RTR configuration command. To remove the type configuration for the probe, use the **no** form of this command.

type udpEcho dest-ipaddr {*name* | *ipaddr*} **dest-port** *port-number* [**source-ipaddr** {*name* | *ipaddr*} **source-port** *port-number*] [**control** {**enable** | **disable**}]

no type udpEcho dest-ipaddr {*name* | *ipaddr*} **dest-port** *port-number*

Syntax Description

dest-ipaddr *name* | *ipaddr*	Destination of the udpEcho probe. Use an IP host name or IP address.
dest-port *port-number*	Destination port number. The range of port numbers is from 1 to 65,535.
source-ipaddr *name* | *ipaddr*	(Optional) Source IP host name or IP address.
source-port *port-number*	(Optional) Port number of the source. When a port number is not specified, SAA picks the best IP address (nearest to the target) and available UDP port
control	(Optional) Specifies that the SAA RTR control protocol should be used when running this probe. The control protocol is required when the probe's target is a Cisco router that does not natively provide the service (UDP service in this case). Combined with the **enable** or **disable** keyword, enables or disables sending of a control message to the destination port. The default is that the control protocol is enabled.
enable	Enable the SAA collector to send a control message to the destination port prior to sending a probe packet.
disable	Disable the SAA from sending a control message to the responder prior to sending a probe packet.

Defaults

The control protocol is enabled. Prior to sending a probe packet to the Responder, the SAA collector sends a control message to the Responder to enable the destination port.

Command Modes

SAA RTR configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

You must configure an operation type before you can configure any of the other characteristics of the operation.

The source IP address and port number are optional. If they are not specified, SAA selects the IP address nearest to the target and an available UDP port.

Examples

In the following example, SAA operation 12 is created and configured as udpEcho probe using the destination IP address 172.16.1.175 and destination port 2400:

```
Router# configure terminal
Router(config)# rtr 12
Router(config-rtr)# type udpEcho dest-ipaddr 172.16.1.175 dest-port 2400
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.
show rtr configuration	Displays configuration values for SAA operations.

verify-data

To cause the SAA operation to check each response for corruption, use the **verify-data** SAA RTR configuration command. To return to the default value, use the **no** form of this command.

verify-data

no verify-data

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

SAA RTR configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Only use the **verify-data** command when corruption may be an issue.

Caution Do not enable this feature during normal operation because it causes unnecessary overhead.

Examples

In the following example, operation 5 is configured to verify the data for each response:

```
Router(config)# rtr 5
Router(config-rtr)# type echo protocol ipIcmpEcho 172.16.1.174
Router(config-rtr)# response-data-size 2
Router(config-rtr)# verify-data
```

Related Commands

Command	Description
rtr	Specifies an SAA operation and enters SAA RTR configuration mode.