

Call Information Logging, Quality of Service Logging

DESCRIPTION



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Abstract

1 GENERAL

The Call Information Logging function permits recording of different types of data. It can record all types of calls, including quality of service data if provided.

The Call Information Logging (CIL) allows customers to analyze, and thus control, their telephone costs, and to allocate payment for calls made.

2 GLOSSARY

For a complete list of abbreviations and glossary, see the description for *ACRONYMS, ABBREVIATIONS AND GLOSSARY*.

3

CALL DATA

The Call Information Logging function generates records for storage of call data. Each record contains data for one call. All types of calls can be registered, such as internal calls, outgoing external calls, abandoned calls, and even failed calls (calls to a busy party and calls to vacant numbers).

The following call data can be included in a record:

- Date
- End time
- Start time
- Call duration
- Calling party number
- First and second access code
- Time in queue to a busy external line or route
- Queuing time for incoming call to PBX operator
- Ring time duration
- Queue time duration
- Dialed number
- Number of metering pulses
- Authorization Code
- Account Code
- Outgoing/Incoming External line identification
- Condition code
- Free of charge call information
- Media encryption information

Note: The record data for each party may include some of the following QoS data fields:

- Codec type
- Cumulative number of packets lost
- Estimated throughput
- Fraction lost rate
- Mean estimated end-to-end delay
- Mean jitter
- Packet lost rate
- Simple R-value
- Extension TCP/IP address

3.1

CONDITION DATA FOR CALL DATA

The condition data is the key element in the call record. It designates the type of call that was made.

Condition code field used may have either one, two, or three characters or a user-defined string. The one-, two-, or three-character codes are shown below. The condition fields of two or three characters allow a more detailed description of the call case.

The user-defined condition code string can provide a printout in plain text to enhance readability. The default for the custom string is to use the three character codes.

Condition data are divided into segments and positions. Depending on the segments, condition codes for one, two, and three characters will differ. Segments indicates the type of call. For further clarifications, see the interworking descriptions for *Station Message Detail Recording, Call Information Logging, Quality Logging*.

3.1.1

ONE-CHARACTER CONDITION CODE

Example of some of the condition codes used for Segment 0 (zero).

- () Outgoing call
- (A) Call handled by a PBX operator
- (B) Calls to a busy party
- (C) Abandoned calls
- (D) Extremely long call duration
- (E) Group call pickup calls
- (F) Group Hunting calls
- (G) Call has been connected with alternative route selection
- (H) Recall to route
- (I) Incoming call or tandem call
- (J) Internal call
- (K) Calls to vacant numbers
- (L) Conference call
- (M) Least cost routing
- (N) Dialed party not equal to answering party
- (Q) Malicious Call Tracing
- (R) Intrusion
- (T) Transferred call
- (W) Call terminated due to route optimization
- (X) External follow me
- (Y) Call established due to route optimization

All these condition codes are the same across all the Segments, but some will differ, that is., single-character condition codes falling under Segment 1 for Long duration calls will always display D (for all types of traffic cases).

Single-character condition codes for the traffic cases, Operator Extended (A), ECF (X), Transfer (T), Route optimization (Y), LCR(M), MCT(Q), Call terminated due to Route optimization (W) will be the same across all the Segments 2, 3, 5, 6, and 7. Single-character condition code for the remaining cases will change depending on the type of call.

Single-character condition codes for the traffic case, Group Hunt Calls displays only F for the Segment 3. Similarly, Group Call Pickup calls displays only E for the Segment 5. Similarly Direct Diversion calls and Diversion on Busy or Diversion on No Reply displays only D for Segment 6 and Segment 7, for the remaining cases displays N for all the Segments.

3.1.2

TWO-CHARACTER CONDITION CODE

- (DO) Long outgoing call /Direct Divert /Diversion on Busy /Diversion on No Answer outgoing call
- (DA) Long PBX operator extended call /Direct Diverted /Diversion on Busy /Diversion on No Reply calls Extended by operator
- (DI) Long incoming call /Direct Diverted /Diversion on Busy /Diversion on No Reply incoming calls
- (DJ) Long internal call /Direct Diverted /Diversion on Busy /Diversion on No Answer internal calls
- (DX) Long external follow me call
- (NJ) Dialed party is not the answering party on an internal call
- (NI) Incoming DID call when the answering party was not the dialed party
- (NT) Dialed party is not the answering party on a transferred call
- (CJ) Abandoned internal call for Segment 0
- (CO) Abandoned outgoing call in a private network for Segment 0
- (FC) Abandoned Group Hunting outgoing /Incoming /Internal calls for Segment 3 and Segment 7
- (DC) Abandoned outgoing /Incoming /Internal call due to Direct Diversion /Diversion on Busy /Diversion on No Reply in a private network for Segment 6 and Segment 7

All these condition codes are the same across all the Segments, but some will differ, that is, double-character condition codes falling under Segment 1 for Long duration calls will always displays D and followed by the traffic case (for all types of traffic cases), similarly double character condition codes falling under Segment 4 for Data call will always displays V and followed by the traffic case (for all traffic cases).

Double-character condition codes for the traffic cases, Operator Extended (A), ECF (X), Transfer (T), Route optimization (Y), LCR(M), MCT(Q), Call terminated due to Route optimization (W) will be same across all the Segments 2, 3, 5, 6, and 7 followed by a blank SPACE. Double character condition code for the remaining cases will change depending on the type of call.

Double-character condition codes for the traffic case, Group Hunt Calls displays only F for the Segment 3 and follows the traffic case. Similarly Group Call Pickup calls displays only E for the Segment 5 and follows the traffic case. Similarly Direct Diversion calls and Diversion on Busy or Diversion on No Reply displays D and follows the traffic case, for Segment 6 and Segment 7. Double-character condition code for the remaining cases displays N and follows the traffic case, for the remaining Segments.

3.1.3

THREE-CHARACTER CONDITION CODE

- (NCJ) Abandoned internal call, dialed party is not the answering party.
- (NCO) Abandoned outgoing private network call, dialed party is not the answering party.
- (FCJ) Abandoned internal Group Hunting Call.
- (FCO) Abandoned outgoing Group Hunting Call.
- (DCI) Abandoned incoming Direct Diversion Call.
- (DCJ) Abandoned internal Direct Diversion Call.
- (DCO) Abandoned outgoing Direct Divert Call.
- (DRI) Incoming call Diverted on No Answer.
- (DRJ) Internal call Diverted on No Answer.
- (DRO) Outgoing call Diverted on No Answer.
- (DRT) Transferred call Diverted on No Answer.
- (DA) Operator Extended call after Direct Diversion to the operator.
- (DRA) Operator Extended call after Diverted on No Answer to operator

All these condition codes are the same across all the Segments, but some will differ, that is, triple-character condition codes falling under Segment 1 for Long duration calls will always display D and followed by the traffic case and a space (for all types of traffic cases).

Triple-character condition codes for the traffic cases, Operator Extended (A), ECF (X), Transfer (T), Route optimization (Y), LCR(M), MCT(Q), Call terminated due to Route optimization (W) will be same across all the Segments 2, 3, 5, 6, and 7 and followed by two blank SPACES. Triple-character condition codes for the remaining cases will change depending on the type of call.

Triple-character condition codes for the traffic case, Group Hunt Calls display only F for the Segment 3 and follows either the traffic case or a combinational condition code or a space. Similarly Group Call Pickup calls display only E for the Segment 5 and follows either the traffic case or a combinational condition code or a space. Similarly Direct Diversion calls and Diversion on Busy or Diversion on No Reply displays D and follows either the traffic case or a combinational condition code or a space, for Segment 6 and Segment 7. Triple-character condition code for the remaining cases displays N and follows either the traffic case or a combinational condition code or a space Segments.

Triple-character condition codes falling under Segment 1 for all the traffic cases will display only the appropriate condition code and followed by two spaces.

3.1.4

USER-DEFINED CONDITION STRING

User-defined condition code strings can be set with command and will provide a readable string associated with any segment and position. The default is to use the three-character format when no custom specification exists. This data field is available in the general subtype.

4

OUTPUT TYPES AND SUBTYPES

Commands can be entered to select output type and subtype. The output type is generally describing the transport mechanism and the target where the data is written. The subtype is describing the formatting rules that apply. The format string is used to actually order the formatter to produce the output in the desired way. See 1 Output Types and Subtypes on page 8 for more information.

Each output can be used independently from any other output regarding type, subtype and formatting rules.

4.1

NOTE

The type **file** writes synchronously to file. It is efficient, but should only be used with a reliable local hard disk. The type **asyncFile** writes asynchronously to file. It is inefficient, but can handle unreliable network file systems. If you are logging onto an NFS-mounted file system, it must be mounted with the options "soft" and "intr".

Table 1 Output Types and Subtypes

Type	Subtype	Description
sql	postgresql none	Stores all. (no selection possible) Stores nothing
file	none commaSeparated xml general fp15 mdfp15 asb501 asbumdfp15 demo1 demo2	Stores nothing Stores all. (no selection possible) Stores all. (no selection possible) Scripting for formatting and selection Scripting for selection Scripting for selection Scripting for selection Scripting for selection
tcp	commaSeparated xml general fp15 mdfp15 asb501 asbumdfp15 demo1 demo2	Stores all. (no selection possible) Stores all. (no selection possible) Scripting for formatting and selection Scripting for selection Scripting for selection Scripting for selection Scripting for selection
V24	commaSeparated xml general fp15 mdfp15 asb501 asbumdfp15 demo1 demo2	Stores all. (no selection possible) Stores all. (no selection possible) Scripting for formatting and selection Scripting for selection Scripting for selection Scripting for selection Scripting for selection

Type	Subtype	Description
asyncFile	commaSeparated xml general fp15 mdfp15 asb501 asbumdfp15 demo1 demo2	Stores all. (no selection possible) Stores all. (no selection possible) Scripting for formatting and selection Scripting for selection Scripting for selection Scripting for selection Scripting for selection Scripting for selection

4.2 OUTPUT TYPES

Each output can be assigned to an external device, file, or TCP/IP device by command.

All outputs are working independently and can be active all at the same time, writing the same information on several outputs or using different script filters to output selected information on different outputs as desired.

SQL type is used when communicating with an SQL data base. It can be an internal or external data base.

The type "file" is stored in the file system, locally or over NFS. The data will be stored as daily files during a week on the hard disk before over written. Each file should have a distinctive file name. In addition to the given file name the system will add a "day number" to the name which reflects the day it was produced (example: callData.1.xml callData.2.xml 1= monday,2= tuesday...).

The type "tcp" can be used to connect to an external computer with an application that will accept a TCP/IP stream of data in the format written.

The type "V24" can be used for writing to a serial port, a parallel printer port, or any type of streaming device in the local computer.

4.3 OUTPUT SUBTYPES

PostgreSQL format is always writing all valid data to the data base, and it assumed that the post processing will take care of all filtering and deleting of not wanted data.

Comma separated and XML format is also writing all data but in a readable form.

The fixed subtypes fp15, mdfp15, asb501, and asbumdfp15 each have a predefined format with fixed fields and preassigned widths defined. If the width of the field is defined larger than the actual width, the unused position is padded with spaces. On the other hand, if the width of the field is defined smaller than the actual width, a truncation will occur.

The subtype "general" will allow the customer to tailor a script to output virtually any printout format. In fact subtypes fp15, mdfp15, asb501, asbumdfp15, demo1, and demo2 are made this way internally.

The demo1 and demo2 formats are just sample formats that can be used. They are made available to demonstrate the potential of the script language, and the user friendliness that can be achieved by using a verbose printout.

For more details, refer to the command description for *Call information logging* and the operational directions for *Call Information Logging*.

5

MOBILITY DATA

The call information logging function generates records for storage of mobility data. Each record contains data for one mobility event for one extension, that is, a call between extensions will result in two records if both extensions are included in the logging. Mobility events which can be logged are Location Registration, Detach, Handover and Call to/from cordless extensions (CXN).

The following mobility data are included in a record :

- Date
- Time
- Directory Number
- Board position
- Individual
- Event

5.1

CONDITION CODES FOR MOBILITY EVENTS

The condition code is the key element in the mobility record. It designates the type of call that was made.

- (AXX) Abnormal Call Release.
- (BCA) Call from Cordless Extension
- (BCB) Call to Cordless Extension
- (CHS) Connection Handover, Successful
- (CHU) Connection Handover, Unsuccessful
- (DS) Detach, Successful
- (DU) Detach, Unsuccessful
- (EHS) External Handover, Successful
- (EHU) External Handover, Unsuccessful
- (HFS) Handover Fallback, Successful
- (HFU) Handover Fallback, Unsuccessful
- (LRS) Location Registration, Successful
- (LRU) Location Registration, Unsuccessful
- (TNA) Temporary Not Available
- (MSB) SMS to Extension, Successful
- (UMB) SMS to Extension, Unsuccessful
- (MSA) SMS from Extension, Successful
- (UMA) SMS from Extension, Unsuccessful

6

MOBILITY CRITERIA

Commands can be entered to determine what mobility events should be output to external equipment. This is done by defining one or more mobility criteria for an output file. One or more external equipment units can be associated to an output file. The following mobility criteria can be defined:

- All Mobility Events
- The LIM in which the mobility events occur
- The board position at which the mobility events occur
- Mobility event type
- The mobility event in combination with board position
- Mobility event in combination with a LIM
- Directory number of the involved party
- A directory number in combination with a board position
- A directory number in combination with a LIM
- A directory number in combination with a mobility event
- A directory number in combination with a mobility event and board position
- A directory number in combination with mobility event and a LIM

There are 60 output mobility criteria records. The output criteria records are used as follows when initiating mobility logging call data:

- A single directory number, LIM or BPOS will use 1 record
- A range of directory numbers, LIMs or BPOSes will use 2 records
- A mobility event will use 1 record

7

OUTPUT FORMATTING

A command is used to set the time zone to use for the time information in printouts for the fixed output formats (fp15, mdfp15, asb501, and asbumdfp15), thus keeping compatibility with md110 but allowing use of UTC to prevent problems with normal or summer time.

Commands can be entered to determine what calls should be output to external equipment. This is done by defining a formatting string per output by command.

The format string is defined in a script language and can filter the output based on all data available in the call logging data.

Any field in the output can be tested and used to filter the output of data.

For the subtype "general" the format string is also used to format the data output.

8

CIL HEARTBEAT

This facility is used to monitor the overall status of an MX-ONE. It is activated by an option (-heartbeat) and the record is generated periodically with the time interval of 15 minutes. The Heartbeat record will be output to the ordinary CL output file.

It is only possible to initiate heartbeat for the v24 and tcp types.

The following data is included in the Heartbeat record:

- Year
- Month
- Day
- Hour
- Minutes
- Text HEARTBEAT FROM
- Exchange ID

9

CAPACITY

How to set up a system is dependent on the size of the system and the output devices and facilities to be used.

Calculations must be made, when using hardware devices (such as V.24) on communication speed and the number of characters to print per call. Consider to use more than one device if the device is too slow, then more outputs can be used with different filters. With this method a simple load sharing is created.

9.1

MAXIMUM CAPACITY, INDEPENDENT OF OUTPUT DEVICES

Below follow the maximum capacities independent of the output devices.

- The maximum number of outputs per LIM is 10.
- The maximum number of active outputs per LIM is 10.
- The maximum number of data forwarding positions per LIM is 3.
- All calls can be recorded (up to 65534 simultaneous calls per LIM).
- Considerations have to be taken if the SQL data base should reside in the same computer as the telephone application or on a separate (external) computer. In a situation with less than 7 calls/second less than 70,000 call records in the data base and low query rate, the data base can coexist on the same computer. If more than 20 calls/second and more than 200,000 call records in the data base and high query rate a high, an external data base server is needed.

9.2

SYSTEM RELIABILITY

The SMDR/CIL/QoS outputs can be configured to have many simultaneous outputs. They can each have different output types, subtypes, and formats. Thus it is recommended to initiate one output as a safety backup with type = file, subtype = commaseparated or xml, storing all data to local files. Then the rest of the outputs can be assigned to do the main outputs in any type and subtype format as desired.

With this method of overlapping recording it is possible to have a local safety copy in the case the main device is offline. The safety backup can then be used to create the missing data to the main device, with the help of the three conversion commands that are accompanying this feature.

Conversion programs are available to perform conversions of file format in post production/recovery. These commands can only operate on source types/subtypes that contain all data. The conversion programs can convert data from -> to in the following ways:

- file/commaseparated -> SQL
- file/xml -> SQL
- file/commaseparated -> file/all
- file/xml -> file/all
- SQL -> file

10

ALARMS

The SMDR/CIL/QoS feature generates alarms to indicate:

- Faulty configuration (*alarm 1:3*)
- Error has occurred during output of call records (*alarm 1:4*)
- Output device is disconnected or not available (*alarm 1:5*)
- Output queues are almost full. (indicating low bandwidth on output stream)(*alarm 1:8*)
- Speech quality is poor (warning)(*alarm 1:6*)
- Speech quality is bad (*alarm 1:7*)