



APPENDIX **B**

Additional Information about Billing Support

The following sections describe billing and its many aspects. It is critical to understand all SBC billing features and capabilities before performing billing configurations for the SBC.

- [Integrated Billing Systems](#)
- [Event Message Transmission](#)
- [Supported Event Message Detail](#)
- [Logging and Alarms](#)
- [Fault Tolerance](#)
- [Example for Event Messages from SBC to RADIUS Billing Server, page B-12](#)
- [Security](#)

Integrated Billing Systems

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 exemplified in [Figure B-1](#) where the SBC is integrated into this architecture. As shown, the billing server supports PacketCable Event Messages.

The SBC on the Cisco 7600 router supports remote billing in the unified mode. Remote billing is call billing that is integrated with a third-party accounting server.

[Figure B-1](#) shows the SBC operating in a unified model where the billing system is being deployed with three billing servers. The SBC can be configured to send to these servers in a range of ways, such as to all three simultaneously, or to use one primary and two backups.

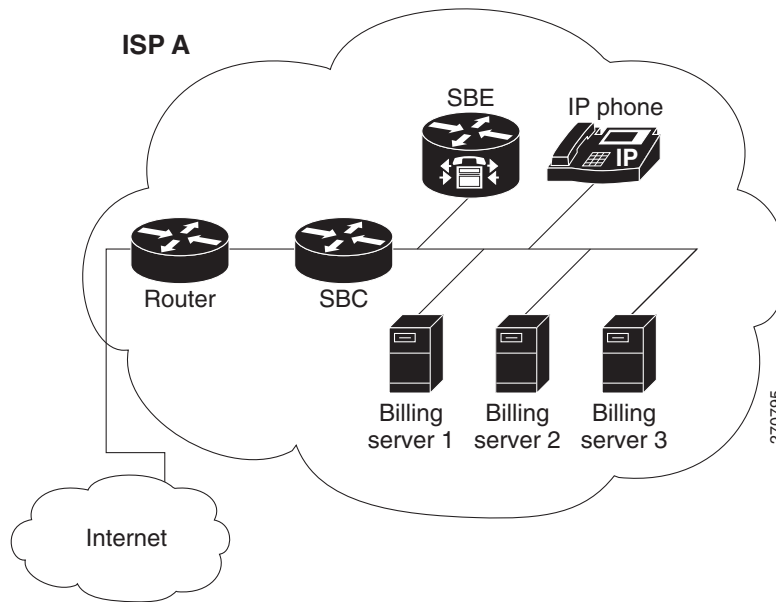
The system operates as follows:

- The SBC produces event messages (EMs). These event messages are billable or other interesting events, such as call start, call end, and media-type changes.
- The SBC (and other elements of the system), which produces EMs, sends them in real time (or batched up for network efficiency) using the RADIUS protocol to the billing server.

**Note**

The *PacketCable 1.5 Event Messages Specification* discusses sending the identifying information (the BCID and FEID) on the outgoing INVITE and responding SDP so that correlation can be done between the two sets of billing data. SBC does not support this mechanism for intra-domain or inter-domain transmission. The billing server must perform the correlation using an alternative method (for example, using the telephone numbers dialed and the time of the call).

Figure B-1 Integrated Billing Deployment



Event Message Transmission

The generated event messages, as described in the “[Event Messages Set Overview](#)” section are sent using the RADIUS protocol to a preconfigured set of billing servers. Before getting into the actual detail of the event messages, review the following event message transmission considerations described in the following sections:

- [Multiple Server Support](#)
- [Event Message Batching](#)

Multiple Server Support

Billing servers are configured at start-up, in SETs:

- Each SET contains a list of one or more billing servers, consisting of a single primary server and an ordered list of zero or more backup servers.
- The SBE can be configured with one or more sets of billing servers.

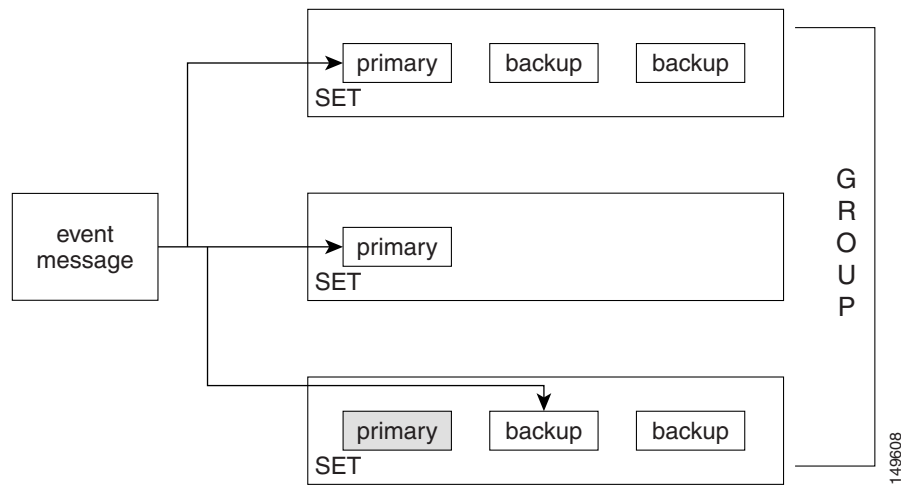
Each event message is sent to the entire collection of sets, but to only one machine within each set.

- For each set, the SBE sends the event message to the primary server within the set.

- If the primary server is unavailable, then the message is sent to the first backup server (if present). If the first backup server is also unavailable, the message is sent to the second backup etc. until either a machine accepts the message or all the servers in the set have been tried.
- If there are no machines in a set accepting messages, then the entire set is marked as unavailable.

Multiple server support is illustrated in [Figure B-2](#).

Figure B-2 Multiple Server Support



Event Message Batching

Because of the inefficiency of the RADIUS protocol, the SBE collates event messages into batches and sends them using a single RADIUS message to alleviate the burden on the transport mechanism.

Batching is possible only on a per-set basis. The batch size is not configurable, but is determined by the load on the billing component.

It is not possible to disable batching.

Event Messages Set Overview

This section specifies the set of event messages supported by SBC:

- [Call-Specific Messages](#)
- [Out-of-Band Messages](#)
- [Unsupported Messages](#)

Call-Specific Messages

The messages listed in [Table B-1](#) are supported call event messages.

Table B-1 Supported Event Message Sets

Event Message	Notes
Signaling_Start	Sent when signaling has begun (inbound) and when it is about to begin (outbound); for example, received INVITE on inbound and about to send INVITE on outbound for a SIP endpoint
QoS_Reserve	Sent when there is reserved QoS in the DBE. Sent for the inbound leg when the inbound QoS is reserved, and for the outbound leg when we reserve the outbound QoS is reserved.
Call_Answer	Indicates that the terminating party has answered and that media has started. This message is sent for both legs at the same time.
QoS_Commit	Sent when QoS is committed by the DBE. This message is sent for both legs at the same time.
Call_Disconnect	The call has been terminated; media has ceased flowing. Sent for both legs at the same time.
QoS_Release	The QoS has been released by the DBE. Sent for both legs at the same time.
Signaling_Stop	All signaling is complete for each party in the call. (The event is generated once for each party, when the last signaling message has been sent.)
Media_Statistics	Media statistics for the call as reported by the DBE. This is sent for each leg when the media is released.
Media_Alive	Indicates that a long-duration call is still active. This is sent for each leg of the call, at a preconfigured time of day, every 24 hours.

Out-of-Band Messages

The event messages listed in [Table B-2](#) are non-call-related, out-of-band event messages.

Table B-2 Out-of-Band Event Message Sets

Event Message	Notes
Time_Change	Sent when changes of more than 200 ms occur in the time; also sent for daylight savings changes, and so on.

Unsupported Messages

The event messages listed in [Table B-3](#) are not supported.

Table B-3 Unsupported Event Messages

Event Message	Notes	Why Not Supported?
Database_Query	Sent when querying external databases about toll-free carriers, LNP routing, and so on.	SBC does not support database queries.
Service_Instance	Indicates an instance of a service.	SBC does not support services. (Services are more applicable to softswitches and application servers.)
Service_Activation	Indicates service activation.	
Service_Deactivation	Indicates service deactivation.	

Table B-3 *Unsupported Event Messages (continued)*

Event Message	Notes	Why Not Supported?
Interconnect_Start	Sent when interconnecting to PSTN.	SBC does not interface directly to the public switch telephony network (PSTN).
Interconnect_Stop	Sent when terminating a connection to PSTN.	
Conference_Party_Change	Indicates a party state change in a multi-party call.	SBC does not support multi-party calls.

Supported Event Message Detail

This section specifies the supported event messages and the attributes sent for each one.

Signaling_Start

This message is sent when signaling starts for a call. That is, when the SBC has ascertained that the destination is routable, and that the originating endpoint is allowed to make the call (i.e. after the SLA has been checked).

Table A-4 lists the attributes sent with this message.

Table B-4 *Attributes Included for Signaling_Start*

Attribute Name	Comment
EM_Header	Common header attribute.
Direction_Indicator	Specifies if the device represents an originating or terminating part of the call. 1= originating 2 = terminating
MTA_Endpoint_Name	The originating or terminating endpoint name (dependent on direction).
Calling_Party_Number	The number of the calling party (if available).
Called_Party_Number	The number of the called party (always present).
Routing_Number	Indicates a routable number (always present).
Billing_Type	Included when the originating endpoint is a measured rate subscriber.

Table A-5 lists the attributes not sent with this message.

Table B-5 *Attributes Not Included in Signaling_Start*

Attribute Name	Comment
Location_Routing_Number	LNP not supported
Carrier_Identification_Code	PSTN interfacing not supported (softswitch function).
Trunk_Group_ID	As above.

Intl_Code	Indicates the origin of an international call.
Dial_Around_Code	Carrier specification via dial-around codes not supported.
Jurisdiction_Information_Parameter	Ported-In billing not supported (transparent to SBC).
Ported_In_Calling_Number	As above.
Ported_In_Called_Number	As above.
Called_Party_NP_source	LNP not supported.
Calling_Party_NP_source	As above.

QoS_Reserve

This message is generated when the SBE has reserved bandwidth (QoS) on the network through the DBE.

If this reserved bandwidth changes, this message (along with the partner QoS_Commit message) is generated anew.



Note

If the SBE is managing multiple gates, this message is generated only for the gates to and from each MTA endpoint (and not the internal gates). There are no optional attributes not sent on this message.

Table A-6 lists the attributes sent with this message.

Table B-6 Attributes Sent on QoS_Reserve

Attribute Name	Comment
EM_Header	Common header attribute
QoS_Descriptor	Description of the QoS reserved (see below).
MTA_UDP_Portnum	The UDP port number on the network element endpoint.
Flow_Direction	1 = upstream 2 = downstream
SF_ID	This is a required, DOCSIS-specific attribute, generated by the CMTS in a PacketCable architecture. Since the SBC does not support DOCSIS, this attribute is always 0.

Call_Answer

This message indicates the earliest point at which non-early two-way media is established.

The SBE sends the message to the billing servers when it is notified that the called party has gone off-hook; that is, that they have answered the call.

Table A-7 lists the attributes sent with this message.

Table B-7 Attributes Sent on the Call_Answer Message

Attribute Name	Comment
EM_Header	Common header attribute
Charge_Number	The charge number in the appropriate cases such as collect call, calling-card call, call billed to a 3rd party, or others For SBC, this number is always the calling number.

Table A-8 lists the attributes not sent with this message.

Table B-8 Attributes Not Sent on the Call_Answer Message

Attribute Name	Comment
Related_Call_Billing_Correlation_ID	The BCID assigned to the leg from the terminating network element. the SBC does not share BCID and FEID information with other network elements.
FEID	Contains the FEID assigned to the network element at the other end of the leg. the SBC does not share BCID and FEID information with other network elements.

QoS_Commit

This message is sent by the SBE when the gate bandwidth is committed. This message is only sent if a QoS_Reserve has been sent previously.

Table A-9 lists the attributes sent with this message.

Table B-9 Attributes Sent on QoS_Commit

Attribute Name	Comment
EM_Header	Common header attribute.
MTA_UDP_Portnum	The UDP port number on the network element endpoint.
Flow_Direction	1 = upstream 2 = downstream
SF_ID	Always 0 (the SBC does not support DOCSIS).

Table A-10 lists the attributes not sent with this message.

Table B-10 Attributes Not Sent on QoS_Commit

Attribute Name	Comment
QoS_Descriptor	Information is sent on the QoS_Reserve message and not duplicated on this message

Call_Disconnect

This message is generated by the SBE when 2-way media flow terminates - i.e. when sending a 200 OK response to a BYE from either party.

Usually, this message immediately precedes QoS_Release and Signaling_Stop.

This message is only sent if a Call_Answer has previously been sent.

Table A-11 lists the attributes sent with this message.

Table B-11 Attributes Sent on Call_Disconnect

Attribute Name	Comment
EM_Header	Common header attribute.
Call_Termination_Cause	Reason for termination of the call.

There are no optional attributes not sent for this message.

QoS_Release

This message is generated by the SBE when reserved bandwidth has been released. That is, the gate on the DBE has been closed.

Table A-12 lists the attributes sent with this message.

Table B-12 Attributes Sent on QoS_Release

Attribute Name	Comment
EM_Header	Common header attribute.
Flow_Direction	1 = upstream 2 = downstream
SF_ID	A DOCSIS specific attribute, service flow ID, generated by the CMTS in a PacketCable architecture. SBC does not support DOCSIS, and therefore this attribute is always set to 0.

There are no optional attributes not sent for this message.

Signaling_Stop

This message is sent when:

- The terminating signaling request (e.g. a SIP BYE) from the party terminating the call is acknowledged by the SBE
- The terminating signaling request for the party not terminating the call is sent by the SBE and acknowledged by that party.

This message is not sent if we have not sent a Signaling_Start for this call.

Table A-13 lists the attributes sent with this message.

Table B-13 Attributes Sent on Signaling_Stop

Attribute Name	Comment
EM_Header	The header attribute (must be first).
Related_Call_Billing_Correlation_ID	The BCID of the other leg (i.e. if this is the caller, then the callee, and vice-versa).
Call_Termination_Cause	The reason the call was terminated.

Table A-14 lists the attributes not sent with this message.

Table B-14 Attributes Not Sent on Signaling_Stop

Attribute Name	Comment
FEID	The FEID of the terminating network element; the SBC does not transmit this between network elements.

Media_Statistics

When a call is terminated on the DBE (that is, the gate is closed), statistics are returned to the SBE. On receipt of these statistics, this message is generated.

When media QoS is renegotiated, the gate is closed and re-opened. In this case, we will also log statistics for the first gate when it closes, and the second gate when it closes (say at the end of the call).

There may be multiple gates for each Media. The statistics will be aggregated and will result in only one Media_Statistics message per billing leg.

Table A-15 lists the attributes sent with this message.

Table B-15 Attributes Sent on Media_Statistics

Attribute Name	Comment
EM_Header	Common header attribute.
RTCP_Data	The report data from the DBE on the gate statistics.

There are no optional attributes not sent for this message.

Media_Alive

This message is generated once a day, at a pre-configured time.

At the preconfigured time, the SBE audits the active calls, and determines which calls (if any) have been active for more than 24 hours. For each call satisfying this condition, a Media_Alive message is generated.

Table A-16 lists the attributes sent with this message.

Table B-16 Attributes Sent on Media_Alive

Attribute Name	Comment
EM_Header	Common header attribute.

There are no optional attributes not sent for this message.

Time_Change

This message is generated by the SBE either on its own behalf, or on the behalf of the DBE, when either the DBE or SBE experiences a time change of more than 200ms (discounting slew adjustments via NTP). This includes step adjustments, manual time settings changes and daylight savings time adjustments.

Table A-17 lists the attributes sent with this message.

Table B-17 Attributes Sent on Time_Change

Attribute Name	Comment
EM_Header	Common header attribute.
Time_Adjustment	Adjustment in milliseconds.

There are no optional attributes not sent for this message.

Administration and Configuration

Billing requires the following generic configuration:

Integrated Mode Configuration

If integrated mode is specified, then the following configuration information is required:

- The assigned element ID. This is an ID assigned by the Internet service provider (ISP). The ID must be unique across the set of SBEs, sending event messages to a particular set of billing servers.
- The minor, major, and critical threshold sizes for the event message cache file.
- The location of the event message cache file on disk.
- The time at which to generate the **Media_Alive** message.
- RADIUS client configuration information.

Integrated mode requires the RADIUS client component of SBC. This has configuration requirements (such as the sets of billing servers). Each of these sets also has a state, which depends on the existence or absence of the event message cache file for that set. The administrator may change this state. The state may be disabled, active, failed, or resending.

Administering SBC Billing

The billing component is administered using the SBC command-line interface.

Logging and Alarms

Alarms are tripped differently, based on how billing has been integrated, as described in [Table B-18](#).

Table B-18 Billing System Logging Conditions

Billing System Type	Logging Conditions
Integrated Billing Alarms	<p>Alarms are tripped under the following conditions:</p> <ul style="list-style-type: none"> • Minor, major, and critical alarms are sent if the cache file size exceeds a preconfigured threshold. • Alarms are tripped when billing servers become unavailable, as follows. <ul style="list-style-type: none"> – A minor alarm is tripped if just one of the configured sets of billing servers is unavailable. – A major alarm is tripped if more than one of the billing server sets is unavailable. – A critical alarm is tripped if none of the billing servers is available. <p>Note In this situation, it may be that the condition for more than one alarm is satisfied (for example, there is just one server set configured, which fails). The most severe alarm dominates.</p>

Fault Tolerance

The SBC billing system is fault tolerant on the following two levels:

- **Warm Failover**—Failover to a live backup (for example, a second card on the same machine).
- **Cold Failover**—Failover to a new machine with no software connection between the defunct machine and the new machine.

Warm Failover

In the event of failover to a backup system, warm failover mechanisms are supported. In the case of warm failover:

- No data is lost on the SBE.
- The value for media statistics for the call on the DBE is reset (this information is lost).

Cold Failover

In the event of failover to a cold, non-dedicated backup, some billing data is lost in the transition from the old, failed system to the new server. The number of billing records completely lost during this transition is less than 10,000 per failover. However, in such a situation, consider the following possibilities:

- The remaining billing records may be corrupted, and only partial billing records recovered. This is especially true with local CDR generation, because no logs are produced in a hard format until the call ends.

- If an event message cache exists on the failed machine, more billing events may be lost, because the disk record may be unrecoverable due to fire, hardware malfunction, or whatever the original cause of the total failure was. This, however, is an unlikely scenario, given that it would require the billing server to be unavailable and unrecovered for a period preceding the cold failover.
- If the media to which the CDRs are written is lost, the entire store of CDRs not backed up (by extracting the records using FTP) is lost.
- It is not possible to detect long-duration calls following a cold failover. Data is only recoverable from the system only when an event occurs in the network, such as the media being terminated).

Example for Event Messages from SBC to RADIUS Billing Server

This example shows two requests from the SBC to the RADIUS server for a single placed call.

The first RADIUS event message has messages related to call setup:

- Event Message Type: Signaling_Start
- Event Message Type: QoS_Reserve
- Event Message Type: Call_Answer
- Event Message Type: QoS_Commit

The second RADIUS event message has messages related to call teardown:

- Event Message Type: QoS_Release
- Event Message Type: Call_Disconnect
- Event Message Type: Signaling_Stop

Radius Protocol

```
Code: Accounting-Request (4)
Packet identifier: 0x0 (0)
Length: 1298
Authenticator: 25CE1B487AE4AE70033D61E0EF540A4A
[The response to this request is in frame 4]
Attribute Value Pairs
  AVP: l=6 t=NAS-IP-Address(4): 77.111.1.51
      NAS-IP-Address: 77.111.1.51 (77.111.1.51)
  AVP: l=6 t=Acct-Status-Type(40): Interim-Update(3)
      Acct-Status-Type: Interim-Update (3)
  AVP: l=26 t=Acct-Session-Id(44): HDq] 01+000000\000\000\000\001
      Acct-Session-Id: HDq] 01+000000
  AVP: l=84 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=78 t=CableLabs-Event-Message(1):
          Event Message Version ID: 4
          BCID
          Timestamp: 1212445021
          Element ID: 0
          Time Zone: DST: 1, Offset: +000000
          Event Counter: 1
          Event Message Type: Signaling_Start (1)
          Element Type: CMS (1)
          Element ID: 0
          Time Zone: DST: 1, Offset: +000000
          Sequence Number: 0
          Event Time: 20080602221700.000
          Status: 0x00000008
```

```

      .... .00 = Status: No Error
(0x00000000)
      .... .0.. = Event Origin: Trusted
Element (0x00000000)
      .... 1... = Event Message Proxied:
Proxied (0x00000001)
      Priority: 128
      Attribute Count: 6
      Event Object: 0
      AVP: l=10 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=4 t=CableLabs-Direction-indicator(37): Originating(1)
      CableLabs-Direction-indicator: Originating (1)
      AVP: l=20 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=14 t=CableLabs-MTA-Endpoint-Name(3): MTA Endpoint
      CableLabs-MTA-Endpoint-Name: MTA Endpoint
      AVP: l=28 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=22 t=CableLabs-Calling-Party-Number(4): 123
      CableLabs-Calling-Party-Number: 123
      AVP: l=28 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=22 t=CableLabs-Called-Party-Number(5): service
      CableLabs-Called-Party-Number: service
      AVP: l=28 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=22 t=CableLabs-Routing-Number(25): service
      CableLabs-Routing-Number: service
      AVP: l=10 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=4 t=CableLabs-Billing-Type(87): 3
      CableLabs-Billing-Type: 3
      AVP: l=84 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=78 t=CableLabs-Event-Message(1):
      Event Message Version ID: 4
      BCID
      Timestamp: 1212445021
      Element ID: 0
      Time Zone: DST: 1, Offset: +000000
      Event Counter: 2
      Event Message Type: Signaling_Start (1)
      Element Type: CMS (1)
      Element ID: 0
      Time Zone: DST: 1, Offset: +000000
      Sequence Number: 1
      Event Time: 20080602221700.000
      Status: 0x00000008
      .... .00 = Status: No Error
(0x00000000)
      .... .0.. = Event Origin: Trusted
Element (0x00000000)
      .... 1... = Event Message Proxied:
Proxied (0x00000001)
      Priority: 128
      Attribute Count: 6
      Event Object: 0
      AVP: l=10 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=4 t=CableLabs-Direction-indicator(37): Terminating(2)
      CableLabs-Direction-indicator: Terminating (2)
      AVP: l=20 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=14 t=CableLabs-MTA-Endpoint-Name(3): MTA Endpoint
      CableLabs-MTA-Endpoint-Name: MTA Endpoint
      AVP: l=28 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=22 t=CableLabs-Calling-Party-Number(4): 123
      CableLabs-Calling-Party-Number: 123
      AVP: l=28 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=22 t=CableLabs-Called-Party-Number(5): service
      CableLabs-Called-Party-Number: service
      AVP: l=28 t=Vendor-Specific(26) v=CableLabs(4491)

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```

VSA: l=22 t=CableLabs-Routing-Number(25):          service
      CableLabs-Routing-Number:          service
AVP: l=10 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: l=4 t=CableLabs-Billing-Type(87): 3
      CableLabs-Billing-Type: 3
AVP: l=84 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: l=78 t=CableLabs-Event-Message(1):
      Event Message Version ID: 4
      BCID
      Timestamp: 1212445021
      Element ID: 0
      Time Zone: DST: 1, Offset: +000000
      Event Counter: 1
      Event Message Type: QoS_Reserve (7)
      Element Type: CMS (1)
      Element ID: 0
      Time Zone: DST: 1, Offset: +000000
      Sequence Number: 2
      Event Time: 20080602221700.000
      Status: 0x00000008
      .... = Status: No Error
(0x00000000)
      .... = Event Origin: Trusted
Element (0x00000000)
      .... = Event Message Proxied:
Proxied (0x00000001)
      Priority: 128
      Attribute Count: 4
      Event Object: 0
AVP: l=32 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: l=26 t=CableLabs-QoS-Descriptor(32):
      QoS Status: 0x00000005
      .... = Status Indication: Resource
Reserved but not Activated (1)
      .... = Service Flow Scheduling
Type: 1
      .... = Grant Interval: 0
      .... = Tolerated Grant Jitter: 0
      .... = Grants Per Interval: 0
      .... = Unsolicited Grant Size: 0
      .... = Traffic Priority: 0
      .... = Maximum Sustained Rate: 0
      .... = Maximum Traffic Burst: 0
      .... = Minimum Reserved Traffic
Rate: 0
      .... = Minium Packet Size: 0
      .... = Maximum Concatenated Burst:
0
      .... = Status Request/Transmission
Policy: 0
      .... = Nominal Polling Interval: 0
      .... = Tolerated Poll Jitter: 0
      .... = Type of Service Override: 0
      .... = Maximum Downstream Latency:
0
      Service Class Name:
      Service Flow Scheduling Type: 1
AVP: l=12 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: l=6 t=CableLabs-MTA-UDP-Portnum(26): 0
      CableLabs-MTA-UDP-Portnum: 0
AVP: l=12 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: l=6 t=CableLabs-SF-ID(30): 0
      CableLabs-SF-ID: 0
AVP: l=10 t=Vendor-Specific(26) v=CableLabs(4491)

```

```

VSA: l=4 t=CableLabs-Flow-Direction(50): Upstream(1)
      CableLabs-Flow-Direction: Upstream (1)
AVP: l=84 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: l=78 t=CableLabs-Event-Message(1):
      Event Message Version ID: 4
      BCID
      Timestamp: 1212445021
      Element ID: 0
      Time Zone: DST: 1, Offset: +000000
      Event Counter: 2
      Event Message Type: QoS_Reserve (7)
      Element Type: CMS (1)
      Element ID: 0
      Time Zone: DST: 1, Offset: +000000
      Sequence Number: 3
      Event Time: 20080602221700.000
      Status: 0x00000008
      .... = Status: No Error
(0x00000000)
      .... = Event Origin: Trusted
Element (0x00000000)
      .... = Event Message Proxied:
Proxied (0x00000001)
      Priority: 128
      Attribute Count: 4
      Event Object: 0
AVP: l=32 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: l=26 t=CableLabs-QoS-Descriptor(32):
      QoS Status: 0x00000005
      .... = Status Indication: Resource
Reserved but not Activated (1)
      .... = Service Flow Scheduling
Type: 1
      .... = Grant Interval: 0
      .... = Tolerated Grant Jitter: 0
      .... = Grants Per Interval: 0
      .... = Unsolicited Grant Size: 0
      .... = Traffic Priority: 0
      .... = Maximum Sustained Rate: 0
      .... = Maximum Traffic Burst: 0
      .... = Minimum Reserved Traffic
Rate: 0
      .... = Minium Packet Size: 0
      .... = Maximum Concatenated Burst:
0
      .... = Status Request/Transmission
Policy: 0
      .... = Nominal Polling Interval: 0
      .... = Tolerated Poll Jitter: 0
      .... = Type of Service Override: 0
      .... = Maximum Downstream Latency:
0

      Service Class Name:
      Service Flow Scheduling Type: 1
AVP: l=12 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=6 t=CableLabs-MTA-UDP-Portnum(26): 0
      CableLabs-MTA-UDP-Portnum: 0
AVP: l=12 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=6 t=CableLabs-SF-ID(30): 0
      CableLabs-SF-ID: 0
AVP: l=10 t=Vendor-Specific(26) v=CableLabs(4491)
      VSA: l=4 t=CableLabs-Flow-Direction(50): Downstream(2)
      CableLabs-Flow-Direction: Downstream (2)
AVP: l=84 t=Vendor-Specific(26) v=CableLabs(4491)

```

```

VSA: l=78 t=CableLabs-Event-Message(1):
  Event Message Version ID: 4
  BCID
    Timestamp: 1212445021
    Element ID: 0
    Time Zone: DST: 1, Offset: +000000
    Event Counter: 1
  Event Message Type: Call_Answer (15)
  Element Type: CMS (1)
  Element ID: 0
  Time Zone: DST: 1, Offset: +000000
  Sequence Number: 4
  Event Time: 20080602221701.000
  Status: 0x00000008
    .... = Status: No Error
(0x00000000)
    .... = Event Origin: Trusted
Element (0x00000000)
    .... = Event Message Proxied:
Proxied (0x00000001)
  Priority: 128
  Attribute Count: 2
  Event Object: 0
  AVP: l=28 t=Vendor-Specific(26) v=CableLabs(4491)
    VSA: l=22 t=CableLabs-Charge-Number(16): 123
      CableLabs-Charge-Number: 123
  AVP: l=32 t=Vendor-Specific(26) v=CableLabs(4491)
    VSA: l=26 t=CableLabs-Related-Call-Billing-Correlation-ID(13):
      Timestamp: 1212445021
      Element ID: 0
      Time Zone: DST: 1, Offset: +000000
      Event Counter: 2
  AVP: l=84 t=Vendor-Specific(26) v=CableLabs(4491)
    VSA: l=78 t=CableLabs-Event-Message(1):
      Event Message Version ID: 4
      BCID
        Timestamp: 1212445021
        Element ID: 0
        Time Zone: DST: 1, Offset: +000000
        Event Counter: 2
      Event Message Type: Call_Answer (15)
      Element Type: CMS (1)
      Element ID: 0
      Time Zone: DST: 1, Offset: +000000
      Sequence Number: 5
      Event Time: 20080602221701.000
      Status: 0x00000008
        .... = Status: No Error
(0x00000000)
        .... = Event Origin: Trusted
Element (0x00000000)
        .... = Event Message Proxied:
Proxied (0x00000001)
  Priority: 128
  Attribute Count: 2
  Event Object: 0
  AVP: l=28 t=Vendor-Specific(26) v=CableLabs(4491)
    VSA: l=22 t=CableLabs-Charge-Number(16): service
      CableLabs-Charge-Number: service
  AVP: l=32 t=Vendor-Specific(26) v=CableLabs(4491)
    VSA: l=26 t=CableLabs-Related-Call-Billing-Correlation-ID(13):
      Timestamp: 1212445021
      Element ID: 0
      Time Zone: DST: 1, Offset: +000000

```



```

Event Counter: 1
AVP: 1=84 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: 1=78 t=CableLabs-Event-Message(1):
Event Message Version ID: 4
BCID
Timestamp: 1212445021
Element ID: 0
Time Zone: DST: 1, Offset: +000000
Event Counter: 1
Event Message Type: QoS_Commit (19)
Element Type: CMS (1)
Element ID: 0
Time Zone: DST: 1, Offset: +000000
Sequence Number: 6
Event Time: 20080602221701.000
Status: 0x00000008
.....00 = Status: No Error
(0x00000000)
.....0.. = Event Origin: Trusted
Element (0x00000000)
.....1... = Event Message Proxied:
Proxied (0x00000001)
Priority: 128
Attribute Count: 3
Event Object: 0
AVP: 1=12 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: 1=6 t=CableLabs-MTA-UDP-Portnum(26): 0
CableLabs-MTA-UDP-Portnum: 0
AVP: 1=12 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: 1=6 t=CableLabs-SF-ID(30): 0
CableLabs-SF-ID: 0
AVP: 1=10 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: 1=4 t=CableLabs-Flow-Direction(50): Upstream(1)
CableLabs-Flow-Direction: Upstream (1)
AVP: 1=84 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: 1=78 t=CableLabs-Event-Message(1):
Event Message Version ID: 4
BCID
Timestamp: 1212445021
Element ID: 0
Time Zone: DST: 1, Offset: +000000
Event Counter: 2
Event Message Type: QoS_Commit (19)
Element Type: CMS (1)
Element ID: 0
Time Zone: DST: 1, Offset: +000000
Sequence Number: 7
Event Time: 20080602221701.000
Status: 0x00000008
.....00 = Status: No Error
(0x00000000)
.....0.. = Event Origin: Trusted
Element (0x00000000)
.....1... = Event Message Proxied:
Proxied (0x00000001)
Priority: 128
Attribute Count: 3
Event Object: 0
AVP: 1=12 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: 1=6 t=CableLabs-MTA-UDP-Portnum(26): 0
CableLabs-MTA-UDP-Portnum: 0
AVP: 1=12 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: 1=6 t=CableLabs-SF-ID(30): 0
CableLabs-SF-ID: 0

```

```

AVP: l=10 t=Vendor-Specific(26) v=CableLabs(4491)
VSA: l=4 t=CableLabs-Flow-Direction(50): Downstream(2)
      CableLabs-Flow-Direction: Downstream (2)

```

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Radius Protocol

```

Code: Accounting-Response (5)
Packet identifier: 0x0 (0)
Length: 20
Authenticator: EB0BD7E187D3301CB7D73349761F9DE0
[This is a response to a request in frame 1]
[Time from request: 0.041131000 seconds]

```

No.	Time	Source	Destination	Protocol Info
	5 29.324537	77.111.1.51	200.200.1.2	RADIUS
Accounting-Request(4) (id=0, l=1162)				

```

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```

Radius Protocol

```

Code: Accounting-Request (4)
Packet identifier: 0x0 (0)
Length: 1162
Authenticator: 78D7DE7EA0162046A7936593F80048D5
[The response to this request is in frame 6]
Attribute Value Pairs
  AVP: l=6 t=NAS-IP-Address(4): 77.111.1.51
        NAS-IP-Address: 77.111.1.51 (77.111.1.51)
  AVP: l=6 t=Acct-Status-Type(40): Interim-Update(3)
        Acct-Status-Type: Interim-Update (3)
  AVP: l=26 t=Acct-Session-Id(44): HDq] 01+000000\000\000\000\001
        Acct-Session-Id: HDq] 01+000000
  AVP: l=84 t=Vendor-Specific(26) v=CableLabs(4491)
        VSA: l=78 t=CableLabs-Event-Message(1):
              Event Message Version ID: 4
              BCID
              Timestamp: 1212445021
              Element ID: 0
              Time Zone: DST: 1, Offset: +000000
              Event Counter: 1
              Event Message Type: Unknown (22)
              Element Type: CMS (1)
              Element ID: 0
              Time Zone: DST: 1, Offset: +000000
              Sequence Number: 8
              Event Time: 20080602221731.000
              Status: 0x00000008
              .... = Status: No Error
(0x00000000)
              .... = Event Origin: Trusted
Element (0x00000000)
              .... = Event Message Proxied:
Proxied (0x00000001)
              Priority: 128
              Attribute Count: 1
              Event Object: 0
  AVP: l=134 t=Vendor-Specific(26) v=CableLabs(4491)

```



```

AVP: l=10 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: l=4 t=CableLabs-Flow-Direction(50): Upstream(1)
    CableLabs-Flow-Direction: Upstream (1)
AVP: l=84 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: l=78 t=CableLabs-Event-Message(1):
    Event Message Version ID: 4
    BCID
    Timestamp: 1212445021
    Element ID: 0
    Time Zone: DST: 1, Offset: +000000
    Event Counter: 2
    Event Message Type: QoS_Release (8)
    Element Type: CMS (1)
    Element ID: 0
    Time Zone: DST: 1, Offset: +000000
    Sequence Number: 11
    Event Time: 20080602221731.000
    Status: 0x00000008
    .... = Status: No Error
(0x00000000)
    .... = Event Origin: Trusted
Element (0x00000000)
    .... = Event Message Proxied:
Proxied (0x00000001)
  Priority: 128
  Attribute Count: 2
  Event Object: 0
AVP: l=12 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: l=6 t=CableLabs-SF-ID(30): 0
    CableLabs-SF-ID: 0
AVP: l=10 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: l=4 t=CableLabs-Flow-Direction(50): Downstream(2)
    CableLabs-Flow-Direction: Downstream (2)
AVP: l=84 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: l=78 t=CableLabs-Event-Message(1):
    Event Message Version ID: 4
    BCID
    Timestamp: 1212445021
    Element ID: 0
    Time Zone: DST: 1, Offset: +000000
    Event Counter: 1
    Event Message Type: Call_Disconnect (16)
    Element Type: CMS (1)
    Element ID: 0
    Time Zone: DST: 1, Offset: +000000
    Sequence Number: 12
    Event Time: 20080602221731.000
    Status: 0x00000008
    .... = Status: No Error
(0x00000000)
    .... = Event Origin: Trusted
Element (0x00000000)
    .... = Event Message Proxied:
Proxied (0x00000001)
  Priority: 128
  Attribute Count: 1
  Event Object: 0
AVP: l=14 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: l=8 t=CableLabs-Call-Termination-Cause(11):
    Source Document: BAF (0x0001)
    Event Object: 16
AVP: l=84 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: l=78 t=CableLabs-Event-Message(1):
    Event Message Version ID: 4

```

```

BCID
  Timestamp: 1212445021
  Element ID: 0
  Time Zone: DST: 1, Offset: +000000
  Event Counter: 1
  Event Message Type: Signaling_Stop (2)
  Element Type: CMS (1)
  Element ID: 0
  Time Zone: DST: 1, Offset: +000000
  Sequence Number: 13
  Event Time: 20080602221731.000
  Status: 0x00000008
  .... = Status: No Error
(0x00000000)
  .... = Event Origin: Trusted
Element (0x00000000)
  .... = Event Message Proxied:
Proxied (0x00000001)
  Priority: 128
  Attribute Count: 2
  Event Object: 0
  AVP: 1=32 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: 1=26 t=CableLabs-Related-Call-Billing-Correlation-ID(13):
  Timestamp: 1212445021
  Element ID: 0
  Time Zone: DST: 1, Offset: +000000
  Event Counter: 2
  AVP: 1=14 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: 1=8 t=CableLabs-Call-Termination-Cause(11):
  Source Document: BAF (0x0001)
  Event Object: 16
  AVP: 1=84 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: 1=78 t=CableLabs-Event-Message(1):
  Event Message Version ID: 4
  BCID
  Timestamp: 1212445021
  Element ID: 0
  Time Zone: DST: 1, Offset: +000000
  Event Counter: 2
  Event Message Type: Call_Disconnect (16)
  Element Type: CMS (1)
  Element ID: 0
  Time Zone: DST: 1, Offset: +000000
  Sequence Number: 14
  Event Time: 20080602221731.000
  Status: 0x00000008
  .... = Status: No Error
(0x00000000)
  .... = Event Origin: Trusted
Element (0x00000000)
  .... = Event Message Proxied:
Proxied (0x00000001)
  Priority: 128
  Attribute Count: 1
  Event Object: 0
  AVP: 1=14 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: 1=8 t=CableLabs-Call-Termination-Cause(11):
  Source Document: BAF (0x0001)
  Event Object: 16
  AVP: 1=84 t=Vendor-Specific(26) v=CableLabs(4491)
  VSA: 1=78 t=CableLabs-Event-Message(1):
  Event Message Version ID: 4
  BCID
  Timestamp: 1212445021

```

```

        Element ID:          0
        Time Zone: DST: 1, Offset: +000000
        Event Counter: 2
        Event Message Type: Signaling_Stop (2)
        Element Type: CMS (1)
        Element ID:          0
        Time Zone: DST: 1, Offset: +000000
        Sequence Number: 15
        Event Time: 20080602221731.000
        Status: 0x00000008
        .... = Status: No Error
(0x00000000)
        .... = Event Origin: Trusted
Element (0x00000000)
        .... = Event Message Proxied:
Proxied (0x00000001)
        Priority: 128
        Attribute Count: 2
        Event Object: 0
        AVP: l=32 t=Vendor-Specific(26) v=CableLabs(4491)
        VSA: l=26 t=CableLabs-Related-Call-Billing-Correlation-ID(13):
        Timestamp: 1212445021
        Element ID:          0
        Time Zone: DST: 1, Offset: +000000
        Event Counter: 1
        AVP: l=14 t=Vendor-Specific(26) v=CableLabs(4491)
        VSA: l=8 t=CableLabs-Call-Termination-Cause(11):
        Source Document: BAF (0x0001)
        Event Object: 16

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Radius Protocol
  Code: Accounting-Response (5)
  Packet identifier: 0x0 (0)
  Length: 20
  Authenticator: 663449DAB02BF4CC5480672195DFFFE0
  [This is a response to a request in frame 5]
  [Time from request: 0.063580000 seconds]

```

Security

The *PacketCable 1.5 Event Messages Specification* mandates that the billing messages are sent using the RADIUS protocol and IPsec for security.



Note

In ACE SBC Release 3.0.00, only the RADIUS security mechanism, based on its own Request Authenticator, is supported.