Implementing QoS (Marking)

Cisco Unified Border Element (SP Edition) supports quality of service (QoS) profiles that the integrator configures for IP packet marking on the data path. IP packet marking is used in Cisco Unified Border Element (SP Edition) in the following contexts:

- Configuring media packet real-time transport protocol (RTP) and real-time control protocol (RTCP) marking based on a per call scope.
- Supporting Differentiated Services Code Point (DSCP) marking as well as IP precedence/Type of Service (ToS) marking for voice service.
- Enabling the unique marking of media packets depending on the branch of the call (either the caller branch or the callee branch) on which the packets are sent.
- Supporting signaling and media packet marking based on Session Initiation Packet (SIP) resource priority header.

Cisco Unified Border Element (SP Edition) was formerly known as Integrated Session Border Controller and may be commonly referred to in this document as the session border controller (SBC).

For a complete description of the commands used in this chapter, refer to the *Cisco Unified Border Element (SP Edition) Command Reference: Unified Model* at:

http://www.cisco.com/en/US/docs/ios/sbc/command/reference/sbcu_book.html

For information about all Cisco IOS commands, use the Command Lookup Tool at http://tools.cisco.com/Support/CLILookup or a Cisco IOS master commands list.

Feature History for Implementing QoS (Marking)

Release	Modification
Cisco IOS XE Release 2.4	This feature was introduced on the Cisco IOS XR along with support for the unified model.
Cisco IOS XE Release 3.3S	The Flow Statistics Enhancements feature was introduced in the Cisco ASR 1000 Series Routers.
Cisco IOS XE Release 3.4S	The QoS Demarcation feature was introduced in the Cisco ASR 1000 Series Routers. The Flow Statistics Enhancements feature mentioned in the preceding row is part of the QoS Demarcation feature.

Contents

This chapter contains the following sections:

Prerequisites for Implementing QoS

The following is the prerequisite to implement QoS on Cisco Unified Border Element (SP Edition):

Before implementing QoS, Cisco Unified Border Element (SP Edition) must already be configured.

Information About Implementing QoS

To implement QoS marking on Cisco Unified Border Element (SP Edition), the user configures Cisco Unified Border Element (SP Edition) with a number of QoS profiles, which are given unique names to identify them. These QoS profiles are used exclusively for marking packets.

Each QoS profile contains the following mutually exclusive parameters.

- A 6-bit DSCP value to mark packets that match the QoS.
- A 3-bit IP precedence value and a 4-bit ToS value to mark packets that match the QoS.

Note A default QoS profile that can be neither modified nor deleted is preconfigured on Cisco Unified Border Element (SP Edition). If the user does not define a QoS profile, the default QoS profile is used for marking packets.

QoS signaling profiles are currently supported only for SIP signaling.

How to Implement QoS

To implement QoS marking on Cisco Unified Border Element (SP Edition), follow the procedures in the following sections:

Configuring QoS Profiles

This task configures a signaling QoS profile to use an IP precedence value of 1 and a ToS value of 12 to mark packets that match the QoS.

Note QoS signaling profiles are currently supported only for SIP signaling.

SUMMARY STEPS

1. **configure terminal**
2. **sbc** *sbc-name*
3. **sbe**
4. **qos sig** *name*
5. **marking** *type*
6. **ip precedence** *value*
7. **ip tos** *value*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Router# configure terminal`	Enables global configuration mode.

Step 2	**sbc** *sbc-name*
	
	Example:
	`Router(config)# sbc mysbc`
	`Router(config-sbc)#`
		Enters the mode of an SBC service.
		• Use the *sbc-name* argument to define the name of the SBC.

Step 3	**sbe**
	
	Example:
	`Router(config-sbc)# sbe`
	`Router(config-sbc-sbe)#`
		Enters the mode of an signaling border element (SBE) entity within a SBC service.

Step 4	**qos sig** ***name***
	
	Example:
	`Router(config-sbc-sbe)# qos sig residential`
	`Router(config-sbc-sbe-qos-sig)#`
		Enters the mode of configuring a QoS profile. The *name* parameter must be the name of an existing QoS profile. The string “default” is reserved.

Step 5	**marking** *type* **Example:** `Router(config-sbc-sbe-qos-sig)# marking ip-precedence`	Configures whether the QoS policy marks packets with a DSCP value or an IP precedence and ToS value or a policy that does not mark. The *type* can be one of the following: • dscp • ip-precedence • passthrough—creates a QoS policy that does not mark packets. The **no** version of this command removes the QoS policy.

	Command or Action	Purpose
Step 6	**ip precedence** *value* **Example:** `Router(config-sbc-sbe-qos-sig)# ip precedence 1`	Configures an IP precedence with which to mark IP packets belonging to the given QoS profile. The range of IP precedence values is 0 to 7. The **no** version of this command sets the default IP precedence value to 0. **Note** If the QoS profile is configured to mark packets DSCP value takes precedence.
Step 7	**ip tos** *value* **Example:** `Router(config-sbc-sbe-qos-sig)# ip tos 12`	Configures an IP ToS with which to mark IP packets belonging to the given QoS profile. The *value* parameter is a bit field consisting of one or more of the following bits linked together using an arithmetic OR: • 8—Minimize delay • 4—Maximize throughput • 2—Maximize reliability • 1—Minimize monetary cost

Analyzing the SIP Resource-Priority Header

Users can configure Cisco Unified Border Element (SP Edition) to map SIP packets with Resource-Priority header strings to the following SBC priority values:

- Routine
- Priority
- Immediate
- Flash
- Flash override
- Critical

The Call Admission Control (CAC) uses the assigned priority value to choose the QoS profile.

The following task configures Cisco Unified Border Element (SP Edition) to assign priority value“flash” to a SIP packet with Resource-Priority header string “dsn.flash.”

SUMMARY STEPS

1. **configure terminal**
2. **sbc** *service name*
3. **sbe**
4. **resource-priority-set** *name*
5. **resource-priority** *string value*
6. **priority** *priority-value*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Router# configure terminal`	Enables global configuration mode.
Step 2	**sbc** *sbc-name* **Example:** `Router(config)# sbc mysbc`	Enters the mode of an SBC service. • Use the *sbc-name* argument to define the name of the SBC.
Step 3	**sbe** **Example:** `Router(config-sbc)# sbe`	Enters the mode of an SBE entity within a SBC service.
Step 4	**resource-priority-set** *name* **Example:** `Router(config-sbc-sbe)# resource-priority-set dsn`	Enters the mode to map SIP Resource-Priority header string to SBC priority values.
Step 5	**resource-priority** *string value* **Example:** `Router(config-sbc-sbe-rsrc-pri-set)# resource-priority dsn.flash`	Enters the mode to configure the priority of the Resource-Priority header string.
Step 6	**priority** *priority-value* **Example:** `Router(config-sbc-sbe-rsrc-pri)# priority flash`	Sets the SBC priority value of the Resource-Priority header string. The SBC priority value must be one of the following: • routine • priority • immediate • flash • flash-override • critical

Configuring a Resource Priority Set on a SIP Adjacency

The following task configures the SIP adjacency “SipToIsp42”to use resource-priority-set “dsn.”

SUMMARY STEPS

1. **configure terminal**
2. **sbc** *service name*
3. **sbe**
4. **adjacency sip** *adjacency-name*

5. **resource-priority-set** *name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Router# configure terminal`	Enables global configuration mode.
Step 2	**sbc** *sbc-name* **Example:** `Router(config)# sbc mysbc`	Enters the mode of an SBC service. • Use the *sbc-name* argument to define the name of the SBC.
Step 3	**sbe** **Example:** `Router(config-sbc)# sbe`	Enters the mode of an SBE entity within a SBC service.
Step 4	**adjacency sip** *adjacency-name* **Example:** `Router(config-sbc-sbe)# adjacency sip SipToIsp42`	Configures the SIP adjacency that is to be used with the specified resource priority set.
Step 5	**resource-priority-set** *name* **Example:** `Router(config-sbc-sbe-adj-sip)# resource-priority-set dsn`	Sets the SIP adjacency that is to be used with the specified resource priority set.

Selecting a QoS Profile Using CAC

This task configures calls from the account *cisco* to use the voice QoS profile *enterprise* for packets sent from Cisco Unified Border Element (SP Edition) to the original caller.

Note This command can only be run at the per-call scope. The CAC policy does not get activated if this command is run at any other scope.

SUMMARY STEPS

1. **configure terminal**
2. **sbc** *sbc-name*
3. **sbe**
4. **cac-policy-set** *policy-set-id*
5. **first-cac-scope** *scope-name*

6. **first-cac-table** *table-name*
7. **cac-table** *table-name*
8. **table-type** ***limit*** *list of limit tables*
9. **entry** *entry-id*
10. **match-value** *key*
11. **caller-voice-qos-profile** *profile-name*
12. **caller-video-qos-profile** *profile-name*
13. **caller-sig-qos-profile** *profile name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Router# configure terminal`	Enables global configuration mode.
Step 2	**sbc** *sbc-name* **Example:** `Router(config)# sbc mysbc`	Enters the mode of an SBC service. • Use the *sbc-name* argument to define the name of the service.
Step 3	**sbe** **Example:** `Router(config-sbc)# sbe`	Enters the mode of an SBE entity within an SBC service.
Step 4	**cac-policy-set** *policy-set-id* **Example:** `Router(config-sbc-sbe)# cac-policy-set 1`	Enters the mode of Call Admission Control (CAC) policy set configuration within an SBE entity, creating a new policy set, if necessary.

	Command or Action	Purpose
Step 5	**first-cac-scope** *scope-name* **Example:** `Router(config-sbc-sbe-cacpolicy)# first-cac-scope call`	Configures the scope at which to begin defining limits when performing the admission control stage of policy. The *scope-name* argument configures the scope at which limits should be initially defined. Possible values are: • adj-group • call • dst-account • dst-adj-group • dst-adjacency • dst-number • global • src-account • src-adj-group • arc-adjacency
Step 6	**first-cac-table** *table-name* **Example:** `Router(config-sbc-sbe-cacpolicy)# first-cac-table MyCacTable`	Configures the name of the first policy table to process when performing the admission control stage of policy.
Step 7	**cac-table** *table-name* **Example:** `Router(config-sbc-sbe-cacpolicy)# cac-table MyCacTable`	Enters the mode for configuration of an admission control table (creating one, if necessary) within the context of an SBE policy set.

	Command or Action	Purpose
Step 8	**table-type limit** *list of limit tables* **Example:** `Router(config-sbc-sbe-cacpolicy-cactable)# table-type limit src-account`	Configures a CAC Limit table-type within the context of an SBE policy set. *list of limit tables* can be one of the following values: • **account**—Compare the name of the account. • **adj-group**—Compare the name of the adjacency group. • **adjacency**—Compare the name of the adjacency. • **all**—No comparison type. All events match this type. • **call-priority**—Compare with call priority. • **category**—Compare the number analysis assigned category. • **dst-account**—Compare the name of the destination account. • **dst-adj-group**—Compare the name of the destination adjacency group. • **dst-adjacency**—Compare the name of the destination adjacency. • **dst-prefix**—Compare the beginning of the dialed digit string. • **event-type**—Compare with CAC policy event types. • **src-account**—Compare the name of the source account. • **src-adj-group**—Compare the name of the source adjacency group. • **src-adjacency**—Compare the name of the source adjacency. • **src-prefix**—Compare the beginning of the calling number string.
Step 9	**entry** *entry-id* **Example:** `Router(config-sbc-sbe-cacpolicy-cactable)# entry 1`	Enters the mode for configuring an entry in an admission control table, creating the entry, if necessary.
Step 10	**match-value** *key* **Example:** `Router(config-sbc-sbe-cacpolicy-cac-table-ent)# match-value cisco`	Configures the match value of an entry in an admission control table.

	Command or Action	Purpose
Step 11	**caller-voice-qos-profile** *profile-name* **Example:** `Router(config-sbc-sbe-cacpolicy-cac-table-ent)# caller-voice-qos-profile enterprise`	Configures the QoS profile to use for voice media packets sent to the original caller.
Step 12	**caller-video-qos-profile** *profile-name* **Example:** `Router(config-sbc-sbe-cacpolicy-cac-table-ent)# caller-video-qos-profile enterprise`	Configures the QoS profile to use for packets sent to the original caller.
Step 13	**caller-sig-qos-profile** *profile-name* **Example:** `Router(config-sbc-sbe-cacpolicy-cac-table-ent)# caller-sig-qos-profile enterprise`	Configures the QoS profile to use for signaling packets sent to the original caller.

Implementing QoS Demarcation

In the context of a network, a QoS demarcation point is a transit point within the network that provides features for measuring call quality and fixing problems that affect call quality. You can configure the SBC as a QoS demarcation point to meet the following objectives:

- Generate an alert when a problem in the network affects call quality.
- Provide information that can be used to determine the location of the problem.
- Calculate statistics that can assist in diagnosing and fixing the problem.

The quality of a group of calls (or media streams processed by the SBC) can be determined by measuring parameters such as the following along the packet data path:

- Media packets lost while in transit from the sender to the receiver
- Media packets dropped from the set of media packets received
- Jitter in the media packets received
- Network latency in the media streams

Using these measurements, the SBC can calculate the following QoS statistics:

- Average local media packet jitter

  See RFC 3550 for the definition of local media packet jitter.
- Average remote media packet jitter

  See RFC 3550 for the definition of remote media packet jitter.
- Average round trip delay
- Mean Opinion Score for Conversational Quality, Estimated (MOS-CQE) score

  The MOS-CQE score provides an overall view of the statistics listed earlier. See Recommendations G.107 and G.113 of the ITU-T for the definition of the MOS-CQE score.

Note The International Telecommunication Union (ITU) coordinates and assists in the development of telecommunications standards. The ITU Telecommunication Standardization Sector (ITU-T) is a division of the ITU. Recommendations G.107 and G.113 that are published by the ITU-T explain the MOS-CQE score and the method for calculating it. For more information about these recommendations, visit the ITU-T website at http://www.itu.int/ITU-T/index.html.

  Of the various factors defined in Recommendations G.107 and G. 113 for calculation of the MOS-CQE score, you can specify values for the following factors:
  - Advantage (A) factor, which is specified at the per-adjacency level
  - Equipment Impairment (Ie) factor, which is specified at the per-codec level
  - Packet-Loss Robustness (Bpl) factor, which is specified at the per-codec level

  Detailed information about these factors is available on the ITU-T website.
- Ratio of unanswered calls to the total number of calls

Note The ratio of unanswered calls is not based on the measurements listed earlier.

- Ratio of media packets that are lost to the total number of media packets sent
- Ratio of media packets that are dropped to the total number of media packets received

Note Stored QoS statistics data is lost after an RP failover.

For each statistic, you can configure a combination of the following alerts to denote the state of the statistic:

- Critical
- Major

- Minor

For each alert, you specify a minimum (low) value and a maximum (upper) value. For statistics for which a higher value signifies an adverse effect on call quality, the alert changes when the upper limit of the earlier alert level is crossed. The following example illustrates how this works:

You specify the following alert levels for the Local Media Packet Jitter statistic:

- Major Low alert level: 60
- Major Upper alert level: 70
- Critical Low alert level: 71
- Critical Upper alert level: 80

A higher value of local media packet jitter indicates an adverse effect on call quality. While this statistic is being monitored, if the value of the statistic is increasing and crosses 80, the alert level changes to Critical. In contrast, if the value is decreasing and crosses 60, the alert changes to Normal. If the value is decreasing but does not go below 60, the alert level remains at Major.

Note You can configure the SBC to generate an SNMP trap in response to changes in alert levels.

The reverse is true for the MOS-CQE score. If the alert levels listed earlier are specified for the MOS-CQE score, a MOS-CQE score higher than the specified Minor Upper alert level is classified as Normal. A value lower than the Critical Low alert level signifies that the statistic is in the Critical state.

You can specify the following time intervals at which a statistic must be measured. Because these are moving-average statistics, their values do not change suddenly over the boundaries of the time interval that you specify.

- Current 5 minutes—Statistics for the current 5-minute interval
- Current 15 minutes—Statistics for the current 15-minute interval
- Current hour—Statistics for the current 60-minute interval
- Current day—Statistics for the current day, starting from midnight
- Indefinitely—Statistics for the period starting from the last explicit reset

The following sections describe the procedures to configure the SBC for calculating the QoS statistics. Note that stored QoS statistics data is lost after an RP failover.

- Configuring the Calculation of the Local Jitter Ratio, page 38-12
- Configuring the G.107 Factors, page 38-15
- Configuring the Calculation of the MOS-CQE Score, page 38-18
- Configuring Alert Levels for the QoS Statistics, page 38-20
- Configuring SNMP Notifications for the QoS Statistics, page 38-23

Configuring the Calculation of the Local Jitter Ratio

Prior to Cisco IOS XE Release 3.3S, the Media Packet Forwarder (MPF) used the RTCP Sender Reports (SR) and Receiver Reports (RR) exchanged between a caller and a callee, and performed its own measurements on the media stream. QoS-related information was then passed to the media stream. Local jitter was not calculated because it requires tracking of the packet inter-arrival time, which is a processor-intensive operation in the MPF.

From Cisco IOS XE Release 3.3S, the SBC can be configured to calculate local jitter by tracking the percentage of calls that match criteria such as the source adjacency or destination adjacency. Local jitter is calculated according to the method specified in RFC 3550. The calculation is performed for both RTP streams and SRTP streams.

This task explains how to specify the percentage of calls for which the SBC must calculate the local jitter ratio. This task is one of the prerequisites for calculation of the MOS-CQE score.

SUMMARY STEPS

1. **configure terminal**
2. **sbc** *sbc-name*
3. **sbe**
4. **adjacency** {**sip** | **h323**} *adjacency-name*
5. **local-jitter-ratio** *call-percentage*
6. **end**
7. **show sbc** *sbc-name* **sbe adjacencies** *adjacency-name* **detail**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Router# configure terminal`	Enables the global configuration mode.
Step 2	**sbc** *sbc-name* **Example:** `Router(config)# sbc mySbc`	Enters the SBC service mode. • *sbc-name*—Name of the SBC.
Step 3	**sbe** **Example:** `Router(config-sbc)# sbe`	Enters the SBE entity mode within the SBC service.
Step 4	**adjacency** {**sip** | **h323**} *adjacency-name* **Example:** `Router(config-sbc-sbe)# adjacency h323 adj1`	Specifies whether you want to configure an SBE SIP adjacency mode or an SBE H.323 adjacency mode. • *adjacency-name*—Specifies the name of the SIP adjacency or H.323 adjacency.

	Command or Action	Purpose
Step 5	**local-jitter-ratio** *call-percentage* **Example:** `Router(config-sbc-sbe-adj-h323)# local-jitter-ratio 205`	Specifies the percentage of calls that must be used to calculate the local jitter ratio. • *call-percentage*—Specifies the percentage of calls. The value is expressed as an integer in the range from 0 to 1000. For example, if you enter 205 as the value of *call-percentage*, the SBC uses 20.5 percent of the calls for measuring local jitter. The default value is 0 because jitter determination is a performance drain on the MPF. When the value is 0, the jitter ratio and MOS-CQE are not calculated for the adjacency.
Step 6	**end** **Example:** `Router(config-sbc-sbe-adj-h323)# end`	Exits the SBE H.323 adjacency mode, and enters the privileged EXEC mode.
Step 7	**show sbc** *sbc-name* **sbe adjacencies** *adjacency-name* **detail** **Example:** `Router# show sbc mySbc sbe adjacencies h323adj detail`	Displays details of the specified adjacency. The output also includes the local jitter ratio.

The following example displays details of an adjacency using the **show sbc sbe adjacencies detail** command. The output also includes the *call-percentage* parameter value.

```
Router# show sbc mySbc sbe adjacencies adj1 detail

SBC Service "mySbc"
  Adjacency adj1 (H.323)
    Status:                    Attached
    Signaling address: 1.0.0.3:1720 (default)
    Signaling-peer: 40.40.40.4:1720 (default)
    Admin Domain: None
    Account:
    Media passthrough: Yes
    Group:
    Hunting triggers: Global Triggers
    Hunting mode: Global Mode
    Technology Prefix:
    H245 Tunnelling: Enabled
    Fast-Slow Interworking: None
    Trust-level: Untrusted
    Call-security: Insecure
    Realm: None
    Warrant Match-Order: None
    Local Jitter Ratio: 205/1000
    Calc Moscqe: 0/1000
    G107A factor: 0
    H225 address block: Disabled (default)
    H225 address usage: h323id (default)
```

Configuring the G.107 Factors

The Advantage (A) factor, Equipment Impairment (Ie) factor, and Packet-Loss Robustness (Bpl) factor are used in the calculation of the MOS-CQE score. From Cisco IOS XE Release 3.4S, you can specify values for these factors.

This task explains how to configure the Advantage factor, Equipment Impairment factor, and Packet-Loss Robustness factor.

SUMMARY STEPS

1. **configure terminal**
2. **sbc** *sbc-name*
3. **sbe**
4. **adjacency** {**sip** | **h323**} *adjacency-name*
5. **g107a-factor** *factor-number*
6. **exit**
7. **codec system** *sys-codec* **id** *payload-id*
8. **g107 ie** *factor-number*
9. **g107 bpl** *factor-number*
10. **end**
11. **show sbc** *sbc-name* **sbe adjacencies** *adjacency-name* **detail**
12. **show sbc** *sbc-name* **sbe codecs name** *codec-name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Router# configure terminal`	Enables the global configuration mode.
Step 2	**sbc** *sbc-name* **Example:** `Router(config)# sbc mySbc`	Enters the SBC service mode. • *sbc-name*—Name of the SBC.
Step 3	**sbe** **Example:** `Router(config-sbc)# sbe`	Enters the SBE entity mode within a SBC service.
Step 4	**adjacency** {**sip** | **h323**} *adjacency-name* **Example:** `Router(config-sbc-sbe)# adjacency h323 adj1`	Specifies whether you want to configure an SBE SIP adjacency mode or an SBE H.323 adjacency mode. • *adjacency-name*—Name of the SIP adjacency or H.323 adjacency.

	Command or Action	Purpose
Step 5	**g107a-factor** *factor-number* **Example:** `Router(config-sbc-sbe-adj-h323)# g107a-factor 10`	Sets the Advantage factor. • *factor-number*—Value of the Advantage factor. The range is from 0 to 20. The default value is 0. See Recommendation G.107 for information about the significance of this default value.
Step 6	**exit** **Example:** `Router(config-sbc-sbe)# exit`	Exits the SBE H.323 adjacency mode or the SBE SIP adjacency mode, and enters the SBE entity mode.
Step 7	**codec system** *sys-codec* **id** *payload-id* **Example:** `Router(config-sbc-sbe)# codec system PCMU id 0`	Enters the codec definition mode.
Step 8	**g107 ie** *factor-number* **Example:** `Router(config-sbc-sbe-codec-def)# g107 ie 20`	Sets the Equipment Impairment factor. • *factor-number*—Value of the Equipment Impairment factor. The range is from 0 to 50. See Appendix I of Recommendation G.113 for information about the values that you can set for various codecs. If you have a custom codec, you can set a value that best matches the impairment introduced by the codec. The default value is 0. See Appendix I of Recommendation G.113 for information about the significance of this default.
Step 9	**g107 bpl** *factor-number* **Example:** `Router(config-sbc-sbe-codec-def)# g107 bpl 30`	Sets the Packet-Loss Robustness factor. • *factor-number*—Specifies the value of the Packet-Loss Robustness factor, which can range from 1 to 40. See Appendix I of Recommendation G.113 for information about the values that you can set for various codecs. If you have a custom codec, you can set a value that best matches the Packet-Loss Robustness factor for the codec. The default value is 1. See Appendix I of Recommendation G.113 for information about the significance of this default.
Step 10	**end** **Example:** `Router(config-sbc-sbe-adj-h323)# end`	Exits the codec definition mode, and enters the privileged EXEC mode.

	Command or Action	Purpose
Step 11	**show sbc** *sbc-name* **sbe adjacencies** *adjacency-name* **detail** **Example:** `Router# show sbc mySbc sbe adjacencies h323adj detail`	Displays details of the specified adjacency. The output includes the value set for the Advantage factor.
Step 12	**show sbc** *sbc-name* **sbe codecs name** *codec-name* **Example:** `Router#show sbc Mysbc sbe codecs name PCMU`	Displays details of the specified codec. The output includes the Equipment Impairment factor and Packet-Loss Robustness factor values.

The following example displays the details of a specified adjacency using the **show sbc sbe adjacencies detail** command. The output includes the Advantage factor value.

```
Router# show sbc mySbc sbe adjacencies adj1 detail

SBC Service "mySbc"
  Adjacency adj1 (H.323)
    Status: Attached
    Signaling address: 1.0.0.3:1720 (default)
    Signaling-peer: 40.40.40.4:1720 (default)
    Admin Domain: None
    Account:
    Media passthrough: Yes
    Group:
    Hunting triggers: Global Triggers
    Hunting mode: Global Mode
    Technology Prefix:
    H245 Tunnelling: Enabled
    Fast-Slow Interworking: None
    Trust-level: Untrusted
    Call-security: Insecure
    Realm: None
    Warrant Match-Order: None
    Local Jitter Ratio: 1000/1000
    Calc Moscqe: 305/1000
    G107A factor: 10
    H225 address block: Disabled (default)
    H225 address usage: h323id (default)
```

The following example displays the details of a specified codec using the **show sbc sbe codecs name codec** command. The output includes the Equipment Impairment factor and Packet-Loss Robustness factor values.

```
Router# show sbc mySbc sbe codecs name PCMU

codec_name                = PCMU
    static_payload_id     = 0
    codec_type            = sample
    clock_rate            = 8000
    packet_time           = 10
    bandwidth             = 64000
    sample_size           = 8
    num_channels          = 1
    max_fpp               = 20
    media_type            = audio
    g107 bpl              = 40
    g107 ie               = 50
```

```
options                 = transcode, inband-dtmf
```

Configuring the Calculation of the MOS-CQE Score

This section describes the procedure to configure a target MOS-CQE score.

The following are prerequisites for calculation of the MOS-CQE score:

- Performing the procedure described in the ?$paranum>Configuring the Calculation of the Local Jitter Ratio? section on page 38-12. Note that it is optional to configure caculation of the local jitter ratio. If you do not perform the procedure, the default value set for the percentage of calls for which the local jitter is to be calculated is used in the calculation of the MOS-CQE score.
- Performing the procedure described in the ?$paranum>Configuring the G.107 Factors? section on page 38-15. Note that it is optional to configure the G.107 factors. If you do not perform this procedure, the default values that are set for these factors are used to calculate the MOS-CQE score.

SUMMARY STEPS

1. **configure terminal**
2. **sbc** *sbc-name*
3. **sbe**
4. **adjacency {sip | h323}** *adjacency-name*
5. **calc-moscqe** *call-percentage*
6. **end**
7. **show sbc** *sbc-name* **sbe adjacencies** *adjacency-name* **detail**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Router# configure terminal`	Enables the global configuration mode.
Step 2	**sbc** *sbc-name* **Example:** `Router(config)# sbc mySbc`	Enters the SBC service mode. • *sbc-name*—Name of the SBC.
Step 3	**sbe** **Example:** `Router(config-sbc)# sbe`	Enters the SBE entity mode within a SBC service.
Step 4	**adjacency** {**sip** | **h323**} *adjacency-name* **Example:** `Router(config-sbc-sbe)# adjacency h323 adj1`	Specifies whether you want to configure an SBE SIP adjacency mode or an SBE H.323 adjacency mode. • *adjacency-name*—Name of the SIP adjacency or H.323 adjacency.

	Command or Action	Purpose
Step 5	**calc-moscqe** *call-percentage* **Example:** `Router(config-sbc-sbe-adj-h323)# calc-moscqe 305`	Specifies the percentage of calls that must be used to calculate the MOS-CQE score. • *call-percentage*—Percentage of calls. The range is from 0 to 1000. For example, if you enter 305 as the value of *call-percentage*, the SBC uses 30.5 percent of the calls for calculating the MOS-CQE score. The default value is 0. When the value is 0, the MOS-CQE score is not calculated. Note that the MOS-CQE score also depends on the local jitter ratio. If you do not perform the procedure described in the ?$paranum>Configuring the Calculation of the Local Jitter Ratio? section on page 38-12, the MOS-CQE score is not calculated.
Step 6	**end** **Example:** `Router(config-sbc-sbe)# end`	Exits the SBE SIP adjacency mode or SBE H.323 adjacency mode, and returns to the privileged EXEC mode.
Step 7	**show sbc** *sbc-name* **sbe adjacencies** *adjacency-name* **detail** **Example:** `Router# show sbc mySbc sbe adjacencies h323adj detail`	Displays details of the specified adjacency. The output also includes the value that is set for the *call-percentage* parameter. • *sbc-name*—Name of the SBC. • *adjacency-name*—Name of the adjacency.

The following example displays the details of a specified adjacency using the **show sbc sbe adjacencies detail** command. The output also includes the *call-percentage* parameter value.

```
Router# show sbc mySbc sbe adjacencies adj1 detail

SBC Service "mySbc"
  Adjacency adj1 (H.323)
    Status: Attached
    Signaling address: 1.0.0.3:1720 (default)
    Signaling-peer: 40.40.40.4:1720 (default)
    Admin Domain: None
    Account:
    Media passthrough: Yes
    Group:
    Hunting triggers: Global Triggers
    Hunting mode: Global Mode
    Technology Prefix:
    H245 Tunnelling: Enabled
    Fast-Slow Interworking: None
    Trust-level: Untrusted
    Call-security: Insecure
    Realm: None
    Warrant Match-Order: None
    Local Jitter Ratio: 1000/1000
    Calc Moscqe: 305/1000
    G107A factor: 0
    H225 address block: Disabled (default)
    H225 address usage: h323id (default)
```

Note You can display the MOS-CQE score calculated by the SBC by running the **show sbc sbe call-stats per-adjacency** command. A sample output of this command is provided later in this chapter.

Configuring Alert Levels for the QoS Statistics

This task explains how to configure alert levels for the QoS statistics.

SUMMARY STEPS

1. **configure terminal**
2. **sbc** *sbc-name*
3. **sbe**
4. **statistics {lcl-jit | mos-cqe | mpd-pct | mpl-pct | rmt-jit | rtd | ucr}**
5. **currenthour {adjacency** *adjacency-name* **{critical low** *value* **upper** *value* **| major low** *value* **upper** *value* **[critical low** *value* **upper** *value***] | minor low** *value* **upper** *value* **[[critical low value upper value] | [major low** *value* **upper** *value* **[critical low** *value* **upper** *value*]]]} **| default {critical low** *value* **upper** *value* **| major low** *value* **upper** *value* **[critical low** *value* **upper** *value***] | minor low** *value* **upper** *value* **[[critical low** *value* **upper** *value***] | [major low** *value* **upper** *value* **[critical low** *value* **upper** *value*]]]}}

Note Depending on your requirement, you can use **current15mins**, **currentday**, or **currentindefinite** instead of **currenthour**. The time interval for which statistical data is monitored varies according to the command that you run. The syntax is the same for all these commands. The time intervals for which these commands are applicable are described at the start of the ?$paranum>Implementing QoS Demarcation? section on page 38-10.

6. **end**
7. **show sbc** *sbc-name* **sbe call-stats per-adjacency** *adjacency-name period*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enables the global configuration mode.

Step 2	**sbc** *sbc-name* **Example:** `Router(config)# sbc mySbc`	Enters the SBC service mode. • *sbc-name*—Name of the SBC.

	Command or Action	Purpose
Step 3	**sbe** **Example:** `Router(config-sbc)# sbe`	Enters the SBE configuration mode.
Step 4	**statistics {lcl-jit | mos-cqe | mpd-pct | mpl-pct | rmt-jit | rtd | ucr}** **Example:** `Router(config-sbc-sbe)# statistics lcl-jit`	Specifies the statistic for which you want to set alert levels. You can specify one of the following statistics: • **lcl-jit**—Specifies the average local media packet jitter. • **mos-cqe**—Specifies the MOS-CQE score. • **mpd-pct**—Specifies the ratio of media packets that are dropped to the total number of media packets received. • **mpl-pct**—Specifies the ratio of media packets that are lost to the total number of media packets sent. • **rmt-jit**—Specifies the average remote media packet jitter. • **rtd**—Specifies the average round trip delay. • **ucr**—Specifies the ratio of unanswered calls to the total number of calls.

	Command or Action	Purpose
Step 5	**currenthour {adjacency** *adjacency-name* **{critical low** *value* **upper** *value* **| major low** *value* **upper** *value* **[critical low** *value* **upper** *value***] | minor low** *value* **upper** *value* **[major low** *value* **upper value [critical low** *value* **upper** *value***]] } | default {critical low** *value* **upper** *value* **| major low** *value* **upper** *value* **[critical low** *value* **upper** *value***] | minor low** *value* **upper** *value* **[major low** *value* **upper** *value* **[critical low** *value* **upper** *value***]] }}** **Example:** `Router(config-sbc-sbe-stats)# currenthour default critical low 30 upper 50`	Specifies that statistical data must be monitored for the next hour for the QoS statistic specified by the **statistics** command. **Note** Depending on your requirement, you can use **current15mins**, **currentday**, or **currentindefinite** instead of **currenthour**. The time interval for which statistical data is monitored varies according to the command that you run. The syntax is the same for all these commands. The time intervals for these commands is described at the start of the ?$paranum>Implementing QoS Demarcation? section on page 38-10. • **adjacency**—Specifies that alert levels must be set for the specified adjacency. • *adjacency-name*—Name of the adjacency. • **critical**—Specifies the lower and upper limits for the Critical alert level. • **low**—Specifies the lower limit for the alert level. • *value*—Value of the lower limit or upper limit. • **upper**—Specifies the upper limit for the alert level. • **major**—Specifies the lower limit and upper limit for the Major alert level. • **minor**—Specifies the lower limit and upper limit for the Minor alert level. • **default**—Specifies that alert levels must be set for all adjacencies on the SBC.
Step 6	**end** **Example:** `Router(config-sbc-sbe-adj-h323)# end`	Exits the SBE entity mode, and enters the privileged EXEC mode.
Step 7	**show sbc** *sbc-name* **sbe call-stats per-adjacency** *adjacency-name period* **Example:** `Router# show sbc mySbc sbe call-stats per-adjacency adj1 currentindefinite`	Displays QoS statistics for the specified adjacency. • *sbc-name*—Name of the SBC. • *adjacency-name*—Name of the adjacency. • *period*—Interval for which the statistics must be displayed.

The following example displays the call statistics pertaining to the adjacency (since the last explicit reset) using the **show sbc sbe call-stats per-adjacency** command. The output also includes QoS statistics.

```
Router# show sbc Mysbc sbe call-stats per-adjacency adj1 currentindefinite
…
Statistics for the current hour for adjacency adj1

Stats Reset Timestamp:
```

```
Timestamp when stats for this summary period were reset =   2011/04/08 04:05:09
Current count of Media Packets Lost =                       0
Current count of Media Packets Dropped =                    1
Current count of Media Packets Sent =                       116
Current count of Media Packets Received =                   116
Current count of RTCP Packets Sent =                        0
Current count of RTCP Packets Received =                    0
Average Call Duration =                                     21 secs 16 ms
Average of the Unanswered Call Ratio per thousand call =    0
Average of the Round Trip Delay =                           0 ms
Average of the locally calculated jitter =                  77 ms
Average of the remotely calculated jitter =                 0 ms
Average of the received media dropped per thousand pkts =   8
Average of the sent media lost per thousand pkts =          0
Average of Mean Opinion Score =                             20
Current alert level of the Unanswer Seizure Ratio =         NONE
Current alert level of the Round Trip Delay =               NORMAL
Current alert level of the locally calculated Jitter =      MINOR
Current alert level of the remotely calculated Jitter =     NORMAL
Current alert level of the media packet dropped =           MAJOR
Current alert level of the sent packets lost =              NORMAL
Current alert level of the Media Opinion Score =            MINOR
```

Configuring SNMP Notifications for the QoS Statistics

To configure SNMP notifications for the QoS statistics, perform the procedure described in the ?$paranum>Configuring SNMP Notifications? section on page 5-3 for running the following command:

snmp-server enable traps sbc qos-statistics

Configuration Examples of QoS Profiles

This section provides the following configuration examples:

- Configuring a QoS Voice Profile Using IP Precedence Marking: Example
- Configuring a QoS Voice Profile Using DSCP Marking: Example
- Choosing a QoS Profile Using CAC: Example
- Configuring a SIP Adjacency Using a Resource-Priority Set: Example

Configuring a QoS Voice Profile Using IP Precedence Marking: Example

This task configures a QoS voice profile to use an IP precedence value of 1 and a ToS value of 12 to mark packets that match the QoS.

```
configure
 sbc mysbc
  sbe
   qos voice residential
    marking ip-precedence
    ip precedence 1
    ip tos 12
```

Configuring a QoS Voice Profile Using DSCP Marking: Example

This task configures a QoS voice profile to mark packets with a DSCP value of 10.

```
configure
 sbc mysbc
  sbe
   qos voice residential
    marking dscp
    dscp 10
```

Choosing a QoS Profile Using CAC: Example

This task configures calls from the account “cisco” to use the voice QoS profile “enterprise” for packets sent from Cisco Unified Border Element (SP Edition) to the original caller.

```
configure
 sbc mysbc
  sbe
   cac-policy-set 1
    first-cac-scope call
     first-cac-table MyCacTable
      cac-table MyCacTable
      table-type limit src-account
      entry 1
      match-value cisco
      caller-voice-qos-profile enterprise
      caller-video-qos-profile enterprise


sbc mysbc
 sbe
  cac-policy-set 1
   first-cac-scope call
   first-cac-table MyCacTable
   cac-table MyCacTable
    table-type limit src-account
    entry 1
     match-value cisco
     caller-video-qos-profile enterprise
     caller-voice-qos-profile enterprise
   !
  !
 !
```

Configuring a SIP Adjacency Using a Resource-Priority Set: Example

The following example shows how to configure a SIP adjacency using a resource-priority set:

```
configure
 sbc mysbc
  sbe
   adjacency sip SipToIsp42
    resource-priority-set dsn
```