CHAPTER 12

Quality Monitoring and Statistics Gathering

The Data Border Element (DBE) deployment of the Cisco Unified Border Element (SP Edition) distributed model has a main objective in supporting quality monitoring and statistics reporting. The DBE supports generation of event messages detailing significant events that occur on each call. In addition, the DBE supports generation of correct billing, call usage and detail records.

Some of the monitoring events that the DBE tracks and reports are as follows:

- Checking on occurrence of hung calls using the H.248 Network Quality Alert event.
- Reporting on congestion events and critical status changes, such as a resource shortage or performance degradation, quality degradations of media streams, and service level agreement (SLA) violations.
- Reporting media timeout while the association with the controller is down.
- Enabling H.248 event storage and reporting.
- Detecting media gateway controller (MGC) failure.

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, see *Cisco Unified Border Element (SP Edition) Command Reference: Distributed Model* at:

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

Contents

This chapter provides information about the following topics:

Billing and Call Detail Records

One main function of Cisco Unified Border Element (SP Edition) is to generate correct billing, call detail and usage records. The DBE supports collecting statistics data and sending the data to the Signaling Border Element (SBE).

Prerequisites for Implementing Billing

The following prerequisite is required to implement Cisco Unified Border Element (SP Edition) billing:

- Before implementing interworking billing, Cisco Unified Border Element (SP Edition) must already be configured. See the procedures described in Chapter 2, "Configuring the Cisco Unified Border Element (SP Edition) Distributed Model."

Information About Billing

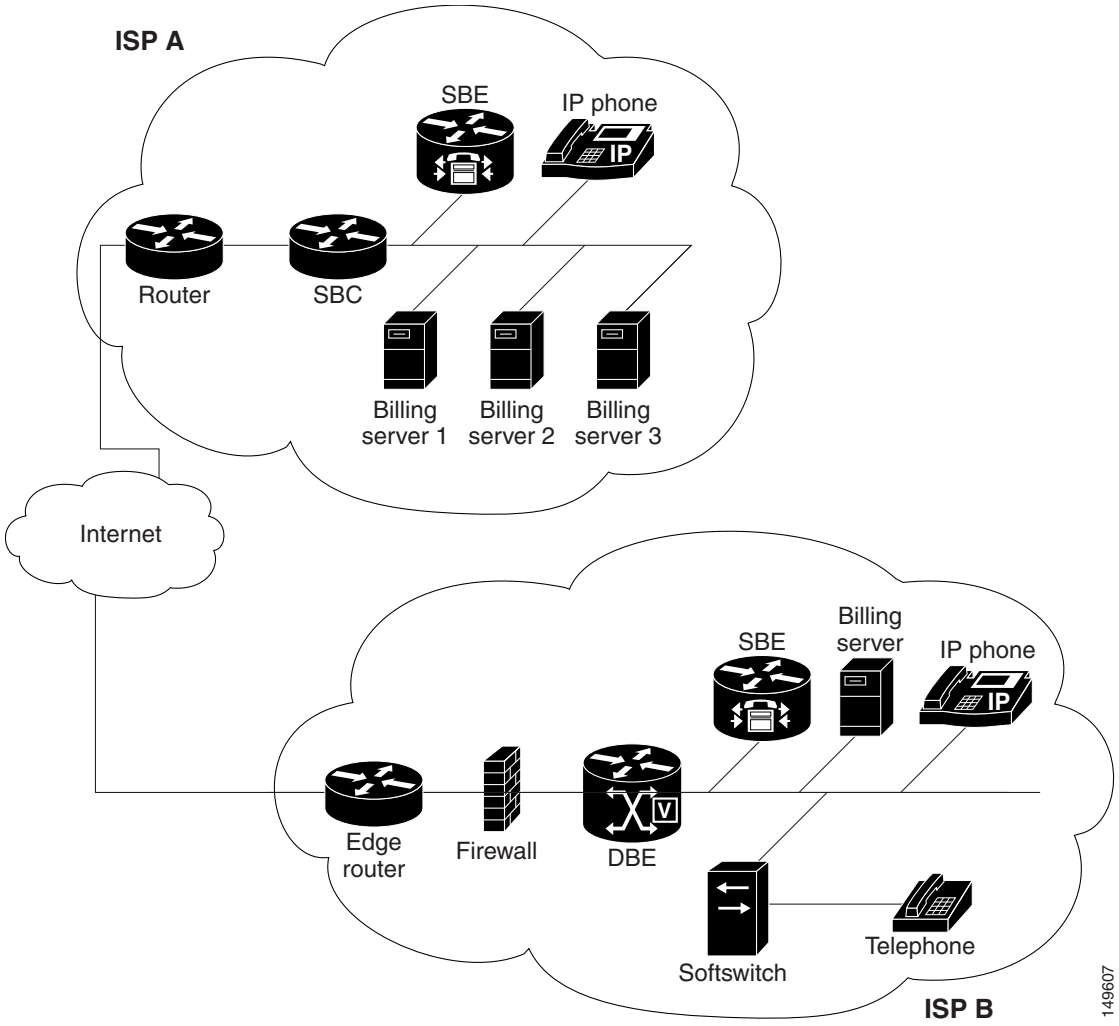
Integrated billing is achieved through the PacketCable Event Messages architecture (see the *PacketCable 1.5 Event Messages Specification*; PKT-SP-EM1.5-I01-050128) as shown in Figure 12-1 where the Cisco Unified Border Element (SP Edition) is integrated into this architecture. As shown, the billing server and softswitch both support PacketCable Event Messages.

ISP-B in Figure 12-1 shows Cisco Unified Border Element (SP Edition) operating in a distributed model where the billing system is being deployed using a single billing server and a softswitch. Note that ISP-A operates in the unified model.

In the distributed model, the system operates as follows:

- Only the SBE communicates with the billing server. That is, no event messages are generated by the DBE. All media-specific information (for example: gate request information and media statistics) is sent by the DBE to the SBE, which then generates event messages as required to send to the billing servers.
- The billing server collates billing information both from the SBE and the softswitch to provide the ISP with a single billing point. The softswitch only interface to the billing service is one of the ways service providers could use to get billing information. It is outside the scope of Cisco Unified Border Element (SP Edition) billing.

Figure 12-1 Integrated Billing Deployment



Tracking Statistics

The following are some of the methods by which the DBE keeps track of statistics:

- Call statistics

  The DBE generates statistics for a given call by collecting information such as packet count and packets dropped. The DBE also snoops into the RTCP packets and reports back to the SBE at the end of the call. The DBE tracks and reports other statistics, such as call duration, media up event, media down event, and invalid source alert, to the SBE for billing and security purposes.

- H.248 Network Quality Alert (nt/qualert) event

  The H.248 nt/qualert event offers another method to check whether there are any hung calls. A voice call is considered a hung call when media packets are not present on the active stream and the call is not on hold nor has the hold timer expired. The H.248 nt/qualert feature generates a middlebox pinhole timer expired event when it detects this type of media loss. This feature is enabled by default.

- Discarded Packets Statistics

  The DBE tracks dropped packets when incoming packets fail to match the address and port mask specified using the H.248 Gate Management package. With this type of reporting, the DBE collects accurate packet information for a given user and also enhances network security.

congestion-threshold Command

The **congestion-threshold** command configures the DBE to signal a congestion event to the SBE when a maximum percentage has been reached. When the DBE reaches the maximum configured congestion-threshold percentage for either number of calls or media bandwidth, it sends a congestion message to the SBE.

DBE Status Notification

The DBE notifies the SBE about critical status changes (for example, resource shortage or performance degradation).

Enhanced Event Notification and Auditing

The Enhanced Event Notification and Auditing features address some of the limitations of H.248 event notification.

Previously, event notification was subject to the following limitations:

- If an H.248 event notification request from the DBE went unacknowledged by the MGC, then details of that event were lost, and the MG and MGC states could diverge as a result. (There is no current H.248 mechanism by which historical event information can be relearned by the MGC.)
- If the DBE switched to a new MGC for some reason, the new MGC had no means to learn what events had occurred on the streams and terminations programmed on the DBE. This behavior was particularly problematic for the nt/qualert and emp/phtoexp events, which are used to indicate that media has ceased flowing on a particular stream and can trigger the MGC to delete the context once all streams within the context reported either of these events.
- If an event notification failed, and the event being notified was not the inactivity timer event (it/ito), then the DBE did not reset the H.248 association with the MGC. As a result, the MGC could be unaware that it had failed to process some events.
- Silent gate deletion could occur because the DBE would delete contexts when all streams within the context had received media-down indications and there was no current H.248 association with an MGC.

With Enhanced Event Notification and Auditing, these limitations have been minimized with the following features:

- Retention and Returning of H.248 Event Information
- Association Reset
- Silent Gate Deletion
- Resetting the Media Timeout Timers

Retention and Returning of H.248 Event Information

The storage of H.248 events is always turned on by default. A configuration option (the **h248-event-storage** command) enables two modes of H.248 events storage—permanent H.248 events storage and H.248 events storage until the events are acknowledged by the media gateway controller (MGC).

Permanent H.248 Event Storage

The **h248-event-storage** command enables permanent events storage. In this mode, all H.248 events are retained until the stream on which they occurred is deleted.

These events are stored internally and reported to the SBE using a Notify command. A subsequent audit of the ObservedEvents descriptor for the stream can be used to return any events that are stored, with timestamp information indicating when the event actually occurred.

To reduce the memory required to store event information, the DBE only stores the most recent event of each type for each stream. The only exception is the dd/etd event, which indicates that the end of a dual-tone multifrequency (DTMF) tone has been detected, and also indicates which tone was detected. All instances of this event are stored because the entire sequence of tones is likely to be significant.

H.248 Events Storage Until Event Acknowledgment

The system default is the mode where H.248 events are stored only until the events are acknowledged by the media gateway controller (MGC). This can also be enabled by the **no h248-event-storage** command.

H.248 events other than those relating to a media timeout are deleted by the MGC after the MGC has acknowledged them. In this mode, the H.248 events relating to a media timeout are retained if the H.248 association fails.

Association Reset

A configuration option (the **h248-association-timeout** command) has been added that allows an alternative association reset behavior. The possible options are:

- The it/ito event is the only event where failure to notify the SBE about it causes the H.248 association with the SBE to be reset. (This behavior is the default and the standard H.248 protocol behavior.)
- Failure of any event notification causes an H.248 association with the SBE to be reset.

Silent Gate Deletion

To prevent silent gate deletion, a configuration option (the **h248-preserve-gates** command) has been added that allows you to block this behavior. When silent gate deletion is blocked, all gates (media terminations and contexts) remain on the device until they are deleted by the SBE or the DBE service is deactivated.

Resetting the Media Timeout Timers

The DBE will stop re-arming the media timeout timers after a pinhole timeout occurs. As a result, the receipt of a packet on a pinhole on which a media timeout has occurred will not generate a media-up notification, or restart the timer again.

The media timeout timers can be restarted by the MGC by its sending in a Modify request for the pinhole. An example of a Modify request is to change the state of an H.248 event subscription. In this case, the Modify request takes the call on hold or off hold and the DBE forwarding process changes the nt/qualert event subscription, which, in turn, restarts the media timeout timers.

Restrictions for DBE Resetting the Media Timeout Timers

The following are DBE restrictions pertaining to Enhanced Event Notification and Auditing feature:

- After the DBE has determined that the Notify message for a given event occurrence has failed, it does not attempt to send the Notify message again.
- The event buffering model of DBE is unchanged. The DBE continues to detect and report events that match the current events descriptor.
- Receipt of a transaction response acknowledgement for an AuditValue response is not used to clear the ObservedEvents descriptor.

Related Commands

The commands related to the resetting the media timeout timers include:

The **h248-event-storage** command enables permanent H.248 event storage, which retains all H.248 events until the stream on which they occurred is deleted.

The **h248-association-timeout** command configures the DBE to reset associations with a SBE when the controller does not respond to an event notification.

The **h248-preserve-gates** command configures the DBE to preserve the media terminations or contexts when there is a media timeout while the association with the controller is down.

H.248 Network Package Quality Alert Event and Middlebox Pinhole Timer Expired Event

When the DBE detects media loss (media has stopped flowing and a call is not on hold), the DBE may issue one or more H.248/Megaco events to the media gateway controller (MGC): a Network (nt) package Quality Alert (qualert) event, a Middlebox Pinhole Timer Expired event[1], or both events.

Network Package Quality Alert Event

The DBE will return a Network (nt) package Quality Alert (qualert) event when media loss is detected if the media gateway controller (MGC) requests it.

When the MGC requests an nt/qualert event, it specifies a Threshold parameter value based on a percentage of network quality loss. Although the DBE accepts any valid value (0 through 99) for this parameter, only a value of 99 triggers the generation of the nt/qualert event because the DBE only detects complete media failure and is not able to detect partial frame loss, which can occur during network congestion.

Requests for nt/qualert events are on a per-stream or per-termination basis, but the event is always reported on a per-stream basis. The event subscription can be added or removed during the lifetime of the stream. The event is monitored independently for each side of the stream.

Middlebox Pinhole Timer Expired Event

The **h248-media-alert-event** command defines whether a Middlebox Pinhole Timer Expired event is generated when the DBE detects media loss.

Note The Middlebox Pinhole Timer Expired event and the Network package Quality Alert event are independently generated, so that either, both, or neither of these events are generated when the DBE detects media loss.

Restrictions for DBE Middlebox Pinhole Timer Expired Event

The following are restrictions pertaining to DBE support for the H.248 Network Package Quality Alert Event feature:

- The DBE does not send notification when the last termination in a context expires.
- The DBE deletes the context when all of its terminations time out during an H.248 association outage.
- When an H.248 association is down and then resumes, the DBE resumes sending notification events. However, during the H.248 association outage, notification events may be lost after retries.

1. ETSI TS 101 332 Version 4.1.1

Related Command

The **h248-media-alert-event** command is used to enable or disable the Middlebox Pinhole Timer Expired event when the DBE detects media loss.

Improved Media Timeout Detection

In the previous media timeout functionality on the data border element (DBE), if no SBC packets had been seen by the configured number of seconds since the call had been established, the DBE generated a media timeout alert to the media gateway controller (MGC). The enhanced media timeout capability delays reporting of the media timeout event by instructing the DBE to wait until it has received the first packet since the call was established. Only then does the media timeout timer start counting the number of seconds for which it has not seen an SBC packet. At the end of the count, the DBE generates an alert to the MGC. During the reporting delay, SBC packets can continue to be forwarded because there is no media timeout yet.

The following example describes how this enhanced media timeout capability is used. In a scenario where the improved media timeout detection is not configured, a signaling node fails during call setup and takes 30 seconds to recover. Therefore, the SIP "200 OK" is delayed from reaching the caller by 30 seconds. During this time, the caller is unable to send any media to the callee. This results in the callee's DBE reporting a media timeout notification (nt/qualert) to the MGC. The undesirable timeout is avoided by configuring the improved media timeout detection capability. The configuration is done with a new **first-packet** option on the **media-timeout** command.

The **first-packet** keyword of the **media-timeout** command instructs the DBE to wait until it receives the first SBC packet on a flow before starting the media timeout function. See *Cisco Unified Border Element (SP Edition) Command Reference: Distributed Model* at:

http://www.cisco.com/en/US/docs/ios/sbc/command/reference/sbc_book.html for more details on the **media-timeout** command.

Restriction for DBE Improved Media Timeout Detection

In this mode, no media alerts can be generated until the first packet is seen on a flow.

Configuring Improved Media Timeout Detection

This section contains steps to configure the Improved Media Timeout Detection functionality in a typical configuration scenario on the Cisco ASR 1000 Series Routers.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface sbc** {*interface-number*}
4. **ip address** *ip-address*
5. **exit**
6. **sbc** {*sbc-name*} **dbe**

7. **media-timeout** {*timeout*} **first-packet**
8. **vdbe** [**global**]
9. **h248-version** *version*
10. **h248-napt-package** [**napt** | **ntr**]
11. **local-port** {*port-num*}
12. **control-address h248 ipv4** {*A.B.C.D*}
13. **controller h248** {*controller-index*}
14. **remote-address ipv4** {*A.B.C.D*}
15. **remote-port** {*port-num*}
16. **transport** {**udp** | **tcp**} [**interim-auth-header**]
17. **exit**
18. **attach-controllers**
19. **exit**
20. **location-id** {*location-id*}
21. **media-address ipv4** {*A.B.C.D*}
22. **activate**
23. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface sbc** {*interface-number*} **Example:** `Router(config)# interface sbc 1`	Creates an SBC virtual interface and enters into interface configuration mode.
Step 4	**ip address** *ip-address* **Example:** `Router(config-if)# ip address 1.1.1.1 255.0.0.0`	Configures an IP address on the SBC virtual interface.
Step 5	**exit** **Example:** `Router(config-if)# exit`	Exits interface configuration mode.

	Command or Action	Purpose
Step 6	**sbc** {*sbc-name*} **dbe** **Example:** `Router(config)# sbc global dbe`	Creates the DBE service on the SBC and enters into SBC-DBE configuration mode.
Step 7	**media-timeout** {*timeout*} **first-packet** **Example:** `Router(config-sbc-dbe)# media-timeout 1000 first-packet`	Configures the DBE to wait until it receives the first SBC packet after the call has been established before it starts to count the configured number of seconds, after which the DBE generates a media timeout alert to the SBE.
Step 8	**vdbe** [**global**] **Example:** `Router(config-sbc-dbe)# vdbe global`	Enters into VDBE configuration mode with a default DBE named “global”. Only one DBE is supported and its name must be “global”.
Step 9	**h248-version** *version* **Example:** `Router(config-sbc-dbe-vdbe)# h248-version 3`	Specifies that the DBE uses an H.248 version when it forms associations with an H.248 controller. Version 2 is the default.
Step 10	**h248-napt-package** [**napt** | **ntr**] **Example:** `Router(config-sbc-dbe-vdbe)# h248-napt-package napt`	Defines whether the DBE uses the Network Address and Port Translation (NAPT) or NAT Traversal (NTR) H.248 package for signaling NAT features. NTR is the default. The example shows how to configure the DBE to use NAPT.
Step 11	**local-port** {*port-num*} **Example:** `Router(config-sbc-dbe-vdbe)# local-port 2971`	Configures the DBE to use the specific local port number when connecting to the default media gateway controller (MGC).
Step 12	**control-address h248 ipv4** {*A.B.C.D*} **Example:** `Router(config-sbc-dbe-vdbe)# control-address h248 ipv4 200.50.1.41`	Configures the DBE to use a specific IPv4 H.248 control address, which is the local IP address the DBE uses as its own address when connecting to the SBE.
Step 13	**controller h248** {*controller-index*} **Example:** `Router(config-sbc-dbe-vdbe)# controller h248 2`	Configures the H.248 controller for the DBE and enters into Controller H.248 configuration mode. In the example, the configured number 2 identifies the H.248 controller for the DBE.
Step 14	**remote-address ipv4** {*A.B.C.D*} **Example:** `Router(config-sbc-dbe-vdbe-h248)# remote-address ipv4 200.50.1.254`	Configures the IPv4 remote address of the H.248 controller for the SBE. In the example, 200.50.1.254 is configured as the remote SBE IP address.
Step 15	**remote-port** {*port-num*} **Example:** `Router(config-sbc-dbe-vdbe-h248)# remote-port 2971`	Configures the port number of the H.248 controller that is used to connect to the SBE.

	Command or Action	Purpose
Step 16	**transport** {**udp** | **tcp**} [**interim-auth-header**] **Example:** `Router(config-sbc-dbe-vdbe-h248)# transport udp`	Configures the DBE to use either UDP or TCP for H.248 control signaling, and to configure the Interim Authentication Header (IAH).
Step 17	**exit** **Example:** `Router(config-sbc-dbe-vdbe-h248)# exit`	Exits Controller H.248 configuration mode.
Step 18	**attach-controllers** **Example:** `Router(config-sbc-dbe-vdbe)# attach-controllers`	Attaches the DBE to an H.248 controller.
Step 19	**exit** **Example:** `Router(config-sbc-dbe-vdbe)# exit`	Exits VDBE configuration mode.
Step 20	**location-id** {*location-id*} **Example:** `Router(config-sbc-dbe)# location-id 1`	Configures a location ID for the DBE. The location ID is used by the network to route calls.
Step 21	**media-address ipv4** {*A.B.C.D*} **Example:** `Router(config-sbc-dbe)# media-address ipv4 1.1.1.1 255.0.0.0`	Adds the IPv4 address to the set of addresses, which can be used by the DBE as a local media address. This address is the SBC virtual interface address. Configure this command for each IP address that you specified under the SBC virtual interface in Step 4.
Step 22	**activate** **Example:** `Router(config-sbc-dbe)# activate`	Initiates the DBE service of the SBC.
Step 23	**end** **Example:** `Router(config-sbc-dbe)# end`	Exits SBC-DBE configuration mode and returns to privileged EXEC mode.

Improved Media Timeout Detection Configuration Example

The following example shows that the **media-timeout** command is configured to instruct the DBE to wait until it receives the first SBC packet on the call before it starts to count 1000 seconds, after which the DBE generates a media timeout alert to the MGC:

```
interface sbc 1
 ip address 1.1.1.1 255.0.0.0
sbc global dbe
media-timeout 1000 first-packet
 vdbe global
  use-any-local-port
  control-address h248 ipv4 210.229.108.254
```

```
 controller h248 1
  remote-address ipv4 210.229.108.252
 attach-controllers
location-id 1
media-address ipv4 1.1.1.1
activate
```

Provisioned Inactivity Timer

The DBE can be configured with a default value for the H.248 connection's inactivity timer value (the it and ito properties). This default value is used if the media gateway controller (MGC) does not request that the DBE runs an inactivity timer.

The advantage is that the DBE can detect media gateway controller (MGC) failure whether or not the MGC has subscribed to the inactivity timer event.

The system default is that no provisioned inactivity timer is configured. The provisioned timer is started when a successful response is received to the media gateway (MG) initial ServiceChange request to the MGC.

The MGC subscription timer duration can override the provisioned timer duration value if the MGC subscribes to the inactivity timer with a different timer duration than the provisioned timer duration. However, the subscribed timer value is replaced by the provisioned timer value if the MGC cancels its subscription or the association fails.

Related Commands

The **h248-inactivity-duration** command configures the duration of the inactivity timer. The provisioned duration time is zero unless the user sets the duration parameter. It returns to zero if the user configures the **no h248-inactivity-duration** command.

ServiceChange Notification for Interface Status Change

This feature enables the media gateway (MG) to generate a ServiceChange H.248 notification to the media gateway controller (MGC) containing the Termination ID of the physical interface on the data border element (DBE) when the interface experiences status changes. This feature is described in the "ServiceChange Notification for Interface Status Change" section on page 6-22.