



## SAA SLM for ATM Interfaces

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The Cisco Service Assurance Agent (SAA) is an embedded performance monitoring utility in Cisco IOS software. The Service Level Monitor (SLM) is one of the features available in the SAA feature set.

The SAA Service Level Monitor (SLM) for ATM Interfaces feature expands the capabilities of SAA by providing detailed monitoring statistics for your ATM network. The SAA SLM can be used to gather statistics for either physical links or circuits. Monitoring service levels for ATM connections allows service providers to ensure that their networks are meeting or exceeding the performance outlined in service level agreements (SLAs).

### Specifications for the SAA SLM for ATM Interfaces Feature

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#### Feature History

Release	Modification
12.2(11)T	The SAA for ATM Interfaces (Service Level Monitor) feature was introduced. Only T1 ATM interfaces and DS1 Port Adapters were supported in this release.
12.2(15)T	The SAA SLM for ATM Interfaces feature was introduced to replace the SAA for ATM Interfaces feature: the command syntax was changed, and support for OC3 and DS3 (T3) ATM Port Adaptors was added.

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#### Supported Platforms

Cisco IAD2420 Smart Integrated Access Device (IAD); Cisco 2600 Series with T1 or E1 interfaces (Cisco 2650 and 2651 Modular Access Routers); Cisco 3660 Series with T1 or E1 ATM interfaces; Cisco MC3810 Multiservice Access Concentrators; and Cisco 7200 series. For support updates, see Feature Navigator.

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#### Document Version

1.0	August 5, 2003
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**Corporate Headquarters:**  
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

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## Information About SAA SLM for ATM Interfaces

To configure the SAA SLM for ATM Interfaces feature, you should understand the following concepts:

- [ATM Service Level Monitoring, page 2](#)
- [Enabling Operations on Both Ends of the Connection, page 4](#)

## ATM Service Level Monitoring

The SLM ATM operations provide both active and passive monitoring and can be applied to either interfaces or circuits.

Specifically, this feature provides four operations that perform the following functions:

- **Monitoring of a Physical Interface**—The SLM interface operation (“**type slm interface**”) provides physical layer (Layer 1) data for interfaces configured for ATM. This operation provides data for T1 (IMA) interfaces and Serial interfaces.
- **Monitoring of a Physical Controller**— The SLM controller operation (“**type slm controller**”) provides physical layer (Layer 1) data for controllers configured for ATM. This operation provides data for T1 or E1 controllers.
- **Monitoring of a ATM Link**—The SLM ATM interface operation (“**type slm atm interface**”) provides Layer 2 data for an ATM interface.
- **Monitoring of a ATM Circuit**—The SLM ATM circuit operation (“**type slm atm pvc interface**”) provides ATM permanent virtual circuit (PVC) data.

By using these operations together, you can generate statistics for the physical interface, the ATM connection as a whole, and for specific ATM circuits (PVCs). [Table 1](#) shows the correspondence between the operation name and the command used to enable the operation.

**Table 1** *Types of SAA Frame Relay Monitoring Operations*

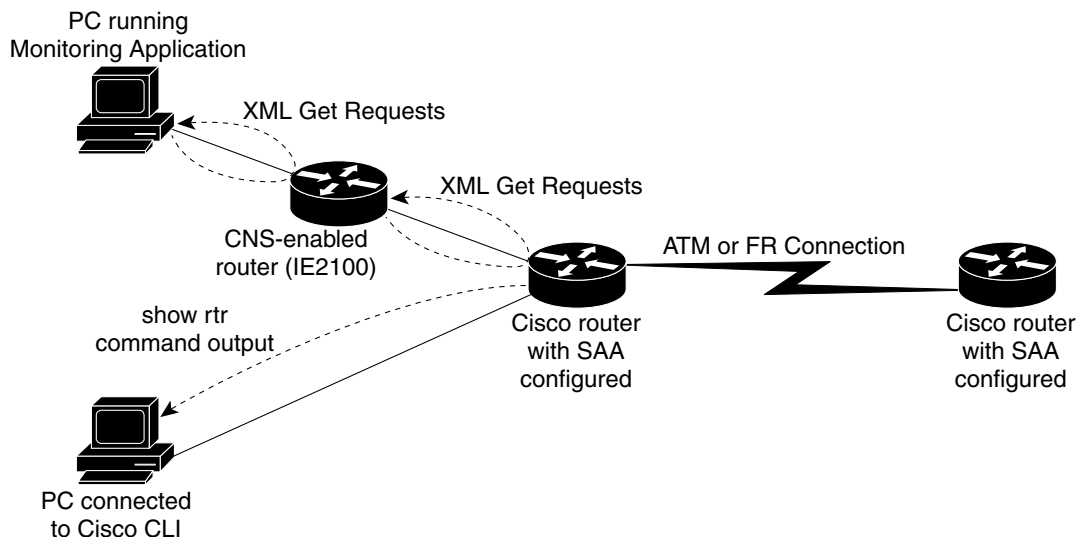
Operation	Purpose	Command	Name (Type) in CLI
SLM Interface or Controller Operation	Monitors a physical interface configured for ATM or Frame Relay.  For ATM, applies to T1 or E1 controllers, and IMA interfaces.	<b>type slm {interface   controller}</b>	“slm interface” or “slm controller”

**Table 1** Types of SAA Frame Relay Monitoring Operations

Operation	Purpose	Command	Name (Type) in CLI
SLM ATM Interface Operation	Monitors an ATM connection at the link layer.	<b>type slm atm interface</b>	“Slm Atm Interface”
SLM ATM Circuit Operation	Monitors an ATM permanent virtual circuit (PVC).	<b>type slm atm pvc interface</b>	“Slm Atm Pvc”

The metrics provided by SAA service level monitoring operations, such as the ATM SLM operations, are designed to provide information useful in determining that service level agreements (SLAs) are being met (SLA validation). Service providers can use the SLM ATM operations to determine round trip time (RTT), bandwidth usage, throughput, packet loss, burst analysis, delivery ratio, utilization, total frames transmitted, total frames received, and more. The SLM ATM operations can provide over 100 different metrics for traffic analysis.

The SAA for ATM Interfaces feature can be used with Cisco Networking Services (CNS). A device running CNS, such as the IE2100, can be used to retrieve the ATM performance statistics generated by the SAA. An XML Get or Set request can be issued from the IE2100 after the router registers with the CNS event agent. Additionally, these results can be passed, in an XML format, to other devices running third-party monitoring software, such as Visual Networks' UpTime application.

**Figure 1** Retrieval Methods for SAA SLM Operational Data

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SAA, when used with external applications such as Visual Network's UpTime, provides the information and toolsets required to:

- completely automate the collection, archiving, and presentation of data to validate a carrier SLA
- accurately measure network availability
- accurately measure network delay
- accurately measure throughput

Trending, reporting, troubleshooting and planning tools enhance the performance and availability of the integrated access network. This provides short and long-term cost savings through reduced downtime, increased productivity of network support staff, and optimization of the network.

## Enabling Operations on Both Ends of the Connection

Unlike other SAA operations, you do not enable the SAA Responder on the operational target (replying) device. Instead, to get the full monitoring statistics for ATM connections, you should enable the same operation on both the sending (agent) device and replying (target) device. SAA will automatically retrieve the additional statistics generated when the Frame Relay operations are configured on the target device. For ATM SLM operations, it may be helpful to think of the routers as “near-end” and “far-end” devices instead of as “sending” and “replying” devices.

## Restrictions

The following operations are not supported in the CISCO-RTTMON-MIB:

- HTTP first byte operations
- Frame Relay operations
- Path Jitter operations
- ATM interface service level monitoring operations
- Frame Relay service level monitoring operations
- Interface service level monitoring operations (Serial/HSSI/DDS/IMA-E1/IMA-T1)
- Controller service level monitoring operations (T1/E1/DS3/E3/FT1)

This means that ATM performance statistics cannot be retrieved from Cisco IOS devices using SNMP. This feature was designed to provide data by responding to extensible markup language (XML) requests.

## How to Configure SAA Monitoring for ATM Connections

To configure SAA Monitoring for ATM connections, perform one or more of the following tasks:

- [Configuring Monitoring of a Physical Interface or Controller, page 4](#)
- [Configuring Monitoring of an ATM Link, page 10](#)
- [Configuring Monitoring of a ATM Circuit, page 15](#)
- [Enabling CNS for SAA Data Retrieval, page 21](#)

## Configuring Monitoring of a Physical Interface or Controller

ATM monitoring using SAA can be configured for an interface or controller at the physical layer, for an interface at the data layer, or for a specific circuit. The follow task describes configuring the SAA operation for an ATM interface or controller at the physical layer.

All steps are required unless otherwise indicated.

## Restrictions

To enable full statistics gathering for SAA ATM service level monitoring operations, the operation must be configured on both ends of the ATM connection.

Standard SAA distribution and history statistics are not supported in SLM operations; instead, use the **show enhanced-history** commands. Enhanced history data is stored as individual samples in each bucket. Aggregated (averaged) data for SLM operations is not available from the CLI.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **atm slm statistics**
4. **rtr operation-id**
5. **type slm interface OR type slm controller**
6. **enhanced history**
7. **exit**
8. Repeat Steps 1 through 7 on the device at the far end of the connection.
9. **rtr schedule**
10. **end**
11. **copy running-config startup-config** (optional)
12. Allow statistics to be gathered for the desired amount of time.
13. **show rtr operational-state** (optional)
14. **show rtr enhanced-history collection-statistics** (optional)
15. **show rtr enhanced-history distribution-statistics** (optional)

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>atm slm statistics</b>  <b>Example:</b> Router(config)# atm-slm statistics	Enables the SAA SLM to collect ATM performance monitoring statistics. <ul style="list-style-type: none"> <li>• This command is required to begin gathering statistics for ATM interfaces or circuits.</li> </ul>
Step 4	<b>rtr operation-number</b>  <b>Example:</b> Router(config)# rtr 1	Specifies an identification number (ID) for the operation being configured, and enters SAA RTR configuration mode.

	Command or Action	Purpose
Step 5	<pre>type slm interface interface-id</pre> <p>OR</p> <pre>type slm controller controller-id</pre> <p><b>Example:</b>  Router(config-rtr)# type slm interface ATM 0.1  OR  Router(config-rtr)# type slm controller T1 0</p>	<p>Specifies that the operation is an SLM physical interface operation, which provides information about the data link layer connection, and specifies the interface that the operation should be run on.</p> <ul style="list-style-type: none"> <li>• Controllers that can be monitored using this operation include T1,E1,T3, and E3.</li> <li>• For a T1 controller operation on an Integrated (IMA) interface, use the <b>type slm interface IMA-interface-number</b> command.</li> <li>• The specified interface or controller should be configured for ATM.</li> <li>• The <b>type slm interface</b> or <b>type slm controller</b> commands bring you into SAA SLM Controller/Interface configuration mode.</li> </ul>
Step 6	<pre>enhanced-history interval seconds buckets number-of-buckets</pre> <p><b>Example:</b>  Router(config-rtr-slm-if)# enhanced-history interval 900 buckets 100</p>	<p>Enables SAA enhanced history for the operation. Performance statistics are stored in “buckets” which keep the accumulated data separate from each other. Each bucket consists of data accumulated over the specified interval. For Frame Relay SLM and ATM SLM operations, each bucket consists of 15 minutes (900 seconds) worth of statistics. The following line will be written to the configuration:</p> <pre>enhanced-history interval 900 buckets 100</pre> <p><b>Note</b> Regardless of the values entered for <i>seconds</i> and <i>number-of-buckets</i>, the default of value of a 900 second interval and 100 history buckets will be used. Your input is overridden in the ATM operations so that complete SLM statistics can be provided.</p>
Step 7	<pre>exit</pre> <p><b>Example:</b>  Router(config-rtr-slm-if)# exit</p>	<p>Exits SAA SLM Controller/Interface configuration mode.</p>
Step 8	<p>Repeat Steps 1 through 7 on the device at the far end of the connection.</p>	<p>—</p>
Step 9	<pre>rtr schedule operation-number {start-time {hh:mm[:ss] [month day   day month]   pending   now   after hh:mm:ss} [ageout seconds] [life {forever   seconds}]</pre> <p><b>Example:</b>  Router(config)# rtr schedule 1 start-time now life forever</p>	<p>Specifies when the operation should start.</p> <ul style="list-style-type: none"> <li>• This step, unlike Steps 1 through 7, only has to be performed on one end of the ATM connection.</li> </ul>
Step 10	<pre>end</pre> <p><b>Example:</b>  Router(config)# end</p>	<p>(Optional) Ends the current configuration session.</p>

	Command or Action	Purpose
Step 11	<pre>copy running-config startup-config</pre> or <pre>copy system:running-config nvram:startup-config</pre> <b>Example:</b> <pre>Router# copy running-config startup-config</pre>	(Optional) Saves the configuration to NVRAM.
Step 12	Allow statistics to be gathered for the desired amount of time.	—
Step 13	<pre>show rtr operational-state operation-number</pre> <b>Example:</b> <pre>Router# show rtr operation 1</pre>	(Optional) Displays the state of the operation and the statistics for the last probe operation.
Step 14	<pre>show rtr enhanced-history collection-statistics operation-number</pre> <b>Example:</b> <pre>Router# show rtr enhanced-history collection-statistics 1</pre>	(Optional) Displays data for all collected history buckets for the specified SAA operation with failure data for each bucket.
Step 15	<pre>show rtr enhanced-history distribution-statistics operation-number</pre> <b>Example:</b> <pre>Router# show rtr enhanced-history distribution-statistics 1</pre>	(Optional) Displays enhanced history data for all collected buckets in a summary table. <ul style="list-style-type: none"> <li>Because the enhanced history aggregation interval is fixed at 900 seconds for SLM operations, the optional <b>interval</b> keyword available for this command will not work for SLM operations.</li> </ul>

## Example

```
Router> enable
Password:
Router# configure terminal
Enter configuration commands, one per line.
Router(config)# atm-slm statistics
Router(config)# rtr 1
Router(config-rtr)# type slm controller T1 0
Router(config-rtr-slm-if)# enhanced-history interval 900 buckets 100
Router(config-rtr-slm-if)# exit
Router(config)# rtr schedule 1 start-time now life forever
Router(config)# end
Router#
slm1-3810-4# show rtr config 1
Entry number: 1
Owner:
Tag:
Type of operation to perform: slm controller
T1/E1/T3/E3 Controller: T1 0
Operation timeout (milliseconds): 5000
Operation frequency (seconds): 900
Next Scheduled Start Time: Start Time already passed
Life (seconds): Forever
```

```

Entry Ageout (seconds): never
Status of entry (SNMP RowStatus): Active
Connection loss reaction enabled: No
Timeout reaction enabled: No
Verify error enabled: No
Threshold reaction type: Never
Threshold (milliseconds): 5000
Threshold Falling (milliseconds): 3000
Threshold Count: 5
Threshold Count2: 5
Reaction Type: None
Number of statistic hours kept: 2
Number of statistic distribution buckets kept: 1
Statistic distribution interval (milliseconds): 20
Enhanced History:
Aggregation Interval:900 Buckets:100

```

```

Router#
Router# show rtr operational-state 1

```

```

Entry number: 1
Modification time: *02:13:28.643 UTC Mon May 5 2003
Number of operations attempted: 9
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): 0
Latest operation start time: *02:15:00.007 UTC Mon May 5 2003
Latest operation return code: OK

```

```

DslStatRxLineStatus: 16385
DslStatRxBPVs: 0, DslStatRxCrcFrameErrors: 0
DslStatRxErrSecs: 0, DslStatRxSevereErrSecs: 0
DslStatRxUnavailSecs: 0, DslStatRxBurstyErrSecs: 0

```

```
Sample Index = 9
```

```
Router# show rtr enhanced-history collection-statistics 1
```

```

Entry number: 1
Aggregation Interval: 900

Bucket Index: 1
Aggregation start time 00:15:00.004 UTC Mon May 5 2003
Target Address:
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

```

```

DslStatRxLineStatus: 16385
DslStatRxBPVs: 0, DslStatRxCrcFrameErrors: 0
DslStatRxErrSecs: 0, DslStatRxSevereErrSecs: 0
DslStatRxUnavailSecs: 0, DslStatRxBurstyErrSecs: 0

```

```

Sample Index = 1

Bucket Index: 2
Aggregation start time 00:30:00.005 UTC Mon May 5 2003
Target Address:
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

DslStatRxLineStatus: 16385
DslStatRxBPVs: 0,          DslStatRxCrcFrameErrors: 0
DslStatRxErrSecs: 0,      DslStatRxSevereErrSecs: 0
DslStatRxUnavailSecs: 0,  DslStatRxBurstyErrSecs: 0

```

```
Sample Index = 2
```

```
Bucket Index: 3
```

```
.
.
.
```

```
Rotuer# show rtr enhanced-history distribution-statistics 1
```

```
Point by point Enhanced History
```

```

Entry   = Entry Number
Int     = Aggregation Interval
BucI    = Bucket Index
StartT  = Aggregation Start Time
Pth     = Path index
Hop     = Hop in path index
Comps   = Operations completed
OvrTh   = Operations completed over thresholds
SumCmp  = Sum of RTT (milliseconds)
SumCmp2L = Sum of RTT squared low 32 bits (milliseconds)
SumCmp2H = Sum of RTT squared high 32 bits (milliseconds)
TMax    = RTT maximum (milliseconds)
TMin    = RTT minimum (milliseconds)

```

Entry	Int	BucI	StartT	Pth	Hop	Comps	OvrTh	SumCmp	SumCmp2L	SumCmp2H	n
1	900	1	900001	1	1	1	0	0	0	0	
1	900	2	1800003	1	1	1	0	0	0	0	
1	900	3	2700001	1	1	1	0	0	0	0	
1	900	4	3600002	1	1	1	0	0	0	0	
1	900	5	4500004	1	1	1	0	0	0	0	
1	900	6	5400002	1	1	1	0	0	0	0	
1	900	7	6300003	1	1	1	0	0	0	0	
1	900	8	7200001	1	1	1	0	0	0	0	
1	900	9	8100003	1	1	1	0	0	0	0	
.											
.											
.											

## What to Do Next

If SAA data is to be passed to a CNS enabled router, you should perform the task in the [“Enabling CNS for SAA Data Retrieval”](#) section on page 21.

## Configuring Monitoring of an ATM Link

ATM monitoring using SAA can be configured for an interface at the physical layer, for an interface at the data link layer, or for a specific circuit. The follow task describes configuring the SAA operation for a ATM interface at the data link layer.

### Restrictions

To enable full statistic gathering for the SAA ATM service level monitoring operation, the operation must be configured on both ends of the ATM connection.

Standard SAA distribution and history statistics are not supported in SLM operations. Aggregated (averaged) data for SLM operations is not available from the CLI. Enhanced history data is stored as individual samples in each bucket.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **atm-slm statistics**
4. **rtr operation-number**
5. **type slm atm interface**
6. **enhanced history**
7. **exit**
8. Repeat Steps 1 through 7 on the device at the far end of the connection.
9. **rtr schedule**
10. **end**
11. **copy running-config startup-config** (optional)
12. Allow statistics to be gathered for the desired amount of time.
13. **show rtr operational-state** (optional)
14. **show rtr enhanced-history collection-statistics** (optional)
15. **show rtr enhanced-history distribution-statistics** (optional)

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 3	<p><b>atm-slm statistics</b></p> <p><b>Example:</b> Router(config)# atm-slm statistics</p>	<p>Enables SAA to collect ATM performance monitoring statistics.</p> <ul style="list-style-type: none"> <li>This command is required to begin gathering statistics for the ATM interface or circuit.</li> </ul>
Step 4	<p><b>rtr operation-number</b></p> <p><b>Example:</b> Router(config)# rtr 2</p>	<p>Specifies an identification number for the operation being configured, and enters SAA RTR configuration mode.</p> <ul style="list-style-type: none"> <li>To stop a previously configured operation, use the <b>no rtr operation-number</b> command.</li> </ul>
Step 5	<p><b>type slm atm interface interface-id</b></p> <p><b>Example:</b> Router(config-rtr)# type slm atm interface ATM1/1/0</p>	<p>Specifies that the operation is an SLM ATM interface operation, which provides Layer 2 data for a ATM link, and specifies the interface that the operation should be run on.</p> <ul style="list-style-type: none"> <li>The specified interface should be configured for ATM.</li> <li>The ATM interface link statistics are used to monitor the basic health of a ATM interface. This information includes some traffic counters, assorted error counts, and some performance related counters.</li> </ul>
Step 6	<p><b>enhanced-history interval seconds buckets number-of-buckets</b></p> <p><b>Example:</b> Router(config-rtr-slm-atm-if)# enhanced-history interval 900 buckets 100</p>	<p>Enables SAA enhanced history for the operation. Performance statistics are stored in “buckets” which keep the accumulated data separate from each other. Each bucket consists of data accumulated over the specified interval. For Frame Relay SLM and ATM SLM operations, each bucket consists of 15 minutes (900 seconds) worth of statistics. The following line will be written to the configuration:</p> <pre>enhanced-history interval 900 buckets 100</pre> <p><b>Note</b> Regardless of the values entered for <i>seconds</i> and <i>number-of-buckets</i>, the default of value of a 900 second interval and 100 history buckets will be used. Your input is overridden in the ATM operations so that complete SLM statistics can be provided.</p>
Step 7	<p><b>exit</b></p> <p><b>Example:</b> Router(config-rtr-slm-atm-if)# exit</p>	<p>Exits SAA SLM ATM Interface configuration mode.</p>
Step 8	<p>Repeat Steps 1 through 7 on the device at the far end of the connection.</p>	—

	Command or Action	Purpose
Step 9	<pre>rtr schedule operation-number {start-time {hh:mm[:ss] [month day   day month]   pending   now   after hh:mm:ss} [ageout seconds] [life {forever   seconds}]</pre> <p><b>Example:</b> Router(config)# rtr schedule 2 start-time now life forever</p>	<p>Specifies when the operation should start.</p> <ul style="list-style-type: none"> <li>This step, unlike Steps 1 through 7, only has to be performed on one end of the ATM connection.</li> </ul>
Step 10	<pre>end</pre> <p><b>Example:</b> Router(config)# end</p>	(Optional) Ends the current configuration session.
Step 11	<pre>copy running-config startup-config or copy system:running-config nvram:startup-config</pre> <p><b>Example:</b> Router# copy running-config startup-config</p>	(Optional) Saves the configuration to NVRAM.
Step 12	Allow statistics to be gathered for the desired amount of time.	—
Step 13	<pre>show rtr operational-state operation-number</pre> <p><b>Example:</b> Router# show rtr operation 2</p>	(Optional) Displays the state of the operation and the statistics for the last probe operation.
Step 14	<pre>show rtr enhanced-history collection-statistics operation-number</pre> <p><b>Example:</b> Router# show rtr enhanced-history collection-statistics 2</p>	<p>(Optional) Displays data for all collected history buckets for the specified SAA operation with failure data for each bucket.</p> <ul style="list-style-type: none"> <li>Because the command displays statistics per bucket, and SLM operations are configured for 100 buckets, this command may generate a large amount of output. To escape back to the command line, use Ctrl-Z.</li> </ul>
Step 15	<pre>show rtr enhanced-history distribution-statistics operation-number</pre> <p><b>Example:</b> Router# show rtr enhanced-history distribution-statistics 2</p>	<p>(Optional) Displays enhanced history data for all collected buckets in a summary table.</p> <ul style="list-style-type: none"> <li>Because the enhanced history aggregation interval is fixed at 900 seconds for SLM operations, the optional <b>interval</b> keyword available for this command will not work for SLM operations.</li> </ul>

## Example

```
Router> enable
Password:
Router# configure terminal
Enter configuration commands, one per line.
Router(config)# atm-slm statistics
```

```

Router(config)# rtr 2
Router(config-rtr)# type slm atm interface ATM0
Router(config-rtr-slm-atm-if)# ?
SAA slm atm interface Configuration Commands:
! Only the following list of commands in this mode apply to SLM operations:
  default                Set a command to its defaults
  enhanced-history       Enable enhanced history collection
  exit                   Exit from RTR configuration mode
  no                     Negate a command or set its defaults
  owner                  Owner of Entry
  tag                    User defined tag
  threshold              Operation threshold in milliseconds
  timeout                Timeout of an operation

Router(config-rtr-slm-atm-if)# enhanced-history interval 900 buckets 100
Router(config-rtr-slm-atm-if)# exit
Router(config)# rtr schedule 2 start-time now life forever
Router(config)# end
Router# show rtr configuration 2
Entry number: 2
Owner:
Tag:
Type of operation to perform: Slm Atm Interface
Atm Interface: ATM0
Operation timeout (milliseconds): 5000
Operation frequency (seconds): 900
Next Scheduled Start Time: *12:44:59.851 PDT Fri Mar 26 1993
Life (seconds): Forever
Entry Ageout (seconds): never
Status of entry (SNMP RowStatus): Active
Connection loss reaction enabled: No
Timeout reaction enabled: No
Verify error enabled: No
Threshold reaction type: Never
Threshold (milliseconds): 5000
Threshold Falling (milliseconds): 3000
Threshold Count: 5
Threshold Count2: 5
Reaction Type: None
Number of statistic hours kept: 2
Number of statistic distribution buckets kept: 1
Statistic distribution interval (milliseconds): 20
Enhanced History:
Aggregation Interval:900 Buckets:100

Router# show rtr operational-state 2
Entry number: 2
Modification time: *17:00:07.502 PDT Sun June 29 2003
Number of operations attempted: 2476
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): 0
Latest operation start time: *11:59:59.856 PDT Fri Jul 4 2003
Latest operation return code: OK

LinkState :0
LinkState :0
Tx Total Cells: 185          Rx Total Cells: 185

```

```

Tx AAL1 Cells: 0           Rx AAL1 Cells: 0
Tx AAL2 Cells: 0           Rx AAL2 Cells: 0
Tx AAL5 Cells: 3           Rx AAL5 Cells: 3
Tx Path Cells: 0           Rx Path Cells: 0
Tx Plcp Framing: 2         Rx Plcp Framing: 0
Tx Plcp Errors: 0          Rx Plcp Errors: 0
Tx Corrected Cells: 0      Rx Corrected Cells: 0
Tx Uncorrected Cells: 0    Rx Uncorrected Cells: 0
Tx OCD Secs: 0             Rx OCD Secs: 0
Tx AIS Secs: 0             Rx AIS Secs: 0
Tx RDI Secs: 0             Rx RDI Secs: 0
Tx Max Cells Per Secs: 2   Rx Max Cells Per Secs: 2
Cell Replacement Events: 0  Rx Cell Unalyzed Data Event: 0
Tx Burst Percent1(sec): 900 Rx Burst Percent1(sec): 900
Tx Burst Percent2(sec): 0   Rx Burst Percent2(sec): 0
Tx Burst Percent3(sec): 0   Rx Burst Percent3(sec): 0
Tx Burst Percent4(sec): 0   Rx Burst Percent4(sec): 0
Tx Burst Percent5(sec): 0   Rx Burst Percent5(sec): 0

```

Sample Index = 2476

Router# **show rtr enhanced-history collection-statistics 2**

```

Entry number: 2
Aggregation Interval: 900
Bucket Index: 1
Aggregation start time 11:14:59.856 PDT Thu Jul 3 2003
Target Address:
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

```

```

LinkState :0
Tx Total Cells: 184       Rx Total Cells: 184
Tx AAL1 Cells: 0         Rx AAL1 Cells: 0
Tx AAL2 Cells: 0         Rx AAL2 Cells: 0
Tx AAL5 Cells: 3         Rx AAL5 Cells: 3
Tx Path Cells: 0         Rx Path Cells: 0
Tx Plcp Framing: 2       Rx Plcp Framing: 0
Tx Plcp Errors: 0        Rx Plcp Errors: 0
Tx Corrected Cells: 0     Rx Corrected Cells: 0
Tx Uncorrected Cells: 0   Rx Uncorrected Cells: 0
Tx OCD Secs: 0           Rx OCD Secs: 0
Tx AIS Secs: 0           Rx AIS Secs: 0
Tx RDI Secs: 0           Rx RDI Secs: 0
Tx Max Cells Per Secs: 2 Rx Max Cells Per Secs: 2
Cell Replacement Events: 0 Rx Cell Unalyzed Data Event: 0
Tx Burst Percent1(sec): 900 Rx Burst Percent1(sec): 900
Tx Burst Percent2(sec): 0   Rx Burst Percent2(sec): 0
Tx Burst Percent3(sec): 0   Rx Burst Percent3(sec): 0
Tx Burst Percent4(sec): 0   Rx Burst Percent4(sec): 0
Tx Burst Percent5(sec): 0   Rx Burst Percent5(sec): 0

```

Sample Index = 2377

```

Bucket Index: 2
Aggregation start time 11:29:59.852 PDT Thu Jul 3 2003

```

.

```

Router# show rtr enhanced-history distribution-statistics 2
Point by point Enhanced History
Entry    = Entry Number
Int      = Aggregation Interval (seconds)
BucI     = Bucket Index
StartT   = Aggregation Start Time
Pth      = Path index
Hop      = Hop in path index
Comps    = Operations completed
OvrTh    = Operations completed over thresholds
SumCmp   = Sum of RTT (milliseconds)
SumCmp2L = Sum of RTT squared low 32 bits (milliseconds)
SumCmp2H = Sum of RTT squared high 32 bits (milliseconds)
TMax     = RTT maximum (milliseconds)
TMin     = RTT minimum (milliseconds)

Entry Int BucI StartT      Pth Hop Comps OvrTh SumCmp SumCmp2L SumCmp2H TMax TMin
2     900 1   2140200001 1 1 1 0 0 0 0 0 0
2     900 2   2141100003 1 1 1 0 0 0 0 0 0
2     900 3   2142000001 1 1 1 0 0 0 0 0 0
2     900 4   2142900002 1 1 1 0 0 0 0 0 0
2     900 5   2143800004 1 1 1 0 0 0 0 0 0
2     900 6   2144700002 1 1 1 0 0 0 0 0 0
2     900 7   2145600004 1 1 1 0 0 0 0 0 0
2     900 8   2146500001 1 1 1 0 0 0 0 0 0
2     900 9   2147400003 1 1 1 0 0 0 0 0 0
2     900 10  2148300001 1 1 1 0 0 0 0 0 0
2     900 11  2149200002 1 1 1 0 0 0 0 0 0
2     900 12  2150100004 1 1 1 0 0 0 0 0 0
2     900 13  2151000002 1 1 1 0 0 0 0 0 0
2     900 14  2151900003 1 1 1 0 0 0 0 0 0
2     900 15  2152800001 1 1 1 0 0 0 0 0 0
--More--

```

## What to Do Next

If SAA data is to be passed to a CNS enabled router, you should perform the task in the [“Enabling CNS for SAA Data Retrieval”](#) section on page 21.

## Configuring Monitoring of a ATM Circuit

ATM monitoring using SAA can be configured for an interface at the physical layer, for an interface at the data link layer, or for a specific circuit. The follow task describes configuring the SAA operation for a ATM circuit.

## Restrictions

To enable full statistic gathering for the SAA ATM service level monitoring operation, the operation must be configured on both ends of the ATM connection.

Standard SAA distribution and history statistics are not supported in SLM operations; instead use the show enhanced history commands. Enhanced history data is stored as individual samples in each bucket. Aggregated (averaged) data for SLM operations is not available from the CLI.

## SUMMARY STEPS

All steps are required unless otherwise indicated.

1. **enable**
2. **configure terminal**
3. **atm-slm statistics**
4. **rtr operation-number**
5. **type slm atm pvc interface**
6. **enhanced history**
7. **exit**
8. Repeat Steps 1 through 7 on the device at the far end of the connection.
9. **rtr schedule**
10. **end**
11. **copy running-config startup-config** (optional)
12. Allow statistics to be gathered for the desired amount of time.
13. **show rtr operational-state** (optional)
14. **show rtr enhanced-history collection-statistics** (optional)
15. **show rtr enhanced-history distribution-statistics** (optional)

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>atm-slm statistics</b>  <b>Example:</b> Router(config)# atm-slm statistics	Enables SAA to collect ATM performance monitoring statistics. <ul style="list-style-type: none"> <li>• This command is required to begin gathering statistics for the ATM interface or circuit.</li> </ul>
Step 4	<b>rtr operation-number</b>  <b>Example:</b> Router(config)# rtr 3	Specifies an identification number for the operation being configured, and enters SAA RTR configuration mode.

	Command or Action	Purpose
Step 5	<p><b>type slm atm pvc interface</b> <i>interface-id</i> <i>pvc-id</i></p> <p><b>Example:</b> Router(config-rtr)# type slm atm pvc interface ATM0 100/100</p>	<p>Specifies that the operation is an SLM ATM circuit operation, which provides data for the specified circuit, and specifies the interface that the operation should be run on.</p> <ul style="list-style-type: none"> <li>The specified interface should be configured with a permanent virtual circuit (PVC) connection.</li> <li>The ATM circuit statistics are used to monitor the basic health of a ATM circuit. This information includes some traffic counters, assorted error counts, and some performance related counters.</li> <li>This command bring you into SAA SLM ATM Circuit configuration mode.</li> </ul>
Step 6	<p><b>enhanced-history interval</b> <i>seconds</i> <i>buckets</i> <i>number-of-buckets</i></p> <p><b>Example:</b> Router(config-rtr-slm-atm-pvc)# enhanced-history interval 900 buckets 100</p>	<p>Enables SAA enhanced history for the operation. Performance statistics are stored in “buckets” which keep the accumulated data separate from each other. Each bucket consists of data accumulated over the specified interval. For ATM SLM and ATM SLM operations, each bucket consists of 15 minutes (900 seconds) worth of statistics. The following line will be written to the configuration:</p> <p><b>enhanced-history interval 900 buckets 100</b></p> <p><b>Note</b> Regardless of the values entered for <i>seconds</i> and <i>number-of-buckets</i>, the default of value of a 900 second interval and 100 history buckets will be used. Your input is overridden in the ATM operations so that complete SLM statistics can be provided.</p>
Step 7	<p><b>exit</b></p> <p><b>Example:</b> Router(config-rtr)# exit</p>	Exits SAA SLM FR Circuit configuration mode.
Step 8	Repeat Steps 1 through 7 on the device at the far end of the connection.	—
Step 9	<p><b>rtr schedule</b> <i>operation-number</i> {<b>start-time</b> {<i>hh:mm[:ss]</i> [<i>month day</i>   <i>day month</i>]   <b>pending</b>   <b>now</b>   <b>after</b> <i>hh:mm:ss</i>} [<b>ageout</b> <i>seconds</i>] [<b>life</b> {<b>forever</b>   <i>seconds</i>}]</p> <p><b>Example:</b> Router(config)# rtr schedule 3 start-time now life forever</p>	<p>Specifies when the operation should start.</p> <ul style="list-style-type: none"> <li>This step, unlike Steps 1 through 7, only has to be performed on one end of the ATM connection.</li> </ul>
Step 10	<p><b>end</b></p> <p><b>Example:</b> Router(config)# end</p>	(Optional) Ends the current configuration session.

	Command or Action	Purpose
Step 11	<pre>copy running-config startup-config</pre> or <pre>copy system:running-config nvram:startup-config</pre> <b>Example:</b> <pre>Router# copy running-config startup-config</pre>	(Optional) Saves the configuration to NVRAM.
Step 12	Allow statistics to be gathered for the desired amount of time.	—
Step 13	<pre>show rtr operational-state operation-number</pre> <b>Example:</b> <pre>Router# show rtr operation 3</pre>	(Optional) Displays the state of the operation and the statistics for the last probe operation.
Step 14	<pre>show rtr enhanced-history collection-statistics operation-number</pre> <b>Example:</b> <pre>Router# show rtr enhanced-history collection-statistics 3</pre>	(Optional) Displays data for all collected history buckets for the specified SAA operation with failure data for each bucket. <ul style="list-style-type: none"> <li>Because this command displays statistics per bucket, and SLM operations are configured for 100 buckets, this command may generate a large amount of output. To escape back to the command line, use Ctrl-Z.</li> </ul>
Step 15	<pre>show rtr enhanced-history distribution-statistics operation-number</pre> <b>Example:</b> <pre>Router# show rtr enhanced-history distribution-statistics 3</pre>	(Optional) Displays enhanced history data for all collected buckets in a summary table. <ul style="list-style-type: none"> <li>Because the enhanced history aggregation interval is fixed at 900 seconds for SLM operations, the optional <b>interval</b> keyword available for this command will not work for SLM operations.</li> </ul>

## Examples

```
Router> enable
Password:
Router# configure terminal
Enter configuration commands, one per line.
Router(config)# atm-slm statistics
Router(config)# rtr 3
Router(config-rtr)# type slm atm pvc interface ATM0 100/100
Router(config-rtr-slm-atm-dlci)# enhanced-history interval 900 buckets 100
Router(config-rtr-slm-atm-dlci)# exit
Router(config)# rtr schedule 3 start-time now life forever
Router(config)# end
Router#
Router# show rtr configuration 3 | include Type
Type of operation to perform: Slm Atm Pvc
Reaction Type: None

Router# show rtr operational-state 3
Entry number: 3
Modification time: *00:12:35.686 UTC Thur May 1 2003
Number of operations attempted: 276
```

```

Number of operations skipped: 277
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): 16
Latest operation start time: *21:07:29.988 UTC Sat May 3 2003
Latest operation return code: OK

```

Sample Index = 277

```

Echo Receive Time = *00:22:30.005 UTC Thur May 1 2003
Echo Response Time = 21 (ms)
Remote IP Address      : 14.1.1.1          Remote Product Id      : 2198864392
Remote Interface Type : 32                Remote Interface Index: 11
Remote Circuit Index  : 111

```

```

Offered Frames/PDUs   : 2                Delivered Frames/PDUs: 2

```

```

Tx Total Frames: 2                Rx Total Frames: 2
Tx Total Octets: 60              Rx Total Octets: 70
Tx DeFrames: 0                   Rx DeFrames: 0
Tx MaxThroughput: 448            Rx MaxThroughput: 528
Rx FecnSeconds: 0                Rx BecnSeconds: 0
OctetsAboveCIR: 0               FramesAboveCIR: 0
Unavailable Seconds: 0

```

```

Tx Burst Percent1(sec): 900      Tx Burst Percent2(sec): 0
Tx Burst Percent3(sec): 0        Tx Burst Percent4(sec): 0
Tx Burst Percent5(sec): 0

```

Router# **show rtr enhanced-history collection-statistics 3**

```

Entry number: 3
Aggregation Interval: 900
!-----!
Bucket Index: 1
Aggregation start time 21:37:29.988 UTC Fri May 2 2003
Target Address:
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

```

Sample Index = 183

```

Echo Receive Time = *00:22:30.006 UTC Thur May 1 2003
Echo Response Time = 21 (ms)
Remote IP Address      : 14.1.1.1          Remote Product Id      : 2198864392
Remote Interface Type : 32                Remote Interface Index: 11
Remote Circuit Index  : 111

```

```

Offered Frames/PDUs   : 2                Delivered Frames/PDUs: 2

```

```

Tx Total Frames: 2                Rx Total Frames: 2
Tx Total Octets: 60              Rx Total Octets: 70
Tx DeFrames: 0                   Rx DeFrames: 0
Tx MaxThroughput: 448            Rx MaxThroughput: 528

```

```

Rx FecnSeconds: 0
OctetsAboveCIR: 0
Unavailable Seconds: 0

Rx BecnSeconds: 0
FramesAboveCIR: 0

Tx Burst Percent1(sec): 900
Tx Burst Percent3(sec): 0
Tx Burst Percent5(sec): 0

Tx Burst Percent2(sec): 0
Tx Burst Percent4(sec): 0

!-----!
Bucket Index: 2
Aggregation start time 21:52:29.990 UTC Fri May 2 2003
Target Address:
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

Sample Index = 184

Echo Receive Time = *00:22:30.007 UTC Thur May 1 2003
Echo Response Time = 21 (ms)
Remote IP Address : 14.1.1.1
Remote Interface Type : 32
Remote Circuit Index : 111

Remote Product Id : 2198864392
Remote Interface Index: 11

Offered Frames/PDUs : 2
Delivered Frames/PDUs: 2

Tx Total Frames: 2
Tx Total Octets: 60
Tx DeFrames: 0
Tx MaxThroughput: 448
Rx FecnSeconds: 0
OctetsAboveCIR: 0
Unavailable Seconds: 0

Rx Total Frames: 2
Rx Total Octets: 70
Rx DeFrames: 0
Rx MaxThroughput: 528
Rx BecnSeconds: 0
FramesAboveCIR: 0

Tx Burst Percent1(sec): 900
Tx Burst Percent3(sec): 0
Tx Burst Percent5(sec): 0

Tx Burst Percent2(sec): 0
Tx Burst Percent4(sec): 0

!-----!
Bucket Index: 3
Aggregation start time 22:07:29.993 UTC Fri May 2 2003
.
.
.

Router# show rtr enhanced-history distribution-statistics 3

Point by point Enhanced History
Entry = Entry Number
Int = Aggregation Interval (seconds)
BucI = Bucket Index
StartT = Aggregation Start Time
Pth = Path index
Hop = Hop in path index
Comps = Operations completed
OvrTh = Operations completed over thresholds
SumCmp = Sum of RTT (milliseconds)
SumCmp2L = Sum of RTT squared low 32 bits (milliseconds)
SumCmp2H = Sum of RTT squared high 32 bits (milliseconds)
TMax = RTT maximum (milliseconds)
TMin = RTT minimum (milliseconds)

```

Entry	Int	BucI	StartT	Pth	Hop	Comps	OvrTh	SumCmp	SumCmp2L	SumCmp2H	n
3	900	1	166050003	1	1	2	0	28	394	0	
3	900	2	166950001	1	1	2	0	29	421	0	
3	900	3	167850002	1	1	2	0	31	481	0	
3	900	4	168750000	1	1	2	0	30	450	0	
3	900	5	169650002	1	1	2	0	27	369	0	
3	900	6	170550000	1	1	2	0	29	421	0	
3	900	7	171450001	1	1	2	0	31	481	0	
3	900	8	172350003	1	1	2	0	30	452	0	
3	900	9	173250001	1	1	2	0	29	421	0	
3	900	10	174150002	1	1	2	0	31	481	0	
.											
.											
.											

## What to Do Next

If SAA data is to be passed to a CNS enabled router, you should perform the task [“Enabling CNS for SAA Data Retrieval”](#).

## Enabling CNS for SAA Data Retrieval

If a CNS-enabled device will be used to retrieve data, you must also enable the CNS client on one of the devices running the SAA operation.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **cns id**
4. **cns event**
5. **end**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>• Enter your password if prompted.</li></ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 3	<b>cns id</b> <i>interface-id</i> <b>ip-address</b> <b>event</b>  <b>Example:</b> Router(config)# <b>cns id</b> Ethernet2/0 <b>ipaddress</b> <b>event</b>	Sets the unique event identification value (ID) used by the remote CNS agent. <ul style="list-style-type: none"> <li>The event ID value is used to identify the router for CNS event services.</li> <li>The <b>ip-address</b> keyword specifies that the IP address for the interface should be used as the event ID. For SAA, only the IP-address should be used as the event ID.</li> </ul>
Step 4	<b>cns event</b> { <i>hostname</i>   <i>ip-address</i> } [ <i>port-number</i> ] <b>[encrypt]</b> [ <b>backup</b> ] <b>keepalive</b> <i>seconds</i> <i>retry-count</i> [ <b>source</b> <i>ip-address</i> ] [ <b>force-fmt1</b> ]	Enables the Cisco Networking Services (CNS) event gateway, allowing access to the remote CNS agent.
Step 5	<b>end</b>  <b>Example:</b> Router(config)# <b>end</b>	(Optional) Ends the current configuration session.

## Configuration Examples for SAA Monitoring for ATM Connections

The following example shows a typical configuration with all three ATM SLM operations configured, as well as the CNS commands needed for passing this information to a remote CNS server.

```
Router# show running-configuration
Building configuration...
!
version 12.3
no service pad
service timestamps debug uptime
service timestamps log uptime
. . .
!
frame-relay switching
!
voice call carrier capacity active
no voice confirmation-tone
no voice hpi capture buffer
no voice hpi capture destination
!
voice-card 0
!
atm slm statistics
!
controller T1 0
framing esf
linecode b8zs
channel-group 0 timeslots 24
!
!
```

```
interface Ethernet0
 ip address 209.165.202.129 255.255.255.224
 no ip mroute-cache
 no cdp enable
!
interface Serial0
 no ip address
 encapsulation frame-relay
 no ip mroute-cache
 shutdown
 clockrate 64000
 no fair-queue
 frame-relay class cisco
 frame-relay traffic-shaping
 frame-relay intf-type dce
!
interface Serial0.1 point-to-point
 frame-relay interface-dlci 101
!
interface Serial1
 description physical connection to c1ne-2
 mtu 5000
 no ip address
 encapsulation frame-relay
 no ip mroute-cache
 load-interval 30
 shutdown
 no arp frame-relay
 frame-relay lmi-type q933a
!
interface Serial0:0
 ip address 209.165.200.226 255.255.255.224
 encapsulation frame-relay
 frame-relay interface-dlci 111
 frame-relay intf-type dce
!
interface FR-ATM20
 no ip address
 encapsulation frame-relay
 shutdown
!
ip default-gateway 10.4.23.1
ip classless
ip route 0.0.0.0 0.0.0.0 Ethernet0
no ip http server
!
!
!
map-class frame-relay cisco
 frame-relay cir 64000
 frame-relay bc 8000
 frame-relay be 16000
 frame-relay mincir 32000
 frame-relay adaptive-shaping becn
 frame-relay fecn-create
!
map-class frame-relay set_fecn_becn
 frame-relay fecn-adapt
!
!
snmp-server enable traps rtr
snmp-server host 209.165.200.225 public
!
rtr slm frame-relay statistics
```

```

rtr responder
rtr 1
  type slm controller T1 0
  enhanced-history interval 900 buckets 100
rtr schedule 1 start-time now life forever
rtr 2
  type slm frame-relay interface Serial0:0
  enhanced-history interval 900 buckets 100
rtr schedule 2 start-time now life forever
rtr 3
  type slm frame-relay pvc interface Serial0:0 111
  enhanced-history interval 900 buckets 100
rtr schedule 3 start-time now life forever
!
.
.
!
cns id Ethernet0 ipaddress event
cns event 172.19.209.172 11027 keepalive 30 3
!
cns notifications encapsulation snmp

```

## Additional References

For additional information related to SAA Monitoring for ATM Connections, refer to the following references:

## Related Documents

Related Topic	Document Title
SAA Configuration	Cisco IOS Configuration Fundamentals and Network Monitoring Configuration Guide and Command Reference, Release 12.3
SAA for Frame Relay Interfaces	“SAA for Frame Relay Interfaces,” Release 12.3 Feature Guide

## Standards

No relevant standards.

## MIBs

MIBs	MIBs Link
<ul style="list-style-type: none"><li>CISCO-RTTMON-MIB; “Response Time Monitor MIB”</li></ul>	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

## RFCs

No relevant RFCs.

## Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

# Command Reference

This section documents new and modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.3 command reference publications.

- [atm-slm statistics](#)
- [type slm interface](#)
- [type slm controller](#)
- [type slm atm interface](#)
- [type slm atm pvc interface](#)
- [show rtr enhanced-history distribution-statistics](#)

# atm-slm statistics

To enable the Service Assurance Agent (SAA) or Cisco Networking services (CNS) to collect ATM performance monitoring statistics, use the **atm-slm statistics** command in global configuration mode. To disable the collection of ATM performance monitoring statistics, use the no form of this command.

**atm-slm statistics**

**no atm-slm statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Collection of ATM performance monitoring statistics is disabled.

## Command Modes

Global configuration mode

## Command History

Release	Modification
12.2(11)T	This command was introduced.

## Usage Guidelines

To generate and retrieve performance statistics for ATM services using SAA, the SAA ATM feature must first be enabled on the device using the **atm-slm statistics** global configuration command. (Note that these performance statistics can be retrieved by other applications, such as CNS.) If this command is not used, the ATM SLM operations (**type slm interface**, **type slm controller**, **type slm atm interface**, or **type slm atm pvc interface**) can not be configured on the system. Service level monitoring (SLM) techniques include gathering physical link and circuit performance statistics.



### Note

Disabling the SAA ATM SLM feature with the **no atm-slm statistics** command will cause any currently configured ATM SLM operations to be removed from the running configuration.

When SAA ATM is disabled, no CNS/XML requests are processed.

## Examples

In the following example, the SAA ATM feature is enabled to collect ATM performance monitoring statistics before a permanent virtual circuit (PVC) SAA performance monitoring operation is configured for ATM interface 0/1:

```
Router(config)# atm-slm statistics
Router(config)# rtr 1
Router(config-rtr)# type slm atm interface ATM0/1
Router(config-rtr-slm)# enhanced-history interval 900 buckets 100
Router(config-rtr-slm)# exit
Router(config)# rtr schedule 1 start-time now life forever
```

# type slm interface

To configure an SAA operation as an SLM interface operation, and specify the interface that the operation should be run on, use the **type slm interface** command in SAA RTR configuration mode. To remove or replace a previously configured SAA operation, use the **no rtr operation-number** global configuration command.

**type slm interface** *interface-id*

## Syntax Description

<i>interface-id</i>	The interface type and number. Interface types include <b>Serial</b> and <b>FR-ATM</b> . Alternatively, an Inverse Multiplexing over ATM (IMA) group number can be specified.
---------------------	---

## Defaults

No default behavior or values.

## Command Modes

SAA RTR configuration mode (config-rtr)

## Command History

Release	Modification
12.2(11)T	This command was introduced to support ATM SLM operations.
12.2(13)T	This command was updated to support T1 IMA (ATM) interfaces.
12.3(1)	This command was updated to support FR SLM operations (Serial interfaces).

## Usage Guidelines

The **type slm interface** SAA RTR configuration command specifies that the operation is an SLM physical interface operation, which provides information about the data link layer connection. The specified interface should be configured for Frame Relay or ATM.

Interfaces that can be monitored using this operation include Serial or HSSI (high speed serial interface) for Frame Relay interfaces, and IMA for ATM interfaces. To specify an HSSI interface, use the **Serial** keyword in the *interface-id*.

In order for this operation to work, either the **atm slm statistics** global configuration command or the **rtr slm frame-relay statistics** global configuration command must be enabled on the device.

This command takes you into SAA SLM controller/interface configuration mode, in which you can configure optional characteristics for the operation. To view the available options, enter the **?** command at the (config-rtr-slm-if) prompt.

## Examples

In the following example, SAA operation 1 is configured as an SLM interface operation for a frame relay interface:

```
Router> enable
Password:
Router# configure terminal
Enter configuration commands, one per line.
```

```

Router(config)# atm-slm statistics
Router(config)# rtr 1
Router(config-rtr)# type slm interface Serial 0.1
Router(config-rtr-slm-if)# enhanced-history interval 900 buckets 100
Router(config-rtr-slm-if)# exit
Router(config)# rtr schedule 1 start-time now life forever
Router(config)# end
Router#
Router# show rtr configuration 1 | include Type
Type of operation to perform: slm interface
Reaction Type: None
Router#

```

**Related Commands**

Command	Description
<b>rtr</b>	Allows configuration of SAA operations by entering SAA RTR configuration mode for the specified operation number.
<b>show rtr enhanced-history collection-statistics</b>	Displays data for all collected history buckets for the specified SAA operation, with data for each bucket shown individually.
<b>show rtr enhanced-history distribution-statistics</b>	Displays enhanced history data for all collected buckets in a summary table.
<b>type slm controller</b>	Specifies that the SAA operation is an SLM controller operation, and specifies the controller that the operation should be run on.

# type slm controller

To configure an SAA operation as an SLM interface operation, and specify the interface that the operation should be run on, use the **type slm interface** command in SAA RTR configuration mode. To remove or replace a previously configured SAA operation, use the **no rtr operation-number** global configuration command.

**type slm controller** *controller-id*

## Syntax Description

<i>controller-id</i>	The controller type and slot/port number. Valid controller types include <b>E1</b> , <b>E3</b> , <b>T1</b> , and <b>T3</b> .
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## Defaults

No default behavior or values

## Command Modes

SAA RTR configuration mode (config-rtr)

## Command History

Release	Modification
12.2(15)T	This command was introduced for controllers using ATM. This command replaced the <b>type t1-slm</b> command.
12.3(1)	Support for controllers configured for Frame Relay was added.

## Usage Guidelines

This SAA RTR configuration command specifies that the operation is an SLM physical controller operation, which provides information about the data link layer connection, and specifies the controller that the operation should be run on.

Controllers that can be monitored using this operation include T1,E1,T3, and E3.

The specified controller should be configured for Frame Relay or ATM.

## Examples

In the following example, SAA operation 1 is configured as an SLM controller operation:

```
Router> enable
Password:
Router# configure terminal
Enter configuration commands, one per line.
Router(config)# atm-slm statistics
Router(config)# rtr 1
Router(config-rtr)# type slm controller T1 0
Router(config-rtr-slm-if)# enhanced-history interval 900 buckets 100
Router(config-rtr-slm-if)# exit
Router(config)# rtr schedule 1 start-time now life forever
Router(config)# end
Router#
Router# show rtr configuration 1 | include Type
Type of operation to perform: slm controller
Reaction Type: None
Router#
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>rtr</b>	Allows configuration of SAA operations by entering SAA RTR configuration mode for the specified operation number.
<b>show rtr enhanced-history collection-statistics</b>	Displays data for all collected history buckets for the specified SAA operation, with data for each bucket shown individually.
<b>show rtr enhanced-history distribution-statistics</b>	Displays enhanced history data for all collected buckets in a summary table.
<b>type slm interface</b>	Specifies that the SAA operation is an SLM interface operation, and specifies the interface that the operation should be run on.

# type slm atm interface

To configure an SAA operation as an SLM ATM interface operation, and specify the interface that the operation should be run on, use the **type slm atm interface** command in SAA RTR configuration mode. To remove or replace a previously configured SAA operation, use the **no rtr operation-number** global configuration command.

**type slm atm interface** *interface-id*

<b>Syntax Description</b>	<i>interface-id</i>	The interface type ( <b>ATM</b> ) and number (slot/port-adapter/port).
<b>Defaults</b>	No default behavior or values	
<b>Command Modes</b>	SAA RTR configuration mode (config-rtr)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(15)T	This command was introduced as part of the SAA SLM for ATM Interfaces feature. This command replaced the <b>type atm-slm interface</b> command.

## Usage Guidelines

The SAA SLM ATM interface operation provides monitoring data for an ATM connection at the link layer. The **type slm atm interface** command specifies the operation type and the interface that the operation should be run on. The specified interface should be configured for ATM.

The ATM interface link statistics are used to monitor the basic health of a ATM interface. This information includes some traffic counters, assorted error counts, and some performance related counters.

For SLM operations to function properly, the operation should be configured on the interface on both ends of the ATM connection. The **atm-slm statistics** command should also be used to enable data collection.

To view the gathered statistics, use the **show rtr enhanced-history distribution-statistics** command or the **show rtr enhanced-history collection-statistics** command. Statistics gathered with this operation can also be retrieved from external network monitoring applications via the CNS event gateway.

## Examples

In the following example, SAA operation 2 is configured as an SLM ATM Interface operation:

```
Router> enable
Password:
Router# configure terminal
Enter configuration commands, one per line.
Router(config)# atm-slm statistics
Router(config)# rtr 2
Router(config-rtr)# type slm atm interface ATM 1/1/0
Router(config-rtr-slm-atm-if)# enhanced-history interval 900 buckets 100
Router(config-rtr-slm-atm-if)# exit
Router(config)# rtr schedule 2 start-time now life forever
```

```
Router(config)# end
Router#
Router# show rtr configuration 2 | include Type
Type of operation to perform: Slm Atm Interface
Reaction Type: None
```

**Related Commands**

Command	Description
<b>atm-slm statistics</b>	Enables the SAA Service Level Monitor (SLM) feature.
<b>rtr</b>	Allows configuration of SAA operations by entering SAA RTR configuration mode for the specified operation number.
<b>show rtr enhanced-history collection-statistics</b>	Displays data for all collected history buckets for the specified SAA operation, with data for each bucket shown individually.
<b>show rtr enhanced-history distribution-statistics</b>	Displays enhanced history data for all collected buckets in a summary table.

# type slm atm pvc interface

To configure an SAA operation as an SLM ATM Circuit operation, and specify the interface that the operation should be run on, use the **type slm atm pvc interface** command in SAA RTR configuration mode. To remove or replace a previously configured SAA operation, use the **no rtr operation-number** global configuration command.

**type slm atm pvc interface** *interface-id dlc*

Syntax Description		
	<i>interface-id</i>	Type, slot and port number of the ATM interface.
	<i>dlci</i>	Data link connection identifier of the permanent virtual circuit (PVC) to be monitored (also called the PVC number).

**Defaults** No default behavior or values

**Command Modes** SAA RTR configuration mode

Command History	Release	Modification
	12.2(15)T	This command was introduced as part of the SAA SLM for ATM Interfaces feature. This command replaces the <b>type slm interface</b> (atm) command from 12.2(11)T.

**Usage Guidelines** This command specifies that the operation is an SAA SLM ATM circuit operation, which provides data for the specified circuit. The specified interface should be configured with a permanent virtual circuit (PVC) connection.

The ATM circuit statistics are used to monitor the basic health of an ATM circuit. This information includes some traffic counters, assorted error counts, and some performance related counters.

This command will bring the CLI into SAA SLM ATM Circuit configuration mode (config-rtr-slm-atm-dlci).

**Examples** In the following example SAA operation 3 is configured as an SLM ATM Circuit (PVC) operation:

```
Router> enable
Password:
Router# configure terminal
Enter configuration commands, one per line.
Router(config)# atm-slm statistics
Router(config)# rtr 3
Router(config-rtr)# type slm atm pvc interface ATM0:1 100/100
Router(config-rtr-slm-atm-dlci)# enhanced-history interval 900 buckets 100
Router(config-rtr-slm-atm-dlci)# exit
Router(config)# rtr schedule 3 start-time now life forever
Router(config)# end
Router#
```

```
Router# show rtr configuration 3 | include Type
Type of operation to perform: Slm Atm Pvc
Reaction Type: None
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>rtr</b>	Allows configuration of SAA operations by entering SAA RTR configuration mode for the specified operation number.
<b>show rtr enhanced-history collection-statistics</b>	Displays data for all collected history buckets for the specified SAA operation, with data for each bucket shown individually.
<b>show rtr enhanced-history distribution-statistics</b>	Displays enhanced history data for all collected buckets in a summary table.

# show rtr enhanced-history distribution-statistics

To display enhanced history distribution statistics for SAA operations in tabular format, use the **show rtr enhanced-history distribution-statistics** command in user or privileged EXEC mode.

**show rtr enhanced-history distribution-statistics** *operation-number* [**interval** *seconds*]

<b>Syntax Description</b>	<b>interval</b> <i>seconds</i>	Specifies a distribution interval for the displayed statistics, in seconds. The valid range is from 1 to 3,600 seconds (1 hour). This syntax is not valid for SLM operations.
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**Defaults** The default distribution interval is 900 seconds.

**Command Modes** User EXEC  
Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(15)T	This command was introduced.

**Usage Guidelines** The distribution 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 enhanced-history collection-statistics** and **show rtr enhanced-history totals-statistics** commands to display additional statistical information.

**Examples** The following is sample output from the **show rtr enhanced-history distribution-statistics** command. The fields are defined at the beginning of the output for the command. RTT means round-trip-time.

```
Router# show rtr enhanced-history distribution-statistics 3
```

```
Point by point Enhanced History
Entry    = Entry Number
Int      = Aggregation Interval (seconds)
BucI     = Bucket Index
StartT   = Aggregation Start Time
Pth      = Path index
Hop      = Hop in path index
Comps    = Operations completed
OvrTh    = Operations completed over thresholds
SumCmp   = Sum of RTT (milliseconds)
```

SumCmp2L = Sum of RTT squared low 32 bits (milliseconds)  
 SumCmp2H = Sum of RTT squared high 32 bits (milliseconds)  
 TMax = RTT maximum (milliseconds)  
 TMin = RTT minimum (milliseconds)

Entry	Int	BucI	StartT	Pth	Hop	Comps	OvrTh	SumCmp	SumCmp2L	SumCmp2H	n
3	900	1	166050003	1	1	2	0	28	394	0	
3	900	2	166950001	1	1	2	0	29	421	0	
3	900	3	167850002	1	1	2	0	31	481	0	
3	900	4	168750000	1	1	2	0	30	450	0	
3	900	5	169650002	1	1	2	0	27	369	0	
3	900	6	170550000	1	1	2	0	29	421	0	
3	900	7	171450001	1	1	2	0	31	481	0	
3	900	8	172350003	1	1	2	0	30	452	0	
3	900	9	173250001	1	1	2	0	29	421	0	
3	900	10	174150002	1	1	2	0	31	481	0	
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.											
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**Related Commands**

Command	Description
<b>rtr</b>	Allows configuration of SAA operations by entering SAA RTR configuration mode for the specified operation number.
<b>show rtr enhanced-history collection-statistics</b>	Displays data for all collected history buckets for the specified SAA operation, with data for each bucket shown individually.

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