

# Service Assurance Agent

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This document is specific to Cisco IOS Release 12.0(5)T.

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**Note** The Service Assurance Agent (SAA) replaces the Response Time Reporter (RTR) feature. The SAA can be used in conjunction with the existing RTR feature (described in the Cisco IOS Release 12.0(3)T Response Time Reporter Enhancements feature module document). The command line interface for the feature does not reflect the name change; commands retain the RTR name.

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## Feature Overview

The Service Assurance Agent (SAA) is both an enhancement to and a new name for the Response Time Reporter (RTR) feature that was introduced in Cisco IOS release 11.2. The feature allows you to monitor network performance by measuring key Service Level Agreement (SLA) metrics such as response time, network resources, availability, jitter, connect time, packet loss and application performance.

With Cisco IOS release 12.0(5)T, the SAA provides new capabilities that enable you to:

- Monitor the Domain Name Server, DHCP Server, and DLSw peer stack and tunnel performance. Thresholds can be used to trigger additional collection of time delay statistics.
- Monitor network one-way delay variance (jitter) and packet loss.
- Monitor web server response time.

## Benefits

The SAA feature extends IP support and enhances the management and measurement of enterprise and service provider networks. With the increasing importance of mission-critical applications and networks that link global enterprises, customers are demanding SLAs that guarantee minimum acceptable levels of service. The SAA provides a reliable mechanism to accurately monitor and measure the key metrics in SLAs.

The SAA allows you to measure and monitor the following:

- SLA metrics such as round-trip response time and availability.
- Voice-over-IP (VoIP) metrics such as jitter, packet loss, and availability of synthetic VoIP traffic.
- Web metrics and applications.

- Quality of Service (QoS) and accuracy metrics such as IP packet precedence levels.

Specifically, the SAA feature allows you to define the following operations:

- DHCP
- DLSw
- DNS
- HTTP
- Jitter

## Related Features and Technologies

Related features and technologies include the Simple Network Management Protocol (SNMP), Remote Monitoring (RMON), and Response Time Monitoring (RTTMON).

Because SA Agent is accessible using SNMP, it can also be used by performance monitoring applications and Network Management Systems such as CiscoWorks2000 (CiscoWorks Blue) and the Internetwork Performance Monitor (IPM). SAA notifications can also be enabled via SNA NMVT for applications such as NetView.

## Related Documents

For full documentation of this feature, use the following documents in conjunction with this feature module update:

- Cisco IOS Release 12.0 *Configuration Fundamentals Configuration Guide*
- Cisco IOS Release 12.0 *Configuration Fundamentals Command Reference*
- Cisco IOS Release 12.0(3)T *Response Time Reporter Enhancements* feature module

## Supported Platforms

- Cisco 12000 series gigabit switch router
- Cisco 1600 series routers
- Cisco 2500 series routers
- Cisco 2600 series routers
- Cisco 3600 series access servers and routers
- Cisco 3800 series
- Cisco 38xx series
- Cisco 4000/m series routers
- Cisco 4500 series routers
- Cisco 7200 series and 7500 series routers
- Cisco uBR7200 series cable routers
- Cisco AS5200, AS5300, and AS5800 access servers
- Cisco C5RSM

## Supported MIBs and RFCs

### MIBs

The SAA supports the Cisco Round Trip Time Monitor (RTTMON) MIB and the following MIB enhancements:

- Addition of rttMonHTTPStatsTable, rttMonJitterStatsTable, rttMonLatestHTTPOperTable, and rttMonLatestJitterOperTable
- Extensions of rttMonEchoAdminTable and rttMonAppl

For descriptions of supported MIBs and how to use MIBs, see Cisco's MIB web site on CCO at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

### RFCs

- No RFCs are supported by this feature.

## List of Terms and Acronyms

**bound**—Client has accepted an IP address from the DHCP server.

**DHCP**—Dynamic Host Configuration Protocol. Provides a mechanism for allocating IP addresses dynamically so that addresses can be reused when hosts no longer need them.

**DLSw**—data-link switching. Interoperability standard, described in RFC 1795 and 2166, that provides a method for forwarding SNA and NetBIOS traffic over TCP/IP networks using data link layer switching and encapsulation.

**DNS**—domain name server. System used in the Internet for translating names of network nodes into addresses.

**data-link switching**—See DLSw.

**Discover**—A broadcast frame looking for DHCP server.

**domain name server**—See DNS.

**Dynamic Host Configuration Protocol**—See DHCP.

**HTTP**—Hypertext Transfer Protocol. The protocol used by Web browsers and Web servers to transfer files, such as text and graphic files.

**Hypertext Transfer Protocol**—See HTTP.

**jitter**—Jitter is the inter-packet delay variance; the difference between inter-packet arrival and departure. Jitter is an important QoS metric for voice and video applications.

**lease**—IP address that lasts a fixed amount of time.

**operation**—Test that measures network performance. See synthetic operation.

**offer**—Frame from a DHCP server with a proposed IP address for the client.

**QoS**—Quality of Service. Measure of performance for a transmission system that reflects its transmission quality and service availability.

**Quality of Service**—See QoS.

**RTR**—Response Time Reporter. Cisco IOS feature that monitors network performance, network resources, and applications by measuring response times and availability. This feature was expanded in Cisco IOS 12.0(5)T and was renamed Service Assurance Agent (SAA). The Command-Line Interface (CLI) retains the use of the RTR term

**response time reporter**—See RTR.

**Service Level Agreement**—See SLA.

**SLA**—Agreement between a service provider and a customer that specifies and guarantees minimum acceptable levels of service.

**SSP**—Switch-to-Switch Protocol. Protocol specified in the DLSw standard that routers use to establish DLSw connections, locate resources, forward data, and handle flow control and error recovery.

**Switch-to-Switch Protocol**—See SSP.

**synthetic operation**—Packets sent into the network that appear to be user data traffic but actually measure network performance. Formerly known as a probe. Also referred to as “operation.”

## Configuration Tasks

Perform the following tasks to configure the SAA feature. Refer to the “Command Reference” section for detailed syntax description of the commands used in these tasks. Configuring the operation and scheduling the operation are required tasks; the remaining task is optional.

- Configuring the Operation (Required)
- Configuring Optional Operation Characteristics (Optional)
- Scheduling the Operation (Required)
- Verifying SAA (Optional)

## Configuring the Operation

Response time and availability information is collected by *operations* that you configure on the router. You must configure the operation type before you can configure any of the other characteristics.

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**Note** Service Assurance Agent uses RTR configuration mode for the configuration of SAA operations.

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The tasks in this section describe how to:

- Configure an HTTP Operation
- Configure a DNS Operation
- Configure a Jitter Operation
- Configure a DLSw Operation
- Configure a DHCP Operation

## Configure an HTTP Operation

To define a HTTP operation, use the following commands starting in global configuration mode:

| Step | Command   | Purpose   |
|------|---|---|
| 1    | <b>rtr</b> <i>number</i>  | Specifies an SAA operation and enters RTR configuration mode. |
| 2    | <b>type http operation</b> <i>type of operation url</i> <b>url</b> [ <b>name-server</b> <i>ipaddress</i> ] [ <b>version</b> <i>version number</i> ] [ <b>source-ipaddr</b> <i>name   ipaddr</i> ] [ <b>source-port</b> <i>port number</i> ] [ <b>cache</b> { <i>enable   disable</i> }] [ <b>proxy</b> <i>proxy information</i> ] | Defines an HTTP operation.                                    |

## Configure a DNS Operation

To define a DNS operation, use the following commands starting in global configuration mode:

| Step | Command   | Purpose   |
|------|---|---|
| 1    | <b>rtr</b> <i>number</i>  | Specifies an SAA operation and enters RTR configuration mode. |
| 2    | <b>type dns target-addr</b> <i>target address</i> <b>name-server</b> <i>ipaddress</i> | Defines a DNS operation.                                      |

## Configure a Jitter Operation

To define a jitter operation, use the following commands starting in global configuration mode:

| Step | Command  | Purpose   |
|------|--|---|
| 1    | <b>rtr</b> <i>number</i>   | Specifies an SAA operation and enters RTR configuration mode. |
| 2    | <b>type jitter dest-ipaddr</b> { <i>name   ipaddr</i> } <b>dest-port</b> <i>port number</i> [ <b>source-ipaddr</b> { <i>name   ip addr</i> }] [ <b>source-port</b> <i>port number</i> ] [ <b>control</b> { <i>enable   disable</i> }] [ <b>num-packets</b> <i>number of packets</i> ] [ <b>interval</b> <i>inter-packet interval</i> ] | Defines a UDP Jitter operation.                               |

## Configure a DLSw Operation

To define a DLSw operation, use the following commands starting in global configuration mode:

| Step | Command  | Purpose   |
|------|--|---|
| 1    | <b>rtr</b> <i>number</i>   | Specifies an SAA operation and enters RTR configuration mode. |
| 2    | <b>type dlsw peer-ipaddr</b> <i>ipaddr</i> [ <b>request-data-size</b> <i>bytes</i> ] | Defines a DLSw operation.                                     |

## Configure a DHCP Operation

To define a DHCP operation, use the following commands starting in global configuration mode:

| Step | Command                 | Purpose   |
|------|-------------------------|---|
| 1    | <code>rtr number</code> | Specifies an SAA operation and enters RTR configuration mode. |
| 2    | <code>type dhcp</code>  | Defines a DHCP operation.                                     |

## Configuring Optional Operation Characteristics

To configure optional characteristics, use one or more of the following commands in response time reporter configuration mode:

| Command   | Purpose  |
|---|--|
| <code>buckets-of-history-kept size</code>                               | For a pathEcho operation, sets the number of paths to store. For all other operations, sets the number ( <i>size</i> ) of data points to be kept.<br><br>This command is applicable for the following operations: DHCP, DLSw, and DNS.   |
| <code>distributions-of-statistics-kept size</code>                      | Sets the number of buckets or statistical distributions kept during the operation's lifetime. Size is the number of buckets that contain data counts for their intervals.<br><br>This command is applicable for the following operations: DHCP, DLSw, and DNS.                         |
| <code>filter-for-history {none   all   overthreshold   failures}</code> | Defines the type of information kept in the history table for the operation. This is a required command to enable history. All, overthreshold, or failures must be specified for history to work.<br><br>This command is applicable for the following operations: DHCP, DLSw, and DNS. |
| <code>frequency seconds</code>  | Sets the frequency for SAA operation.<br><br>This command is applicable for the following operations: DHCP, DLSw, DNS, HTTP, and jitter.   |
| <code>hours-of-statistics-kept hours</code>                             | Sets the number of hours for which statistics are maintained for the operation.<br><br>This command is applicable for the following operations: DHCP, DLSw, and DNS.   |
| <code>http-raw-request</code>   | This command is applicable for the following operations: HTTP.   |
| <code>lives-of-history-kept lives</code>                                | Enables history collection and sets the number of lives maintained in the history table for the operation.<br><br>This command is applicable for the following operations: DHCP, DLSw, and DNS.  |
| <code>lsr-path {name   ip addr} [name   ip addr] ...</code>             | Specifies the path on which to measure the ICMP echo response time.  |
| <code>owner text</code>   | Configures the SNMP owner of the operation.<br><br>This command is applicable for the following operations: DHCP, DLSw, DNS, HTTP, and jitter.   |

| Command   | Purpose   |
|---|---|
| <b>request-data-size</b> <i>bytes</i>                       | Sets the protocol data size in the payload of the operation's request packet.<br><br>This command is applicable for the following operations: DLSw and jitter. The default for the DLSw operation is 0 bytes. The range is 0 to 16384 bytes. The default for jitter is 32 bytes. The range is 16 to 1500 bytes. |
| <b>samples-of-history-kept</b> <i>samples</i>               | For a pathEcho operation, sets the number of hops in a path. For all other operations, RTR sets the number of samples to 1.<br><br>This command is applicable for the following operations: DHCP, DLSw, and DNS.  |
| <b>statistics-distribution-interval</b> <i>milliseconds</i> | Sets the time interval for each statistical distribution.<br><br>This command is applicable for the following operations: DHCP, DLSw, and DNS.  |
| <b>tag</b> <i>text</i>                                      | Logically links operations together in a group.<br><br>This command is applicable for the following operations: DHCP, DLSw, DNS, HTTP, and jitter.  |
| <b>timeout</b> <i>milliseconds</i>                          | Sets the amount of time the operation waits for a response from its request packet.<br><br>This command is applicable for the following operations: DHCP, DLSw, DNS, HTTP, and jitter. The default for DLSw is 30 seconds. The default for all other applicable operations is 5 seconds.                        |
| <b>threshold</b> <i>milliseconds</i>                        | Sets the rising threshold (hysteresis) that generates a reaction event and stores history information for the operation.<br><br>This command is applicable for the following operations: DHCP, DLSw, DNS, HTTP, and jitter.   |
| <b>tos</b> <i>number</i>                                    | Defines the IP ToS byte for request packets.<br><br>This command is applicable for the following operations: HTTP and jitter.   |
| <b>verify-data</b>  | Checks each operation response for corruption.  |

## Scheduling the Operation

After you have configured the operation, you must schedule the operation to begin capturing statistics and collecting error information. You can schedule an operation to start immediately or start at a certain month, day, or hour. Use the **pending** keyword to set an operation to wait to be triggered. Pending is also an internal state of the operation visible through SNMP.

To schedule an SAA operation, use the following command in global configuration mode:

| Command  | Purpose   |
|--|---|
| <b>rtr schedule</b> <i>number</i> [ <b>life</b> <i>seconds</i> ] [ <b>start-time</b> { <b>pending</b>   <b>now</b>   <i>hh:mm</i> [ <i>month</i> <i>day</i>   <i>day</i> <i>month</i> ]}] [ <b>ageout</b> <i>seconds</i> ] | Schedules the operation by configuring the time parameters. |

**Note** After you schedule the operation with the **rtr schedule** command, you cannot change the operation configuration with the **rtr** global configuration command. To change the configuration of a scheduled operation, use the **no** form of the **rtr** command. The **no** form of the command removes all the operation configuration information including the operation schedule, reaction configuration, and reaction triggers. You can now create a new configuration for the operation.

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

## Verifying SAA

To verify that the SAA feature is configured properly, use the following commands:

- **show rtr application**
- **show rtr collection-statistics**
- **show rtr operational-state**
- **show rtr configuration**

The following example verifies how many operations are running.

```
router#show rtr application
      Response Time Reporter
Version:2.1.0 Round Trip Time MIB
Max Packet Data Size (ARR and Data):16384
Time of Last Change in Whole RTR:*22:37:12.000 UTC Sat Mar 6 1993
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

      Supported Protocols
Protocol Type:ipIcmpEcho
Protocol Type:ipUdpEchoAppl
Protocol Type:ipTcpConn
Protocol Type:httpAppl
Protocol Type:dnsAppl
Protocol Type:jitterAppl
Protocol Type:dhcp

Number of configurable probe is 490
```

The following example verifies that the statistics are being collected for an HTTP operation:

```
router#show rtr collection-statistics
      Collected Statistics
```

```
Entry Number:1
HTTP URL:http://172.20.150.200
Start Time:*00:01:16.000 UTC Mon Mar 1 1993

          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
```

The following example verifies that the operations are running:

```
router#show rtr operational-state
      Current Operational State
Entry Number:3
Modification Time:*22:15:43.000 UTC Sat Mar 6 1993
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 Sat Mar 6 1993
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 output for the **show rtr operational-state** command and the **show rtr collection-statistics** command have been expanded to show detailed information about Jitter operations. The following example shows information about a Jitter operation which has been numbered as 1. For an explanation of the report fields, please see the documentation in the command reference section of this document.

```
saa-ts1-6#show rtr operational-state 1
      Current Operational State
Entry Number:1
Modification Time:*19:20:55.000 UTC Mon Mar 22 1993
Diagnostics Text:
Last Time this Entry was Reset:Never
Number of Octets in use by this Entry:1382
Number of Operations Attempted:1
Current Seconds Left in Life:3545
Operational State of Entry:active
Latest Operation Start Time:*19:20:55.000 UTC Mon Mar 22 1993
RTT Values:
NumOfRTT:10      RTTSum:32      RTTSum2:128
Packet Loss Values:
PacketLossSD:0 PacketLossDS:0
PacketOutOfSequence:0 PacketMIA:0      PacketLateArrival:0
InternalError:0      Busies:0
Jitter Values:
MinOfPositivesSD:4      MaxOfPositivesSD:4
NumOfPositivesSD:2      SumOfPositivesSD:8      Sum2PositivesSD:32
MinOfNegativesSD:4      MaxOfNegativesSD:4
NumOfNegativesSD:1      SumOfNegativesSD:4      Sum2NegativesSD:16
MinOfPositivesDS:0      MaxOfPositivesDS:0
NumOfPositivesDS:0      SumOfPositivesDS:0      Sum2PositivesDS:0
MinOfNegativesDS:4      MaxOfNegativesDS:4
NumOfNegativesDS:1      SumOfNegativesDS:4      Sum2NegativesDS:16
```

The following example verifies that the SAA is configured:

```
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

```

## Monitoring and Maintaining the SAA

To shut down the SAA (stop all operations and clear the SAA configuration), use the following command in global configuration mode:



**Caution** Use the **rtr reset** command only in extreme situations such as the incorrect configuration of a number of operations. The **rtr reset** command reconfigures the router to its startup configuration.

| Command                  | Purpose  |
|--------------------------|--|
| Router# <b>rtr reset</b> | Stops all operations and clears the SAA configuration information. |

In addition to stopping all operations and clearing the SAA configuration information, the **rtr reset** command returns the SAA feature to the startup condition. All rows in the `rttMonStatsCaptureTable` and `rttMonHistoryCaptureTable` will be deleted. This command does not reread the configuration stored in NVRAM. You must retype the SAA configuration.

## Configuration Examples

This section provides the following configuration examples for setting up operations on the router to monitor network performance and send notifications:

- Configuring a DHCP Operation Example
- Configuring a DLSw Operation Example
- Configuring a DNS Operation Example
- Configuring an HTTP Operation Example
- Configuring a Jitter Operation Example

## Configuring a DHCP Operation Example

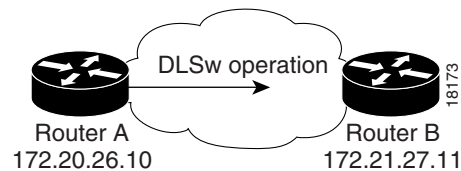
In the following example, SAA operation number 4 is configured as a DHCP operation enabled for DHCP server 172.16.20.3:

```
Router(config)# rtr 4
Router(config-rtr)# type dhcp
Router(config-rtr)# exit
Router(config)# ip dhcp-server 172.16.20.3
```

## Configuring a DLSw Operation Example

In the example shown in Figure 1, DLSw peers 172.20.26.10 and 172.21.27.11 are configured:

**Figure 1** DLSw Operation



### Router A

```
RouterA(config)# dlsw local-peer peer-id 172.20.26.10
RouterA(config)# dlsw remote-peer 0 tcp 172.21.27.11
RouterA(config)# rtr 1
RouterA(config-rtr)# type dlsw peer-ipaddr 172.21.27.11
RouterA(config-rtr)# exit
RouterA(config)# rtr schedule 1 start-time now
```

### Router B

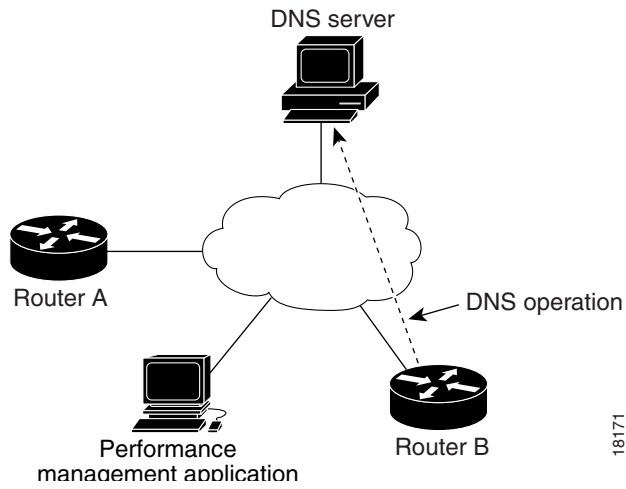
```
RouterB(config)# dlsw local-peer peer-ip 172.21.27.11
RouterB(config)# dlsw remote-peer 0 tcp 172.20.26.10
```

For more information on DLSw commands, see the “DLSw+ Commands” chapter of the *Cisco IOS 12.0 Bridging and IBM Networking Command Reference*.

## Configuring a DNS Operation Example

In the example shown in Figure 2, SAA operation 7 is created and configured as a DNS operation using the name server IP address 172.20.2.132:

**Figure 2 DNS Operation**



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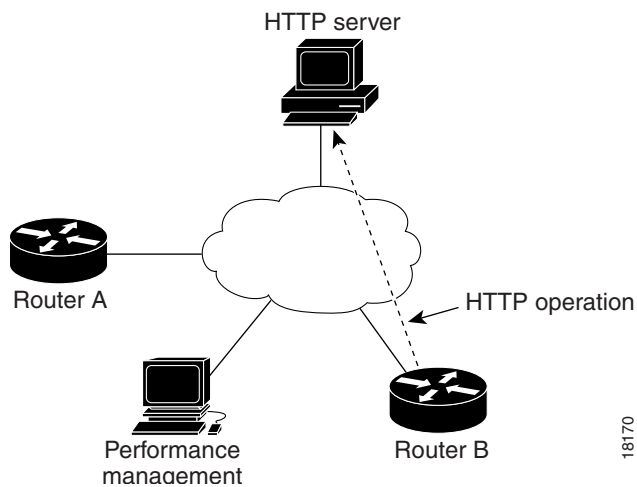
Router B

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

## Configuring an HTTP Operation Example

In the example shown in Figure 3, an HTTP operation is polling the HTTP server:

**Figure 3 HTTP Operation**



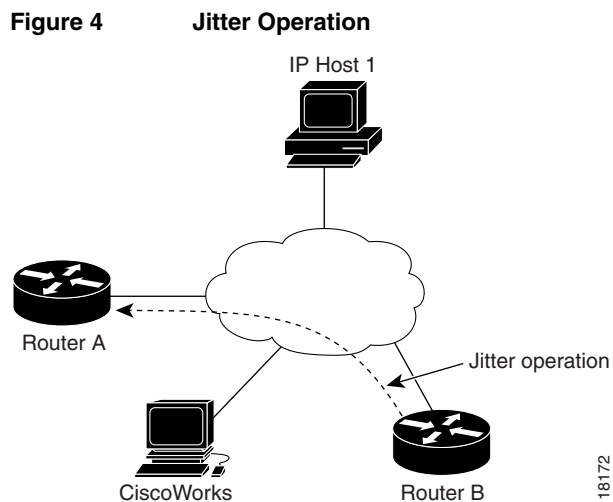
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Router B

```
RouterB(config)# rtr 1
RouterB(config-rtr)# type http operation get url http://www.cisco.com
```

## Configuring a Jitter Operation Example

In the example shown in Figure 4, SAA number 5 is created and configured as a Jitter operation using the destination IP address 172.24.132.100 destination UDP port number 99. The operation will send 20 packets at 20 ms intervals. You must enable the RTR responder on Router A for the Jitter operation to run.



Router B

```
RouterB(config)# rtr 5
RouterB(config-rtr)# type jitter dest-ip 172.24.132.100 dest-port 99 num-packets 20
interval 20
```

## Command Reference

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**Note** The SAA is a new name for the Response Time Reporter feature. The SAA document describes new enhancements that are available in Cisco IOS release 12.0(5)T. This feature module should be used in conjunction with the Cisco IOS release 12.0(3)T Response Time Reporter Enhancements feature module document. The command line interface for the feature does not reflect the name change; commands retain the RTR name.

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This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS release 12.0 command references and in the Cisco IOS 12.0(3)T Response Time Reporter Enhancements feature module.

- **rtr low-memory** (New)
- **show rtr operational-state** (Modified)
- **show rtr collection-statistics** (Modified)
- **type dhcp** (New)
- **type dlsw** (New)
- **type dns** (New)
- **type echo** (Modified)
- **type http** (New)
- **type jitter** (New)

In Cisco IOS Release 12.0(1)T or later, you can search and filter the output for **show** and **more** commands. This functionality is useful when you need to sort through large amounts of output, or if you want to exclude output that you do not need to see.

To use this functionality, enter a **show** or **more** command followed by the “pipe” character (|), one of the keywords **begin**, **include**, or **exclude**, and an expression that you want to search or filter on:

```
command | {begin | include | exclude} regular-expression
```

Following is an example of the **show atm vc** command in which you want the command output to begin with the first line where the expression “PeakRate” appears:

```
show atm vc | begin PeakRate
```

For more information on the search and filter functionality, refer to the Cisco IOS Release 12.0(1)T feature module titled *CLI String Search*.

## rtr low-memory

To configure how much system memory must be available to configure the SAA, use the **rtr low-memory** response time reporter 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

|              |  |
|--------------|--|
| <i>value</i> | Specifies amount of memory, in bytes, that must be available to configure the SAA. The range is 0 to the maximum amount of free memory bytes available. The default is 25 percent of the memory available on the system. |
|--------------|--|

### Defaults

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

### Command Modes

RTR configuration

### Command History

| Release  | Modification                       |
|----------|------------------------------------|
| 12.0(5)T | This command was first 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.

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 SAA is configured so that the router will have no less than 2 MB of free memory for the SAA:

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

## Related Commands

| <b>Command</b>     | <b>Description</b>   |
|--------------------|--|
| <b>rtr</b>         | Specifies an operation and enters response time reporter configuration mode. |
| <b>show memory</b> | Shows statistics about memory, including memory-free pool statistics.        |

## show rtr collection-statistics

To display information collected about SAA operations, use the **show rtr collection-statistics** EXEC command.

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

### Syntax Description

|                |   |
|----------------|---|
| <i>number</i>  | (Optional) Number of the SAA operation to display.  |
| <b>tabular</b> | (Optional) Displays information in a column format to reduce the number of screens required to display the information. |
| <b>full</b>    | (Optional) Displays all information using identifiers next to each displayed value. This is the default.                |

### Default

If an operation number is not specified, all current operations are displayed. If a format keyword is not specified, output is displayed in **full** format.

### Command Mode

EXEC

### Usage Guidelines

This command first appeared in Cisco IOS Release 11.2. The output for this command was expanded in Cisco IOS Release 12.0(5)T to include information for Jitter operations.

This command displays information collected for the amount of time specified by the **hours-of-statistics kept** command. Use the **show rtr collection-statistics** command to display information such as the number of failed operations and the failure reason. See the examples below for an explanation of the output fields.

## Sample Display

The following shows sample output from the **show rtr collection-statistics** command, where operation 1 is a Jitter operation:

```
Router# show rtr collection-statistics 1
      Collected Statistics

Entry Number:1
Target Address:10.0.55.106, Port Number:99
Start Time:*19:20:54.000 UTC Mon Mar 22 1993
RTT Values:
NumOfRTT:30      RTTSum:40      RTTSum2:160
Packet Loss Values:
PacketLossSD:0 PacketLossDS:0
PacketOutOfSequence:0 PacketMIA:0      PacketLateArrival:0
InternalError:0      Busies:0
Jitter Values:
MinOfPositivesSD:4      MaxOfPositivesSD:4
NumOfPositivesSD:2      SumOfPositivesSD:8      Sum2PositivesSD:32
MinOfNegativesSD:4      MaxOfNegativesSD:4
NumOfNegativesSD:3      SumOfNegativesSD:12     Sum2NegativesSD:48
MinOfPositivesDS:0      MaxOfPositivesDS:0
NumOfPositivesDS:0      SumOfPositivesDS:0      Sum2PositivesDS:0
MinOfNegativesDS:4      MaxOfNegativesDS:4
NumOfNegativesDS:1      SumOfNegativesDS:4      Sum2NegativesDS:16
```

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. Table 1 describes the significant fields shown in this output.

**Table 1** show rtr collection-statistics Field Descriptions

| Field                                | Description  |
|--------------------------------------|--|
| 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).   |
| 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/DS) cannot be determined.   |
| PacketLateArrival                    | The number of packets that arrived after the timeout.  |
| 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.                               |
| MinOfPositivesSD<br>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<br>MaxOfNegativesSD | The minimum and maximum negative jitter values from source to destination. The absolute value is given.                                      |

**Table 1** show rtr collection-statistics Field Descriptions (continued)

| <b>Field</b>     | <b>Description</b>   |
|------------------|--|
| 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.  |

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

Related Commands

- show rtr configuration**
- show rtr distributions-statistics**
- show rtr operational-state**
- show rtr totals-statistics**

## show rtr operational-state

To display the operational state of the last attempted SAA operation (probe), use the **show rtr operational-state** EXEC command.

```
show rtr operational-state [number] [tabular | full]
```

### Syntax Description

|                |   |
|----------------|---|
| <i>number</i>  | (Optional) Number of the SAA operation to display.  |
| <b>tabular</b> | (Optional) Displays information in a column format to reduce the number of screens required to display the information. |
| <b>full</b>    | (Optional) Displays all information using identifiers next to each displayed value. This is the default.                |

### Default

If an operation number is not specified, all current operations are displayed. If a format keyword is not specified, output is displayed in **full** format.

### Command Mode

EXEC

### Usage Guidelines

This command first appeared in Cisco IOS Release 11.2. The output for this command was expanded in Cisco IOS Release 12.0(5)T to include information for Jitter operations.

Use the **show rtr operational-state** command to determine whether a connection loss, timeout, or over-threshold occurred; how much life the specified operation has left; whether the operation is active; and the completion time. This command displays the results of the latest operation attempt.

## Sample Display

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

```
Router# show rtr operational-state 1 full

      Current Operational State
Entry Number: 1
Modification Time: *17:15:41.000 UTC Thu May 16 1996
Diagnostics Text:
Last Time this Entry was Reset: Never
Number of Octets in use by this Entry: 2438
Connection Loss Occurred: FALSE
Timeout Occurred: FALSE
Over Thresholds Occurred: FALSE
Number of Operations Attempted: 6
Current Seconds Left in Life: 3336
Operational State of Entry: active
Latest Completion Time (milliseconds): 60
Latest Operation Return Code: ok
Latest Operation Start Time: *17:19:41.000 UTC Thu May 16 1996
Latest Target Address: 172.16.1.176
```

The following example shows sample output when the specified operation is a Jitter operation:

```
Router# show rtr operational-state 1

      Current Operational State
Entry Number:1
Modification Time:*19:20:55.000 UTC Mon Mar 22 1993
Diagnostics Text:
Last Time this Entry was Reset:Never
Number of Octets in use by this Entry:1382
Number of Operations Attempted:1
Current Seconds Left in Life:3545
Operational State of Entry:active
Latest Operation Start Time:*19:20:55.000 UTC Mon Mar 22 1993
RTT Values:
NumOfRTT:10      RTTSum:32      RTTSum2:128
Packet Loss Values:
PacketLossSD:0 PacketLossDS:0
PacketOutOfSequence:0 PacketMIA:0 PacketLateArrival:0
InternalError:0      Busies:0
Jitter Values:
MinOfPositivesSD:4      MaxOfPositivesSD:4
NumOfPositivesSD:2      SumOfPositivesSD:8      Sum2PositivesSD:32
MinOfNegativesSD:4      MaxOfNegativesSD:4
NumOfNegativesSD:1      SumOfNegativesSD:4      Sum2NegativesSD:16
MinOfPositivesDS:0      MaxOfPositivesDS:0
NumOfPositivesDS:0      SumOfPositivesDS:0      Sum2PositivesDS:0
MinOfNegativesDS:4      MaxOfNegativesDS:4
NumOfNegativesDS:1      SumOfNegativesDS:4      Sum2NegativesDS:16
```

The values shown indicate the values for the last SAA operation. RTT stands for Round-Trip-Time. SD stands for Source-to-Destination. DS stands for Destination-to-Source. For a description of the output fields, see Table 1 in the **show rtr collection-statistics** command documentation.

## Related Commands

**show rtr collection-statistics**

## type dhcp

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

**type dhcp**

**no type dhcp**

### Syntax Description

This command has no arguments or keywords.

### Defaults

No default behavior or values.

### Command Modes

RTR configuration

### Command History

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

### Usage Guidelines

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

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

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

### 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
Router(config-rtr)# exit
Router(config)# ip dhcp-server 172.16.20.3
```

### Related Commands

| Command               | Description  |
|-----------------------|--|
| <b>rtr</b>            | Specifies an operation and enters response time reporter configuration mode. |
| <b>ip dhcp-server</b> | Specifies the address of one or more DHCP servers available on the network.  |

## type dlsw

To configure a DLSw SAA operation, use the **type dlsw** response time reporter 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

|                    |                   |
|--------------------|-------------------|
| <b>peer-ipaddr</b> | Peer destination. |
| <i>ipaddr</i>      | IP address.       |

### Defaults

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.

### Command Modes

RTR configuration

### Command History

| Release  | Modification                       |
|----------|------------------------------------|
| 12.0(5)T | This command was first 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.

### 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**

| <b>Command</b>           | <b>Description</b>  |
|--------------------------|---|
| <b>rtr</b>               | Specifies an operation and enters response time reporter configuration mode.  |
| <b>request-data-size</b> | Sets the protocol data size in the payload of the operation's request packet.<br>The default setting for a DLSw operation is 0. |
| <b>show dlsw peer</b>    | Displays DLSw peer information.   |

## type dns

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

```
type dns target-addr {name | ipaddr} name-server ipaddress  
no type dns target-addr target address name-server ipaddress
```

### Syntax Description

|                             |   |
|-----------------------------|---|
| <b>target-addr</b>          | Target IP address for the operation to measure. |
| <i>name</i>   <i>ipaddr</i> | IP host name or IP host address.                |
| <b>name-server</b>          | Name server of the Domain Name Server.          |
| <i>ipaddress</i>            | IP address of the Domain Name Server.           |

### Defaults

No default behavior or values.

### Command Modes

RTR configuration

### Command History

| Release  | Modification                       |
|----------|------------------------------------|
| 12.0(5)T | This command was first 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  |
|------------|--|
| <b>rtr</b> | Specifies an operation and enters response time reporter configuration mode. |

## type echo

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

**type echo protocol** *protocol-type target-addr* [**source-ipaddr** *ipaddr*]

**no type echo protocol** *protocol-type target-addr* [**source-ipaddr** *ipaddr*]

### Syntax Description

|  |  |
|--|--|
| <b>protocol</b>                            | Protocol used by the operation.  |
| <i>protocol-type</i><br><i>target-addr</i> | Protocol used by the operation. Type can be one of the following keywords (the keywords available depend on the Cisco IOS software features installed on your router) followed by the required parameter (appropriate target address): <ul style="list-style-type: none"> <li>• <b>ipIcmpEcho</b> {<i>ip-address</i>   <i>ip-host-name</i>}—IP/ICMP Echo that requires a destination IP address or IP host name.</li> <li>• <b>snaRUEcho</b> <i>sna-host-name</i>—SNA's SSCP Native Echo that requires the host name defined for the SNA's PU connection to VTAM.</li> <li>• <b>snaLU0EchoAppl</b> <i>sna-host-name</i> [<i>sna-host-application-name</i>] [<i>sna-mode</i>] —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.</li> <li>• <b>snaLU2EchoAppl</b> <i>sna-host-name</i> [<i>sna-host-application-name</i>] [<i>sna-mode</i>] —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.</li> </ul> |
| <b>source-ipaddr</b>                       | Source for type echo operation.  |
| <i>ipaddr</i>                              | IP address of source for echo operation.   |

### Defaults

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

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

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

### Command Modes

RTR configuration

## type echo

---

### Command History

| Release  | Modification                       |
|----------|------------------------------------|
| 11.2     | This command was first introduced. |
| 12.0(5)T | This command was modified.         |

### Usage Guidelines

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

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.

---

### Examples

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

```
rtr 10
  type echo protocol ipIcmpEcho 172.16.1.175
```

### Related Commands

| Command                       | Description   |
|-------------------------------|---|
| <b>rtr</b>                    | Specifies an operation and enters response time reporter configuration mode.                            |
| <b>show rtr configuration</b> | Displays configuration values including all defaults for all RTR operations or the specified operation. |

## type http

To configure an HTTP response time reporter operation, use the **type http** response time reporter 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

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

### Default

No default behavior or values.

### Command Mode

RTR configuration

### Command History

| Release  | Modification                       |
|----------|------------------------------------|
| 12.0(5)T | This command was first 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`.

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

#### HTTP RAW operation using RAW submodule

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

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

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

### Related Commands

| Command          | Description   |
|------------------|---|
| <code>rtr</code> | Specifies an SAA operation and enters RTR configuration mode. |

## type jitter

To configure a jitter SAA operation, use the **type jitter** response time reporter 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

|                              |   |
|------------------------------|---|
| <b>dest-ipaddr</b>           | Destination.  |
| <i>name</i>                  | IP host name.   |
| <i>ipaddr</i>                | IP address.   |
| <b>dest-port</b>             | Destination port.   |
| <i>port number</i>           | Port number of the destination port.  |
| <b>source-ipaddr</b>         | (Optional) Source IP address.   |
| <i>name</i>                  | IP host name.   |
| <i>ipaddr</i>                | IP address.   |
| <b>source-port</b>           | (Optional) Source port.   |
| <i>port number</i>           | Port number of the source.  |
| <b>control</b>               | (Optional) Combined with the enable or disable keyword, enables or disables sending a control message to the destination port.              |
| <b>enable</b>                | Enables the SAA collector to send a control message to the destination port prior to sending a operation packet. This is the default value. |
| <b>disable</b>               | Disables the SAA from sending a control message to the responder prior to sending a operation packet.                                       |
| <b>num-packets</b>           | (Optional) Packet number. The default value is 10.  |
| <i>number of packets</i>     | Number of packets.  |
| <b>interval</b>              | (Optional) Interval.  |
| <i>inter-packet interval</i> | Inter-packet interval in milliseconds. The default value is 20 ms.  |

### Defaults

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

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

### Command Modes

RTR configuration

## type jitter

---

### Command History

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

### Usage Guidelines

You must enable the RTR (SAA) responder on the target router before you can configure a jitter operation.

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   |
|------------|---|
| <b>rtr</b> | Specifies an SAA operation and enters RTR configuration mode. |

## Debug Commands

This section documents modified debug commands. All other commands used with this feature are documented in the Cisco IOS Release 12.0 Command References.

- **debug rtr error**
- **debug rtr trace**

## debug rtr error

To enable logging of SAA runtime errors, use the **debug rtr error** EXEC command. To disable debugging output, use the **no** form of this command.

**[no] debug rtr error** [*probe*]

### Syntax Description:

*probe* (Optional) Number of the probe in the range 0 to 31.

### Defaults

Logging is off.

### Command History

| Release  | Modification                       |
|----------|------------------------------------|
| 11.2     | This command was first introduced. |
| 12.0(5)T | This command was modified          |

### Usage Guidelines

The **debug rtr error** command displays runtime errors. When a probe number other than 0 is specified, all runtime errors for that probe are displayed when the probe is active. When the probe number is 0 all runtime errors relating to the response time reporter scheduler process are displayed. When no probe number is specified, all runtime errors for all active probes configured on the router and probe control are displayed.

---

**Note** Use the **debug rtr error** command before using the **debug rtr trace** command because the **debug rtr error** command generates a smaller amount of debug output.

---

### Examples

The following example shows output from the **debug rtr error** command. The output indicates failure because the target is not there or because the responder is not enabled on the target. All debug output for the response time reporter (including **debug rtr trace**) has the format shown in Table 2.

```
Router# debug rtr error
May  5 05:00:35.483: control message failure:1
May  5 05:01:35.003: control message failure:1
May  5 05:02:34.527: control message failure:1
May  5 05:03:34.039: control message failure:1
May  5 05:04:33.563: control message failure:1
May  5 05:05:33.099: control message failure:1
May  5 05:06:32.596: control message failure:1
May  5 05:07:32.119: control message failure:1
May  5 05:08:31.643: control message failure:1
May  5 05:09:31.167: control message failure:1
May  5 05:10:30.683: control message failure:1
```

---

Table 2 describes the **debug rtr error** command fields.

**Table 2**      **Debug SAA Error Field Descriptions**

| <b>Field</b>  | <b>Description</b>  |
|---|---|
| RTR 1   | Number of the probe generating the message.                     |
| Error Return Code   | Message identifier indicating the error type (or error itself). |
| LU0 RTR Probe 1   | Name of the process generating the message.                     |
| in echoTarget on call luReceive                                       | Supplemental messages that pertain to the message identifier.   |
| LuApiReturnCode of InvalidHandle -<br>invalid host name or API handle |   |

### Related Commands

| <b>Command</b>         | <b>Description</b>                        |
|------------------------|---|
| <b>debug rtr trace</b> | Traces the execution of an SAA operation. |

## debug rtr trace

To trace the execution of an SAA operation, use the **debug rtr trace** EXEC command. To disable trace debugging output (but not **debug rtr error** output), use the **no** form of this command.

[no] **debug rtr trace** [*probe*]

### Syntax Description:

*probe* (Optional) Number of the probe in the range 0 to 31.

### Defaults

No default behavior or values.

### Command History

| Release  | Modification                       |
|----------|------------------------------------|
| 11.2     | This command was first introduced. |
| 12.0(5)T | This command was modified          |

### Usage Guidelines

---

**Note** The **debug rtr trace** command can generate a large number of debug messages. First use the **debug rtr error** command, and then use the **debug rtr trace** on a per probe basis.

---

When a probe number other than 0 is specified, execution for that probe is traced. When the probe number is 0, the response time reporter scheduler process is traced. When no probe number is specified, all active probes and every probe control is traced.

The **debug rtr trace** command also enables **debug rtr error** command for the specified probe. However, the **no debug rtr trace** command does not disable the **debug rtr error** command. You must manually disable the command by using the **no debug rtr error** command.

All debug output (including **debug rtr error** command output) has the format shown in the **debug rtr error** command output example.

## Examples

The following output is from the **debug rtr trace** command. In this example, a probe is traced through a single operation attempt: the setup of a connection to the target, the attempt at an echo to calculate UDP packet response time.

```
rtr9#debug rtr trace
rtr9#RTR 1:Starting An Echo Operation - IP RTR Probe 1

May 5 05:25:08.584:rtr hash insert :3.0.0.3 3383
May 5 05:25:08.584:source=3.0.0.3(3383) dest-ip=5.0.0.1(9)
May 5 05:25:08.588:sending control msg:
May 5 05:25:08.588: Ver:1 ID:51 Len:52
May 5 05:25:08.592:cmd:command:RTT_CMD_UDP_PORT_ENABLE, ip:5.0.0.1, port:9,
duration:5000
May 5 05:25:08.607:receiving reply
May 5 05:25:08.607: Ver:1 ID:51 Len:8
May 5 05:25:08.623:local delta:8
May 5 05:25:08.627:delta from responder:1
May 5 05:25:08.627:received <16> bytes and responseTime = 3 (ms)
May 5 05:25:08.631:rtr hash remove:3.0.0.3 3383RTR 1:Starting An Echo Operation - IP
RTR Probe 1

May 5 05:26:08.104:rtr hash insert :3.0.0.3 2974
May 5 05:26:08.104:source=3.0.0.3(2974) dest-ip=5.0.0.1(9)
May 5 05:26:08.108:sending control msg:
May 5 05:26:08.108: Ver:1 ID:52 Len:52
May 5 05:26:08.112:cmd:command:RTT_CMD_UDP_PORT_ENABLE, ip:5.0.0.1, port:9,
duration:5000
May 5 05:26:08.127:receiving reply
May 5 05:26:08.127: Ver:1 ID:52 Len:8
May 5 05:26:08.143:local delta:8
May 5 05:26:08.147:delta from responder:1
May 5 05:26:08.147:received <16> bytes and responseTime = 3 (ms)
May 5 05:26:08.151:rtr hash remove:3.0.0.3 2974RTR 1:Starting An Echo Operation - IP
RTR Probe 1
```

## Related Commands

| Command                | Description                            |
|------------------------|--|
| <b>debug rtr error</b> | Enables logging of SAA runtime errors. |

