



## Configuring Link Latency

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### Finding Feature Information

Your software release may not support all of the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

### Prerequisites for Configuring Link Latency

- The device displays the current round-trip time as well as a running minimum and maximum round-trip time. The minimum and maximum times continue to run as long as the device is up or can be cleared and allowed to restart.
- You can configure link latency for a specific access point using the device GUI or CLI or for all access points joined to the device using the CLI.

### Restrictions for Configuring Link Latency

- Link latency calculates the Control and Provisioning of Wireless Access Points (CAPWAP) response time between the access point and the device. It does not measure network latency or ping responses.

# Information About Configuring Link Latency

You can configure link latency on the device to measure the link between an access point and the device. You can use this feature with all access points that are joined to the device where the link can be a slow or unreliable WAN connection.

## TCP MSS

If the client's maximum segment size (MSS) in a Transmission Control Protocol (TCP) three-way handshake is greater than the maximum transmission unit can handle, the client might experience reduced throughput and the fragmentation of packets. To avoid this problem, you can specify the MSS for all access points that are joined to the device or for a specific access point.

When you enable this feature, the access point selects the MSS for TCP packets to and from wireless clients in its data path. If the MSS of these packets is greater than the value that you configured or greater than the default value for the CAPWAP tunnel, the access point changes the MSS to the new configured value.

## Link Tests

A link test is used to determine the quality of the radio link between two devices. Two types of link-test packets are transmitted during a link test: request and response. Any radio receiving a link-test request packet fills in the appropriate text boxes and echoes the packet back to the sender with the response type set.

The radio link quality in the client-to-access point direction can differ from that in the access point-to-client direction due to the asymmetrical distribution of the transmit power and receive sensitivity on both sides. Two types of link tests can be performed: a ping test and a CCX link test.

With the *ping link test*, the controller can test link quality only in the client-to-access point direction. The RF parameters of the ping reply packets received by the access point are polled by the controller to determine the client-to-access point link quality.

With the *CCX link test*, the device can also test the link quality in the access point-to-client direction. The device issues link-test requests to the client, and the client records the RF parameters (received signal strength indicator [RSSI], signal-to-noise ratio [SNR], and so on) of the received request packet in the response packet. Both the link-test requestor and responder roles are implemented on the access point and device. Not only can the access point or device initiate a link test to a CCX v4 or v5 client, but a CCX v4 or v5 client can initiate a link test to the access point or device.

The device shows the link-quality metrics for CCX link tests in both directions (out—the access point to the client; in—the client to the access point):

- Signal strength in the form of RSSI (minimum, maximum, and average)
- Signal quality in the form of SNR (minimum, maximum, and average)
- Total number of packets that are retried
- Maximum retry count for a single packet
- Number of lost packets
- Data rate of a successfully transmitted packet

The controller shows this metric regardless of direction:

- Link test request/reply round-trip time (minimum, maximum, and average)

The controller software supports CCX versions 1 through 5. CCX support is enabled automatically for every WLAN on the controller and cannot be disabled. The controller stores the CCX version of the client in its client database and uses it to limit the features for this client. If a client does not support CCXv4 or v5, the controller performs a ping link test on the client. If a client supports CCXv4 or v5, the controller performs a CCX link test on the client. If a client times out during a CCX link test, the controller switches to the ping link test automatically.

## How to Configure Link Latency

### Configuring Link Latency (CLI)

#### SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ap link-latency`
4. `ap tcp-adjust-mss size size`
5. `show ap name Cisco_AP config general`
6. `ap name Cisco_AP link-latency [reset]`
7. `show ap name Cisco_AP config general`

#### DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> <b>Example:</b> Device# <code>enable</code>	Enters privileged EXEC mode.
Step 2	<code>configure terminal</code> <b>Example:</b> Device# <code>configure terminal</code>	Enters global configuration mode.
Step 3	<code>ap link-latency</code> <b>Example:</b> Device(config)# <code>ap link-latency</code>	Enables link latency for all access points that are currently associated with the device.  <b>Note</b> To disable link latency for all the access points that are associated with the device, use the <b>no ap link-latency</b> command.

	Command or Action	Purpose
		<p><b>Note</b> These commands enable or disable link latency only for access points that are currently joined to the device. You have to enable or disable link latency for the access points that join in the future.</p> <p><b>Note</b> To enable or disable link latency for specific access points that are associated with the device, enter the following commands in Privileged EXEC mode:</p> <ul style="list-style-type: none"> <li>• <b>ap name</b> <i>Cisco_AP</i> <b>link-latency</b>—Enables link latency.</li> <li>• <b>ap name</b> <i>Cisco_AP</i> <b>no link-latency</b>—Disables link latency.</li> </ul>
<b>Step 4</b>	<p><b>ap tcp-adjust-mss size</b> <i>size</i></p> <p><b>Example:</b></p> <pre>Device(config)# ap tcp-adjust-mss size 537</pre>	Configures TCP MSS adjust size for all access points. The range is from 536 to 1363.
<b>Step 5</b>	<p><b>show ap name</b> <i>Cisco_AP</i> <b>config general</b></p> <p><b>Example:</b></p> <pre>Device(config)# show ap name AP02 config general</pre>	<p>Displays the general configuration details of the access point. These configuration details contain the link latency results that correspond to the access point that you specify in the command.</p> <p>The output of this command contains the following link latency results:</p> <ul style="list-style-type: none"> <li>• <b>Current Delay</b>—The current round-trip time (in milliseconds) of CAPWAP heartbeat packets from the access point to the device and back.</li> <li>• <b>Maximum Delay</b>—Since the time that link latency has been enabled or reset, the maximum round-trip time (in milliseconds) of CAPWAP heartbeat packets from the access point to the device and back.</li> <li>• <b>Minimum Delay</b>—Since the time that link latency has been enabled or reset, the minimum round-trip time (in milliseconds) of CAPWAP heartbeat packets from the access point to the device and back.</li> </ul>
<b>Step 6</b>	<p><b>ap name</b> <i>Cisco_AP</i> <b>link-latency [reset]</b></p> <p><b>Example:</b></p> <pre>Device(config)# ap name AP02 link-latency reset</pre>	Clears the current, minimum, and maximum link latency statistics on the device for a specific access point.

	Command or Action	Purpose
Step 7	<b>show ap name <i>Cisco_AP</i> config general</b> <b>Example:</b> Device(config)# show ap name AP02 config general	Displays the general configuration details of the access point. Use this command to see the result of the reset operation.

# How to Configure TCP MSS

## Configuring TCP MSS (CLI)

### SUMMARY STEPS

1. configure terminal
2. ap tcp-adjust-mss size *size\_value*
3. reload
4. show ap tcp-adjust-mss

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
Step 2	<b>ap tcp-adjust-mss size <i>size_value</i></b> <b>Example:</b> Device(config)# ap tcp-adjust-mss size 537	Enables the TCP MSS on the particular access point that you specify.  <b>Note</b> To enable TCP MSS on all the access points that are associated with the device, enter the <b>ap tcp-adjust-mss size <i>size_value</i></b> command, where the size parameter is from 536 to 1363 bytes. The default value varies for different clients.
Step 3	<b>reload</b> <b>Example:</b> Device# reload	Reboots the device in order for your change to take effect.
Step 4	<b>show ap tcp-adjust-mss</b> <b>Example:</b> Device# show ap tcp-adjust-mss	Displays the current TCP MSS setting for all the access points that are associated with the device.  <b>Note</b> To display the TCP MSS settings that correspond to a specific access point, enter the <b>show ap name <i>Cisco_AP</i> tcp-adjust-mss</b> command.

# Performing a Link Test (CLI)



**Note** The procedure to perform this task using the device GUI is not currently available.

## SUMMARY STEPS

1. `test wireless linktest mac_address`
2. `configure terminal`
3. `wireless linktest frame-size frame_size`
4. `wireless linktest number-of-frames number_of_frames`
5. `end`

## DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>test wireless linktest mac_address</b> <b>Example:</b> Device# test wireless linktest 00:0d:88:c5:8a:d1	Runs a link test.
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Device# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 3</b>	<b>wireless linktest frame-size frame_size</b> <b>Example:</b> Device(config)# wireless linktest frame-size 41	Configures the link test frame size for each packet.
<b>Step 4</b>	<b>wireless linktest number-of-frames number_of_frames</b> <b>Example:</b> Device(config)# wireless linktest number-of-frames 50	Configures the number of frames to send for the link test.
<b>Step 5</b>	<b>end</b> <b>Example:</b> Device(config)# <b>end</b>	Returns to privileged EXEC mode. Alternatively, you can also press <b>Ctrl-Z</b> to exit global configuration mode.

# Configuration Examples for Configuring Link Latency

## Running a Link Test: Example

This example shows how to run a link test:

```
Device# test wireless linktest 6470.0227.ca55
Device# show wireless linktest statistic

Link Test to 64700227CA55 with 500 frame-size.
Client MAC Address           : 6470.0227.ca55
AP Mac Address               : 44e4.d901.19c0
Link Test Packets Sent       : 20
Link Test Packets Received   : 20
Link Test Pkts Lost (Total/AP->Clnt/Clnt->AP) : 0/0/0
Link Test Pkts round trip time (min/max/avg) : 9ms/31ms/14ms
RSSI at AP (min/max/average) : -53dBm/-51dBm/-52dBm
RSSI at Client (min/max/average) : -48dBm/-40dBm/-44dBm
```

## Displaying Link Latency Information: Example

This example shows how to display general configuration details of the access point. These configuration details contain the link latency results that correspond to the access point that you specify in the command.

```
Device# show ap name AP01 config general

Cisco AP Name                : AP01
Cisco AP Identifier          : 55
Country Code                 : US - United States
Regulatory Domain Allowed by Country : 802.11bg:-A      802.11a:-A
AP Country Code              : US - United States
AP Regulatory Domain         : Unconfigured
Switch Port Number          : Tel/0/1
MAC Address                  : 0000.2000.03f0
IP Address Configuration     : Static IP assigned
IP Address                   : 9.9.9.16
IP Netmask                   : 255.255.0.0
Gateway IP Address          : 9.9.9.2
Fallback IP Address Being Used : 9.9.9.16
Domain                       : Cisco
Name Server                  : 0.0.0.0
CAPWAP Path MTU              : 1485
Telnet State                 : Enabled
SSH State                    : Disabled
Cisco AP Location            : default-location
Cisco AP Group Name          : default-group
Primary Cisco Controller Name : CAPWAP Controller
Primary Cisco Controller IP Address : 9.9.9.2
Secondary Cisco Controller Name :
Secondary Cisco Controller IP Address : Not Configured
Tertiary Cisco Controller Name :
Tertiary Cisco Controller IP Address : Not Configured
Administrative State         : Enabled
Operation State              : Registered
AP Mode                      : Local
AP Submode                   : Not Configured
Remote AP Debug              : Disabled
```

```

Logging Trap Severity Level      : informational
Software Version                 : 7.4.0.5
Boot Version                     : 7.4.0.5
Stats Reporting Period          : 180
LED State                        : Enabled
PoE Pre-Standard Switch         : Disabled
PoE Power Injector MAC Address  : Disabled
Power Type/Mode                 : Power Injector/Normal Mode
Number of Slots                  : 2
AP Model                         : 3502E
AP Image                         : C3500-K9W8-M
IOS Version                      :
Reset Button                     :
AP Serial Number                 : SIM1140K002
AP Certificate Type              : Manufacture Installed
Management Frame Protection Validation : Disabled
AP User Mode                     : Customized
AP User Name                     : Not Configured
AP 802.1X User Mode              : Not Configured
AP 802.1X User Name              : Not Configured
Cisco AP System Logging Host     : 255.255.255.255
AP Up Time                       : 16 days 3 hours 14 minutes 1 s
econd
AP CAPWAP Up Time                : 33 minutes 15 seconds
Join Date and Time               : 01/02/2013 22:41:47
Join Taken Time                  : 16 days 2 hours 40 minutes 45
seconds
Join Priority                     : 1
Ethernet Port Duplex             : Auto
Ethernet Port Speed              : Auto
AP Link Latency                  : Enabled
Current Delay                    : 0
Maximum Delay                    : 0
Minimum Delay                    : 0
Last Updated (based on AP up time) : 0 seconds
Rogue Detection                  : Disabled
AP TCP MSS Adjust                : Disabled
AP TCP MSS Size                  : 536

```

## Displaying TCP MSS Settings: Example

This example shows how to display the current TCP MSS setting for all the access points that are associated with the device:

```
Device# show ap tcp-adjust-mss
```

AP Name	TCP State	MSS Size
AP01	Disabled	6146
AP02	Disabled	536
AP03	Disabled	6146
AP04	Disabled	6146
AP05	Disabled	6146