



Real-Time Performance Monitoring Services



Published: 2014-05-02

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Real-Time Performance Monitoring Services
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About the Documentation

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- Using the Examples in This Manual on page xi
- Documentation Conventions on page xiii
- Documentation Feedback on page xv
- Requesting Technical Support on page xv

Documentation and Release Notes

To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at <http://www.juniper.net/techpubs/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

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Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see the *CLI User Guide*.

Documentation Conventions

Table 1 on page xiii defines notice icons used in this guide.

Table 1: Notice Icons







Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page xiii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none">Introduces or emphasizes important new terms.Identifies guide names.Identifies RFC and Internet draft titles.	<ul style="list-style-type: none">A policy <i>term</i> is a named structure that defines match conditions and actions.<i>Junos OS CLI User Guide</i>RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none">To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level.The console port is labeled CONSOLE.
< > (angle brackets)	Encloses optional keywords or variables.	stub <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast (<i>string1</i> <i>string2</i> <i>string3</i>)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Encloses a variable for which you can substitute one or more values.	community name members [<i>community-ids</i>]
Indentation and braces ({ })	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none">In the Logical Interfaces box, select All Interfaces.To cancel the configuration, click Cancel.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select Protocols>Ospf .

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to techpubs-comments@juniper.net, or fill out the documentation feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>. If you are using e-mail, be sure to include the following information with your comments:

- Document or topic name
- URL or page number
- Software release version (if applicable)

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Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

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- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <http://kb.juniper.net/InfoCenter/>

- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://tools.juniper.net/SerialNumberEntitlementSearch/>

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <http://www.juniper.net/support/requesting-support.html>.

PART 1

Overview

- [RPM Services on page 3](#)

CHAPTER 1

RPM Services

- [Real-Time Performance Monitoring Services Overview on page 3](#)
- [RFC 2544-Based Benchmarking Tests Overview on page 4](#)

Real-Time Performance Monitoring Services Overview

Real-Time Performance Monitoring (RPM) enables you to configure active probes to track and monitor traffic. Probes collect packets per destination and per application, including PING Internet Control Message Protocol (ICMP) packets, User Datagram Protocol and Transmission Control Protocol (UDP/TCP) packets with user-configured ports, user-configured Differentiated Services code point (DSCP) type-of-service (ToS) packets, and Hypertext Transfer Protocol (HTTP) packets. RPM provides Management Information Base (MIB) support with extensions for RFC 2925, *Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations*.

You can also configure RPM services to determine automatically whether a path exists between a host router and its configured BGP neighbors. You can view the results of the discovery using an SNMP client. Results are stored in `pingResultsTable`, `jnxPingResultsTable`, `jnxPingProbeHistoryTable`, and `pingProbeHistoryTable`.

Probe configuration and probe results are supported by the command-line interface (CLI) and SNMP.

The following probe types are supported with DSCP marking:

- ICMP echo
- ICMP timestamp
- HTTP get (not available for BGP RPM services)
- UDP echo
- TCP connection
- UDP timestamp

With probes, you can monitor the following:

- Minimum round-trip time
- Maximum round-trip time

- Average round-trip time
- Standard deviation of the round-trip time
- Jitter of the round-trip time—The difference between the minimum and maximum round-trip time

One-way measurements for ICMP timestamp probes include the following:

- Minimum, maximum, standard deviation, and jitter measurements for egress and ingress times
- Number of probes sent
- Number of probe responses received
- Percentage of lost probes



NOTE: Timestamping is not supported on PTX Series Packet Transport Routers.

You can configure the following RPM thresholds:

- Round-trip time
- Ingress/egress delay
- Standard deviation
- Jitter
- Successive lost probes
- Total lost probes (per test)

Support is also implemented for user-configured CoS classifiers and for prioritization of RPM packets over regular data packets received on an input interface.

**Related
Documentation**

- [Configuring BGP Neighbor Discovery Through RPM on page 11](#)
- [\[edit services rpm\] Hierarchy Level on page 9](#)
- [Examples: Configuring BGP Neighbor Discovery Through RPM on page 31](#)

RFC 2544-Based Benchmarking Tests Overview

RFC 2544 defines a series of tests that can be used to describe the performance characteristics of a network-interconnecting device, such as a router, and outlines specific formats to report the results of the tests. These tests can be used to benchmark interconnected network devices and devise a guideline or a measurement pattern to analyze the health and efficiency of the network devices. Because of the ability of these tests to measure throughput, bursty frames, frame loss, and latency, this mechanism is also used to diagnose Ethernet-based networks. These tests are the standard benchmarking tests for Ethernet networks and are known as RFC 2544-based

benchmarking tests. The test methodology enables you to define various parameters such as different frame sizes to be examined (64, 128, 256, 512, 1024, 1280 and 1518 bytes), the test time for each test iteration, and the frame format (IP or UDP).

In Junos OS Release 13.3, MX104 routers support only the reflector function and the corresponding benchmarking tests. These tests display only the reflected bytes and packets on the routers.

RFC 2544-based benchmarking test is performed by transmitting test packets from a device that functions as the generator or the initiator. The initiator is also called the originator. These packets are sent to a device that functions as the reflector, which receives and returns the packets back to the initiator.

The RFC 2544 methodology assesses different parameters that are defined in service-level agreements (SLAs). By measuring the performance availability, transmission delay, link bursts, and service integrity, a carrier provider can certify that the working parameters of the deployed Ethernet circuit comply with the SLA and other defined policies.

[Table 3 on page 5](#) describes the different network topologies in which the benchmarking test is supported:

Table 3: Supported Network Topologies for RFC 2544 Benchmarking Tests

Type of Network	Traffic Direction	Supported Packet Types	Whether the Benchmarking Test Is Supported
Ethernet pseudowire	Ingress and Egress	All EtherTypes for Ingress and MPLS encapsulated packets for Egress	Supported
Layer 3 IPv4	Egress	IPv4 in Layer 3 and any protocol in Layer 2	Supported

Related Documentation

- [Configuring an RFC 2544-Based Benchmarking Test on page 25](#)

PART 2

Configuration

- [Configuration Tasks on page 9](#)
- [Examples on page 31](#)
- [Configuration Statements on page 59](#)

CHAPTER 2

Configuration Tasks

- [\[edit services rpm\] Hierarchy Level on page 9](#)
- [Configuring BGP Neighbor Discovery Through RPM on page 11](#)
- [Configuring RPM Probes on page 13](#)
- [Configuring RPM Receiver Servers on page 18](#)
- [Limiting the Number of Concurrent RPM Probes on page 18](#)
- [Configuring RPM Timestamping on page 19](#)
- [Configuring TWAMP on page 22](#)
- [Enabling RPM for the Junos OS extension-provider package on page 24](#)
- [Configuring an RFC 2544-Based Benchmarking Test on page 25](#)
- [Tracing RPM Operations on page 28](#)

[\[edit services rpm\] Hierarchy Level](#)

To configure Real-Time Performance Monitoring (RPM) services, include the **rpm** statement at the **[edit services]** hierarchy level:

```
[edit services]
rpm {
  bgp {
    data-fill data;
    data-size size;
    destination-port port;
    history-size size;
    logical-system logical-system-name [routing-instances routing-instance-name];
    moving-average-size number;
    probe-count count;
    probe-interval seconds;
    probe-type type;
    routing-instances instance-name;
    test-interval interval;
  }
  probe owner {
    test test-name {
      data-fill data;
      data-size size;
      destination-interface interface-name;
```

```
    destination-port port;  
    dscp-code-point dscp-bits;  
    hardware-timestamp;  
    history-size size;  
    moving-average-size number;  
    one-way-hardware-timestamp;  
    probe-count count;  
    probe-interval seconds;  
    probe-type type;  
    routing-instance instance-name;  
    source-address address;  
    target (url url | address address);  
    test-interval interval;  
    thresholds thresholds;  
    traps traps;  
  }  
}  
probe-server {  
  tcp {  
    destination-interface interface-name;  
    port number;  
  }  
  udp {  
    destination-interface interface-name;  
    port number;  
  }  
}  
probe-limit limit;  
traceoptions {  
  file filename <files number> <match regular-expression > <size maximum-file-size >  
    <world-readable | no-world-readable>;  
  flag flag;  
}  
twamp {  
  server {  
    authentication-mode (authenticated | encrypted | none);  
    client-list list-name {  
      [ address address ];  
    }  
    inactivity-timeout seconds;  
    maximum-connections-duration hours;  
    maximum-connections count;  
    maximum-connections-per-client count;  
    maximum-sessions count;  
    maximum-sessions-per-connection count;  
    port number;  
    server-inactivity-timeout minutes;  
  }  
}  
rfc2544-benchmarking {  
  tests {  
    test-name (RFC 2544 Benchmarking) test-name {  
      test-interface interface-name;  
      mode reflect;  
      family (inet | ccc);  
      destination-ipv4-address address;
```

```

    destination-udp-port port-number;
    source-ipv4-address address;
    source-udp-port port-number;
    direction (egress | ingress);
  }
}
}

```



NOTE: RPM does not require an Adaptive Services (AS) or Multiservices PIC or Multiservices Dense Port Concentrator (DPC) unless you are configuring RPM timestamping as described in [“Configuring RPM Timestamping” on page 19](#).

Related Documentation

- [Configuring BGP Neighbor Discovery Through RPM on page 11](#)
- [Configuring RPM Probes on page 13](#)
- [Configuring RPM Receiver Servers on page 18](#)
- [Limiting the Number of Concurrent RPM Probes on page 18](#)
- [Configuring RPM Timestamping on page 19](#)
- [Configuring TWAMP on page 22](#)
- [Enabling RPM for the Junos OS extension-provider package on page 24](#)
- [Tracing RPM Operations on page 28](#)

Configuring BGP Neighbor Discovery Through RPM

BGP neighbors can be configured at the following hierarchy levels:

- **[edit protocols bgp group *group-name*]**—Default logical system and default routing instance.
- **[edit routing-instances *instance-name* protocols bgp group *group-name*]**—Default logical system with a specified routing instance.
- **[edit logical-systems *logical-system-name* protocols bgp group *group-name*]**—Configured logical system and default routing instance.
- **[edit logical-systems *logical-system-name* routing-instances *instance-name* protocols bgp group *group-name*]**—Configured logical system with a specified routing instance.

When you configure BGP neighbor discovery through RPM, if you do not specify a logical system, the RPM probe applies to configured BGP neighbors for all logical systems. If you do not specify a routing instance, the RPM probe applies to configured BGP neighbors in all routing instances. You can explicitly configure RPM probes to apply only to the default logical system, the default routing instance, or to a particular logical system or routing instance.

To configure BGP neighbor discovery through RPM, configure the probe properties at the **[edit services rpm bgp]** hierarchy:

```
data-fill data;  
data-size size;  
destination-port port;  
history-size size;  
logical-system logical-system-name [routing-instances routing-instance-name];  
moving-average-size number;  
probe-count count;  
probe-interval seconds;  
probe-type type;  
routing-instances instance-name;  
test-interval interval;
```

- To specify the contents of the data portion of Internet Control Message Protocol (ICMP) probes, include the **data-fill** statement at the **[edit services rpm bgp]** hierarchy level. The value can be a hexadecimal value.
- To specify the size of the data portion of ICMP probes, include the **data-size** statement at the **[edit services rpm bgp]** hierarchy level. The size can be from 0 through 65400 and the default size is 0.
- To specify the User Datagram Protocol (UDP) port or Transmission Control Protocol (TCP) port to which the probe is sent, include the **destination-port** statement at the **[edit services rpm bgp]** hierarchy level. The **destination-port** statement is used only for the UDP and TCP probe types. The value can be 7 or from 49160 through 65535.
- To specify the number of stored history entries, include the **history-size** statement at the **[edit services rpm bgp]** hierarchy level. Specify a value from 0 to 512. The default is 50.
- To specify the logical system used by ICMP probes, include the **logical-system logical-system-name** statement at the **[edit services rpm bgp]** hierarchy level. If you do not specify a logical system, the RPM probe applies to configured BGP neighbors for all logical systems. To apply the probe to only the default logical system, you must set the value of **logical-system-name** to **null**.
- To specify a number of samples for making statistical calculations, include the **moving-average-size** statement at the **[edit services rpm bgp]** hierarchy level. Specify a value from 0 through 255.
- To specify the number of probes within a test, include the **probe-count** statement at the **[edit services rpm bgp]** hierarchy level. Specify a value from 1 through 15.
- To specify the time to wait between sending packets, include the **probe-interval** statement at the **[edit services rpm bgp]** hierarchy level. Specify a value from 1 through 255 seconds.
- To specify the packet and protocol contents of the probe, include the **probe-type** statement at the **[edit services rpm bgp]** hierarchy level. The following probe types are supported:
 - **icmp-ping**—Sends ICMP echo requests to a target address.
 - **icmp-ping-timestamp**—Sends ICMP timestamp requests to a target address.

- **tcp-ping**—Sends TCP packets to a target.
- **udp-ping**—Sends UDP packets to a target.
- **udp-ping-timestamp**—Sends UDP timestamp requests to a target address.



NOTE: Some probe types require additional parameters to be configured. For example, when you specify the **tcp-ping** or **udp-ping** option, you must configure the destination port using the **destination-port** *port* statement. The **udp-ping-timestamp** option requires a minimum data size of 12; any smaller data size results in a commit error. The minimum data size for TCP probe packets is 1.

- To specify the routing instance used by ICMP probes, include the **routing-instances** statement at the **[edit services rpm bgp]** hierarchy level. The default routing instance is Internet routing table **inet.0**. If you do not specify a routing instance, the RPM probe applies to configured BGP neighbors in all routing instances. To apply the RPM probe to only the default routing instance, you must explicitly set the value of **instance-name** to **default**.
- To specify the time to wait between tests, include the **test-interval** statement at the **[edit services bgp probe]** hierarchy level. Specify a value from **0** through **86400** seconds.

Related Documentation

- [Real-Time Performance Monitoring Services Overview on page 3](#)
- [\[edit services rpm\] Hierarchy Level on page 9](#)
- [Examples: Configuring BGP Neighbor Discovery Through RPM on page 31](#)

Configuring RPM Probes

The owner name and test name identifiers of an RPM probe together represent a single RPM configuration instance. When you specify the test name, you also can configure the test parameters.

To configure the probe owner, test name, and test parameters, include the **probe** statement at the **[edit services rpm]** hierarchy level:

```
probe owner {
  test test-name {
    data-fill data;
    data-size size;
    destination-interface interface-name;
    destination-port port;
    dscp-code-point dscp-bits;
    hardware-timestamp;
    history-size size;
    moving-average-size number;
    one-way-hardware-timestamp;
    probe-count count;
    probe-interval seconds;
```

```
probe-type type;  
routing-instance instance-name;  
source-address address;  
target (url url | address address);  
test-interval interval;  
thresholds thresholds;  
traps traps;  
}  
}
```

Keep the following points in mind when you configure RPM clients and RPM servers:

- You cannot configure an RPM client that is PIC-based and an RPM server that is based on either the Packet Forwarding Engine or Routing Engine to receive the RPM probes.
- You cannot configure an RPM client that is Packet Forwarding Engine-based and an RPM server that receives the RPM probes to be on the PIC or Routing Engine.
- The RPM client and RPM server must be located on the same type of module. For example, if the RPM client is PIC-based, the RPM server must also be PIC-based, and if the RPM server is Packet Forwarding Engine-based, the RPM client must also be Packet Forwarding Engine-based.
- To specify a probe owner, include the **probe** statement at the **[edit services rpm]** hierarchy level. The probe owner identifier can be up to 32 characters in length.
- To specify a test name, include the **test** statement at the **[edit services rpm probe owner]** hierarchy level. The test name identifier can be up to 32 characters in length. A test represents the range of probes over which the standard deviation, average, and jitter are calculated.
- To specify the contents of the data portion of Internet Control Message Protocol (ICMP) probes, include the **data-fill** statement at the **[edit services rpm probe owner]** hierarchy level. The value can be a hexadecimal value. The **data-fill** statement is not valid with the **http-get** or **http-metadata-get** probe types.
- To specify the size of the data portion of ICMP probes, include the **data-size** statement at the **[edit services rpm probe owner]** hierarchy level. The size can be from 0 through 65400 and the default size is 0. The **data-size** statement is not valid with the **http-get** or **http-metadata-get** probe types.



NOTE: If you configure the hardware timestamp feature (see [“Configuring RPM Timestamping” on page 19](#)):

- The **data-size** default value is 32 bytes and 32 is the minimum value for explicit configuration. The UDP timestamp probe type is an exception; it requires a minimum data size of 44 bytes.
 - The **data-size** must be at least 100 bytes smaller than the default MTU of the interface of the RPM client interface.
-
- On M Series and T Series routers, you configure the **destination-interface** statement to enable hardware timestamping of RPM probe packets. You specify an **sp-** interface

to have the AS or Multiservices PIC add the hardware timestamps; for more information, see [“Configuring RPM Timestamping” on page 19](#). You can also include the **one-way-hardware-timestamp** statement to enable one-way delay and jitter measurements.

- To specify the User Datagram Protocol (UDP) port or Transmission Control Protocol (TCP) port to which the probe is sent, include the **destination-port** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. The **destination-port** statement is used only for the UDP and TCP probe types. The value can be 7 or from 49160 through 65535.

When you configure either **probe-type udp-ping** or **probe-type udp-ping-timestamp** along with hardware timestamping, the value for the **destination-port** can be only 7. A constraint check prevents you from configuring any other value for the destination port in this case. This constraint does not apply when you are using one-way hardware timestamping.

- To specify the value of the Differentiated Services (DiffServ) field within the IP header, include the **dscp-code-point** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. The DiffServ code point (DSCP) bits value can be set to a valid 6-bit pattern; for example, 001111. It also can be set using an alias configured at the **[edit class-of-service code-point-aliases dscp]** hierarchy level. The default is 000000.
- To specify the number of stored history entries, include the **history-size** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. Specify a value from 0 to 512. The default is 50.
- To specify a number of samples for making statistical calculations, include the **moving-average-size** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. Specify a value from 0 through 255.
- To specify the number of probes within a test, include the **probe-count** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. Specify a value from 1 through 15.
- To specify the time to wait between sending packets, include the **probe-interval** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. Specify a value from 1 through 255 seconds.
- To specify the packet and protocol contents of the probe, include the **probe-type** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. The following probe types are supported:
 - **http-get**—Sends a Hypertext Transfer Protocol (HTTP) get request to a target URL.
 - **http-metadata-get**—Sends an HTTP get request for metadata to a target URL.
 - **icmp-ping**—Sends ICMP echo requests to a target address.
 - **icmp-ping-timestamp**—Sends ICMP timestamp requests to a target address.
 - **tcp-ping**—Sends TCP packets to a target.

- **udp-ping**—Sends UDP packets to a target.
- **udp-ping-timestamp**—Sends UDP timestamp requests to a target address.

The following probe types support hardware timestamping of probe packets: **icmp-ping**, **icmp-ping-timestamp**, **udp-ping**, **udp-ping-timestamp**.



NOTE: Some probe types require additional parameters to be configured. For example, when you specify the **tcp-ping** or **udp-ping** option, you must configure the destination port using the **destination-port** statement. The **udp-ping-timestamp** option requires a minimum data size of 12; any smaller data size results in a commit error. The minimum data size for TCP probe packets is 1.

When you configure either **probe-type udp-ping** or **probe-type udp-ping-timestamp** along with the **one-way-hardware-timestamp** command, the value for the **destination-port** can be only 7. A constraint check prevents you for configuring any other value for the destination port in this case.

- To specify the routing instance used by ICMP probes, include the **routing-instance** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. The default routing instance is Internet routing table **inet.0**.
- To specify the source IP address used for ICMP probes, include the **source-address** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. If the source IP address is not one of the router's assigned addresses, the packet will use the outgoing interface's address as its source.
- To specify the destination address used for the probes, include the **target** statement at the **[edit services rpm probe owner test test-name]** hierarchy level.
 - For HTTP probe types, specify a fully formed URL that includes **http://** in the URL address.
 - For all other probe types, specify an IP version 4 (IPv4) address for the target host.
- To specify the time to wait between tests, include the **test-interval** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. Specify a value from 0 through 86400 seconds.
- To specify thresholds used for the probes, include the **thresholds** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. A system log message is generated when the configured threshold is exceeded. Likewise, an SNMP trap (if configured) is generated when a threshold is exceeded. The following options are supported:
 - **egress-time**—Measures maximum source-to-destination time per probe.
 - **ingress-time**—Measures maximum destination-to-source time per probe.
 - **jitter-egress**—Measures maximum source-to-destination jitter per test.
 - **jitter-ingress**—Measures maximum destination-to-source jitter per test.

- **jitter-rtt**—Measures maximum jitter per test, from 0 through 60000000 microseconds.
- **rtt**—Measures maximum round-trip time per probe, in microseconds.
- **std-dev-egress**—Measures maximum source-to-destination standard deviation per test.
- **std-dev-ingress**—Measures maximum destination-to-source standard deviation per test.
- **std-dev-rtt**—Measures maximum standard deviation per test, in microseconds.
- **successive-loss**—Measures successive probe loss count, indicating probe failure.
- **total-loss**—Measures total probe loss count indicating test failure, from 0 through 15.
- Traps are sent if the configured threshold is met or exceeded. To set the trap bit to generate traps, include the **traps** statement at the **[edit services rpm probe owner test test-name]** hierarchy level. The following options are supported:
 - **egress-jitter-exceeded**—Generates traps when the jitter in egress time threshold is met or exceeded.
 - **egress-std-dev-exceeded**—Generates traps when the egress time standard deviation threshold is met or exceeded.
 - **egress-time-exceeded**—Generates traps when the maximum egress time threshold is met or exceeded.
 - **ingress-jitter-exceeded**—Generates traps when the jitter in ingress time threshold is met or exceeded.
 - **ingress-std-dev-exceeded**—Generates traps when the ingress time standard deviation threshold is met or exceeded.
 - **ingress-time-exceeded**—Generates traps when the maximum ingress time threshold is met or exceeded.
 - **jitter-exceeded**—Generates traps when the jitter in round-trip time threshold is met or exceeded.
 - **probe-failure**—Generates traps for successive probe loss thresholds crossed.
 - **rtt-exceeded**—Generates traps when the maximum round-trip time threshold is met or exceeded.
 - **std-dev-exceeded**—Generates traps when the round-trip time standard deviation threshold is met or exceeded.
 - **test-completion**—Generates traps when a test is completed.
 - **test-failure**—Generates traps when the total probe loss threshold is met or exceeded.

**Related
Documentation**

- [Real-Time Performance Monitoring Services Overview on page 3](#)
- [Examples: Configuring Real-Time Performance Monitoring on page 32](#)

- [\[edit services rpm\] Hierarchy Level on page 9](#)

Configuring RPM Receiver Servers

The RPM TCP and UDP probes are proprietary to Juniper Networks and require a receiver to receive the probes. To configure a server to receive the probes, include the **probe-server** statement at the **[edit services rpm]** hierarchy level:

```
[edit services rpm]
probe-server {
  tcp {
    destination-interface interface-name;
    port number;
  }
  udp {
    port number;
  }
}
```

The port number specified for the UDP and TCP server can be 7 or from 49160 through 65535.



NOTE: The **destination-interface** statement is not supported on PTX Series Packet Transport Routers.

When you configure either **probe-type udp-ping** or **probe-type udp-ping-timestamp** along with the **one-way-hardware-timestamp** command, the value for the **destination-port** can be only 7. A constraint check prevents you for configuring any other value for the destination port in this case.

Related Documentation

- [Real-Time Performance Monitoring Services Overview on page 3](#)
- [\[edit services rpm\] Hierarchy Level on page 9](#)
- [Examples: Configuring Real-Time Performance Monitoring on page 32](#)

Limiting the Number of Concurrent RPM Probes

To configure the maximum number of concurrent probes allowed, include the **probe-limit** statement at the **[edit services rpm]** hierarchy level:

```
probe-limit limit;
```

Specify a limit from 1 through 500. The default maximum number is 100.

Related Documentation

- [Real-Time Performance Monitoring Services Overview on page 3](#)
- [\[edit services rpm\] Hierarchy Level on page 9](#)
- [Examples: Configuring Real-Time Performance Monitoring on page 32](#)

Configuring RPM Timestamping

To account for latency in the communication of probe messages, you can enable timestamping of the probe packets. You can timestamp the following RPM probe types: **icmp-ping**, **icmp-ping-timestamp**, **udp-ping**, and **udp-ping-timestamp**.

On M Series and T Series routers with an Adaptive Services (AS) or Multiservices PIC, and MX Series routers with a Multiservices DPC, and on EX Series switches, you can enable hardware timestamping of RPM probe messages. The timestamp is applied on both the RPM client router (the router or switch that originates the RPM probes) and the RPM probe server and applies only to IPv4 traffic. It is supported on the following:

- Layer 2 services package on all Multiservices PICs and DPCs.
- Layer 3 service package on AS and Multiservices PICs and Multiservices DPCs.
- Extension-provider services package on M Series, MX Series, and T Series services PICs that support the Extension-Provider packages (In Junos OS releases earlier than 12.3, the extension-provider packages were variously referred to as Junos Services Framework (JSF), MP-SDK, and eJunos.)
- Layer 2, Layer 3, SDK Services, and PFE RPM timestamping interoperate with each other. Here, the RPM client can be on the Layer 3 **sp-** interface and the RPM server can be on an SDK Services package.



NOTE: Hardware timestamping is not supported on PTX Series Packet Transport Routers.

Two-way timestamping is available on **sp-** and **ms-** interfaces. To configure two-way timestamping on M Series and T Series routers, include the **destination-interface** statement at the **[edit services rpm probe probe-owner test test-name]** hierarchy level:

```
destination-interface sp-fpc/pic/port.logical-unit
destination-interface ms-fpc/pic/port.logical-unit
```

Specify the RPM client router and the RPM server router on the adaptive services logical interface or the multiservices interface by including the **rpm** statement at the **[edit interfaces interface-name unit logical-unit-number]** hierarchy level:

```
rpm (client | server);
```

The logical interface must be dedicated to the RPM task. It requires configuration of the **family inet** statement and a **/32** address, as shown in the example. This configuration is also needed for other services such as NAT and stateful firewall. You cannot configure RPM service on **unit 0** because RPM requires a dedicated logical interface; the same unit cannot support both RPM and other services. Because active flow monitoring requires **unit 0**, but RPM can function on any logical interface, a constraint check prevents you from committing an RPM configuration there.



NOTE: If you configure RPM timestamping on an ASPIC, you cannot configure the `source-address` statement at the `[edit services rpm probe probe-name test test-name]` hierarchy level.

On MX Series routers, on M-320 routers using the Enhanced Queuing MPC, and on EX Series switches, you include the `hardware-timestamp` statement at the `[edit services rpm probe probe-name test test-name]` hierarchy level to specify that the probes are to be timestamped in the Packet Forwarding Engine host processor:

```
hardware-timestamp;
```

On the client side, these probes are timestamped in the Packet Forwarding Engine host processor on the egress DPC on the MX or M-320 Series router or EX Series switch originating the RPM probes (RPM client). On the responder side (RPM server), the RPM probes to be timestamped are handled by the Packet Forwarding Engine host processor, which generates the response instead of the RPM process. The RPM probes are timestamped only on the router that originates them (RPM client). As a result, only round-trip time is measured for these probes.

When using the `hardware-timestamp`, the `data-size` value for the probe must be at least 100 bytes smaller than the default MTU of the interface of the RPM client interface (see [“Configuring RPM Probes” on page 13](#)).



NOTE: The Packet Forwarding Engine-based RPM feature does not support any stateful firewall configurations. If you need to combine RPM timestamping with a stateful firewall, you should use the interface-based RPM timestamping service described earlier in this section. Multiservices DPCs support stateful firewall processing as well as RPM timestamping.

To configure one-way timestamping, you must also include the `one-way-hardware-timestamp` statement at the `[edit services rpm probe probe-owner test test-name]` hierarchy level:

```
one-way-hardware-timestamp;
```



NOTE: If you configure RPM probes for a services interface (sp-), you need to announce local routes in a specific way for the following routing protocols:

- For OSPF, you can announce the local route by including the services interface in the OSPF area. To configure this setting, include the interface `sp-fpc/pic/port` statement at the `[edit protocols ospf area area-number]` hierarchy level.
- For BGP and IS-IS, you must export interface routes and create a policy that accepts the services interface local route. To export interface routes, include the `point-to-point` and `lan` statements at the `[edit routing-options interface-routes family inet export]` hierarchy level. To configure an export policy that accepts the services interface local route, include the `protocol local`, `rib inet.0`, and `route-filter sp-interface-ip-address/32` exact statements at the `[edit policy-options policy-statement policy-name term term-name from]` hierarchy level and the `accept` action at the `[edit policy-options policy-statement policy-name term term-name then]` hierarchy level. For the export policy to take effect, apply the policy to BGP or IS-IS with the `export policy-name` statement at the `[edit protocols protocol-name]` hierarchy level.

For more information about these configurations, see the *Routing Policy Feature Guide for Routing Devices* or the *Junos OS Routing Protocols Library for Routing Devices*.

Routing the probe packets through the adaptive services or Multiservices PIC also enables you to filter the probe packets to particular queues. The following example shows the RPM configuration and the filter that specifies queuing:

```
services rpm {
  probe p1 {
    test t1 {
      probe-type icmp-ping;
      target address 10.8.4.1;
      probe-count 10;
      probe-interval 10;
      test-interval 10;
      dscp-code-points af11;
      data-size 100;
      destination-interface sp-1/2/0.0;
    }
  }
}
firewall {
  filter f1 {
    term t1 {
      from {
        dscp af11;
      }
      then {
        forwarding-class assured-forwarding;
      }
    }
  }
}
```

```
    }  
  }  
}  
interfaces sp-1/2/0 {  
  unit 2 {  
    rpm client;  
    family inet {  
      address 10.8.4.2/32;  
      filter {  
        input f1;  
      }  
    }  
  }  
}  
interfaces sp-1/2/1 {  
  unit 2 {  
    rpm server;  
    family inet {  
      address 10.8.3.2/32;  
      filter {  
        input f1;  
      }  
    }  
  }  
}
```

For more information about firewall filters, see the *Routing Policy Feature Guide for Routing Devices*; for more information about queuing, see the *Junos OS Class of Service Library for Routing Devices*.

Related Documentation

- [Real-Time Performance Monitoring Services Overview on page 3](#)
- [\[edit services rpm\] Hierarchy Level on page 9](#)
- [Examples: Configuring Real-Time Performance Monitoring on page 32](#)

Configuring TWAMP

You can configure the Two-Way Active Measurement Protocol (TWAMP) on all M Series and T Series routers that support Multiservices PICs (running in either Layer 2 or Layer 3 mode), and on MX Series routers. Only the responder (server) side of TWAMP is supported.



NOTE: TWAMP is not supported on PTX Series Packet Transport Routers.

For more information on TWAMP, see RFC 5357, *A Two-Way Active Measurement Protocol (TWAMP)*.

To configure TWAMP properties, include the **twamp** statement at the **[edit services rpm]** hierarchy level:

```
[edit services rpm]  
twamp {
```

```

server {
  client-list list-name {
    [ address address ];
  }
  authentication-mode mode;
  max-connection-duration hours;
  maximum-connections count;
  maximum-connections-per-client count;
  maximum-sessions count;
  maximum-sessions-per-connection count;
  port number;
  server-inactivity-timeout minutes;
}

```

The TWAMP configuration process includes the following tasks:

- [Configuring TWAMP Interfaces on page 23](#)
- [Configuring TWAMP Servers on page 23](#)

Configuring TWAMP Interfaces

To specify the service PIC logical interface that provides the TWAMP service, include the **twamp-server** statement at the **[edit interfaces sp-fpc/pic/port unit logical-unit-number]** hierarchy level:

```
twamp-server;
```



NOTE: On MX Series routers that do not include a Multiservices DPC, you can configure the **twamp-server** statement on any interface (for example, **ge-1/0/1.10**). It is not necessary to configure this statement on a service interface (**sp-** or **ms-**) but you do need to include it in the configuration to activate the TWAMP reflector functionality.

Configuring TWAMP Servers

You can specify a number of TWAMP server properties, some of which are optional, by including the **server** statement at the **[edit services rpm twamp]** hierarchy level:

```

[edit services rpm twamp]
server {
  client-list list-name {
    [ address address ];
  }
  authentication-mode mode;
  max-connection-duration hours;
  maximum-connections count;
  maximum-connections-per-client count;
  maximum-sessions count;
  maximum-sessions-per-connection count;
  port number;
  server-inactivity-timeout minutes;
}

```

- To specify the list of allowed control client hosts that can connect to this server, include the **client-list** statement at the **[edit services rpm twamp server]** hierarchy level. Each value you include must be a Classless Interdomain Routing (CIDR) address (IP address plus mask) that represents a network of allowed hosts. You can include multiple client lists, each of which can contain a maximum of 64 entries. You must configure at least one client address to enable TWAMP.
- You must specify the authentication mode by including the **authentication-mode** statement at the **[edit services rpm twamp server]** hierarchy level. There is no default value. You can configure **authenticated** or **encrypted** mode, based on RFC 4656; if there is no authentication or encryptions mode specified, you should set the value to **none**. This statement is required in the TWAMP configuration.
- To specify the inactivity timeout period in seconds, include the **inactivity-timeout** statement at the **[edit services rpm twamp server]** hierarchy level. By default, the value is **1800**; the range is 0 through 3600 seconds.
- To specify the maximum number of concurrent connections the server can have to client hosts, include the **maximum-connections** statement at the **[edit services rpm twamp server]** hierarchy level. The allowed range of values is 1 through 1000 and the default value is 64. You can also limit the number of connections the server can make to a particular client host by including the **maximum-connections-per-client** statement. The allowed range of values is 1 through 500 and the default value is 64.
- To specify the maximum number of sessions the server can have running at one time, include the **maximum-sessions** statement at the **[edit services rpm twamp server]** hierarchy level. The allowed range of values is 1 through 2048 and the default value is 64. You can also limit the number of sessions the server can have on a single connection by including the **maximum-sessions-per-connection** statement.
- To specify the TWAMP server listening port, include the **port** statement at the **[edit services rpm twamp server]** hierarchy level. The range is 1 through 65,535.
- To specify the server inactivity timeout period in minutes, include the **server-inactivity-timeout** statement at the **[edit services rpm twamp server]** hierarchy level. The range is 0 through 30 minutes.

Enabling RPM for the Junos OS extension-provider package

Real-time performance monitoring (RPM), which has been supported on the adaptive services interface, is now supported by the Junos OS extension-provider package. RPM is supported on all platforms and service PICs that support the extension-provider package.



NOTE: In Junos OS releases earlier than 12.3, the extension provider package was variously known as MP-SDK, Junos Services Framework (JSF), and eJunos.

To enable RPM for the Junos OS extension-provider package on the adaptive services interface, configure the **object-cache-size**, **policy-db-size**, and **package** statements at the

[edit chassis fpc *slot-number* pic *pic-number* adaptive-services service-package extension-provider] hierarchy level. For the extension-provider package, *package-name* in the package *package-name* statement is `jservices-rpm`.

For more information about the extension-provider package, see the *SDK Applications Configuration Guide and Command Reference*.

The following example shows how to enable RPM for the extension-provider package on the adaptive services interface:

```
chassis fpc 1 {
  pic 2 {
    adaptive-services {
      service-package {
        extension-provider {
          control-cores 1;
          data-cores 1;
          object-cache-size 512;
          policy-db-size 64;
          package jservices-rpm;
          syslog daemon any;
        }
      }
    }
  }
}
```

Related Documentation

- [Real-Time Performance Monitoring Services Overview on page 3](#)
- [\[edit services rpm\] Hierarchy Level on page 9](#)
- [Examples: Configuring Real-Time Performance Monitoring on page 32](#)
- [destination-interface on page 66](#)

Configuring an RFC 2544-Based Benchmarking Test

You can configure a benchmarking test to detect and measure performance attributes, such as throughput, latency, frame loss, and bursty or back-to-back frames, of network devices. RFC 2544-based benchmarking test is performed by transmitting test packets from a device that functions as the generator or the initiator. These packets are sent to a device that functions as the reflector, which receives and returns the packets back to the initiator.

You must configure a test profile and reference the test profile in a unique test name that defines the parameters for the test to be performed on a certain device. However, the test profile is required when the test mode is configured as initiation and termination. The **test-profile** parameter is disregarded when the test mode is configured as reflection. MX104 routers support only the reflection function in the RFC 2544-based benchmarking tests. A reflection service does not use the parameters specified in the test profile because the reflection service it returns the frames to the initiator.

The following topics describe how to configure a test name for an RFC 2544-based benchmarking test on an MX104 router for Layer 3 IPv4 and Ethernet pseudowire networks:

- [Configuring a Test Name for an RFC 2544-Based Benchmarking Test for a IPv4 Network on page 26](#)
- [Configuring a Test Name for an RFC 2544-Based Benchmarking Test for an Ethernet Pseudowire: on page 27](#)

Configuring a Test Name for an RFC 2544-Based Benchmarking Test for a IPv4 Network

You can configure a test name by including the **test-name test-name** statement at the **[edit services rpm rfc2544-benchmarking]** hierarchy level. In the test name, you can configure attributes of the test iteration, such as the address family (type of service, IPv4 or Ethernet), the logical interface, and test duration that are used for a benchmarking test to be run.

To configure a test name and define its attributes for an IPv4 network:

1. In configuration mode, go to the **[edit services]** hierarchy level.

```
[edit]
user@host# edit services
```

2. Configure a instance.

```
[edit services]
user@host# edit rpm
```

3. Configure an RFC 2544-based benchmarking test for the RPM instance.

```
[edit services rpm]
user@host# edit rfc2544-benchmarking
```

4. Define a name for the test—for example, test1. The test name identifier can be up to 32 characters in length.

```
[edit services rpm rfc2544-benchmarking]
user@host# edit tests test-name test1
```

5. Specify the test mode for the packets that are sent during the benchmarking test. The **reflect** option causes the test frames to be reflected on the IPv4 network.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set mode reflect
```

6. Configure the address type family for the benchmarking test. The **inet** option indicates that the test is run on an IPv4 service.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set family inet
```

7. Configure the destination IPv4 address for the test packets. This parameter is required only if you configure IPv4 family **inet**. If you do not configure the destination IPv4 address, the default value of 192.168.1.20 is used.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set destination-ipv4-address address
```

8. Specify the UDP port of the destination to be used in the UDP header for the generated frames. If you do not specify the UDP port, the default value of 4041 is used.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set destination-udp-port port-number
```

9. (Optional) Specify the source IPv4 address to be used in generated test frames. If you do not configure the source IPv4 address for **inet** family, the source address of the interface is used to transmit the test frames.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set source-ipv4-address address
```

10. Specify the UDP port of the source to be used in the UDP header for the generated frames. If you do not specify the UDP port, the default value of 4041 is used.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set source-udp-port port-number
```

11. Specify the logical interface on which the RFC 2544-based benchmarking test is run. If you configure an **inet** family and the test mode to reflect the frames back on the sender from the other end, then the logical interface is used as the interface to enable the reflection service (reflection is performed on the packets entering the specified interface). If you not configure the logical interface for reflection test mode, then a lookup is performed on the source IPv4 address to determine the interface that hosts the address.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set test-interface interface-name
```

Configuring a Test Name for an RFC 2544-Based Benchmarking Test for an Ethernet Pseudowire:

You can configure a test name by including the **test-name** *test-name* statement at the **[edit services rpm rfc2544-benchmarking]** hierarchy level. In the test name, you can configure attributes of the test iteration, such as the address family (type of service IPv4 or Ethernet), the logical interface, and test duration, that are used for a benchmarking test to be run. The test name combined with the test profile represent a single real-time performance monitoring (RPM) configuration instance.

To configure a test name and define its attributes for an Ethernet Pseudowire:

1. In configuration mode, go to the **[edit services]** hierarchy level.

```
[edit]
user@host# edit services
```

2. Configure an RPM service instance.

```
[edit services]
user@host# edit rpm
```

3. Configure an RFC 2544-based benchmarking test for the RPM instance.

```
[edit services rpm]
user@host# edit rfc2544-benchmarking
```

4. Define a name for the test—for example, test1. The test name identifier can be up to 32 characters in length.

```
[edit services rpm rfc2544-benchmarking]
user@host# edit tests test-name test1
```

5. Specify the test mode for the packets that are sent during the benchmarking test. The **reflect** option causes the test frames to be reflected on the Ethernet pseudowire.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set mode reflect
```

6. Configure the address type family for the benchmarking test. The **ccc** option indicates that the test is run on a CCC or Ethernet pseudowire service.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set family ccc
```

7. Specify the direction of the interface on which the test must be run. This parameter is valid only for a family. To enable the test to be run in the egress direction of the interface (network-to-network interface (NNI)), use the **egress** option. To enable the test to be run in the ingress direction of the interface (user-to-network interface (UNI)), use the **ingress** option.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set direction egress
```

8. (Optional) Specify the source IPv4 address to be used in generated test frames. If you do not configure the source IPv4 address for family, the default value of 192.168.1.10 is used.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set source-ipv4-address address
```

9. Specify the logical interface on which the RFC 2544-based benchmarking test is run.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set test-interface interface-name
```

Related Documentation

- [RFC 2544-Based Benchmarking Tests Overview on page 4](#)
- [Example: Configuring an RFC 2544-Based Benchmarking Test for UNI Direction of Ethernet Pseudowires on page 44](#)
- [Example: Configuring an RFC 2544-Based Benchmarking Test for NNI Direction of Ethernet Pseudowires on page 51](#)
- [Example: Configuring an RFC 2544-Based Benchmarking Test for Layer 3 IPv4 Services on page 36](#)

Tracing RPM Operations

Tracing operations track all RPM operations and record them in a log file. The logged error descriptions provide detailed information to help you solve problems faster.

By default, no events are traced. If you include the **traceoptions** statement at the **[edit services rpm]** hierarchy level, the default tracing behavior is the following:

- Important events are logged in a file called **rmopd** located in the **/var/log** directory.

- When the log file reaches 128 kilobytes (KB), it is renamed **rmopd.0**, then **rmopd.1**, and so on, until there are three trace files. Then the oldest trace file (**rmopd.2**) is overwritten. (For more information about how log files are created, see the *Junos OS System Log Messages Reference*.)
- Log files can be accessed only by the user who configures the tracing operation.

You can change this default behavior by using the **traceoptions** statements. Changing the defaults is described in the following sections:

1. [Configuring the RPM Log File Name on page 29](#)
2. [Configuring the Number and Size of RPM Log Files on page 29](#)
3. [Configuring Access to the Log File on page 29](#)
4. [Configuring a Regular Expression for Lines to Be Logged on page 30](#)
5. [Configuring the Trace Operations on page 30](#)

Configuring the RPM Log File Name

By default, the name of the file that records RPM trace output is **rmopd**. To specify a different file name:

```
[edit services rpm traceoptions]
user@host set file filename
```

Configuring the Number and Size of RPM Log Files

To configure the limits on the number and size of RPM trace files:

```
[edit services rpm traceoptions]
user@host set file filename files number size size
```

The number of files can be from 2 through 1000 files. The file size of each file can be from 10 KB through 1 gigabyte (GB).

For example, set the maximum file size to 2 MB, and the maximum number of files to 20 for a log file named **rpmtrace**:

```
[edit services rpm traceoptions]
user@host set file rpmtrace files 20 size 2MB
```

When the **rpmtrace** file reaches 2 MB, it is renamed **rpmtrace.0**, and a new file called **rpmtrace** is created. When the new **rpmtrace** reaches 2 MB, **rpmtrace.0** is renamed **rpmtrace.1** and **rpmtrace** is renamed **rpmtrace.0**. This process repeats until there are 20 trace files. Then the oldest file (**rpmtrace.19**) is overwritten by **rpmtrace.18**.

Configuring Access to the Log File

By default, log files can be accessed only by the user who configures the tracing operation.

To specify that any user can read all log files:

```
[edit services rpm traceoptions]
user@host set file filename world-readable
```

To explicitly set the default behavior:

```
[edit services rpm traceoptions]
user@host set file filename no-world-readable
```

Configuring a Regular Expression for Lines to Be Logged

By default, the trace operation output includes all lines relevant to the logged events.

To refine the output by specifying a regular expression (regex) to be matched:

```
[edit services rpm traceoptions]
user@host set file filename match regular-expression
```

Configuring the Trace Operations

By default, if the **traceoptions** configuration is present, only important events are logged. You can configure the trace operations to be logged by including the following statements at the **[edit services rpm traceoptions]** hierarchy level:

```
flag {
  all;
  configuration;
  error;
  ipc;
  ppm;
  statistics
}
```

[Table 4 on page 30](#) describes the meaning of the RPM tracing flags.

Table 4: RPM Tracing Flags

Flag	Description	Default Setting
all	Trace all operations.	Off
configuration	Trace configuration events.	Off
error	Trace events related to catastrophic errors in daemon.	Off
ipc	Trace IPC events.	Off
ppm	Trace ppm events.	Off
statistics	Trace statistics.	Off

CHAPTER 3

Examples

- [Examples: Configuring BGP Neighbor Discovery Through RPM on page 31](#)
- [Examples: Configuring Real-Time Performance Monitoring on page 32](#)
- [Example: Configuring an RFC 2544-Based Benchmarking Test for Layer 3 IPv4 Services on page 36](#)
- [Example: Configuring an RFC 2544-Based Benchmarking Test for UNI Direction of Ethernet Pseudowires on page 44](#)
- [Example: Configuring an RFC 2544-Based Benchmarking Test for NNI Direction of Ethernet Pseudowires on page 51](#)

Examples: Configuring BGP Neighbor Discovery Through RPM

Configure BGP neighbor discovery through RPM for all logical systems and all routing instances:

```
[edit services rpm]
bgp {
  probe-type icmp-ping;
  probe-count 5;
  probe-interval 1;
  test-interval 60;
  history-size 10;
  data-size 255;
  data-fill 0123456789;
}
```

Configure BGP neighbor discovery through RPM for only the following logical systems and routing instances: **LS1/RI1**, **LS1/RI2**, **LS2**, and **RI3**:

```
[edit services rpm]
bgp {
  probe-type icmp-ping;
  probe-count 5;
  probe-interval 1;
  test-interval 60;
  history-size 10;
  data-size 255;
  data-fill 0123456789;
  logical-system {
    LS1 {
      routing-instances {
```

```
        RI1;
        RI2;
    }
}
LS2;
}
routing-instance {
    RI3;
}
}
```



NOTE: The `logical-system` statement is not supported on PTX Series Packet Transport Routers.

Configure BGP neighbor discovery through RPM for only the default logical system and default routing instance:

```
[edit services rpm]
bgp {
    probe-type icmp-ping;
    probe-count 5;
    probe-interval 1;
    test-interval 60;
    history-size 10;
    data-size 255;
    data-fill 0123456789;
    logical-system {
        null {
            routing-instances {
                default;
            }
        }
    }
}
```

- Related Documentation**
- [Real-Time Performance Monitoring Services Overview on page 3](#)
 - [Configuring BGP Neighbor Discovery Through RPM on page 11](#)
 - [\[edit services rpm\] Hierarchy Level on page 9](#)

Examples: Configuring Real-Time Performance Monitoring

Configure an RPM instance identified by the probe name **probe1** and the test name **test1**:

```
[edit services rpm]
probe probe1 {
    test test1 {
        dscp-code-points 001111;
        probe-interval 1;
        probe-type icmp-ping;
        target address 172.17.20.182;
        test-interval 20;
        thresholds rtt 10;
    }
}
```



```

        traps rtt-exceeded;
    }
}
probe-server {
    tcp {
        destination-interface lt-0/0/0.0
        port 50000;
    }
    udp {
        destination-interface lt-0/0/0.0
        port 50001;
    }
}
probe-limit 200;

```

Configure packet classification, using **lt-** interfaces to send the probe packets to a logical tunnel input interface. By sending the packet to the logical tunnel interface, you can configure regular and multifield classifiers, firewall filters, and header rewriting for the probe packets. To use the existing tunnel framework, the **dlci** and **encapsulation** statements must be configured.

```

[edit services rpm]
probe p1 {
    test t1 {
        probe-type icmp-ping;
        target address 10.8.4.1;
        probe-count 10;
        probe-interval 10;
        test-interval 10;
        source-address 10.8.4.2;
        dscp-code-points ef;
        data-size 100;
        destination-interface lt-0/0/0.0;
    }
}
[edit interfaces]
lt-0/0/0 {
    unit 0 {
        encapsulation frame-relay;
        dlci 10;
        peer-unit 1;
        family inet;
    }
    unit 1 {
        encapsulation frame-relay;
        dlci 10;
        peer-unit 0;
        family inet;
    }
}
[edit class-of-service]
interfaces {
    lt-0/0/0 {
        unit 1 {
            classifiers {
                dscp default;
            }
        }
    }
}

```

```
    }  
  }  
}
```

Configure an input filter on the interface on which the RPM probes are received. This filter enables prioritization of the received RPM packets, separating them from the regular data packets received on the same interface.

```
[edit firewall]  
filter recos {  
  term recos {  
    from {  
      source-address {  
        10.8.4.1/32;  
      }  
      destination-address {  
        10.8.4.2/32;  
      }  
    }  
    then {  
      loss-priority high;  
      forwarding-class network-control;  
    }  
  }  
}  
[edit interfaces]  
fe-5/0/0 {  
  unit 0 {  
    family inet {  
      filter {  
        input recos;  
      }  
      address 10.8.4.2/24;  
    }  
  }  
}
```

Configure an RPM instance and enable RPM for the extension-provider packages on the adaptive services interface:

```
[edit services rpm]  
probe probe1 {  
  test test1 {  
    data-size 1024;  
    data-fill 0;  
    destination-interface ms-1/2/0.10;  
    dscp-code-points 001111;  
    probe-count 10;  
    probe-interval 1;  
    probe-type icmp-ping;  
    target address 172.17.20.182;  
    test-interval 20;  
    thresholds rtt 10;  
    traps rtt-exceeded;  
  }  
}
```

```

[edit interfaces]
ms-1/2/0 {
  unit 0 {
    family inet;
  }
  unit 10 {
    rpm client;
    family inet {
      address 1.1.1.1/32;
    }
  }
}
[edit chassis]
fpc 1 {
  pic 2 {
    adaptive-services {
      service-package {
        extension-provider {
          control-cores 1;
          data-cores 1;
          object-cache-size 512;
          policy-db-size 64;
          package jservices-rpm;
          syslog {
            daemon any;
          }
        }
      }
    }
  }
}
}

```



NOTE: TWAMP is not supported on PTX Series Packet Transport Routers.

Configure the minimum statements necessary to enable TWAMP:

```

[edit services]
rpm {
  twamp {
    server {
      authentication-mode none;
      port 10000; # Twamp server's listening port
      client-list LIST-1 { # LIST-1 is the name of the client-list. Multiple lists can be
        configured.
        address {
          20.0.0.2/30; # IP address of the control client.
        }
      }
    }
  }
}
[edit interfaces sp-5/0/0]
unit 0 {
  family inet;
}
unit 10 {

```

```
rpm {
    twamp-server; # You must configure a separate logical interface on the service PIC
                  interface for the TWAMP server.
}
family inet {
    address 50.50.50.50/32; # This address must be a host address with a 32-bit mask.
}
}
[edit chassis]
fpc 5 {
    pic 0 {
        adaptive-services {
            service-package layer-2; # Configure the service PIC to run in Layer 2 mode.
        }
    }
}
```

Configure additional TWAMP settings:

```
[edit services]
rpm {
    twamp {
        server {
            maximum-sessions 5;
            maximum-sessions-per-connection 2;
            maximum-connections 3;
            maximum-connections-per-client 1;
            port 10000;
            server-inactivity-timeout ;
            client-list LIST-1 {
                address {
                    20.0.0.2/30;
                }
            }
        }
    }
}
```

Related Documentation

- [Real-Time Performance Monitoring Services Overview on page 3](#)
- [\[edit services rpm\] Hierarchy Level on page 9](#)
- [Examples: Configuring BGP Neighbor Discovery Through RPM on page 31](#)

Example: Configuring an RFC 2544-Based Benchmarking Test for Layer 3 IPv4 Services

- [Requirements on page 36](#)
- [Overview on page 37](#)
- [Configuration on page 37](#)
- [Verifying the Results of the Benchmarking Test for Layer 3 IPv4 Services on page 43](#)

Requirements

This example uses the following hardware and software components:

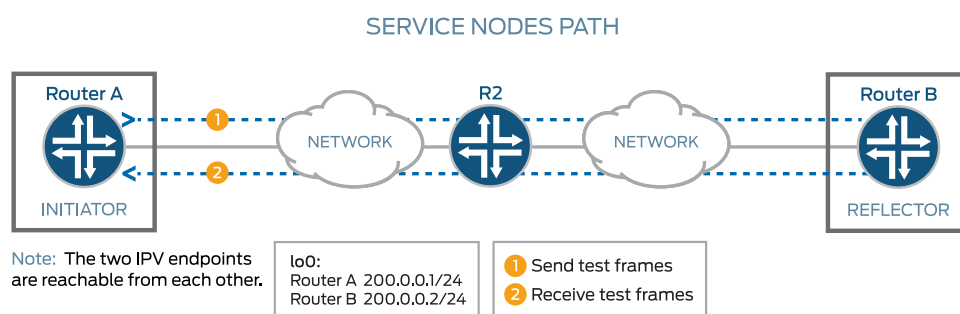
-
- An ACX Series Universal Access Router—
- Junos OS Release or later

Overview

Consider a sample topology in which a router, Router A, functions as an initiator and terminator of the test frames for an RFC 2544-based benchmarking test. Router A is connected over a Layer 3 network to another router, Router B, which functions as a reflector to reflect back the test frames it receives from Router A. IPv4 is used for transmission of test frames over the Layer 3 network. This benchmarking test is used to compute the IPv4 service parameters between Router A and Router B. Logical interfaces on both the routers are configured with IPv4 addresses to measure the performance attributes, such as throughput, latency, frame loss, and bursty frames, of network devices for the IPv4 service.

Figure 1 on page 37 shows the sample topology to perform an RFC 2544 test for a Layer 3 IPv4 service.

Figure 1: RFC 2544-Based Benchmarking Test for a Layer 3 IPv4 Service



Configuration

In this example, you configure the benchmarking test for a Layer 3 IPv4 service that is between interface ge-0/0/0 on Router A and interface ge-0/0/4 on Router B to detect and analyze the performance of the interconnecting routers.

- [Configuring Benchmarking Test Parameters on Router A on page 38](#)
- [Configuring Benchmarking Test Parameters on Router B on page 40](#)
- [Results on page 42](#)

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the [edit] hierarchy level:

Configuring Benchmarking Test

Parameters on Router

A

```
set interfaces ge-0/0/0 unit 0 family inet address 200.0.0.1/24
set interfaces ge-0/0/0 unit 0 family mpls
set rfc2544-benchmarking profiles test-profile throughput test-type throughput
set rfc2544-benchmarking profiles test-profile throughput packet-size 64
set rfc2544-benchmarking profiles test-profile throughput test-duration 20m
set rfc2544-benchmarking profiles test-profile throughput bandwidth-kbps 500
set rfc2544-benchmarking tests test-name test1 test-profile throughput
set rfc2544-benchmarking tests test-name test1 interface ge-0/0/0.1
set rfc2544-benchmarking tests test-name test1 mode initiate-and-terminate
set rfc2544-benchmarking tests test-name test1 family inet
set rfc2544-benchmarking tests test-name test1 dest-address 200.0.0.2
set rfc2544-benchmarking tests test-name test1 udp-port 4001
```

Configuring Benchmarking Test Parameters on Router

B

```
set interfaces ge-0/0/4 unit 0 family inet address 200.0.0.2/24
set interfaces ge-0/0/4 unit 0 family mpls
set services rpm rfc2544-benchmarking tests test-name test1 interface ge-0/0/4.1
set services rpm rfc2544-benchmarking tests test-name test1 mode reflect
set services rpm rfc2544-benchmarking tests test-name test1 family inet
set services rpm rfc2544-benchmarking tests test-name test1 dest-address 200.0.0.1
set services rpm rfc2544-benchmarking tests test-name test1 udp-port 4001
```

Configuring Benchmarking Test Parameters on Router A

Step-by-Step Procedure

The following require you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the test parameters on Router A:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level:

```
[edit]
user@host# edit interfaces
```
2. Configure the interface on which the test must be run.

```
[edit interfaces]
user@host# edit ge-0/0/0
```
3. Configure a logical unit and specify the protocol family.

```
[edit interfaces ge-0/0/0]
user@host# edit unit 0 family inet
```
4. Specify the address for the logical interface.

```
[edit interfaces ge-0/0/0 unit 0 family inet]
user@host# set address 200.0.0.1/24
```
5. Enter the **up** command to go the previous level in the configuration hierarchy.

- ```
[edit interfaces ge-0/0/0 unit 0 family inet]
user@host# up
```
6. Configure the MPLS family on the logical interface.
 

```
[edit interfaces ge-0/0/0 unit 0]
user@host# set family mpls
```
  7. Go to the top level of the configuration command mode.
 

```
[edit interfaces ge-0/0/0 unit 0]
user@host# top
```
  8. In configuration mode, go to the **[edit services]** hierarchy level.
 

```
[edit]
user@host# edit services
```
  9. Configure a real-time performance monitoring service (RPM) instance.
 

```
[edit services]
user@host# edit rpm
```
  10. Configure an RFC 2544-based benchmarking test for the RPM instance.
 

```
[edit services rpm]
user@host# edit rfc2544-benchmarking
```
  11. Define a name for a test profile—for example, throughput.
 

```
[edit services rpm rfc2544-benchmarking]
user@host# edit profiles test-profile throughput
```
  12. Configure the type of test to be performed as throughput.
 

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type throughput
```
  13. Specify the size of the test packet as 64 bytes.
 

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type packet-size 64
```
  14. Specify the period for which the test is to be performed in hours, minutes, or seconds by specifying a number followed by the letter h (for hours), m (for minutes), or s (for seconds), respectively.
 

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type test-duration 20m
```
  15. Define the theoretical maximum bandwidth for the test in kilobits per second, with a value from 1 Kbps through 1,000,000 Kbps.
 

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type bandwidth-kbps 500
```
  16. Enter the **up** command to go the previous level in the configuration hierarchy.
 

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# up
```
  17. Enter the **up** command to go the previous level in the configuration hierarchy.
 

```
[edit services rpm rfc2544-benchmarking profiles]
```

```
user@host# up
```

18. Define a name for the test—for example, test1. The test name identifier can be up to 32 characters in length.

```
[edit services rpm rfc2544-benchmarking]
user@host# edit tests test-name test1
```

19. Specify the name of the test profile—for example, throughput—to be associated with a particular test name.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set test-profile throughput
```

20. Specify the logical interface, ge-0/0/0.1, on which the RFC 2544-based benchmarking test is run.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set test-interface ge-0/0/0.1
```

21. Specify the test mode for the packets that are sent during the benchmarking test as initiation and termination.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set mode initiate-and-terminate
```

22. Configure the address type family, **inet**, for the benchmarking test.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set family inet
```

23. Configure the destination IPv4 address for the test packets.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set dest-address 200.0.0.2
```

24. Specify the UDP port of the destination to be used in the UDP header for the generated frames as 4001.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set udp-port 4001
```

25. Start the benchmarking test on the initiator.

```
user@> test services rpm rfc2544-benchmarking test test1 start
```

After the test is successfully completed, it is automatically stopped at the initiator.

### Configuring Benchmarking Test Parameters on Router B

#### **Step-by-Step Procedure**

The following you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the test parameters on Router B:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level:

```
[edit]
user@host# edit interfaces
```



2. Configure the interface on which the test must be run.  

```
[edit interfaces]
user@host# edit ge-0/0/4
```
3. Configure a logical unit and specify the protocol family as **inet**.  

```
[edit interfaces ge-0/0/4]
user@host# edit unit 0 family inet
```
4. Specify the address for the logical interface.  

```
[edit interfaces ge-0/0/4 unit 0 family inet]
user@host# set address 200.0.0.2/24
```
5. Enter the **up** command to go the previous level in the configuration hierarchy.  

```
[edit interfaces ge-0/0/4 unit 0 family inet]
user@host# up
```
6. Configure the MPLS family on the logical interface.  

```
[edit interfaces ge-0/0/4 unit 0]
user@host# set family mpls
```
7. Go to the top level of the configuration command mode.  

```
[edit interfaces ge-0/0/4 unit 0]
user@host# top
```
8. In configuration mode, go to the **[edit services]** hierarchy level.  

```
[edit]
user@host# edit services
```
9. Configure a real-time performance monitoring service (RPM) instance.  

```
[edit services]
user@host# edit rpm
```
10. Configure an RFC 2544-based benchmarking test for the RPM instance.  

```
[edit services rpm]
user@host# edit rfc2544-benchmarking
```
11. Define a name for the test—for example, **test1**. The test name identifier can be up to 32 characters in length.  

```
[edit services rpm rfc2544-benchmarking]
user@host# edit tests test-name test1
```
12. Specify the logical interface, **ge-0/0/4.1**, on which the RFC 2544-based benchmarking test is run.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set test-interface ge-0/0/4.1
```
13. Specify **reflect** as the test mode for the packets that are sent during the benchmarking test.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set mode reflect
```
14. Configure the address type family, **inet**, for the benchmarking test.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set family inet
```

15. Configure the destination IPv4 address for the test packets as 200.0.0.1.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set dest-address 200.0.0.1
```

16. Specify the UDP port of the destination to be used in the UDP header for the generated frames as 4001.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set udp-port 4001
```

17. Start the benchmarking test on the reflector.

```
user@host> test services rpm rfc2544-benchmarking test test1 start
```

After the test is successfully completed at the initiator, you can stop the test at the reflector by entering the **test services rpm rfc2544-benchmarking test test1** command.

---

## Results

In configuration mode, confirm your configuration on Router A and Router B by entering the **show** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

Benchmarking Test Parameters on Router A:

```
[edit interfaces]
ge-0/0/0 {
 unit 0 {
 family inet {
 address 200.0.0.1/24;
 }
 family mpls;
 }
}

[edit services rpm]
rfc2544-benchmarking {
 profiles {
 test-profile throughput {
 test-type throughput
 packet-size 64;
 test-duration 20m;
 bandwidth-kbps 500;
 }
 }

 tests {
 test-name test1 {
 test-profile throughput;
 interface ge-0/0/0.1;
 mode initiate,terminate;
 family inet;
 dest-address 200.0.0.2
 udp-port 4001;
 }
 }
}
```

```
}

```

Benchmarking Test Parameters on Router B:

```
[edit interfaces]
ge-0/0/4 {
 unit 0 {
 family inet {
 address 200.0.0.2/24;
 }
 family mpls;
 }
}

[edit services rpm]
rfc2544-benchmarking {
 # Note, When in reflector mode, test profile is not needed
 tests {
 test-name test1 {
 interface ge-0/0/4.1;
 mode reflect;
 family inet;
 dest-address 200.0.0.1;
 udp-port 4001;
 }
 }
}
```

After you have configured the device, enter the **commit** command in configuration mode.

## Verifying the Results of the Benchmarking Test for Layer 3 IPv4 Services

Examine the results of the benchmarking test that is performed on the configured service between Router A and Router B.

- [Verifying the Benchmarking Test Results on page 43](#)

### Verifying the Benchmarking Test Results

|                              |                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>               | Verify that the necessary and desired statistical values are displayed for the benchmarking test that is run on the configured service between Router A and Router B.                                                                                                                                                                                                           |
| <b>Action</b>                | In operational mode, enter the <b>show services rpm rfc2544-benchmarking (aborted-tests   active-tests   completed-tests   summary)</b> command to display information about the results of each category or state of the RFC 2544-based benchmarking test, such as aborted tests, active tests, and completed tests, for each real-time performance monitoring (RPM) instance. |
| <b>Related Documentation</b> | <ul style="list-style-type: none"> <li>• <a href="#">RFC 2544-Based Benchmarking Tests Overview on page 4</a></li> <li>• <a href="#">Configuring an RFC 2544-Based Benchmarking Test on page 25</a></li> </ul>                                                                                                                                                                  |

## Example: Configuring an RFC 2544-Based Benchmarking Test for UNI Direction of Ethernet Pseudowires

---

This example shows how to configure the benchmarking test for the user-to-network interface (UNI) direction of an Ethernet pseudowire service.

- [Requirements on page 44](#)
- [Overview on page 44](#)
- [Configuration on page 45](#)
- [Verifying the Results of the Benchmarking Test for UNI Direction of an Ethernet Pseudowire Service on page 51](#)

### Requirements

This example uses the following hardware and software components:

- An ACX Series router—f
- Junos OS Release or later

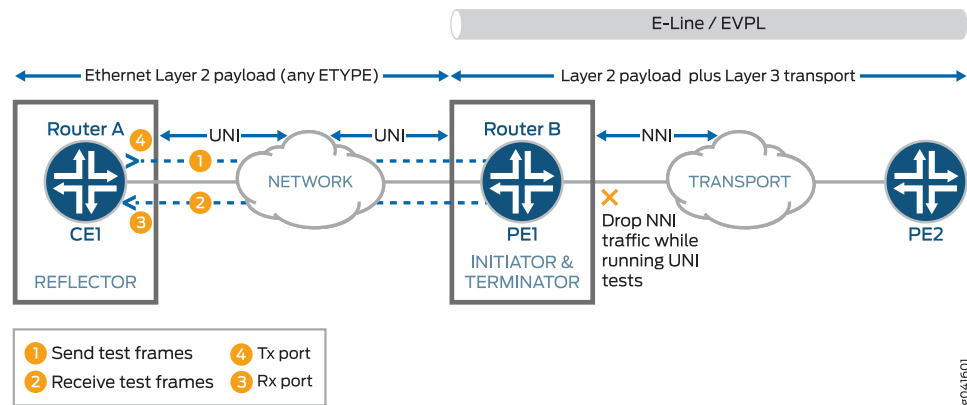
### Overview

Consider a sample topology in which a router, Router A, functions as a reflector of the test frames for an RFC 2544-based benchmarking test. The logical customer edge (CE)-facing interface and **inet** family are configured on Router A. Router A is not part of a pseudowire and therefore, a Layer 3 family configuration is required on it. Router A, which is a customer edge device CE1 is connected to Router B, which functions as a provider edge device PE1 over an Ethernet pseudowire in the UNI direction with EtherType or Layer 2 Ethernet payload. The logical interface, family, and UNI direction are configured on Router B. Router B or PE1 is connected over an Ethernet pseudowire in the NNI direction to a provider edge device at the remote site, PE2. The link between CE1 and PE1 is an Ethernet Layer 2 network and it can be configured with any EtherType value. The link between PE1 and PE2 is an Ethernet line (E-LINE) or an Ethernet Private Line (EPL) that has Layer 2 payload and Layer 3 transport sent over it. Router B or PE1 functions as an initiator and terminator of the test frames that are sent to Router A and reflected back from it.

This benchmarking test is used to compute the performance attributes in the user-to-network interface (UNI) direction of an Ethernet pseudowire service between Router A and Router B. Data traffic arriving from a network-to-network interface (NNI) toward the customer edge is ignored while the test is in progress. Packets from the CE are not sent toward the NNI because all packets are assumed to be test probes.

[Figure 2 on page 45](#) shows the sample topology to perform an RFC 2544 test for the UNI direction of an Ethernet pseudowire service.

Figure 2: RFC 2544-Based Benchmarking Test for UNI Direction of an Ethernet Pseudowire



## Configuration

In this example, you configure the benchmarking test for the UNI direction of an Ethernet pseudowire service that is enabled between two routers to detect and analyze the performance of the interconnecting routers.

- [Configuring Benchmarking Test Parameters on Router A on page 46](#)
- [Configuring Benchmarking Test Parameters on Router B on page 48](#)
- [Results on page 49](#)

### CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the [edit] hierarchy level:

### Configuring Benchmarking Test Parameters on Router A

```
set interfaces ge-0/0/0 vlan-tagging
set interfaces ge-0/0/0 unit 0 vlan-id 101
set interfaces ge-0/0/0 unit 0 family inet address 200.0.0.1/24
set services rpm rfc2544-benchmarking profiles test-profile throughput test-type throughput
set services rpm rfc2544-benchmarking profiles test-profile throughput packet-size 64
set services rpm rfc2544-benchmarking profiles test-profile throughput test-duration 20m
set services rpm rfc2544-benchmarking profiles test-profile throughput bandwidth-kbps 500
set services rpm rfc2544-benchmarking tests test-name test1 interface ge-0/0/0.1
set services rpm rfc2544-benchmarking tests test-name test1 test-profile throughput
set services rpm rfc2544-benchmarking tests test-name test1 mode initiate,terminate
set services rpm rfc2544-benchmarking tests test-name test1 family inet
set services rpm rfc2544-benchmarking tests test-name test1 dest-address 200.0.0.2
set services rpm rfc2544-benchmarking tests test-name test1 udp-port 4001
```

## Configuring Benchmarking Test Parameters on Router B

```
set interfaces ge-0/0/4 vlan-tagging
set interfaces ge-0/0/4 unit 0 encapsulation vlan-ccc
set interfaces ge-0/0/4 unit 0 vlan-id 101
set services rpm rfc2544-benchmarking tests test-name test1 interface ge-0/0/4.1
set services rpm rfc2544-benchmarking tests test-name test1 mode reflect
set services rpm rfc2544-benchmarking tests test-name test1 mode family ccc
set services rpm rfc2544-benchmarking tests test-name test1 direction uni
```

---

### Configuring Benchmarking Test Parameters on Router A

#### Step-by-Step Procedure

The following require you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the test parameters on Router A:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level:  

```
[edit]
user@host# edit interfaces
```
2. Configure the interface on which the test must be run.  

```
[edit interfaces]
user@host# edit ge-0/0/0
```
3. Configure VLAN tagging for transmission and reception of 802.1Q VLAN-tagged frames.  

```
[edit interfaces ge-0/0/0]
user@host# set vlan-tagging
```
4. Configure a logical unit and specify the protocol family as **inet**.  

```
[edit interfaces ge-0/0/0]
user@host# edit unit 0 family inet
```
5. Specify the address for the logical interface.  

```
[edit interfaces ge-0/0/0 unit 0 family inet]
user@host# set address 200.0.0.1/24
```
6. Configure the VLAN ID on the logical interface as 101.  

```
[edit interfaces ge-0/0/0 unit 0]
user@host# set vlan-id 101
```
7. Go to the top level of the configuration command mode.  

```
[edit interfaces ge-0/0/0 unit 0]
user@host# top
```
8. In configuration mode, go to the **[edit services]** hierarchy level.  

```
[edit]
user@host# edit services
```

9. Configure a real-time performance monitoring service (RPM) instance.  

```
[edit services]
user@host# edit rpm
```
10. Configure an RFC 2544-based benchmarking test for the RPM instance.  

```
[edit services rpm]
user@host# edit rfc2544-benchmarking
```
11. Define a name for a test profile—for example, throughput.  

```
[edit services rpm rfc2544-benchmarking]
user@host# edit profiles test-profile throughput
```
12. Configure the type of test to be performed as throughput.  

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type throughput
```
13. Specify the size of the test packet as 64 bytes.  

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type packet-size 64
```
14. Specify the period for which the test is to be performed in hours, minutes, or seconds by specifying a number followed by the letter h (for hours), m (for minutes), or s (for seconds). In this example, you configure the period as 20 minutes.  

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type test-duration 20m
```
15. Define the theoretical maximum bandwidth for the test in kilobits per second, with a value from 1 Kbps through 1,000,000 Kbps.  

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type bandwidth-kbps 500
```
16. Enter the **up** command to go the previous level in the configuration hierarchy.  

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# up
```
17. Enter the **up** command to go the previous level in the configuration hierarchy.  

```
[edit services rpm rfc2544-benchmarking profiles]
user@host# up
```
18. Define a name for the test—for example, test1. The test name identifier can be up to 32 characters in length.  

```
[edit services rpm rfc2544-benchmarking]
user@host# edit tests test-name test1
```
19. Specify the name of the test profile—for example, throughput—to be associated with a particular test name.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set test-profile throughput
```
20. Specify the logical interface, ge-0/0/0.1, on which the RFC 2544-based benchmarking test is run.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
```

```
user@host# set test-interface ge-0/0/0.1
```

21. Specify the test mode for the packets that are sent during the benchmarking test as initiation and termination.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set mode initiate-and-terminate
```

22. Configure the address type family, **inet**, for the benchmarking test.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set family inet
```

23. Configure the destination IPv4 address for the test packets as 200.0.0.2.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set dest-address 200.0.0.2
```

24. Specify the UDP port of the destination to be used in the UDP header for the generated frames as 4001.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set udp-port 4001
```

---

### Configuring Benchmarking Test Parameters on Router B

#### Step-by-Step Procedure

The following require you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the test parameters on Router B:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level:

```
[edit]
user@host# edit interfaces
```

2. Configure the interface on which the test must be run.

```
[edit interfaces]
user@host# edit ge-0/0/4
```

3. Configure VLAN tagging for transmission and reception of 802.1Q VLAN-tagged frames.

```
[edit interfaces ge-0/0/4]
user@host# set vlan-tagging
```

4. Configure a logical unit for the interface.

```
[edit interfaces ge-0/0/4]
user@host# edit unit 0
```

5. Specify the encapsulation for Ethernet VLAN circuits.

```
[edit interfaces ge-0/0/4 unit 0]
user@host# set encapsulation vlan-ccc
```

6. Configure the VLAN ID as 101 on the logical interface.

```
[edit interfaces ge-0/0/4 unit 0]
user@host# set vlan-id 101
```



7. Go to the top level of the configuration command mode.  

```
[edit interfaces ge-0/0/4 unit 0]
user@host# top
```
8. In configuration mode, go to the **[edit services]** hierarchy level.  

```
[edit]
user@host# edit services
```
9. Configure a real-time performance monitoring service (RPM) instance.  

```
[edit services]
user@host# edit rpm
```
10. Configure an RFC 2544-based benchmarking test for the RPM instance.  

```
[edit services rpm]
user@host# edit rfc2544-benchmarking
```
11. Define a name for the test—for example, test1. The test name identifier can be up to 32 characters in length.  

```
[edit services rpm rfc2544-benchmarking]
user@host# edit tests test-name test1
```
12. Specify the logical interface on which the RFC 2544-based benchmarking test is run.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set test-interface ge-0/0/4.1
```
13. Specify **reflect** as the test mode for the packets that are sent during the benchmarking test.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set mode reflect
```
14. Configure the address type family, **ccc**, for the benchmarking test.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set family ccc
```
15. Specify the direction of the interface on which the test must be run, which is UNI in this example.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set direction uni
```

## Results

In configuration mode, confirm your configuration on Router A and Router B by entering the **show** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

Benchmarking Test Parameters on Router A:

```
[edit interfaces]
ge-0/0/0 {
 vlan-tagging;
 unit 0 {
```

```
 vlan-id 101;
 family inet {
 address 200.0.0.1/24;
 }
 }

[edit services rpm]
rfc2544-benchmarking {
 profiles {
 test-profile throughput {
 test-type throughput
 packet-size 64;
 test-duration 20m;
 bandwidth-kbps 500;
 }
 }

 tests {
 test-name test1 {
 interface ge-0/0/0.1;
 test-profile throughput;
 mode initiate,terminate;
 family inet;
 dest-address 200.0.0.2
 udp-port 4001;
 }
 }
}
```

#### Benchmarking Test Parameters on Router B:

```
[edit interfaces]
ge-0/0/4 {
 vlan-tagging;
 unit 0 {
 encapsulation vlan-ccc;
 vlan-id 101;
 }
}

[edit services rpm]
rfc2544-benchmarking {
 # Note, When in reflector mode, test profile is not needed
 tests {
 test-name test1 {
 interface ge-0/0/4.1;
 mode reflect;
 family ccc;
 direction uni;
 }
 }
}
```

After you have configured the device, enter the **commit** command in configuration mode.

## Verifying the Results of the Benchmarking Test for UNI Direction of an Ethernet Pseudowire Service

Examine the results of the benchmarking test that is performed on the configured service between Router A and Router B.

- [Verifying the Benchmarking Test Results on page 51](#)

---

### Verifying the Benchmarking Test Results

|                              |                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>               | Verify that the necessary and desired statistical values are displayed for the benchmarking test that is run on the configured service between Router A and Router B.                                                                                                                                                                                                           |
| <b>Action</b>                | In operational mode, enter the <b>show services rpm rfc2544-benchmarking (aborted-tests   active-tests   completed-tests   summary)</b> command to display information about the results of each category or state of the RFC 2544-based benchmarking test, such as aborted tests, active tests, and completed tests, for each real-time performance monitoring (RPM) instance. |
| <b>Meaning</b>               | The output displays the details of the benchmarking test that was performed. For more information about the <b>show services rpm rfc2544-benchmarking</b> operational command, see <b>show services rpm rfc2544-benchmarking</b> in the <a href="#">CLI Explorer</a> .                                                                                                          |
| <b>Related Documentation</b> | <ul style="list-style-type: none"><li>• <a href="#">RFC 2544-Based Benchmarking Tests Overview on page 4</a></li><li>• <a href="#">Configuring an RFC 2544-Based Benchmarking Test on page 25</a></li></ul>                                                                                                                                                                     |

---

## Example: Configuring an RFC 2544-Based Benchmarking Test for NNI Direction of Ethernet Pseudowires

This example shows how to configure the benchmarking test for a network-to-network interface (NNI) direction of an Ethernet pseudowire service.

- [Requirements on page 51](#)
- [Overview on page 52](#)
- [Configuration on page 52](#)
- [Verifying the Results of the Benchmarking Test for NNI Direction of an Ethernet Pseudowire Service on page 58](#)

### Requirements

This example uses the following hardware and software components:

- An ACX Series router
- Junos OS Release or later

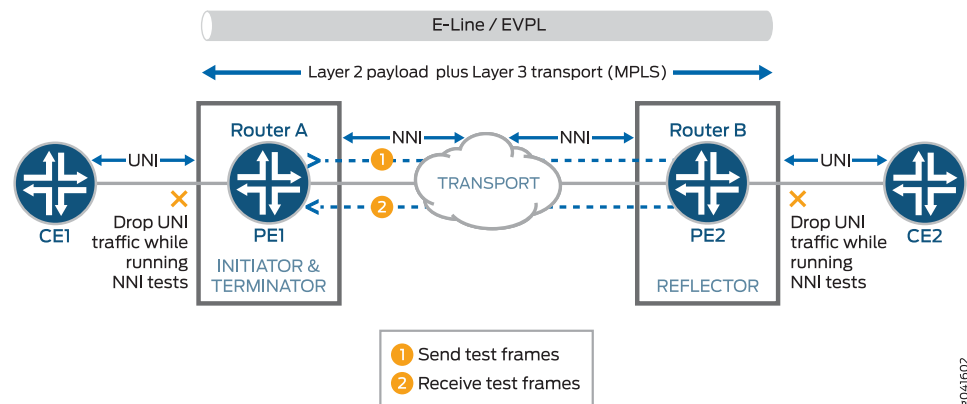
## Overview

Consider a sample topology in which a router, Router A, functions as an initiator and terminator of the test frames for an RFC 2544-based benchmarking test. Router A operates as a provider edge device PE1, which is connected to a customer edge device CE1 on one side and over an Ethernet pseudowire to another router Router B, which functions as a reflector to reflect back the test frames it receives from Router A. Router B operates as a provider edge device, PE2, which is the remote router located at the other side of the service provider core. The UNI direction of CE1 is connected to the NNI direction of PE1. An MPLS tunnel connects PE1 and PE2 over the Ethernet pseudowire or the Ethernet line (E-LINE).

This benchmarking test is used to compute the performance attributes in the network-to-network interface (NNI) direction of an Ethernet pseudowire service between Router A and Router B. The logical interface under test on Router A is the CE1 interface with UNI as the direction, and the logical interface under test on Router B is the CE2 interface with NNI as the direction. Data traffic arriving from UNI toward NNI is ignored while the test is in progress. Packets from NNI are not sent toward the customer edge because all packets are assumed to be test frames. The family and NNI direction are configured on routers A and B.

Figure 3 on page 52 shows the sample topology to perform an RFC 2544 test for the NNI direction of an Ethernet pseudowire service.

**Figure 3: RFC 2544-Based Benchmarking Test for NNI Direction of an Ethernet Pseudowire**



## Configuration

In this example, you configure the benchmarking test for the NNI direction of an Ethernet pseudowire service that is enabled between two routers to detect and analyze the performance of the interconnecting routers.

- [Configuring Benchmarking Test Parameters on Router on page 53](#)
- [Configuring Benchmarking Test Parameters on Router B on page 55](#)
- [Results on page 57](#)

**CLI Quick  
Configuration**

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level:

**Configuring  
Benchmarking Test  
Parameters on Router  
A**

```
set interfaces ge-0/0/0 vlan-tagging
set interfaces ge-0/0/0 unit 0 encapsulation vlan-ccc
set interfaces ge-0/0/0 unit 0 vlan-id 101
set services rpm rfc2544-benchmarking profiles test-profile throughput test-type
throughput
set services rpm rfc2544-benchmarking profiles test-profile throughput packet-size 64
set services rpm rfc2544-benchmarking profiles test-profile throughput test-duration 20
set services rpm rfc2544-benchmarking profiles test-profile throughput bandwidth-kbps
500
set services rpm rfc2544-benchmarking tests test-name test1 interface ge-0/0/0.1
set services rpm rfc2544-benchmarking tests test-name test1 test-profile throughput
set services rpm rfc2544-benchmarking tests test-name test1 mode initiate,terminate
set services rpm rfc2544-benchmarking tests test-name test1 family ccc
set services rpm rfc2544-benchmarking tests test-name test1 direction nni
```

**Configuring  
Benchmarking Test  
Parameters on Router  
B**

```
set interfaces ge-0/0/4 vlan-tagging
set interfaces ge-0/0/4 unit 0 encapsulation vlan-ccc
set interfaces ge-0/0/4 unit 0 vlan-id 101
set services rpm rfc2544-benchmarking tests test-name test1 interface ge-0/0/4.1
set services rpm rfc2544-benchmarking tests test-name test1 mode reflect
set services rpm rfc2544-benchmarking tests test-name test1 mode family ccc
set services rpm rfc2544-benchmarking tests test-name test1 direction uni
```

**Configuring Benchmarking Test Parameters on Router****Step-by-Step  
Procedure**

The following require you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the test parameters on Router A:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level:

```
[edit]
user@host# edit interfaces
```

2. Configure the interface on which the test must be run.

```
[edit interfaces]
user@host# edit ge-0/0/0
```

3. Configure VLAN tagging for transmission and reception of 802.1Q VLAN-tagged frames.  

```
[edit interfaces ge-0/0/0]
user@host# set vlan-tagging
```
4. Configure a logical unit for the interface.  

```
[edit interfaces ge-0/0/0]
user@host# edit unit 0
```
5. Specify the encapsulation for Ethernet VLAN circuits.  

```
[edit interfaces ge-0/0/0 unit 0]
user@host# set encapsulation vlan-ccc
```
6. Configure the VLAN ID on the logical interface.  

```
[edit interfaces ge-0/0/0 unit 0]
user@host# set vlan-id 101
```
7. Go to the top level of the configuration command mode.  

```
[edit interfaces ge-0/0/0 unit 0]
user@host# top
```
8. In configuration mode, go to the **[edit services]** hierarchy level.  

```
[edit]
user@host# edit services
```
9. Configure a real-time performance monitoring service (RPM) instance.  

```
[edit services]
user@host# edit rpm
```
10. Configure an RFC 2544-based benchmarking test for the RPM instance.  

```
[edit services rpm]
user@host# edit rfc2544-benchmarking
```
11. Define a name for a test profile—for example, throughput.  

```
[edit services rpm rfc2544-benchmarking]
user@host# edit profiles test-profile throughput
```
12. Configure the type of test to be performed as throughput.  

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type throughput
```
13. Specify the size of the test packet as 64 bytes.  

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type packet-size 64
```
14. Specify the period—for example, 20 minutes—for which the test is to be performed in hours, minutes, or seconds by specifying a number followed by the letter h (for hours), m (for minutes), or s (for seconds).  

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type test-duration 20m
```

15. Define the theoretical maximum bandwidth for the test in kilobits per second, with a value from 1 Kbps through 1,000,000 Kbps.  

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# set test-type bandwidth-kbps 500
```
16. Enter the **up** command to go the previous level in the configuration hierarchy.  

```
[edit services rpm rfc2544-benchmarking profiles test-profile throughput]
user@host# up
```
17. Enter the **up** command to go the previous level in the configuration hierarchy.  

```
[edit services rpm rfc2544-benchmarking profiles]
user@host# up
```
18. Define a name for the test—for example, test1. The test name identifier can be up to 32 characters in length.  

```
[edit services rpm rfc2544-benchmarking]
user@host# edit tests test-name test1
```
19. Specify the name of the test profile—for example, throughput—to be associated with a particular test name.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set test-profile throughput
```
20. Specify the logical interface, ge-0/0/0.1, on which the RFC 2544-based benchmarking test is run.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set test-interface ge-0/0/0.1
```
21. Specify the test mode for the packets that are sent during the benchmarking test as initiation and termination.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set mode initiate-and-terminate
```
22. Configure the address type family, **ccc**, for the benchmarking test.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set family ccc
```
23. Specify the direction of the interface on which the test must be run, which is NNI in this example.  

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set direction nni
```

### Configuring Benchmarking Test Parameters on Router B

#### Step-by-Step Procedure

The following require you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the test parameters on Router B:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level:

- ```
[edit]
user@host# edit interfaces
```
2. Configure the interface on which the test must be run.

```
[edit interfaces]
user@host# edit ge-0/0/4
```
 3. Configure VLAN tagging for transmission and reception of 802.1Q VLAN-tagged frames.

```
[edit interfaces ge-0/0/4]
user@host# set vlan-tagging
```
 4. Configure a logical unit for the interface.

```
[edit interfaces ge-0/0/4]
user@host# edit unit 0
```
 5. Specify the encapsulation for Ethernet VLAN circuits.

```
[edit interfaces ge-0/0/4 unit 0]
user@host# set encapsulation vlan-ccc
```
 6. Configure the VLAN ID on the logical interface.

```
[edit interfaces ge-0/0/4 unit 0]
user@host# set vlan-id 101
```
 7. Go to the top level of the configuration command mode.

```
[edit interfaces ge-0/0/4 unit 0]
user@host# top
```
 8. In configuration mode, go to the **[edit services]** hierarchy level.

```
[edit]
user@host# edit services
```
 9. Configure a real-time performance monitoring service (RPM) instance.

```
[edit services]
user@host# edit rpm
```
 10. Configure an RFC 2544-based benchmarking test for the RPM instance.

```
[edit services rpm]
user@host# edit rfc2544-benchmarking
```
 11. Define a name for the test—for example, test1. The test name identifier can be up to 32 characters in length.

```
[edit services rpm rfc2544-benchmarking]
user@host# edit tests test-name test1
```
 12. Specify the logical interface, ge-0/0/4.1, on which the RFC 2544-based benchmarking test is run.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set test-interface ge-0/0/4.1
```
 13. Specify **reflect** as the test mode for the packets that are sent during the benchmarking test.


```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set mode reflect
```

14. Configure the address type family, **ccc**, for the benchmarking test.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set family ccc
```

15. Specify the direction of the interface on which the test must be run, which is NNI in this example.

```
[edit services rpm rfc2544-benchmarking tests test-name test1]
user@host# set direction nni
```

Results

In configuration mode, confirm your configuration on Router A and Router B by entering the **show** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

Benchmarking Test Parameters on Router A:

```
[edit interfaces]
ge-0/0/0 {
  vlan-tagging;
  unit 0 {
    encapsulation vlan-ccc;
    vlan-id 101;
  }
}

[edit services rpm]
rfc2544-benchmarking {
  profiles {
    test-profile throughput {
      test-type throughput
      packet-size 64;
      test-duration 20m;
      bandwidth-kbps 500;
    }
  }

  tests {
    test-name test1 {
      interface ge-0/0/0.1;
      test-profile throughput;
      mode initiate,terminate;
      family ccc;
      direction nni;
    }
  }
}
```

Benchmarking Test Parameters on Router B:

```
[edit interfaces]
ge-0/0/4 {
  vlan-tagging;
```

```
        unit 0 {
            encapsulation vlan-ccc;
            vlan-id 101;
        }
    }

[edit services rpm]
rfc2544-benchmarking {
    # Note, When in reflector mode, test profile is not needed
    tests {
        test-name test1 {
            interface ge-0/0/4.1;
            mode reflect;
            family ccc;
            direction nni;
        }
    }
}
```

After you have configured the device, enter the **commit** command in configuration mode.

Verifying the Results of the Benchmarking Test for NNI Direction of an Ethernet Pseudowire Service

Examine the results of the benchmarking test that is performed on the configured service between Router A and Router B.

- [Verifying the Benchmarking Test Results on page 58](#)

Verifying the Benchmarking Test Results

Purpose	Verify that the necessary and desired statistical values are displayed for the benchmarking test that is run on the configured service between Router A and Router B.
Action	In operational mode, enter the show services rpm rfc2544-benchmarking (aborted-tests active-tests completed-tests summary) command to display information about the results of each category or state of the RFC 2544-based benchmarking test, such as aborted tests, active tests, and completed tests, for each real-time performance monitoring (RPM) instance.
Meaning	The output displays the details of the benchmarking test that was performed. For more information about the show services rpm rfc2544-benchmarking operational command, see show services rpm rfc2544-benchmarking in the CLI Explorer .
Related Documentation	<ul style="list-style-type: none">• RFC 2544-Based Benchmarking Tests Overview on page 4• Configuring an RFC 2544-Based Benchmarking Test on page 25

CHAPTER 4

Configuration Statements

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authentication-mode

Syntax	authentication-mode (authenticated control-only-encrypted encrypted none);
Hierarchy Level	[edit services rpm twamp server]
Release Information	Statement introduced in Junos OS Release 9.5.
Description	Specify the authentication or encryption mode support for the TWAMP test protocol. This statement is required in the configuration; if no authentication or encryption is specified, you should set the value to none .
Options	<p>authenticated—Data packets are authenticated.</p> <p>control-only-encrypted—TWAMP control packets are encrypted. TWAMP data packets are in plain text format.</p> <p>encrypted—Data packets are encrypted.</p> <p>none—No authentication or encryption.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring TWAMP on page 22

bgp

Syntax `bgp {
 data-fill data;
 data-size size;
 destination-port port;
 history-size size;
 logical-system logical-system-name <routing-instances routing-instance-name>;
 moving-average-size size;
 probe-count count;
 probe-interval seconds;
 probe-type type;
 routing-instances instance-name;
 test-interval interval;
 }`

Hierarchy Level `[edit services rpm bgp]
 [edit protocols bgp group group-name]
 [edit routing-instances instance-name protocols bgp group group-name]
 [edit logical-system logical-system-name protocols bgp group group-name]
 [edit logical-system logical-system-name routing-instances instance-name protocols bgp
 group group-name]`

Release Information Statement introduced before Junos OS Release 7.4.

Description Configure BGP neighbor discovery through Real-Time Performance Monitoring (RPM).

Options **bgp**—Define properties for configuring BGP neighbor discovery.

The remaining statements are explained separately.



NOTE: On MX Series routers, you can configure all the statements. On M Series and T Series routers, you can configure only the [logical-system](#) and [routing-instances](#) statements.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

Related Documentation

- [Configuring BGP Neighbor Discovery Through RPM on page 11](#)

client-list

Syntax	<code>client-list <i>list-name</i> { address <i>address</i>; }</code>
Hierarchy Level	[edit services rpm twamp server]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	List of allowed control client hosts that can connect to this server. Each entry is a Classless Interdomain Routing (CIDR) address (IP address plus mask) that represents a network of allowed hosts. You can configure more than one list, but you must configure at least one client address to enable TWAMP. Each list can contain up to 64 entries.
Options	<i>list-name</i> —Name of client address list. <i>address</i> —Address and mask for an allowed client.
Required Privilege Level	system—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring TWAMP on page 22

data-fill

Syntax	<code>data-fill <i>data</i>;</code>
Hierarchy Level	[edit services rpm bgp], [edit services rpm probe owner test <i>test-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 9.3 for PTX Series Packet Transport Routers.
Description	Specify the contents of the data portion of Internet Control Message Protocol (ICMP) probes. The data-fill statement is not valid with the http-get or http-metadata-get probe types.
Options	<i>data</i> —A hexadecimal value; for example, 0-9, A-F.
Required Privilege Level	system—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring BGP Neighbor Discovery Through RPM on page 11 • Configuring RPM Probes on page 13

data-size

Syntax	<code>data-size size;</code>
Hierarchy Level	[edit services rpm bgp], [edit services rpm probe owner test test-name]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the size of the data portion of ICMP probes. The data-size statement is not valid with the http-get or http-metadata-get probe type.
Options	data —The size can be from 0 through 65400 Default: 0



NOTE: If you configure the hardware timestamp feature (see [“Configuring RPM Timestamping” on page 19](#)):

- The **data-size** default value is 32 bytes and 32 is the minimum value for explicit configuration. The UDP timestamp probe type is an exception; it requires a minimum data size of 52 bytes.
 - The **data-size** must be at least 100 bytes smaller than the default MTU of the interface of the RPM client interface.
-

Required Privilege Level	system—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring BGP Neighbor Discovery Through RPM on page 11

destination-ipv4-address (RFC 2544 Benchmarking)

Syntax	<code>destination-ipv4-address <i>address</i>;</code>
Hierarchy Level	[edit services rpm rfc2544-benchmarkingtests <i>test-name</i> <i>test-name</i>]
Release Information	Statement introduced in Junos OS Release 12.3X52 for ACX Series routers. Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.
Description	Specify the destination IPv4 address to be used in generated test frames. You must configure this option if you specify <code>inet</code> as the family. This option is not required if you specify <code>cccas</code> as the family.
Options	<p><i>address</i>—Valid IPv4 address.</p> <p>Default: If you do not configure the destination IPv4 address, the default value of 192.168.1.20 is used.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring an RFC 2544-Based Benchmarking Test on page 25 • RFC 2544-Based Benchmarking Tests Overview on page 4 • rfc2544-benchmarking on page 84

destination-interface

Syntax	<code>destination-interface <i>interface-name</i>;</code>
Hierarchy Level	[edit services rpm probe owner test <i>test-name</i>], [edit services rpm probe-server (tcp udp)]
Release Information	Statement introduced in Junos OS Release 7.5.
Description	<p>On M Series and T Series routers, specify a services (sp-) interface that adds a timestamp to RPM probe messages. This feature is supported only with icmp-ping, icmp-ping-timestamp, udp-ping, and udp-ping-timestamp probe types. You must also configure the rpm statement on the sp- interface and include the unit 0 family inet statement with a /32 address.</p> <p>On M Series, MX Series, and T Series routers, specify a multiservices (ms-) interface that adds a timestamp to RPM probe messages. This feature is supported only with icmp-ping, icmp-ping-timestamp, udp-ping, and udp-ping-timestamp probe types. You must also configure the rpm statement on the ms- interface and include the unit 0 family inet statement with a /32 address.</p> <p>To enable RPM for the extension-provider packages on the adaptive services interface, configure the object-cache-size, policy-db-size, and package statements at the [edit chassis fpc slot-number pic pic-number adaptive-services service-package extension-provider] hierarchy level. For the extension-provider package, package-name in the package package-name statement is jservices-rpm.</p>
Options	interface-name —Name of the adaptive services interface.
Required Privilege Level	system —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring RPM Timestamping on page 19• Configuring RPM Receiver Servers on page 18• Configuring RPM Timestamping on page 19• hardware-timestamp on page 71• rpm on page 85• Enabling RPM for the Junos OS extension-provider package on page 24

destination-port

Syntax	<code>destination-port <i>port</i>;</code>
Hierarchy Level	<code>[edit services rpm bgp],</code> <code>[edit services rpm probe owner test test-name]</code>
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	<p>Specify the User Datagram Protocol (UDP) or Transmission Control Protocol (TCP) port to which a probe is sent. This statement is used only for TCP or UDP probe types.</p> <p>The value for the destination-port can be only 7 when you configure along with hardware timestamping. A constraint check prevents you for configuring any other value for the destination port in this case.</p> <p>This constraint does not apply when you are using one-way hardware timestamping along with destination-port and either probe-type udp-ping or probe-type udp-ping-timestamp.</p>
Options	port —The port number can be 7 or from 49,160 to 65,535.
Required Privilege Level	system —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring BGP Neighbor Discovery Through RPM on page 11 • Configuring RPM Probes on page 13

destination-udp-port (RFC 2544 Benchmarking)

Syntax	<code>destination-udp-port <i>port-number</i>;</code>
Hierarchy Level	[edit services rpm rfc2544-benchmarkingtests <i>test-name</i> <i>test-name</i>]
Release Information	Statement introduced in Junos OS Release 12.3X52 for ACX Series routers. Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.
Description	Specify the UDP port of the destination to be used in the UDP header for the generated frames. If you do not specify the UDP port, the default value of 4041 is used.
Options	<i>port-number</i> —UDP port number for the test frames Default: 4041
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an RFC 2544-Based Benchmarking Test on page 25• RFC 2544-Based Benchmarking Tests Overview on page 4• rfc2544-benchmarking on page 84

direction (RFC 2544 Benchmarking)

Syntax	<code>direction (egress ingress);</code>
Hierarchy Level	[edit services rpm rfc2544-benchmarkingtests <i>test-name</i> <i>test-name</i>]
Release Information	Statement introduced in Junos OS Release 12.3X52 for ACX Series routers. Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.
Description	Specify the direction of the interface on which the test must be run. This parameter is valid only for a ccc family.
Options	egress —Causes the test to be run in the egress direction of the interface (network-to-network interface (NNI)). ingress —Causes the test to be run in the ingress direction of the interface (user-to-network interface (UNI)).
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an RFC 2544-Based Benchmarking Test on page 25• RFC 2544-Based Benchmarking Tests Overview on page 4• rfc2544-benchmarking on page 84

dscp-code-point

Syntax	<code>dscp-code-point <i>dscp-bits</i>;</code>
Hierarchy Level	[edit services rpm probe owner test <i>test-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release for PTX Series Packet Transport Routers.
Description	Specify the value of the Differentiated Services (DiffServ) field within the IP header. The DiffServ code point (DSCP) bits value must be set to a valid 6-bit pattern.
Options	<p><i>dscp-bits</i>—A valid 6-bit pattern; for example, 001111, or one of the following configured DSCP aliases:</p> <ul style="list-style-type: none"> • af11—Default: 001010 • af12—Default: 001100 • af13—Default: 001110 • af21—Default: 010010 • af22—Default: 010100 • af23 —Default: 010110 • af31 —Default: 011010 • af32 —Default: 011100 • af33 —Default: 011110 • af41 —Default: 100010 • af42 —Default:100100 • af43 —Default:100110 • be—Default: 000000 • cs1—Default: 001000 • cs2—Default: 010000 • cs3—Default: 011000 • cs4—Default: 100000 • cs5—Default: 101000 • cs6—Default: 110000 • cs7—Default: 111000 • ef—Default: 101110 • nc1—Default: 110000

- **nc2**—Default: 111000

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- [Configuring RPM Probes on page 13](#)

family (RFC 2544 Benchmarking)

Syntax family (inet | ccc);

Hierarchy Level [edit [services](#) rpm [rfc2544-benchmarking](#)tests test-name test-name]

Release Information Statement introduced in Junos OS Release 12.3X52 for ACX Series routers.
Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.

Description Configure the address type family for the benchmarking test.

Options **inet**—Indicates that the test is run on an IPv4 service.
ccc—Indicates that the test is run on a circuit cross-connect (CCC) or Ethernet pseudowire service. The **direction** option specifies the direction (ingress or egress) to be used for the test.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- [Configuring an RFC 2544-Based Benchmarking Test on page 25](#)
- [RFC 2544-Based Benchmarking Tests Overview on page 4](#)
- [rfc2544-benchmarking on page 84](#)

hardware-timestamp

Syntax	hardware-timestamp;
Hierarchy Level	[edit services rpm probe owner test test-name]
Release Information	Statement introduced in Junos OS Release 8.1. Statement applied to MX Series routers in Junos OS Release 10.0. Statement introduced in Junos OS Release 10.3 for EX Series switches.
Description	<p>On MX Series routers, on M-320 routers using the Enhanced Queuing MPC, and on EX Series switches only, enable timestamping of RPM probe messages in the Packet Forwarding Engine host processor. This feature is supported only with icmp-ping, icmp-ping-timestamp, udp-ping, and udp-ping-timestamp probe types.</p> <p>When you configure either probe-type udp-ping or probe-type udp-ping-timestamp along with the hardware-timestamp command, the value for the destination-port can be only 7. A constraint check prevents you for configuring any other value for the destination port in this case.</p> <p>This constraint does not apply when you are configuring one-way-hardware-timestamp.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring RPM Timestamping on page 19

history-size

Syntax	history-size <i>size</i> ;
Hierarchy Level	[edit services rpm bgp], [edit services rpm probe owner test test-name]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the number of stored history entries.
Options	<p>size—A value from 0 to 512.</p> <p>Default: 50</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring BGP Neighbor Discovery Through RPM on page 11 • Configuring RPM Probes on page 13

inactivity-timeout (Services RPM)

Syntax	<code>inactivity-timeout <i>seconds</i>;</code>
Hierarchy Level	[edit services rpm twamp server]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	Inactivity timeout period, in seconds.
Options	<i>seconds</i> —Length of time the session is inactive before it times out. Default: 1800 seconds
Required Privilege Level	system —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring TWAMP on page 22

logical-system

Syntax	<code>logical-system <i>logical-system-name</i> { [routing-instances <i>instance-name</i>]; }</code>
Hierarchy Level	[edit services rpm bgp]
Release Information	Statement introduced in Junos OS Release 7.6.
Description	Specify the logical system used by the probes. The remaining statements are explained separately.
Options	<i>logical-system-name</i> —Logical system name.
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring BGP Neighbor Discovery Through RPM on page 11

maximum-connections

Syntax	<code>maximum-connections <i>count</i>;</code>
Hierarchy Level	[edit services rpm twamp server]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	Maximum number of allowed connections between the server and all control client hosts.
Options	<i>count</i> —Maximum number of connections. Range: 1 through 1000 Default: 64
Required Privilege Level	system —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring TWAMP on page 22

max-connection-duration

Syntax	<code>max-connection-duration <i>hours</i>;</code>
Hierarchy Level	[edit services rpm twamp server]
Release Information	Statement introduced in Junos OS Release 11.1.
Description	Specify the maximum time a connection can exist between a client and the server.
Options	<i>hours</i> —Number of hours a connection can exist between a client and the server.
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring TWAMP on page 22

maximum-connections-per-client

Syntax	maximum-connections-per-client <i>count</i> ;
Hierarchy Level	[edit services rpm twamp server]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	Maximum number of allowed connections between the server and a single control client host.
Options	<i>count</i> —Maximum number of connections. Range: 1 through 500 Default: 64
Required Privilege Level	system—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring TWAMP on page 22

maximum-sessions

Syntax	maximum-sessions <i>count</i> ;
Hierarchy Level	[edit services rpm twamp server]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	Maximum number of allowed test sessions the server can have running at one time.
Options	<i>count</i> —Maximum number of sessions. Range: 1 through 2048 Default: 64
Required Privilege Level	system—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring TWAMP on page 22

maximum-sessions-per-connection

Syntax	<code>maximum-sessions-per-connection count;</code>
Hierarchy Level	[edit services rpm twamp server]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	Maximum number of allowed sessions the server can open on a single client connection.
Options	count —Maximum number of sessions. Default: 64
Required Privilege Level	system—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring TWAMP on page 22

mode (RFC 2544 Benchmarking)

Syntax	<code>mode reflect;</code>
Hierarchy Level	[edit services rpm rfc2544-benchmarkingtests test-name test-name]
Release Information	Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.
Description	Specify the test mode for the packets that are sent during the benchmarking test.
Options	reflect —Causes the test frames to be reflected on the chosen service (IPv4 or Ethernet).
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring an RFC 2544-Based Benchmarking Test on page 25 • RFC 2544-Based Benchmarking Tests Overview on page 4 • rfc2544-benchmarking on page 84

moving-average-size

Syntax	<code>moving-average-size <i>number</i>;</code>
Hierarchy Level	[edit services rpm bgp], [edit services rpm probe owner test <i>test-name</i>]
Release Information	Statement introduced in Junos OS Release 8.5. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Enable statistical calculation operations to be performed across a configurable number of the most recent samples.
Options	<i>number</i> —Number of samples to be used in calculations. Range: 0 through 255
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring RPM Probes on page 13

one-way-hardware-timestamp

Syntax	<code>one-way-hardware-timestamp;</code>
Hierarchy Level	[edit services rpm probe owner test <i>test-name</i>]
Release Information	Statement introduced in Junos OS Release 8.5. Statement introduced in Junos OS Release 9.3 for EX Series switches.
Description	Enable timestamping of RPM probe messages for one-way delay and jitter measurements. You must configure this statement along with the destination-interface statement to invoke timestamping. This feature is supported only with icmp-ping , icmp-ping-timestamp , udp-ping , and udp-ping-timestamp probe types.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring RPM Timestamping on page 19• destination-interface on page 66• hardware-timestamp on page 71

port (RPM)

Syntax	<code>port <i>number</i>;</code>
Hierarchy Level	[edit services rpm probe-server (tcp udp)]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the port number for the probe server.
Options	<i>number</i> —Port number for the probe server. The value can be 7 or 49,160 through 65,535.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring RPM Receiver Servers on page 18

port (TWAMP)

Syntax	<code>port <i>number</i>;</code>
Hierarchy Level	[edit services rpm twamp server]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	TWAMP server listening port.
Options	<i>number</i> —Port number. Range: 1 through 65,535
Required Privilege Level	system—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring TWAMP on page 22

probe

Syntax

```
probe owner {  
  test test-name {  
    data-fill data;  
    data-size size;  
    destination-interface interface-name;  
    destination-port port;  
    dscp-code-point dscp-bits;  
    hardware-timestamp;  
    history-size size;  
    moving-average-size number;  
    one-way-hardware-timestamp;  
    probe-count count;  
    probe-interval seconds;  
    probe-type type;  
    routing-instance instance-name;  
    source-address address;  
    target (url | address);  
    test-interval interval;  
    thresholds thresholds;  
    traps traps;  
  }  
}
```

Hierarchy Level [edit [services](#) rpm]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.3 for EX Series switches.

Description Specify an owner name. The owner name combined with the test name represent a single RPM configuration instance.

Options *owner*—Specify an owner name up to 32 characters in length.

The remaining statements are explained separately.

Required Privilege Level system—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- [Configuring RPM Probes on page 13](#)

probe-count

Syntax	<code>probe-count count;</code>
Hierarchy Level	[edit services rpm bgp], [edit services rpm probe owner test test-name]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the number of probes within a test.
Options	<i>count</i> —A value from 1 through 15.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring BGP Neighbor Discovery Through RPM on page 11 • Configuring RPM Probes on page 13

probe-interval

Syntax	<code>probe-interval interval;</code>
Hierarchy Level	[edit services rpm bgp], [edit services rpm probe owner test test-name]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the time to wait between sending packets, in seconds.
Options	<i>interval</i> —Number of seconds, from 1 through 255.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring BGP Neighbor Discovery Through RPM on page 11 • Configuring RPM Probes on page 13

probe-limit

Syntax	<code>probe-limit <i>limit</i>;</code>
Hierarchy Level	[edit services rpm]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Configure the maximum number of concurrent probes allowed.
Options	limit —Maximum number of concurrent probes allowed. Range: 1 through 500(PTX Series Packet Transport Routers only) 1 through 200 Default: 100
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Limiting the Number of Concurrent RPM Probes on page 18

probe-server

```
Syntax  probe-server {
        tcp {
            destination-interface interface-name;
            port number;
        }
        udp {
            destination-interface interface-name;
            port number;
        }
    }
```

Hierarchy Level [edit [services](#) rpm]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.3 for EX Series switches.
Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.

Description Specify the server to act as a receiver for the probes.

The remaining statements are explained separately.



NOTE: The `destination-interface` statement is not supported on PTX Series routers.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- [Configuring RPM Receiver Servers on page 18](#)

probe-type

Syntax	<code>probe-type type;</code>
Hierarchy Level	<code>[edit services rpm bgp],</code> <code>[edit services rpm probe owner test test-name]</code>
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the packet and protocol contents of a probe.
Options	<p>type—Specify one of the following probe type values:</p> <ul style="list-style-type: none">• http-get—(Not available at the <code>[edit services rpm bgp]</code> hierarchy level.) Sends a Hypertext Transfer Protocol (HTTP) get request to a target URL.• http-metadata-get—(Not available at the <code>[edit services rpm bgp]</code> hierarchy level.) Sends an HTTP get request for metadata to a target URL.• icmp-ping—Sends ICMP echo requests to a target address.• icmp-ping-timestamp—Sends ICMP timestamp requests to a target address.• tcp-ping—Sends TCP packets to a target.• udp-ping—Sends UDP packets to a target.• udp-ping-timestamp—Sends UDP timestamp requests to a target address.
Required Privilege Level	<code>interface</code> —To view this statement in the configuration. <code>interface-control</code> —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring BGP Neighbor Discovery Through RPM on page 11

routing-instance

Syntax	<code>routing-instance <i>instance-name</i>;</code>
Hierarchy Level	[edit services rpm probe owner test test-name]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the routing instance used by the probes.
Options	<i>instance-name</i> —A routing instance configured at the [edit routing-instance] hierarchy level. Default: Internet routing table <code>inet.0</code> .
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring RPM Probes on page 13

routing-instances

Syntax	<code>routing-instances <i>instance-name</i>;</code>
Hierarchy Level	[edit services rpm bgp], [edit services rpm bgp logical-system logical-system-name]
Release Information	Statement introduced in Junos OS Release 7.6. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the routing instance used by the probes.
Options	<i>instance-name</i> —A routing instance configured at the [edit routing-instances] hierarchy level. Default: Internet routing table <code>inet.0</code> .
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring BGP Neighbor Discovery Through RPM on page 11

rfc2544-benchmarking

Syntax	<pre>rfc2544-benchmarking { tests{ test-name (RFC 2544 Benchmarking) test-name { test-interface interface-name; mode reflect; family (inet ccc); destination-ipv4-address address; destination-udp-port port-number; source-ipv4-address address; source-udp-port port-number; direction (egress ingress); } } }</pre>
Hierarchy Level	[edit services rpm]
Release Information	Statement introduced in Junos OS Release 12.3X52 for ACX Series routers. Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.
Description	Configure the parameters for the RFC 2544-based benchmarking test. You must configure a test profile, which specifies the type of test and the manner in which it must be performed, and associate the test profile with a test name. The test name that you configure contains details, such as the address family and the test mode, for the test. You can associate the same test profile with multiple test names.
Options	rfc2544-benchmarking —Define the attributes for the RFC 2544-based benchmarking test to examine and analyze the performance characteristics of a network interconnecting device.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an RFC 2544-Based Benchmarking Test on page 25• RFC 2544-Based Benchmarking Tests Overview on page 4• show services rpm rfc2544-benchmarking on page 119• show services rpm rfc2544-benchmarking test-id on page 124

rpm

Syntax	<code>rpm (client server);</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>]
Release Information	Statement introduced in Junos OS Release 8.1. Statement introduced in Junos OS Release 9.3 for EX Series switches.
Description	Associate an RPM client (router or switch that originates RPM probes) or RPM server with a specified interface.
Options	<i>client</i> —Identifier for RPM client router or switch. <i>server</i> —Identifier for RPM server.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring RPM Timestamping on page 19

rpm

Syntax	<pre>rpm { bgp { data-fill <i>data</i>; data-size <i>size</i>; destination-port <i>port</i>; history-size <i>size</i>; logical-system <i>logical-system-name</i> <routing-instances <i>routing-instance-name</i>>; moving-average-size <i>number</i>; probe-count <i>count</i>; probe-interval <i>seconds</i>; probe-type <i>type</i>; routing-instances <i>instance-name</i>; test-interval <i>interval</i>; } }</pre>
Hierarchy Level	[edit services]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Configure BGP neighbor discovery through RPM. The remaining statements are explained separately.
Usage Guidelines	See “ Configuring BGP Neighbor Discovery Through RPM ” on page 11.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

server

Syntax	<pre>server { client-list <i>list-name</i> { [address <i>address</i>]; } inactivity-timeout <i>seconds</i>; maximum-connections <i>count</i>; maximum-connections-per-client <i>count</i>; maximum-sessions <i>count</i>; maximum-sessions-per-connection <i>count</i>; port <i>number</i>; }</pre>
Hierarchy Level	[edit services rpm twamp]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	TWAMP server configuration settings.
Options	The remaining statements are described separately.
Required Privilege Level	system—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring TWAMP on page 22

server-inactivity-timeout

Syntax	<pre>server-inactivity-timeout <i>minutes</i>;</pre>
Hierarchy Level	[edit services rpm twamp server]
Release Information	Statement introduced in Junos OS Release 11.1.
Description	The maximum time the Two-Way Active Measurement Protocol (TWAMP) server has to finish the TWAMP control protocol negotiation.
Options	<p>minutes—Number of minutes the TWAMP server has to finish the TWAMP control protocol negotiation.</p> <p>Default: 15 minutes</p> <p>Range: 1-30 minutes</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring TWAMP on page 22

services (RPM)

Syntax	<code>services rpm { ... }</code>
Hierarchy Level	[edit]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Define the service rules to be applied to traffic.
Options	<code>rpm</code> —Identifies the RPM set of rules statements.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring BGP Neighbor Discovery Through RPM on page 11 • Configuring RPM Probes on page 13 • Configuring RPM Receiver Servers on page 18 • Limiting the Number of Concurrent RPM Probes on page 18 • Configuring RPM Timestamping on page 19 • Configuring TWAMP on page 22 • Enabling RPM for the Junos OS extension-provider package on page 24

source-address

Syntax	<code>source-address <i>address</i>;</code>
Hierarchy Level	[edit <code>services rpm probe owner test test-name</code>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the source IP address used for probes. If the source IP address is not one of the router's or switch's assigned addresses, the packet will use the outgoing interface's address as its source.
Options	<code>address</code> —Valid IP address.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring RPM Probes on page 13

source-ipv4-address (RFC 2544 Benchmarking)

Syntax	<code>source-ipv4-address <i>address</i>;</code>
Hierarchy Level	[edit services rpm rfc2544-benchmarkingtests <i>test-name</i> <i>test-name</i>]
Release Information	Statement introduced in Junos OS Release 12.3X52 for ACX Series routers. Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.
Description	Specify the source IPv4 address to be used in generated test frames. This parameter is optional for both ccc and inet families. If you do not configure the source IPv4 address for an inet family, the source address of the interface is used to transmit the test frames.
Options	<i>address</i> —Valid IPv4 address. Default: If you do not configure the source IPv4 address for a ccc family, default value of 192.168.1.10 is used.
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an RFC 2544-Based Benchmarking Test on page 25• RFC 2544-Based Benchmarking Tests Overview on page 4• rfc2544-benchmarking on page 84

source-udp-port (RFC 2544 Benchmarking)

Syntax	<code>source-udp-port <i>port-number</i>;</code>
Hierarchy Level	[edit services rpm rfc2544-benchmarkingtests <i>test-name</i> <i>test-name</i>]
Release Information	Statement introduced in Junos OS Release 12.3X52 for ACX Series routers. Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.
Description	Specify the UDP port of the source to be used in the UDP header for the generated frames. If you do not specify the UDP port, the default value of 4041 is used.
Options	<i>port-number</i> —Source UDP port number for the test frames Default: 4041
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an RFC 2544-Based Benchmarking Test on page 25• RFC 2544-Based Benchmarking Tests Overview on page 4• rfc2544-benchmarking on page 84

target (Services RPM)

Syntax	<code>target (url <i>url</i> address <i>address</i>);</code>
Hierarchy Level	<code>[edit services rpm probe <i>owner</i> test <i>test-name</i>]</code>
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Packet Transport Routers.
Description	Specify the destination address or URL used for the probes.
Options	url <i>url</i> —For HTTP probe types, specify a fully formed URL that includes http:// in the URL address. address <i>address</i> —For all other probe types, specify an IPv4 address for the target host.
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring RPM Probes on page 13

tcp

Syntax	<pre>tcp { destination-interface <i>interface-name</i>; port <i>port</i>; }</pre>
Hierarchy Level	<code>[edit services rpm probe-server]</code>
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the port information for the TCP server. The remaining statements are explained separately.
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring RPM Receiver Servers on page 18

test

Syntax `test test-name {
 data-fill data;
 data-size size;
 destination-interface interface-name;
 destination-port port;
 dscp-code-point dscp-bits;
 hardware-timestamp;
 history-size size;
 moving-average-size number;
 one-way-hardware-timestamp;
 probe-count count;
 probe-interval seconds;
 probe-type type;
 routing-instance instance-name;
 source-address address;
 target (url url | address address);
 test-interval interval;
 thresholds thresholds;
 traps traps;
 }`

Hierarchy Level [edit [services](#) rpm [probe](#) owner]

Release Information Statement introduced before Junos OS Release 7.4.
 Statement introduced in Junos OS Release 9.3 for EX Series switches.
 Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.

Description Specify the range of probes over which the standard deviation, average, and jitter are calculated. The test name combined with the owner name represent a single RPM configuration instance.

Options **test-name**—Specify a test name. The name can be up to 32 characters in length.

 The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

Related Documentation • [Configuring RPM Probes on page 13](#)

tests (RFC 2544 Benchmarking)

Syntax

```
tests {
  test-name test-name {
    test-interface interface-name;
    mode reflect;
    family (inet | ccc);
    destination-ipv4-address address;
    destination-udp-port port-number;
    source-ipv4-address address;
    source-udp-port port-number;
    direction (egress | ingress);
  }
}
```

Hierarchy Level [edit [services](#) rpm [rfc2544-benchmarking](#)]

Release Information Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.

Description Specify the attributes of the test iteration, such as the address family (type of service, IPv4 or Ethernet), the logical interface, test duration, and test packet size, that are used for a benchmarking test to be run. The test name combined with the test profile represent a single real-time performance monitoring (RPM) configuration instance.

Options **tests**—Define the test iteration for the RFC 2544-based benchmarking test.

The remaining statements are explained separately.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- [Configuring an RFC 2544-Based Benchmarking Test on page 25](#)
- [RFC 2544-Based Benchmarking Tests Overview on page 4](#)
- [rfc2544-benchmarking on page 84](#)

test-interface (RFC 2544 Benchmarking)

Syntax	<code>test-interface <i>interface-name</i>;</code>
Hierarchy Level	[edit services rpm rfc2544-benchmarkingtests <i>test-name</i> <i>test-name</i>]
Release Information	Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.
Description	<p>Specify the logical interface on which the RFC 2544-based benchmarking test is run. If you configure an inet family and the test mode to initiate and terminate test frames on the same device, the interface you configure is not effective. Instead, the test is run on the egress logical interface that is determined using route lookup on the specified destination IPv4 address. If you configure an inet family and the test mode to reflect the frames back on the sender from the other end, the logical interface is used as the interface to enable the reflection service (reflection is performed on the packets entering the specified interface). If you not configure the logical interface for reflection test mode, a lookup is performed on the source IPv4 address to determine the interface that hosts the address.</p>
Options	<i>interface-name</i> —Name of the logical interface on which the test needs to be run.
Required Privilege Level	<i>interface</i> —To view this statement in the configuration. <i>interface-control</i> —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an RFC 2544-Based Benchmarking Test on page 25• RFC 2544-Based Benchmarking Tests Overview on page 4• rfc2544-benchmarking on page 84

test-interval

Syntax	<code>test-interval <i>frequency</i>;</code>
Hierarchy Level	[edit services rpm bgp], [edit services rpm probe owner test <i>test-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the time to wait between tests, in seconds.
Options	<i>frequency</i> —Number of seconds, from 0 through 86400.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring BGP Neighbor Discovery Through RPM on page 11• Configuring RPM Probes on page 13

test-name (RFC 2544 Benchmarking)

Syntax `test-name test-name {
 test-interface interface-name;
 mode reflect;
 family (inet | ccc);
 destination-ipv4-address address;
 destination-udp-port port-number;
 source-ipv4-address address;
 source-udp-port port-number;
 direction (egress | ingress);
 }`

Hierarchy Level [edit [services](#) rpm [rfc2544-benchmarking tests](#)]

Release Information Statement introduced in Junos OS Release 13.3 for MX104 3D Universal Edge Routers.

Description Define the name of the RFC 2544-based benchmarking test. For each unique test name that you configure, you can specify a test profile, which contains the settings for a test and its type, and also a test interface, which contains the settings for test packets that are sent and received on the selected interface.

Options *test-name*—Specify a test name. The name can be up to 32 characters in length.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

Related Documentation

- [Configuring an RFC 2544-Based Benchmarking Test on page 25](#)
- [RFC 2544-Based Benchmarking Tests Overview on page 4](#)
- [rfc2544-benchmarking on page 84](#)

thresholds

Syntax	<code>thresholds thresholds;</code>
Hierarchy Level	[edit services rpm probe owner test test-name]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Packet Series Transport Routers.
Description	Specify thresholds used for the probes. A system log message is generated when the configured threshold is exceeded. Likewise, an SNMP trap (if configured) is generated when a threshold is exceeded.
Options	<p>thresholds—Specify one or more threshold measurements. The following options are supported:</p> <ul style="list-style-type: none"> • egress-time—Measures maximum source-to-destination time per probe. • ingress-time—Measures maximum destination-to-source time per probe. • jitter-egress—Measures maximum source-to-destination jitter per test. • jitter-ingress—Measures maximum destination-to- source jitter per test. • jitter-rtt—Measures maximum jitter per test, from 0 through 60,000,000 microseconds. • rtt—Measures maximum round-trip time per probe, in microseconds. • std-dev-egress—Measures maximum source-to-destination standard deviation per test. • std-dev-ingress—Measures maximum destination-to-source standard deviation per test. • std-dev-rtt—Measures maximum standard deviation per test, in microseconds. • successive-loss—Measures successive probe loss count, indicating probe failure. • total-loss—Measures total probe loss count indicating test failure, from 0 through 15.
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring RPM Probes on page 13

traceoptions (RPM)

Syntax	<pre>traceoptions { file <i>filename</i> <files <i>number</i>> <match <i>regular-expression</i> > <size <i>maximum-file-size</i>> <world-readable no-world-readable>; flag <i>flag</i>; }</pre>
Hierarchy Level	[edit services rpm]
Release Information	Statement introduced in Junos OS Release 13.2.
Description	Define tracing operations for RPM processes.
Options	<p>file <i>filename</i>—Name of the file to receive the output of the tracing operation. All files are placed in the directory <code>/var/log</code>.</p> <p>Default: <code>rmopd</code></p> <p>files <i>number</i>—(Optional) Maximum number of trace files to create before overwriting the oldest one. If you specify a maximum number of files, you also must specify a maximum file size with the size option.</p> <p>Range: 2 through 1000</p> <p>Default: 3 files</p> <p>match <i>regular-expression</i>—(Optional) Refine the output to include lines that contain the regular expression.</p> <p>size <i>maximum-file-size</i>—(Optional) Maximum size of each trace file. By default, the number entered is treated as bytes. Alternatively, you can include a suffix to the number to indicate kilobytes (KB), megabytes (MB), or gigabytes (GB). If you specify a maximum file size, you also must specify a maximum number of trace files with the files option.</p> <p>Range: 10 KB through 1 GB</p> <p>Default: 128 KB</p> <p>world-readable—(Optional) Enable unrestricted file access.</p> <p>no-world-readable—(Default) Disable unrestricted file access. This means the log file can be accessed only by the user who configured the tracing operation.</p> <p>flag <i>flag</i>—Tracing operation to perform. To specify more than one tracing operation, include multiple flag statements. You can include the following flags:</p> <ul style="list-style-type: none">• all—Trace all operations.• configuration—Trace configuration events.• error—Trace events related to catastrophic errors in daemon.• ipc—Trace IPC events.• ppm—Trace ppm events.• statistics—Trace statistics.

Required Privilege	trace—To view this statement in the configuration.
Level	trace-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Tracing RPM Operations on page 28

traps

Syntax	<code>traps traps;</code>
Hierarchy Level	[edit <code>services rpm probe owner test test-name</code>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Set the trap bit to generate traps for probes. Traps are sent if the configured threshold is met or exceeded.
Options	<p>traps—Specify one or more traps. The following options are supported:</p> <ul style="list-style-type: none">• egress-jitter-exceeded—Generates traps when the jitter in egress time threshold is met or exceeded.• egress-std-dev-exceeded—Generates traps when the egress time standard deviation threshold is met or exceeded.• egress-time-exceeded—Generates traps when the maximum egress time threshold is met or exceeded.• ingress-jitter-exceeded—Generates traps when the jitter in ingress time threshold is met or exceeded.• ingress-std-dev-exceeded—Generates traps when the ingress time standard deviation threshold is met or exceeded.• ingress-time-exceeded—Generates traps when the maximum ingress time threshold is met or exceeded.• jitter-exceeded—Generates traps when the jitter in round-trip time threshold is met or exceeded.• probe-failure—Generates traps for successive probe loss thresholds crossed.• rtt-exceeded—Generates traps when the maximum round-trip time threshold is met or exceeded.• std-dev-exceeded—Generates traps when the round-trip time standard deviation threshold is met or exceeded.• test-completion—Generates traps when a test is completed.• test-failure—Generates traps when the total probe loss threshold is met or exceeded.



NOTE: For RPM traps to be generated, you must configure the remote-operations SNMP trap category by including the `categories` statement at the [edit `snmp trap-group trap-group-name`] hierarchy level.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- [Configuring RPM Probes on page 13](#)
- *categories*

twamp

Syntax

```
twamp {
  server {
    authentication-mode mode;
    client-list list-name {
      [ address address ];
    }
    inactivity-timeout seconds;
    max-connection-duration hours;
    maximum-connections count;
    maximum-connections-per-client count;
    maximum-sessions count;
    maximum-sessions-per-connection count;
    port number;
    server-inactivity-timeout minutes;
  }
}
```

Hierarchy Level [edit services rpm]

Release Information Statement introduced in Junos OS Release 9.3.

Description Two-Way Active Measurement Protocol (TWAMP) configuration settings.

The remaining statements are described separately.

Required Privilege Level system—To view this statement in the configuration.
interface-control—To add this statement to the configuration.


Related Documentation

- [Configuring TWAMP on page 22](#)

twamp-server

Syntax	twamp-server;
Hierarchy Level	[edit interfaces <i>sp-fpc/pic/port</i> unit <i>logical-unit-number</i>]
Release Information	Statement introduced in Junos OS Release 9.3.
Description	Specify the service PIC logical interface to provide the TWAMP service.
Required Privilege Level	system—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring TWAMP on page 22

udp

Syntax	udp { destination-interface <i>interface-name</i> ; port <i>port</i> ; }
Hierarchy Level	[edit services rpm probe-server]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.3 for EX Series switches. Statement introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Specify the port information for the UDP server. The remaining statements are explained separately.
<div> NOTE: The <code>destination-interface</code> statement is not supported on PTX Series routers.</div>	
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring RPM Receiver Servers on page 18

PART 3

Administration

- [RPM Operational Mode Commands on page 103](#)

CHAPTER 5

RPM Operational Mode Commands

- `clear services rpm twamp server connection`
- `show services rpm active-servers`
- `show services rpm history-results`
- `show services rpm probe-results`
- `show services rpm twamp server connection`
- `show services rpm twamp server session`
- `show services rpm rfc2544-benchmarking`
- `show services rpm rfc2544-benchmarking test-id`
- `test services rpm rfc2544-benchmarking test`

clear services rpm twamp server connection

Syntax	clear services rpm twamp server connection <i><connection-id></i>
Release Information	Command introduced in Junos OS Release 9.3.
Description	Clear connections established between the real-time performance monitoring (RPM) Two-Way Active Measurement Protocol (TWAMP) server and control clients. By default all established connections are cleared (along with the sessions on those connections). To clear only a specific connection, specify the connection ID when you issue the command.
Options	<i>connection-id</i> —(Optional) Clear only the specified connection.
Required Privilege Level	clear

show services rpm active-servers

Syntax	show services rpm active-servers
Release Information	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Display the protocols and corresponding ports for which a router or switch is configured as a real-time performance monitoring (RPM) server.
Options	This command has no options.
Required Privilege Level	view
List of Sample Output	show services rpm active-servers on page 105
Output Fields	Table 5 on page 105 lists the output fields for the show services rpm active-servers command. Output fields are listed in the approximate order in which they appear.

Table 5: show services rpm active-servers Output Fields

Field Name	Field Description
Protocol	Protocol configured on the receiving probe server. The protocol can be the User Datagram Protocol (UDP) or the Transmission Control Protocol (TCP).
Port	Port configured on the receiving probe server.
Destination interface name	Output interface name for the probes.

Sample Output

show services rpm active-servers

```
user@host> show services rpm active-servers
  Protocol: TCP, Port: 50000, Destination interface name: lt-0/0/0.0
  Protocol: UDP, Port: 50001, Destination interface name: lt-0/0/0.0
```

show services rpm history-results

Syntax	show services rpm history-results <brief detail> <owner <i>owner</i> > <since <i>time</i> > <test <i>name</i> >
Release Information	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 13.2 for PTX Series Packet Transport Routers.
Description	Display standard information about the results of the last 50 probes for each real-time performance monitoring (RPM) instance.
Options	<p>none—Display the results of the last 50 probes for all RPM instances.</p> <p>brief detail—(Optional) Display the specified level of output.</p> <p>owner <i>owner</i>—(Optional) Display information for the specified probe owner.</p> <p>since <i>time</i>—(Optional) Display information from the specified time. Specify time as <i>yyyy-mm-dd.hh:mm:ss</i>.</p> <p>test <i>name</i>—(Optional) Display information for the specified test.</p>
Required Privilege Level	view
List of Sample Output	show services rpm history-results on page 107 show services rpm history-results detail on page 107
Output Fields	Table 6 on page 106 lists the output fields for the show services rpm history-results command. Output fields are listed in the approximate order in which they appear.

Table 6: show services rpm history-results Output Fields

Field Name	Field Description	Level of Output
Owner	Probe owner.	All levels
Test	Name of a test for a probe instance.	All levels
Probe received	Timestamp when the probe result was determined.	All levels
Round trip time	Average ping round-trip time (RTT), in microseconds.	All levels
Probe results	<p>Result of a particular probe performed by a remote host. The following information is contained in the results:</p> <ul style="list-style-type: none"> Response received—Timestamp when the probe result was determined. Rtt—Average ping round-trip time (RTT), in microseconds. 	detail

Table 6: show services rpm history-results Output Fields (*continued*)

Field Name	Field Description	Level of Output
Results over current test	Displays the results for the current test by probe at the time each probe was completed, as well as the status of the current test at the time the probe was completed.	detail
Probes sent	Number of probes sent with the current test.	detail
Probes received	Number of probe responses received within the current test.	detail
Loss percentage	Percentage of lost probes for the current test.	detail
Measurement	<p>Increment of measurement. Possible values are round-trip time delay and, for the probe type icmp-pin-timestamp, the egress and ingress delay:</p> <ul style="list-style-type: none"> • Minimum—Minimum RTT, ingress delay, or egress delay measured over the course of the current test. • Maximum—Maximum RTT, ingress delay, or egress delay measured over the course of the current test. • Average—Average RTT, ingress delay, or egress delay measured over the course of the current test. • Jitter—Difference, in microseconds, between the maximum and minimum RTT measured over the course of the current test. • Stddev—Standard deviation of the round-trip time, in microseconds, measured over the course of the current test. 	detail

Sample Output

show services rpm history-results

```

user@host> show services rpm history-results
      Owner, Test                Probe received                Round trip time
p1, t1                Wed Aug 12 01:02:35 2009                315 usec
p1, t1                Wed Aug 12 01:02:36 2009                266 usec
p1, t1                Wed Aug 12 01:02:37 2009                314 usec
p1, t1                Wed Aug 12 01:02:38 2009                388 usec
p1, t1                Wed Aug 12 01:02:39 2009                316 usec
p1, t1                Wed Aug 12 01:02:40 2009                271 usec
p1, t1                Wed Aug 12 01:02:41 2009                314 usec
p1, t1                Wed Aug 12 01:02:42 2009                1180 usec

```

show services rpm history-results detail

```

user@host> show services rpm history-results detail
Owner: p1, Test: t1, Probe type: icmp-ping-timestamp
Probe results:
  Response received, Wed Aug 12 01:02:35 2009,
  Client and server hardware timestamps
  Rtt: 315 usec
Results over current test:
  Probes sent: 1, Probes received: 1, Loss percentage: 0
Measurement: Round trip time
  Samples: 1, Minimum: 315 usec, Maximum: 315 usec, Average: 315 usec,
  Peak to peak: 0 usec, Stddev: 0 usec, Sum: 315 usec

```

Owner: p1, Test: t1, Probe type: icmp-ping-timestamp

Probe results:

Response received, Wed Aug 12 01:02:36 2009,
Client and server hardware timestamps
Rtt: 266 usec, Round trip jitter: -50 usec,
Round trip interarrival jitter: 3 usec

Results over current test:

Probes sent: 2, Probes received: 2, Loss percentage: 0
Measurement: Round trip time
Samples: 2, Minimum: 266 usec, Maximum: 315 usec, Average: 291 usec,
Peak to peak: 49 usec, Stddev: 24 usec, Sum: 581 usec
Measurement: Negative round trip jitter
Samples: 1, Minimum: 50 usec, Maximum: 50 usec, Average: 50 usec,
Peak to peak: 0 usec, Stddev: 0 usec, Sum: 50 usec

Owner: p1, Test: t1, Probe type: icmp-ping-timestamp

Probe results:

Response received, Wed Aug 12 01:02:37 2009,
Client and server hardware timestamps
Rtt: 314 usec, Round trip jitter: 49 usec,
Round trip interarrival jitter: 6 usec

Results over current test:

Probes sent: 3, Probes received: 3, Loss percentage: 0
Measurement: Round trip time
Samples: 3, Minimum: 266 usec, Maximum: 315 usec, Average: 298 usec,
Peak to peak: 49 usec, Stddev: 23 usec, Sum: 895 usec
Measurement: Positive round trip jitter
Samples: 1, Minimum: 49 usec, Maximum: 49 usec, Average: 49 usec,
Peak to peak: 0 usec, Stddev: 0 usec, Sum: 49 usec
Measurement: Negative round trip jitter
Samples: 1, Minimum: 50 usec, Maximum: 50 usec, Average: 50 usec,
Peak to peak: 0 usec, Stddev: 0 usec, Sum: 50 usec

Owner: p1, Test: t1, Probe type: icmp-ping-timestamp

Probe results:

Response received, Wed Aug 12 01:02:38 2009,
Client and server hardware timestamps
Rtt: 388 usec, Round trip jitter: 74 usec,
Round trip interarrival jitter: 10 usec

Results over current test:

Probes sent: 4, Probes received: 4, Loss percentage: 0
Measurement: Round trip time
Samples: 4, Minimum: 266 usec, Maximum: 388 usec, Average: 321 usec,
Peak to peak: 122 usec, Stddev: 44 usec, Sum: 1283 usec
Measurement: Positive round trip jitter
Samples: 2, Minimum: 49 usec, Maximum: 74 usec, Average: 62 usec,
Peak to peak: 25 usec, Stddev: 12 usec, Sum: 123 usec
Measurement: Negative round trip jitter
Samples: 1, Minimum: 50 usec, Maximum: 50 usec, Average: 50 usec,
Peak to peak: 0 usec, Stddev: 0 usec, Sum: 50 usec

show services rpm probe-results

Syntax	show services rpm probe-results <owner <i>owner</i> > <test <i>name</i> >
Release Information	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 13.2 for PTX Series Packet Transport Series Routers.
Description	Display the results of the most recent real-time performance monitoring (RPM) probes.
Options	none —Display all results of the most recent RPM probes. owner <i>owner</i> —(Optional) Display information for the specified probe owner. test <i>name</i> —(Optional) Display information for the specified test.
Required Privilege Level	view
List of Sample Output	show services rpm probe-results on page 112 show services rpm probe-results (BGP Neighbor Discovery) on page 114
Output Fields	Table 7 on page 109 lists the output fields for the show services rpm probe-results command. Output fields are listed in the approximate order in which they appear.

Table 7: show services rpm probe-results Output Fields

Field Name	Field Description
Owner	Owner name. When you configure the probe owner statement at the [edit services rpm] hierarchy level, this field displays the configured owner name. When you configure BGP neighbor discovery through RPM, the output for this field is Rpm-Bgp-Owner .
Test	Name of a test representing a collection of probes. When you configure the test test-name statement at the [edit services rpm probe owner] hierarchy level, the field displays the configured test name. When you configure BGP neighbor discovery through RPM, the output for this field is Rpm-BGP-Test-<i>n</i> , where <i>n</i> is a cumulative number.
Target address	Destination address used for the probes.
Source address	Source address used for the probes.
Probe type	Protocol configured on the receiving probe server: http-get , http-metadata-get , icmp-ping , icmp-ping-timestamp , tcp-ping , udp-ping , or udp-ping-timestamp .
Test size	Number of probes within a test.

Table 7: show services rpm probe-results Output Fields (*continued*)

Field Name	Field Description
Routing Instance Name	<p>(BGP neighbor discovery) Name of the configured (if any) routing instance, logical system name, or both, in which the probe is configured:</p> <ul style="list-style-type: none"> When a routing instance is defined within a logical system, the logical system name is followed by the routing instance name. A slash (/) is used to separate the two entities. For example, if the routing instance called R1 is configured within the logical system called LS, the name in the output field is LS/R1. When a routing instance is configured but the default logical system is used, the name in the output field is the name of the routing instance. When a logical system is configured but the default routing instance is used, the name in the output field is the name of the logical system followed by default. A slash (/) is used to separate the two entities. For example, LS/default.
Probe results	<p>Raw measurement of a particular probe sample done by a remote host. This data is provided separately from the calculated results. The following information is contained in the raw measurement:</p> <ul style="list-style-type: none"> Response received—Timestamp when the probe result was determined. Client and server hardware timestamps—If timestamps are configured, an entry appears at this point. Rtt—Average ping round-trip time (RTT), in microseconds. Egress jitter—Egress jitter, in microseconds. Ingress jitter—Ingress jitter, in microseconds. Round trip jitter—Round-trip jitter, in microseconds. Egress interarrival jitter—Egress interarrival jitter, in microseconds. Ingress interarrival jitter—Ingress interarrival jitter, in microseconds. Round trip interarrival jitter—Round-trip interarrival jitter, in microseconds.
Results over current test	<p>Probes are grouped into tests, and the statistics are calculated for each test. If a test contains 10 probes, the average, minimum, and maximum results are calculated from the results of those 10 probes. If the command is issued while the test is in progress, the statistics use information from the completed probes.</p> <ul style="list-style-type: none"> Probes sent—Number of probes sent within the current test. Probes received—Number of probe responses received within the current test. Loss percentage—Percentage of lost probes for the current test. Measurement—Measurement type. Possible values are round-trip time, positive round-trip jitter, negative round-trip jitter, egress time, positive egress jitter, negative egress jitter, ingress time, positive ingress jitter, negative ingress jitter, and, for the probe type icmp-ping-timestamp, the egress delay and ingress delay. <p>For each measurement type, the following individual calculated results are provided:</p> <ul style="list-style-type: none"> Samples—Number of probes. Minimum—Minimum RTT, ingress delay, or egress delay measured over the course of the current test. Maximum—Maximum RTT, ingress delay, or egress delay measured over the course of the current test. Average—Average RTT, ingress delay, or egress delay measured over the course of the current test. Peak to peak—Peak-to-peak difference, in microseconds. Stddev—Standard deviation, in microseconds. Sum—Statistical sum.

Table 7: show services rpm probe-results Output Fields (*continued*)

Field Name	Field Description
Results over last test	<p>Results for the most recently completed test. If the command is issued while the first test is in progress, this information is not displayed</p> <ul style="list-style-type: none"> • Probes sent—Number of probes sent for the most recently completed test. • Probes received—Number of probe responses received for the most recently completed test. • Loss percentage—Percentage of lost probes for the most recently completed test. • Test completed—Time the most recent test was completed. • Measurement—Measurement type. Possible values are round-trip time, positive round-trip jitter, negative round-trip jitter, egress time, positive egress jitter, negative egress jitter, ingress time, positive ingress jitter, negative ingress jitter, and, for the probe type icmp-ping-timestamp, the egress delay and ingress delay. <p>For each measurement type, the following individual calculated results are provided:</p> <ul style="list-style-type: none"> • Samples—Number of probes. • Minimum—Minimum RTT, ingress delay, or egress delay measured for the most recently completed test. • Maximum—Maximum RTT, ingress delay, or egress delay measured for the most recently completed test. • Average—Average RTT, ingress delay, or egress delay measured for the most recently completed test. • Peak to peak—Peak-to-peak difference, in microseconds. • Stddev—Standard deviation, in microseconds. • Sum—Statistical sum.
Results over all tests	<p>Displays statistics made for all the probes, independently of the grouping into tests, as well as statistics for the current test.</p> <ul style="list-style-type: none"> • Probes sent—Number of probes sent in all tests. • Probes received—Number of probe responses received in all tests. • Loss percentage—Percentage of lost probes in all tests. • Measurement—Measurement type. Possible values are round-trip time, positive round-trip jitter, negative round-trip jitter, egress time, positive egress jitter, negative egress jitter, ingress time, positive ingress jitter, negative ingress jitter, and, for the probe types icmp-ping-timestamp and udp-ping-timestamp, the egress delay and ingress delay. <p>For each measurement type, the following individual calculated results are provided:</p> <ul style="list-style-type: none"> • Samples—Number of probes. • Minimum—Minimum RTT, ingress delay, or egress delay measured over the course of the current test. • Maximum—Maximum RTT, ingress delay, or egress delay measured over the course of the current test. • Average—Average RTT, ingress delay, or egress delay measured over the course of the current test. • Peak to peak—Peak-to-peak difference, in microseconds. • Stddev—Standard deviation, in microseconds. • Sum—Statistical sum.

Table 7: show services rpm probe-results Output Fields (*continued*)

Field Name	Field Description
Error Stats	<p>Displays error statistics for each probe.</p> <ul style="list-style-type: none"> • Invalid client rcv timestamp—Number of client receive timestamp less than client send timestamp. • Invalid server send timestamp—Number of server send timestamp less than server receive timestamp. • Invalid server processing time—Number of server side spent time greater than RTT. <p>NOTE: Error Stats is displayed in the output only if non-zero statistics exists.</p>

Sample Output

show services rpm probe-results

```

user@host> show services rpm probe-results
Owner: ADSN-J4300.ADSN-J2300.D2, Test: 75300002
Target address: 172.16.54.172, Source address: 10.206.0.1,
Probe type: udp-ping-timestamp, Test size: 10 probes
Probe results:
  Response received, Tue Feb  6 14:53:15 2007,
  Client and server hardware timestamps
  Rtt: 575 usec, Egress jitter: 5 usec, Ingress jitter: 8 usec,
  Round trip jitter: 12 usec, Egress interarrival jitter: 8 usec,
  Ingress interarrival jitter: 7 usec, Round trip interarrival jitter: 7 usec,

  Round trip interarrival jitter: 669 usec
Results over current test:
  Probes sent: 10, Probes received: 10, Loss percentage: 0
  Measurement: Round trip time
    Samples: 10, Minimum: 805 usec, Maximum: 2859 usec, Average: 1644 usec,
    Peak to peak: 2054 usec, Stddev: 738 usec, Sum: xxxx usec
  Measurement: Positive round trip jitter
    Samples: 5, Minimum: 5 usec, Maximum: 2054 usec, Average: 876 usec,
    Peak to peak: 2049 usec, Stddev: 679 usec, Sum: xxxx usec
  Measurement: Negative round trip jitter
    Samples: 5, Minimum: 5 usec, Maximum: 1812 usec, Average: 926 usec,
    Peak to peak: 1807 usec, Stddev: 665 usec, Sum: xxxx usec
  Measurement: Egress time
    Samples: 10, Minimum: 805 usec, Maximum: 2859 usec, Average: 1644 usec,
    Peak to peak: 2054 usec, Stddev: 738 usec, Sum: xxxx usec
  Measurement: Positive Egress jitter
    Samples: 5, Minimum: 5 usec, Maximum: 2054 usec, Average: 876 usec,
    Peak to peak: 2049 usec, Stddev: 679 usec, Sum: xxxx usec
  Measurement: Negative Egress jitter
    Samples: 5, Minimum: 5 usec, Maximum: 1812 usec, Average: 926 usec,
    Peak to peak: 1807 usec, Stddev: 665 usec, Sum: xxxx usec
  Measurement: Ingress time
    Samples: 10, Minimum: 805 usec, Maximum: 2859 usec, Average: 1644 usec,
    Peak to peak: 2054 usec, Stddev: 738 usec, Sum: xxxx usec
  Measurement: Positive Ingress jitter
    Samples: 5, Minimum: 5 usec, Maximum: 2054 usec, Average: 876 usec,
    Peak to peak: 2049 usec, Stddev: 679 usec, Sum: xxxx usec
  Measurement: Negative Ingress jitter
    Samples: 5, Minimum: 5 usec, Maximum: 1812 usec, Average: 926 usec,
    Peak to peak: 1807 usec, Stddev: 665 usec, Sum: xxxx usec
Results over last test:
  Probes sent: 10, Probes received: 10, Loss percentage: 0

```



```
Test completed on Tue Feb 6 14:53:16 2007
Measurement: Round trip time
  Samples: 10, Minimum: 805 usec, Maximum: 2859 usec, Average: 1644 usec,
  Peak to peak: 2054 usec, Stddev: 738 usec, Sum: xxxx usec
Measurement: Positive round trip jitter
  Samples: 5, Minimum: 5 usec, Maximum: 2054 usec, Average: 876 usec,
  Peak to peak: 2049 usec, Stddev: 679 usec, Sum: xxxx usec
Measurement: Negative round trip jitter
  Samples: 5, Minimum: 5 usec, Maximum: 1812 usec, Average: 926 usec,
  Peak to peak: 1807 usec, Stddev: 665 usec, Sum: xxxx usec
Measurement: Egress time
  Samples: 10, Minimum: 805 usec, Maximum: 2859 usec, Average: 1644 usec,
  Peak to peak: 2054 usec, Stddev: 738 usec, Sum: xxxx usec
Measurement: Positive Egress jitter
  Samples: 5, Minimum: 5 usec, Maximum: 2054 usec, Average: 876 usec,
  Peak to peak: 2049 usec, Stddev: 679 usec, Sum: xxxx usec
Measurement: Negative Egress jitter
  Samples: 5, Minimum: 5 usec, Maximum: 1812 usec, Average: 926 usec,
  Peak to peak: 1807 usec, Stddev: 665 usec, Sum: xxxx usec
Measurement: Ingress time
  Samples: 10, Minimum: 805 usec, Maximum: 2859 usec, Average: 1644 usec,
  Peak to peak: 2054 usec, Stddev: 738 usec, Sum: xxxx usec
Measurement: Positive Ingress jitter
  Samples: 5, Minimum: 5 usec, Maximum: 2054 usec, Average: 876 usec,
  Peak to peak: 2049 usec, Stddev: 679 usec, Sum: xxxx usec
Measurement: Negative Ingress jitter
  Samples: 5, Minimum: 5 usec, Maximum: 1812 usec, Average: 926 usec,
  Peak to peak: 1807 usec, Stddev: 665 usec, Sum: xxxx usec
Results over all tests:
Probes sent: 560, Probes received: 560, Loss percentage: 0
Measurement: Round trip time
  Samples: 560, Minimum: 805 usec, Maximum: 3114 usec, Average: 1756 usec,

  Peak to peak: 2309 usec, Stddev: 519 usec, Sum: xxxx usec
Measurement: Positive round trip jitter
  Samples: 257, Minimum: 0 usec, Maximum: 2054 usec, Average: 597 usec,
  Peak to peak: 2054 usec, Stddev: 427 usec, Sum: xxxx usec
Measurement: Negative round trip jitter
  Samples: 302, Minimum: 1 usec, Maximum: 1812 usec, Average: 511 usec,
  Peak to peak: 1811 usec, Stddev: 408 usec, Sum: xxxx usec
Measurement: Egress time
  Samples: 10, Minimum: 805 usec, Maximum: 2859 usec, Average: 1644 usec,
  Peak to peak: 2054 usec, Stddev: 738 usec, Sum: xxxx usec
Measurement: Positive Egress jitter
  Samples: 5, Minimum: 5 usec, Maximum: 2054 usec, Average: 876 usec,
  Peak to peak: 2049 usec, Stddev: 679 usec, Sum: xxxx usec
Measurement: Negative Egress jitter
  Samples: 5, Minimum: 5 usec, Maximum: 1812 usec, Average: 926 usec,
  Peak to peak: 1807 usec, Stddev: 665 usec, Sum: xxxx usec
Measurement: Ingress time
  Samples: 10, Minimum: 805 usec, Maximum: 2859 usec, Average: 1644 usec,
  Peak to peak: 2054 usec, Stddev: 738 usec, Sum: xxxx usec
Measurement: Positive Ingress jitter
  Samples: 5, Minimum: 5 usec, Maximum: 2054 usec, Average: 876 usec,
  Peak to peak: 2049 usec, Stddev: 679 usec, Sum: xxxx usec
Measurement: Negative Ingress jitter
  Samples: 5, Minimum: 5 usec, Maximum: 1812 usec, Average: 926 usec,
  Peak to peak: 1807 usec, Stddev: 665 usec, Sum: xxxx usec
Error Stats:
  Invalid client rcv timestamp: 3, Invalid server send timestamp: 0
  Invalid server processing time: 0
```

show services rpm probe-results (BGP Neighbor Discovery)

```
user@host> show services rpm probe-results
Owner: Rpm-Bgp-Owner, Test: Rpm-Bgp-Test-1
Target address: 10.209.152.37, Probe type: icmp-ping, Test size: 5 probes
Routing Instance Name: LS1/RI1
Probe results:
  Response received, Fri Oct 28 05:20:23 2005
  Rtt: 662 usec
Results over current test:
  Probes sent: 5, Probes received: 5, Loss percentage: 0
  Measurement: Round trip time
    Minimum: 529 usec, Maximum: 662 usec, Average: 585 usec,
    Jitter: 133 usec, Stddev: 53 usec
Results over all tests:
  Probes sent: 5, Probes received: 5, Loss percentage: 0
  Measurement: Round trip time
    Minimum: 529 usec, Maximum: 662 usec, Average: 585 usec,
    Jitter: 133 usec, Stddev: 53 usec
```

show services rpm twamp server connection

Syntax	show services rpm twamp server connection <i><connection-id></i>
Release Information	Command introduced in Junos OS Release 9.3.
Description	Display information about the connections established between the real-time performance monitoring (RPM) Two-Way Active Measurement Protocol (TWAMP) server and control-clients. By default, all established sessions are displayed, unless you specify a session ID when you issue the command.
Options	<i>connection-id</i> —(Optional) Display only information about the specified connection ID.
Required Privilege Level	view
List of Sample Output	show services rpm twamp server connection on page 115
Output Fields	Table 8 on page 115 lists the output fields for the show services rpm twamp server connection command. Output fields are listed in the approximate order in which they appear.

Table 8: show services rpm twamp server connection Output Fields

Field Name	Field Description
Connection ID	Connection ID that uniquely identifies the connection between the TWAMP server and a particular client.
Client address	Client IP address.
Client port	Client port number.
Server address	Server IP address.
Server port	Server port number.
Session count	Session count.
Auth mode	Authentication mode.

Sample Output

show services rpm twamp server connection

```

user@host> show services rpm twamp server connection
  Connection  Client      Client  Server      Server  Session  Auth
   ID         address      port    address     port    count    mode
         4  1.1.1.1      12345  192.168.219.203    890      16    none

```

	78	3.22.1.55	345	22.2.2.2	89022	5	none
	234	192.168.219.203	2345	2.2.22.2	3333	16	none
	5	221.4.1.1	82345	2.2.2.2	45909	16	
authenticated	1	192.168.1.1	645	32.2.2.23	2394	16	
encrypted							

show services rpm twamp server session

Syntax	show services rpm twamp server session <i><session-id></i>
Release Information	Command introduced in Junos OS Release 9.3.
Description	Display information about the sessions established between the real-time performance monitoring (RPM) Two-Way Active Measurement Protocol (TWAMP) server and control clients. By default, all established sessions are displayed, unless you specify a session ID when you issue the command.
Options	<i>session-id</i> —(Optional) Display only information about the specified session ID.
Required Privilege Level	view
List of Sample Output	show services rpm twamp server session on page 117
Output Fields	Table 9 on page 117 lists the output fields for the show services rpm twamp server session command. Output fields are listed in the approximate order in which they appear.

Table 9: show services rpm twamp server session Output Fields

Field Name	Field Description
Session ID	Session ID that uniquely identifies the session between the TWAMP server and a particular client.
Connection ID	Connection ID that uniquely identifies the connection between the TWAMP server and a particular client.
Sender address	Sender IP address.
Sender port	Sender port number.
Reflector address	Reflector IP address.
Reflector port	Reflector port number.

Sample Output

show services rpm twamp server session

```

user@host> show services rpm twamp server session
  Session  Connection  Sender      Sender  Reflector  Reflector
   ID      ID          address    port    address    port
   4        44      1.1.1.1    12345   192.168.219.203  890
   78        44      3.22.1.55   345     22.2.2.2      89022
  234       423    192.168.219.203  2345    2.2.22.2      3333
   5        423    221.4.1.1     82345   2.2.2.2      45909
   1        423    192.168.1.1    645     32.2.2.23     2394

```


show services rpm rfc2544-benchmarking

Syntax	<pre>show services rpm rfc2544-benchmarking <aborted-tests (test-id test-id brief detail)> <active-tests (test-id test-id brief detail)> <completed-tests (test-id test-id brief detail)> <summary></pre>
Release Information	<p>Command introduced in Junos OS Release 12.3X52 for ACX Series routers.</p> <p>Command introduced in Junos OS Release 13.3R1 for MX104 3D Universal Edge Routers.</p>
Description	<p>Display information about the results of each category or state of the RFC 2544-based benchmarking test, such as aborted tests, active tests, and completed tests, for each real-time performance monitoring (RPM) instance. You can view the results of each test state for all of the configured test IDs or for a specific test ID. Also, you can display statistics about the total number of tests of each state for a high-level, quick analysis. The values in the output displayed vary, depending on the state in which the test is passing through, when you issue the command.</p> <p>You can view the test results of multiple test IDs at the same time by entering the IDs in a single command. If you enter multiple test ID values, you must separate each number with a space.</p>
Options	<p>aborted-tests—Display the list of tests that were aborted or stopped. This list includes tests that failed due to various error conditions and tests that you terminated by entering the test service rpm rfc2544-benchmarking test test-name stop command. The Status field in the output specifies the reason for the termination of the test.</p> <p>test-id test-id—Unique identifier of the test for which the test results must be displayed.</p> <p>brief detail—(Optional) Display the specified level of output.</p> <p>active-tests—Display the results of the set of tests that are currently running.</p> <p>completed-tests—Display the results of the set of tests that were successfully completed. A completed test is one that passes through all the test steps or states specified in RFC 2544. A test that is marked as completed after it went through all the states from the beginning to the end can still be reported as a failed test. For example, a failed test can be a test that sends the desired number of packets, but does not receive the frames back from the other end.</p> <p>summary—(Optional) Display summary output.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • Configuring an RFC 2544-Based Benchmarking Test on page 25 • RFC 2544-Based Benchmarking Tests Overview on page 4 • rfc2544-benchmarking on page 84

List of Sample Output

- [show services rpm rfc2544-benchmarking summary on page 121](#)
- [show services rpm rfc2544-benchmarking aborted-tests \(ACX Series router\) on page 121](#)
- [show services rpm rfc2544-benchmarking completed-tests \(ACX Series router\) on page 121](#)
- [show services rpm rfc2544-benchmarking active-tests \(ACX Series router\) on page 122](#)
- [show services rpm rfc2544-benchmarking aborted-tests \(MX104 router\) on page 122](#)
- [show services rpm rfc2544-benchmarking completed-tests \(MX104 router\) on page 122](#)
- [show services rpm rfc2544-benchmarking active-tests \(MX104 router\) on page 123](#)

Output Fields Table 10 on page 120 lists the output fields for the **show services rpm rfc2544-benchmarking (aborted-tests | active-tests | completed-tests)** command. Output fields are listed in the approximate order in which they appear.

Table 10: show services rpm rfc2544-benchmarking Output Fields

Field Name	Field Description
Test information	Details of the performed RFC 2544 benchmarking test.
Test id	Unique identifier configured for the test.
Test name	Name configured for the test.
Test type	The type of statistical detail that is collected for the test, based on the configured test type. Throughput-related, latency, frame-loss, or back-to-back frames-related information is displayed for ACX Series routers. Reflected packets-related information is displayed for MX104 routers..
Test mode	Mode configured for the test on the router. Test modes are: <ul style="list-style-type: none"> Initiate-and-Terminate: Test frames are initiated from one end and terminated at the same end. This mode requires a reflector to be configured at the peer end to enable the test frames to be returned to the source. This mode is supported only on ACX Series routers Reflect: Test frames that originate from one end are reflected at the other end on the selected service, such as IPv4 or Ethernet.
Test packet size	Size of the test packets in bytes. This field is valid only when the test mode is Initiate-and-Terminate.
Test state	State of the test that is in progress or active when the output is displayed.
Status	Indicates whether the test is currently in progress or has been terminated. This field is displayed for tests that are in progress or were aborted by entering the test services rpm rfc2544-benchmarking test <test-name test-id> stop command.
Test start time	Time at which the test started in Coordinated Universal Time (UTC) format (YYYY-MM-DD-HH:MM:SS).
Test finish time	Time at which the test completed.

Table 10: show services rpm rfc2544-benchmarking Output Fields (*continued*)

Field Name	Field Description
Counters last cleared	Date, time, and how long ago the statistics for the test were cleared. The format is <i>year-month-day hour:minute:second:timezone</i> (<i>hour:minute:second</i> ago). For example, 2010-05-17 07:51:28 PDT (00:04:33 ago). If you did not clear the statistics previously at any point, Never is displayed.
Number of active tests	Total number of tests that are currently running.
Number of completed tests	Total number of tests that were successfully completed
Number of aborted tests	Total number of tests that were aborted or halted.

Sample Output

show services rpm rfc2544-benchmarking summary

```
user@host> show services rpm rfc2544-benchmarking summary
```

Rfc2544 tests summary :

Number of active tests: 0, Number of completed tests: 4, Number of aborted tests: 52

This output indicates that no test iteration is currently in progress (at the time of issue of the command), 4 tests were completed successfully, and 52 tests were halted.

show services rpm rfc2544-benchmarking aborted-tests (ACX Series router)

```
user@host> show services rpm rfc2544-benchmarking aborted-tests
```

Test information :

```
Test id: 1, Test name: test1, Test type: Throughput
Test mode: Initiate-and-Terminate
Test packet size: 64 1280
Test state: RFC2544_TEST_STATE_STOPPED
Status: User-aborted-via-cli
Test start time: 2005-08-05 03:19:58 UTC
Test finish time: 2005-08-05 03:20:00 UTC
Counters last cleared: Never
```

```
Test id: 2, Test name: test1, Test type: Throughput
Test mode: Initiate-and-Terminate
Test packet size: 64 1280
Test state: RFC2544_TEST_STATE_STOPPED
Status: User-aborted-via-cli
Test start time: 2005-08-05 03:20:00 UTC
Test finish time: 2005-08-05 03:20:02 UTC
Counters last cleared: Never
```

show services rpm rfc2544-benchmarking completed-tests (ACX Series router)

```
user@host> show services rpm rfc2544-benchmarking completed-tests
```

```
Test information :
  Test id: 18, Test name: test1, Test type: Throughput
  Test mode: Initiate-and-Terminate
  Test packet size: 64 1280
  Test state: RFC2544_TEST_STATE_COMPLETED
  Test start time: 2005-08-05 03:20:34 UTC
  Test finish time: 2005-08-05 03:21:23 UTC
  Counters last cleared: Never
```

show services rpm rfc2544-benchmarking active-tests (ACX Series router)

```
user@host> show services rpm rfc2544-benchmarking active-tests
Test information :
  Test id: 57, Test name: test1, Test type: Back-Back-Frames
  Test mode: Initiate-and-Terminate
  Test packet size: 64 1280
  Test state: RFC2544_TEST_STATE_RUNNING
  Status: Running
  Test start time: 2005-08-05 20:15:41 UTC
  Test finish time: TEST_RUNNING
  Counters last cleared: Never
```

show services rpm rfc2544-benchmarking aborted-tests (MX104 router)

```
user@host> show services rpm rfc2544-benchmarking aborted-tests
Test information :
  Test id: 1, Test name: prof_tput1, Test type: Reflect
  Test mode: Reflect
  Test packet size: 0
  Test state: TEST_STATE_STOPPED
  Status: Test-intf-ifl-change
  Test start time: 2013-12-16 22:54:27 PST
  Test finish time: 2013-12-16 23:30:28 PST
  Counters last cleared: Never

  Test id: 2, Test name: prof_tput1, Test type: Reflect
  Test mode: Reflect
  Test packet size: 0
  Test state: TEST_STATE_STOPPED
  Status: User-aborted-via-cli
  Test start time: 2013-12-16 23:31:06 PST
  Test finish time: 2013-12-16 23:36:22 PST
  Counters last cleared: Never

  Test id: 3, Test name: prof_tput1, Test type: Reflect
  Test mode: Reflect
  Test packet size: 0
  Test state: TEST_STATE_STOPPED
  Status: User-aborted-via-cli
  Test start time: 2013-12-16 23:36:24 PST
  Test finish time: 2013-12-17 01:49:24 PST
  Counters last cleared: Never
```

show services rpm rfc2544-benchmarking completed-tests (MX104 router)

```
user@host> show services rpm rfc2544-benchmarking completed-tests
Test information :
  Test id: 18, Test name: test1, Test type: Reflect
  Test mode: Reflect
  Test packet size: 0
  Test state: TEST_STATE_COMPLETED
```

Test start time: 2005-08-05 03:20:34 UTC
Test finish time: 2005-08-05 03:21:23 UTC
Counters last cleared: Never

show services rpm rfc2544-benchmarking active-tests (MX104 router)

```
user@host> show services rpm rfc2544-benchmarking active-tests
Test information :
  Test id: 4, Test name: prof_tput1, Test type: Reflect
  Test mode: Reflect
  Test packet size: 0
  Test state: TEST_STATE_RUNNING
  Status: Running
  Test start time: 2013-12-17 01:49:26 PST
  Test finish time: TEST_RUNNING
  Counters last cleared: Never
```

show services rpm rfc2544-benchmarking test-id

Syntax	<code>show services rpm rfc2544-benchmarking test-id <i>test-id</i></code> <code><brief detail></code>
Release Information	Command introduced in Junos OS Release 12.3X52 for ACX Series routers. Command introduced in Junos OS Release 13.3R1 for MX104 3D Universal Edge Routers.
Description	Display information about the results of the RFC 2544-based benchmarking test for a specific test ID for each real-time performance monitoring (RPM) instance. The values in the output displayed vary, depending on the state in which the test is passing through, when you issue the command.
Options	none —Display brief information about a specific test ID of the benchmarking test. test-id <i>test-id</i> —Unique identifier of the test for which the test results must be displayed. brief detail —(Optional) Display the specified level of output.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none">• Configuring an RFC 2544-Based Benchmarking Test on page 25• RFC 2544-Based Benchmarking Tests Overview on page 4• rfc2544-benchmarking on page 84
List of Sample Output	show services rpm rfc2544-benchmarking test-id detail (Throughput Test on ACX Series routers) on page 132 show services rpm rfc2544-benchmarking test-id detail (Latency Test on ACX Series routers) on page 133 show services rpm rfc2544-benchmarking test-id detail (Frame Loss Test on ACX Series routers) on page 136 show services rpm rfc2544-benchmarking test-id detail (Back-to-Back Frames Test on ACX Series routers) on page 137 show services rpm rfc2544-benchmarking test-id detail (Reflection Test on MX104 routers) on page 138 show services rpm rfc2544-benchmarking test-id brief (Reflection Test on MX104 routers) on page 139 show services rpm rfc2544-benchmarking test-id detail (Reflection Test on MX104 routers) on page 139 show services rpm rfc2544-benchmarking test-id brief (Reflection Test on MX104 routers) on page 140
Output Fields	Table 11 on page 125 lists the output fields for the show services rpm rfc2544-benchmarking test-id command. Output fields are listed in the approximate order in which they appear.

Table 11: show services rpm rfc2544-benchmarking test-id Output Fields

Field Name	Field Description	Level of Output
Test information	Details of the performed RFC 2544 benchmarking test.	None specified
Test id	Unique identifier configured for the test.	None specified
Test name	Name configured for the test.	None specified
Test type	The type of statistical detail that is collected for the test, based on the configured test type. Throughput-related, latency, frame-loss, or back-to-back frames-related information is displayed for ACX Series routers. Reflected packets-related information is displayed for MX104 routers.	None specified
Test mode	Mode configured for the test on the router. Test modes are: <ul style="list-style-type: none"> Initiate-and-Terminate: Test frames are initiated from one end and terminated at the same end. This mode requires a reflector to be configured at the peer end to enable the test frames to be returned to the source. This mode is supported only on ACX Series routers. Reflect: Test frames that originate from one end are reflected at the other end on the selected service, such as IPv4 or Ethernet. 	None specified
Test packet size	Size of the test packets in bytes. This field is valid only when the test mode is Initiate-and-Terminate.	None specified
Test state	State of the test that is in progress or active when the output is displayed. For details about the states, see <i>RFC 2544-Based Benchmarking Test States</i> .	None specified
Status	Indicates whether the test is currently in progress or has been terminated.	None specified
Test start time	Time at which the test started in Coordinated Universal Time (UTC) format (YYYY-MM-DD-HH:MM:SS).	None specified
Test finish time	Time at which the test completed.	None specified
Counters last cleared	Date, time, and how long ago the statistics for the test were cleared. The format is <i>year-month-day hour:minute:second:timezone (hour:minute:second ago)</i> . For example, 2010-05-17 07:51:28 PDT (00:04:33 ago). If you did not clear the statistics previously at any point, Never is displayed.	None specified
Test-profile Configuration	(ACX Series routers only) Details of the specified test profile	detail
Test-profile name	(ACX Series routers only) Name of the configured test profile that contains the parameters for the test	detail
Test packet size	(ACX Series routers only) Size of the test packets in bytes	detail
Theoretical max bandwidth	(ACX Series routers only) Theoretical maximum bandwidth configured for the test. This value is typically set to the bandwidth of the server being tested. Valid values are 1 Kbps through 1,000,000 Kbps (1 Gbps). The value defined is the highest bandwidth value tested for this test.	detail

Table 11: show services rpm rfc2544-benchmarking test-id Output Fields (*continued*)

Field Name	Field Description	Level of Output
Test Configuration	Details of the configured test ID.	detail
Test mode	Mode configured for the test. Test modes are Initiate-and-Terminate and Reflect.	detail
Duration in seconds	Period in seconds for which the test has been performed.	detail
Test family	The underlying service on which the test is run. Test families are: <ul style="list-style-type: none"> • INET: Indicates that the test is run on a IPV4 service. • CCC: Indicates that the test is run on a circuit cross-connect (CCC) or pseudowire service. 	detail
Routing Instance Name	(ACX Series routers only) Name of the routing instance for the test	detail
Inet family Configuration	Details of the configured inet family for an IPv4 service	detail
Egress Interface	Name of the egress interface from which the test frames are sent	detail
Source ipv4 address	Source IPv4 address used in the IP header of the generated test frame.	detail
Destination ipv4 address	Destination IPv4 address used in the IP header of the generated test frame.	detail
Source udp port	Source UDP port number used in the UDP header of the generated test frame.	detail
Destination udp port	Destination UDP port number used in the UDP header of the generated test frame.	detail
Ccc family Configuration	Details of the configured CCC family for an Ethernet service	detail
Source MAC address	(ACX Series routers only) Source MAC address used in generated test frames for a CCC or Ethernet pseudowire service.	detail
Destination MAC address	(ACX Series routers only) Destination MAC address used in generated test frames for a CCC or Ethernet pseudowire service.	detail
Ivlan-id	(ACX Series routers only) Inner VLAN ID for test-frames.	detail
Ovlan-id	(ACX Series routers only) Outer VLAN ID for test-frames.	detail
Direction egress	Test is run in the egress direction of the interface (NNI)	detail
Direction ingress	Test is run in the ingress direction of the interface (UNI)	detail

Table 11: show services rpm rfc2544-benchmarking test-id Output Fields (*continued*)

Field Name	Field Description	Level of Output
Rfc2544 throughput test information	(ACX Series routers only) Details of the throughput test	detail
Initial test load percentage	Percentage of the steady state load for the test.	detail
Test iteration mode	Mode of the test iteration: Binary or step-down.	detail
Test iteration step percent	The test step percentage for tests. If not specified, the default step-percent is 10 percent. This parameter is ignored for all type of tests other than frame-loss tests.	detail
Theoretical max bandwidth	The theoretical limit of the media for the frame size configured for the test. This value is typically set to the bandwidth of the server being tested.	detail
Test packet size:	Packet size of the test frames in bytes.	detail
Iteration	Number of the test iteration.	detail
Duration (sec)	Period in seconds for which the test iteration is run	detail
Elapsed time	Amount of time that has passed, in seconds, since the start of the test.	detail
pps	Total count of packets-per-second (pps) transmitted during the test.	detail
Tx Packets	Number of transmitted test packets.	detail
Rx Packets	Number of received test packets.	detail
Tx Bytes	Number of transmitted bytes.	detail
Rx Bytes	Number of received bytes.	detail
Percentage throughput	Percentage of throughput for the test iteration.	detail
Result of the iteration runs (Throughput) :	Results of the completed throughput test for a particular packet size.	detail
Best iteration	Number of the iteration with the highest throughout, among the listed iterations.	detail
Best iteration (pps)	Packets-per-second (pps) count of the iteration with the highest throughput, among the listed iterations.	detail
Best iteration throughput	Percentage of throughput of the iteration with the highest throughout, among the listed iterations.	detail

Table 11: show services rpm rfc2544-benchmarking test-id Output Fields (*continued*)

Field Name	Field Description	Level of Output
RFC2544 Throughput test results summary	Consolidated information of the throughput test.	detail summary
Packet Size	Size of the test packet in bytes.	detail summary
Theoretical rate (pps)	Theoretical frame rate in packets-per-second.	detail summary
Tx Packets	Number of transmitted packets.	detail summary
Rx Packets	Number of received packets.	detail summary
Offered throughput (percentage)	The offered throughput in percentage of the chosen service (such as Layer 3 or Ethernet pseudowire).	detail summary
Measured bandwidth (kbps)	Available bandwidth of the service based on the calculated throughput.	detail summary
Rfc2544 latency test information :	(ACX Series routers only) Details of the latency test	detail
Theoretical max bandwidth	Theoretical maximum bandwidth configured for the test. This value is typically set to the bandwidth of the server being tested. Valid values are 1 Kbps through 1,000,000 Kbps (1 Gbps). The value defined is the highest bandwidth value used for this test.	detail
Initial test load percentage	Percentage of the steady state load for the test.	detail
Duration in seconds	Period in seconds for which the test has been performed.	detail
Test packet size	Size of the test packet in bytes.	detail
Iteration	Number of the test iteration.	detail
Duration (sec)	Period in seconds for which the test iteration is run.	detail
Elapsed time	Amount of time that has passed, in seconds, since the start of the test.	detail
pps	Total count of packets-per-second (pps) transmitted during the test.	detail
Tx Packets	Number of transmitted test packets.	detail
Rx Packets	Number of received test packets.	detail
Latency	Displays the latency parameters.	detail

Table 11: show services rpm rfc2544-benchmarking test-id Output Fields (*continued*)

Field Name	Field Description	Level of Output
Min(ns)	Aggregated minimum latency in nanoseconds.	detail
Avg(ns)	Aggregated average latency in nanoseconds.	detail
Max(ns)	Aggregated maximum latency in nanoseconds.	detail
Probe(ns)	Aggregated probe latency in nanoseconds.	detail
Result of the iteration runs (Latency)	Results of the latency test completed for a particular packet size.	detail
Avg (min) Latency	Average of the minimum latency in nanoseconds.	detail
Avg (avg) latency	Average of the average latency in nanoseconds.	detail
Avg (Max) latency	Average of the maximum latency in nanoseconds.	detail
Avg (probe) latency	Average of the probe latency in nanoseconds.	detail
RFC2544 Latency test results summary:	Consolidated statistics of the latency test.	detail summary
Packet Size	Size of the test packet in bytes.	detail summary
Theoretical rate (pps)	Theoretical frame rate in packets-per-second.	detail summary
Tx Packets	Number of transmitted packets.	detail summary
Rx Packets	Number of received packets.	detail summary
Latency	Displays the latency parameters.	detail summary
Min(ns)	Aggregated minimum latency in nanoseconds.	detail summary
Avg(ns)	Aggregated average latency in nanoseconds.	detail summary
Max(ns)	Aggregated maximum latency in nanoseconds.	detail summary
Probe(ns)	Aggregated probe latency in nanoseconds.	detail summary
Rfc2544 Back-Back test information :	(ACX Series routers only) Details of the back-to-back frames or bursty frames test.	detail
Initial burst length:	Length of the first burst when test frames are sent, as a measure of number of seconds at the rate of Kbps.	detail

Table 11: show services rpm rfc2544-benchmarking test-id Output Fields (*continued*)

Field Name	Field Description	Level of Output
Test iteration mode :	Mode of the test iteration: Binary or step-down.	detail
Test iteration step percent	The test step percentage for tests. If not specified, the default step-percent is 10 percent. This parameter is ignored for all type of tests other than frame-loss tests.	detail
Theoretical max bandwidth	The theoretical limit of the media for the frame size configured for the test. This value is typically set to the bandwidth of the server being tested.	detail
Test packet size:	Packet size of the test frames in bytes.	detail
Iteration	Number of the test iteration.	detail
Burst Length (Packets)	Number of packets in the burst.	detail
Elapsed time	Amount of time that has passed, in seconds, since the start of the test.	detail
Tx Packets	Number of transmitted test packets.	detail
Rx Packets	Number of received test packets.	detail
Tx Bytes	Number of transmitted bytes.	detail
Rx Bytes	Number of received bytes.	detail
Result of the iteration runs :	Results of the back-to-back frames test completed for a certain packet size.	detail
Best iteration :	Number of the iteration with the longest burst.	detail
Measured burst (num sec)	Time in seconds of the burst of the iteration with the longest burst.	detail
Measured burst (num pkts)	Number of packets during the burst of the iteration with the longest burst.	detail
RFC2544 Back-Back test results summary:	Consolidated statistics of the back-to-back frames test.	detail summary
Packet Size	Size of the test packets in bytes.	detail summary
Measure Burst length (Packets)	Computed burst length in terms of number of packets.	detail summary

Table 11: show services rpm rfc2544-benchmarking test-id Output Fields (*continued*)

Field Name	Field Description	Level of Output
Rfc2544 frame-loss test information :	(ACX Series routers only) Details of the frame-loss test.	detail
Initial burst length:	Length of the first burst when test frames are sent, as a measure of number of seconds at the rate of Kbps.	detail
Test iteration mode :	Mode of the test iteration: Binary or step-down.	detail
Test iteration step percent	The test step percentage for tests. If not specified, the default step-percent is 10 percent. This parameter is ignored for all type of tests other than frame-loss tests.	detail
Theoretical max bandwidth	The theoretical limit of the media for the frame size configured for the test. This value is typically set to the bandwidth of the server being tested.	detail
Test packet size	Size of the test packets in bytes.	detail
Iteration	Number of the test iteration.	detail
Duration (sec)	Period, in seconds, for which the test iteration is run.	detail
Offered throughput (percentage)	The offered throughput in percentage of the chosen service (such as Layer 3 or Ethernet pseudowire)	detail
Elapsed time	Amount of time that has passed, in seconds, since the start of the test.	detail
pps	Theoretical frame rate in packets-per-second.	detail
Tx Packets	Number of transmitted test packets.	detail
Rx Packets	Number of received test packets.	detail
Tx Bytes	Number of transmitted bytes.	detail
Rx Bytes	Number of received bytes.	detail
Frame-loss rate %	Percentage of frames that must been forwarded by the router under steady state (constant) load, but were not forwarded due to lack of resources.	detail
Result of the iteration runs :	Results of the frame-loss test completed for a certain packet size.	detail
Frame-loss rate (percent) :	Percentage of dropped frames for the specified packet size	detail
RFC2544 Frame-loss test results summary	Consolidated statistics of the frame-loss test	detail

Table 11: show services rpm rfc2544-benchmarking test-id Output Fields (*continued*)

Field Name	Field Description	Level of Output
Packet Size	Size of the test packet in bytes.	detail summary
Theoretical rate (pps)	Theoretical frame rate in packets-per-second.	detail summary
Percentage throughput	Percentage of throughput for the test iteration.	detail summary
Tx Packets	Number of transmitted packets.	detail summary
Rx Packets	Number of received packets.	detail summary
Frame Loss rate percent	Percentage of dropped frames for the specified packet size	detail summary

Sample Output

show services rpm rfc2544-benchmarking test-id detail (Throughput Test on ACX Series routers)

```
user@host> show services rpm rfc2544-benchmarking test-id 19 detail
```

```
Test information :
```

```
Test id: 19, Test name: test1, Test type: Throughput
```

```
Test mode: Initiate-and-Terminate
```

```
Test packet size: 64 1280
```

```
Test state: RFC2544_TEST_STATE_COMPLETED
```

```
Test start time: 2005-07-29 10:25:00 UTC
```

```
Test finish time: 2005-07-29 10:26:02 UTC
```

```
Counters last cleared: Never
```

```
Test-profile Configuration:
```

```
Test-profile name: prof_tput
```

```
Test packet size: 64 1280
```

```
Therotical max bandwidth : 993000 kbps
```

```
Test Configuration:
```

```
Test mode: Initiate-and-Terminate
```

```
Duration in seconds: 20
```

```
Test family: INET
```

```
Routing Instance Name: default
```

```
Inet family Configuration:
```

```
Egress Interface : ge-0/1/1.0
```

```
Source ipv4 address: 20.6.0.1
```

```
Destination ipv4 address: 20.6.0.2
```

```
Source udp port: 2020
```

```
Destination udp port: 3030
```

```
Rfc2544 throughput test information :
```

```
Initial test load percentage : 100.00 %
```

```
Test iteration mode : Binary
```

```
Test iteration step percent : 50.00 %
```

```
Therotical max bandwidth : 993000 kbps
```

```

Test packet size: 64
Iteration Duration Elapsed pps      Tx      Rx      Tx      Rx
Percentage
(sec)  time      Packets  Packets  Bytes    Bytes
throughput
1      3      3      134918  404754  404754  27523272  27523272  10.00
%
2      20     20     1349184 26983501 26983501 1834878068 1834878068 100.00
%

```

Result of the iteration runs : Throughput Test complete for packet size 64
 Best iteration : 2, Best iteration (pps) : 1349184
 Best iteration throughput : 100.00 %

```

Test packet size: 1280
Iteration Duration Elapsed pps      Tx      Rx      Tx      Rx
Percentage
(sec)  time      Packets  Packets  Bytes    Bytes
throughput
1      3      3      9489   28467   28467   36551628  36551628  10.00
%
2      20     20     94896  1897920 1897920 2436929280 2436929280 100.00
%

```

Result of the iteration runs : Throughput Test complete for packet size 1280
 Best iteration : 2, Best iteration (pps) : 94896
 Best iteration throughput : 100.00 %

RFC2544 Throughput test results summary:

Packet Size	Theoretical rate (pps)	Tx Packets	Rx Packets	Offered throughput (percentage)	Measured bandwidth (kbps)
64	1349184	26983501	26983501	100.00 %	993000
1280	94896	1897920	1897920	100.00 %	993000

show services rpm rfc2544-benchmarking test-id detail (Latency Test on ACX Series routers)

```
user@host> show services rpm rfc2544-benchmarking test-id 37 detail
```

Test information :

```

Test id: 37, Test name: test1, Test type: Latency
Test mode: Initiate-and-Terminate
Test packet size: 64 1280
Test state: RFC2544_TEST_STATE_COMPLETED
Test start time: 2005-07-29 10:26:41 UTC
Test finish time: 2005-07-29 10:36:15 UTC
Counters last cleared: Never

```

Test-profile Configuration:

```

Test-profile name: prof_latency
Test packet size: 64 1280
Theoretical max bandwidth : 993000 kbps

```

Test Configuration:

```

Test mode: Initiate-and-Terminate
Duration in seconds: 10
Test family: INET
Routing Instance Name: default

```

Inet family Configuration:

Egress Interface : ge-0/1/1.0
 Source ipv4 address: 20.6.0.1
 Destination ipv4 address: 20.6.0.2
 Source udp port: 2020
 Destination udp port: 3030

Rfc2544 latency test information :

Theoretical max bandwidth : 993000 kbps
 Initial test load percentage : 100.00 %
 Duration in seconds: 10

Test packet size: 64

Iteration	Duration (sec)	Elapsed time	pps	Tx Packets	Rx Packets
1	3	3	134918	404754	404754
2	10	10	1349184	13491751	13491751
3	10	10	1349184	13491751	13491751
4	10	10	1349184	13491751	13491751
5	10	10	1349184	13491751	13491751
6	10	10	1349184	13491751	13491751
7	10	10	1349184	13491751	13491751
8	10	10	1349184	13491751	13491751
9	10	10	1349184	13491751	13491751
10	10	10	1349184	13491751	13491751
11	10	10	1349184	13491751	13491751
12	10	10	1349184	13491751	13491751
13	10	10	1349184	13491751	13491751
14	10	10	1349184	13491751	13491751
15	10	10	1349184	13491751	13491751
16	10	10	1349184	13491751	13491751
17	10	10	1349184	13491751	13491751
18	10	10	1349184	13491751	13491751
19	10	10	1349184	13491751	13491751
20	10	10	1349184	13491751	13491751
21	10	10	1349184	13491751	13491751

----- Latency -----			
Min(ns)	Avg(ns)	Max(ns)	Probe(ns)
17464	18770	18880	18784
17472	18799	20488	18848
17472	18799	20416	18816
17472	18799	20440	18704
17464	18799	20376	18880
17464	18799	20232	18832
17464	18799	20400	18848
17472	18799	20240	18864
17472	18799	20264	18848
17464	18799	20264	18880
17472	18800	20320	18864
17464	18799	20176	18864
17464	18800	20248	18864
17464	18800	20272	18864
17464	18799	20472	18832
17464	18799	20256	18880
17464	18799	20336	18848
17464	18800	20688	18848
17472	18800	20504	18864
17464	18799	20448	18768
17472	18799	20240	18864

Result of the iteration runs : Latency Test complete for packet size 64

Avg (min) Latency : 17466
 Avg (avg) latency : 18799
 Avg (Max) latency : 20360
 Avg (probe) latency : 18844

Test packet size: 1280

Iteration	Duration (sec)	Elapsed time	pps	Tx Packets	Rx Packets
1	3	3	9489	28467	28467
2	10	10	94896	948960	948960
3	10	10	94896	948960	948960
4	10	10	94896	948960	948960
5	10	10	94896	948960	948960
6	10	10	94896	948960	948960
7	10	10	94896	948960	948960
8	10	10	94896	948960	948960
9	10	10	94896	948960	948960
10	10	10	94896	948960	948960
11	10	10	94896	948960	948960
12	10	10	94896	948960	948960
13	10	10	94896	948960	948960
14	10	10	94896	948960	948960
15	10	10	94896	948960	948960
16	10	10	94896	948960	948960
17	10	10	94896	948960	948960
18	10	10	94896	948960	948960
19	10	10	94896	948960	948960
20	10	10	94896	948960	948960
21	10	10	94896	948960	948960

----- Latency -----

Min(ns)	Avg(ns)	Max(ns)	Probe(ns)
68712	70031	70576	69456
68728	70344	71808	70512
68720	70344	71744	70352
68720	70344	71680	70112
68720	70345	71856	70352
68720	70344	71808	70384
68720	70344	71752	70480
68720	70344	71880	70112
68720	70344	71792	70320
68728	70345	73344	70336
68720	70344	71688	70560
68728	70345	71896	70496
68720	70344	71760	70096
68720	70344	71776	70320
68720	70344	71760	70400
68712	70345	71920	70352
68720	70344	71792	70576
68720	70345	71840	70320
68720	70344	71792	70368
68720	70345	71824	70464
68712	70345	71904	70512

Result of the iteration runs : Latency Test complete for packet size 1280

Avg (min) Latency : 68720
 Avg (avg) latency : 70344

```

Avg (Max) latency           : 71880
Avg (probe) latency         : 70371

```

RFC2544 Latency test results summary:

```

-----
Packet  Theoretical Tx      Rx      ----- Latency -----
Size   rate (pps)  Packets  Packets  Min(ns)  Avg(ns)  Max(ns)  Probe(ns)
64     1349184    269835020 269835020 17466    18799    20360    18844
1280   94896      18979200 18979200  68720    70344    71880    70371

```

show services rpm rfc2544-benchmarking test-id detail (Frame Loss Test on ACX Series routers)

```
user@host> show services rpm rfc2544-benchmarking test-id 73 detail
```

Test information :

```

Test id: 73, Test name: test1, Test type: Frame-Loss
Test mode: Initiate-and-Terminate
Test packet size: 64 1280
Test state: RFC2544_TEST_STATE_COMPLETED
Test start time: 2005-07-29 10:38:41 UTC
Test finish time: 2005-07-29 10:41:19 UTC
Counters last cleared: Never

```

Test-profile Configuration:

```

Test-profile name: prof_fl
Test packet size: 64 1280
Theoretical max bandwidth : 993000 kbps

```

Test Configuration:

```

Test mode: Initiate-and-Terminate
Duration in seconds: 20
Test family: INET
Routing Instance Name: default

```

Inet family Configuration:

```

Egress Interface : ge-0/1/1.0
Source ipv4 address: 20.6.0.1
Destination ipv4 address: 20.6.0.2
Source udp port: 2020
Destination udp port: 3030

```

Rfc2544 frame-loss test information :

```

Initial test load percentage : 100.00 %
Test iteration mode : step-down
Test iteration step percent : 10 %
Theoretical max bandwidth : 993000 kbps

```

Test packet size: 64

Iteration	Duration	Elapsed	Offered	pps	Tx	Rx	Tx	Rx
Frame-loss								
	(sec)	time	throughput%		Packets	Packets	Bytes	Bytes
rate %								
1	3	3	10.00 %	134918	404754	404754	27523272	
27523272	0.00 %							
2	20	20	100.00 %	1349184	26983501	26983501	1834878068	
1834878068	0.00 %							
3	20	20	100.00 %	1349184	26983501	26983501	1834878068	
1834878068	0.00 %							
4	20	20	100.00 %	1349184	26983501	26983501	1834878068	
1834878068	0.00 %							

Result of the iteration runs : Frame-loss test complete for packet size 64
 Frame-loss rate (percent) : 0.00 %

Test packet size: 1280

Iteration	Duration Frame-loss (sec)	Elapsed time	Offered throughput%	pps	Tx Packets	Rx Packets	Tx Bytes	Rx Bytes
1	3	3	10.00 %	9489	404754	28467	36551628	
2	20	20	100.00 %	94896	1897920	1897920	2436929280	
3	20	20	100.00 %	94896	1897920	1897920	2436929280	
4	20	20	100.00 %	94896	1897920	1897920	2436929280	

Result of the iteration runs : Frame-loss test complete for packet size 1280
 Frame-loss rate (percent) : 0.00 %

RFC2544 Frame-loss test results summary:

Packet Loss Size percent	Theoretical rate (pps)	Percentage throughput	Tx Packets	Rx Packets	Frame rate
64	1349184	100.00 %	26983501	26983501	0.00
1280	94896	100.00 %	1897920	1897920	0.00

show services rpm rfc2544-benchmarking test-id detail (Back-to-Back Frames Test on ACX Series routers)

user@host> show services rpm rfc2544-benchmarking test-id 55 detail

Test information :

Test id: 55, Test name: test1, Test type: Back-Back-Frames
 Test mode: Initiate-and-Terminate
 Test packet size: 64 1280
 Test state: RFC2544_TEST_STATE_COMPLETED
 Test start time: 2005-07-29 10:36:54 UTC
 Test finish time: 2005-07-29 10:37:57 UTC
 Counters last cleared: Never

Test-profile Configuration:

Test-profile name: prof_b2b
 Test packet size: 64 1280
 Therotical max bandwidth : 993000 kbps

Test Configuration:

Test mode: Initiate-and-Terminate
 Duration in seconds: 20
 Test family: INET
 Routing Instance Name: default

Inet family Configuration:

Egress Interface : ge-0/1/1.0
 Source ipv4 address: 20.6.0.1
 Destination ipv4 address: 20.6.0.2
 Source udp port: 2020
 Destination udp port: 3030

Rfc2544 Back-Back test information :

Initial burst length: 20 seconds at 993000 kbps
 Test iteration mode : Binary
 Test iteration step percent : 50.00 %

Test packet size: 64

Iteration	Burst Length	Elapsed	Tx	Rx	Tx
	Rx				
	(Packets)	time	Packets	Packets	Bytes
	Bytes				
1	404754	3	404754	404754	27523272
	27523272				
2	26983680	20	26983680	26983680	1834890240
	1834890240				

Result of the iteration runs : Back-Back-Frames Test complete for packet size 64

Best iteration : 2

Measured burst (num sec) : 20 sec,

Measured burst (num pkts) : 26983680 packets

Result of the iteration runs : Back-Back-Frames Test complete for packet size 64

Best iteration : 2

Measured burst (num sec) : 20 sec,

Measured burst (num pkts) : 26983680 packets

Test packet size: 1280

Iteration	Burst Length	Elapsed	Tx	Rx	Tx
	Rx				
	(Packets)	time	Packets	Packets	Bytes
	Bytes				
1	28467	3	28467	28467	36551628
	36551628				
2	1897920	20	1897920	1897920	2436929280
	2436929280				

Result of the iteration runs : Back-Back-Frames Test complete for packet size 12

Best iteration : 2

Measured burst (num sec) : 20 sec,

Measured burst (num pkts) : 1897920 packets

RFC2544 Back-Back test results summary:

```
-----
Packet      Measure Burst
Size        length (Packets)
  64        26983680 packets
 1280       1897920 packets
```

[show services rpm rfc2544-benchmarking test-id detail \(Reflection Test on MX104 routers\)](#)

user@host> show services rpm rfc2544-benchmarking test-id detail 1

```

Test information :
  Test id: 1, Test name: fort_uni_inet_ref, Test type: Reflect
  Test mode: Reflect
  Test packet size: 0
  Test state: RFC2544_TEST_STATE_RUNNING
  Status: Running
  Test start time: 2013-12-09 16:24:52 IST
  Test finish time: TEST_RUNNING
  Counters last cleared: Never

```

```

Test Configuration:
  Test mode: Reflect
  Duration in seconds: 864000
  Test family: INET
  Routing Instance Name: default

```

```

Inet family Configuration:
  Egress Interface : ge-0/3/1.0
  Destination ipv4 address: 21.1.1.2
  Destination udp port: 200

```

Elapsed time	Reflected Packets	Reflected Bytes
176	8977917	9031784502

show services rpm rfc2544-benchmarking test-id brief (Reflection Test on MX104 routers)

```

user@host> show services rpm rfc2544-benchmarking test-id brief 1
Test information :
  Test id: 1, Test name: fort_uni_inet_ref, Test type: Reflect
  Test mode: Reflect
  Test packet size: 0
  Test state: RFC2544_TEST_STATE_RUNNING
  Status: Running
  Test start time: 2013-12-09 16:24:52 IST
  Test finish time: TEST_RUNNING
  Counters last cleared: Never

```

show services rpm rfc2544-benchmarking test-id detail (Reflection Test on MX104 routers)

```

user@host> show services rpm rfc2544-benchmarking test-id detail 2
Test information :
  Test id: 2, Test name: fort_uni_inet_ref, Test type: Reflect
  Test mode: Reflect
  Test packet size: 0
  Test state: RFC2544_TEST_STATE_RUNNING
  Status: Running
  Test start time: 2013-12-09 16:39:18 IST
  Test finish time: TEST_RUNNING
  Counters last cleared: Never

Test Configuration:
  Test mode: Reflect
  Duration in seconds: 864000
  Test family: CCC
  Routing Instance Name: default

CCC family Configuration:
  Interface : ge-0/3/2.0
  Test direction: Egress

```

Elapsed time	Reflected Packets	Reflected Bytes
23	809137	825319740

show services rpm rfc2544-benchmarking test-id brief (Reflection Test on MX104 routers)

```
user@host> show services rpm rfc2544-benchmarking test-id 2 brief
Test information :
  Test id: 2, Test name: fort_uni_inet_ref, Test type: Reflect
  Test mode: Reflect
  Test packet size: 0
  Test state: RFC2544_TEST_STATE_RUNNING
  Status: Running
  Test start time: 2013-12-09 16:39:18 IST
  Test finish time: TEST_RUNNING
  Counters last cleared: Never
```

test services rpm rfc2544-benchmarking test

Syntax test services rpm rfc2544-benchmarking test(ACX Series)
 <clear-counters>
 <routing-instance>
 <test-name>
 <test-id>
 <start>>
 <stop>

Syntax test services rpm rfc2544-benchmarking test(MX104 Router)
 <test-name>
 <test-id>
 <start>>
 <stop>

Release Information Command introduced in Junos OS Release 12.3X52 for ACX Series routers.
 Command introduced in Junos OS Release 13.3R1 for MX104 3D Universal Edge Routers.

Description Start or stop an RFC 2544-based benchmarking test. You can start or stop all of the test names that are defined on a router, or start or stop a specific test name. You can also stop a test based on its test identifier. You can also clear the statistical counters associated with the test. When you trigger an RFC 2544-based benchmarking test, it passes through a series of states. These states are displayed in the Test state field in the brief or displayed output information of the **show services rpm rfc2544-benchmarking** command.



NOTE: The RFC 2544 test is stopped at the initiator automatically after the test successfully completes all of the test steps. You need not explicitly enter the **test services rpm rfc2544-benchmarking test <test-name | test-id> stop** command. However, at the reflector, you must explicitly enter this command to stop the test after the test is completed at the initiator.

Options **start**—Start the RFC 2544-based benchmarking test

stop—Terminate the RFC 2544-based benchmarking test

clear-counters—(ACX Series routers only) Clear the statistics associated with the benchmarking test that was run.

routing-instance—(ACX Series routers only) Name of the routing instance for the test.

test-name—Name of the benchmarking test that must be started or stopped.

test-id—Unique identifier of the test that must be stopped. You can stop a test based on the test identifier. You can use the **test-id** option with only the **test services rpm rfc2544-benchmarking stop** command.

Additional Information The test session is supported in out-of-service mode for the underlying service. You must not transmit any traffic to the UNI port, configured as a generator or a reflector, that is being tested during the duration of the test.

Required Privilege Level view

Related Documentation

- [Configuring an RFC 2544-Based Benchmarking Test on page 25](#)
- [RFC 2544-Based Benchmarking Tests Overview on page 4](#)
- [rfc2544-benchmarking on page 84](#)

List of Sample Output [test services rpm rfc2544-benchmarking on page 142](#)

Output Fields To display the results of the benchmarking test, use the **show services rpm rfc2544-benchmarking** command.

Sample Output

[test services rpm rfc2544-benchmarking](#)

```
user@host> test services rpm rfc2544-benchmarking test test-name test1 start
Test "test1" id 56 started
```

The response specifies that a test has been started with test id 56. The test ID can be further used in **show** commands to view test output.

PART 4

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