Enhanced Event Logging

This chapter describes the MME's Event Logging functionality which occurs at the subscriber level, from the MME to an external server.

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Feature Description

The MME handles numerous subscriber calls from different eNodeBs in the network. In order to troubleshoot any issues for a particular subscriber, the events that caused the issue is recorded. The events could be individual procedures listed below:

- Attach Procedures
- Detach Procedures
- TAU Procedures
- Handover Procedures
- All types of Service Requests
- Paging based on different triggers
- PDN Connectivity Requests
- All types of PDN detach and network initiated PDN detach procedures
- Dedicated Bearer Activation Requests
- Dedicated Bearer Deactivation Requests
- All types of Bearer modification procedures
- CSFB procedures
- SRVCC procedures
- eCSFB procedures

- eSRVCC procedures

The Event Data Record is a proprietary feature of StarOS. In this feature, MME provides a debugging framework to capture procedure level information for each subscriber. On the completion of a procedure successfully or unsuccessfully, the MME generates a procedure summary. This summary provides details of the events and issues, which is nearly comparable to real-time debugging.

Important This feature is license controlled. Please consult your Cisco Account Representative for information about the specific license.

MME supports the following functionality in this feature:

- Event Logging for 4G subscribers.
- The Event Records are stored in CSV file format.
- A framework to collect information and eventually provide log information. The framework is extensible to hold more procedures and information fields.
- The order of fields are easily changeable.
- The event logs are generated on completion of the procedure successfully or unsuccessfully. The procedure could be unsuccessful because of local reasons such as – HSS/Peer element triggered reasons, Timeouts for responses, arrival of procedures and so on.
- Each record has a smgr-no and sequence-no field. If there is no guaranteed delivery of events, the sequence number will help in identifying the lost events.
- Event reporting can be enabled or disabled through the CLI command reporting-action mme-event-record under the Call Control Configuration mode. For detailed information on feature configuration see the *Configuring Event Logging* section in this feature chapter.

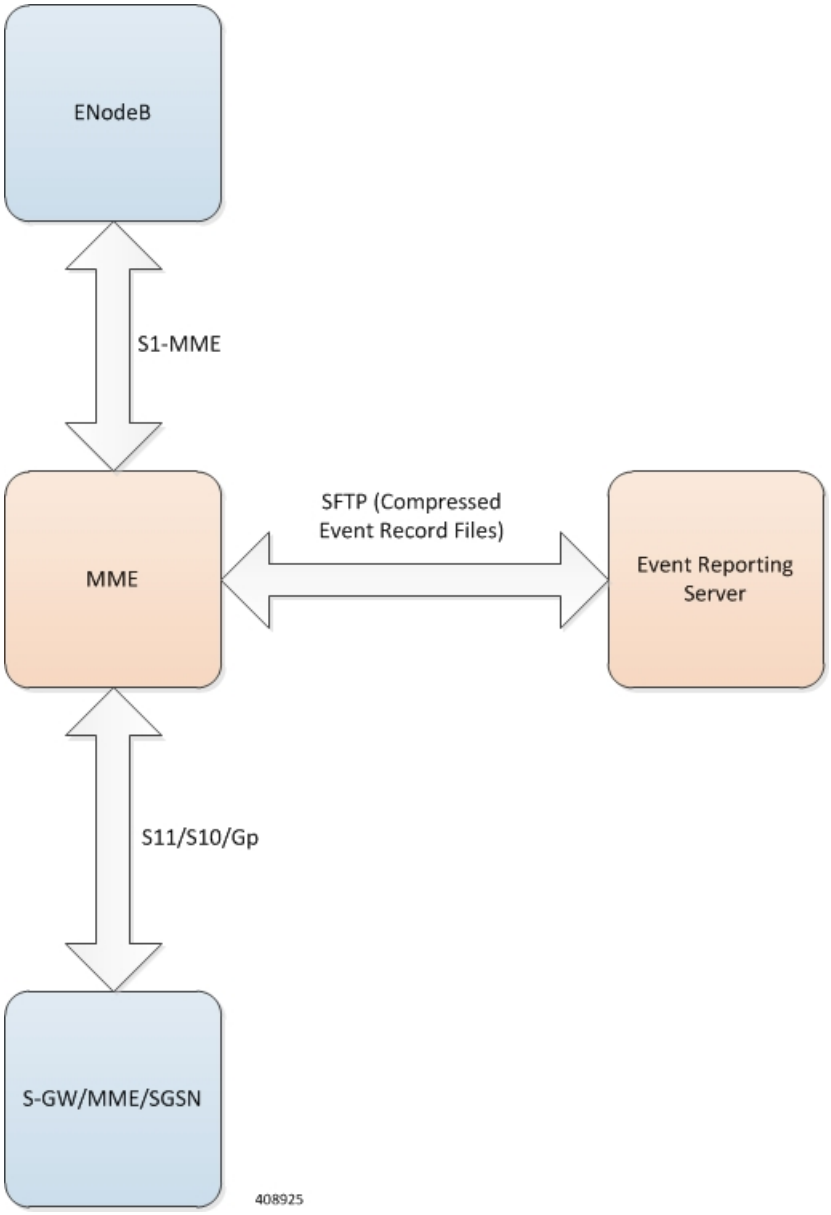
How Event Logging Works

Event Logging in the MME is implemented by providing subscriber event information to an external server. Data analyzers use the event information in the record, which is stored in the external server, to debug and troubleshoot subscriber issues.

Architecture

This section describes the framework designed in the MME to support Event Logging.

Figure 1: Event Logging - Interfaces



The interface between the MME and the external server is based on SFTP. Each record (CSV record) is generated as comma-separated ASCII values. The MME sends one ASCII formatted CSV record per line. The CSV records are stored in a file. If configured, these files can be compressed before sending it to the external server.

The transfer of CSV record files between the MME and the external server is based on either PULL or PUSH model. In case of the PULL model, the external server is responsible for initiating the SFTP with MME, and in the PUSH model, MME is responsible for sending the CSV record file to external server based on the configured PUSH timer interval.

The event report includes the information in CSV format as shown in the table given below.

Table 1: Information Fields in the EDR

Sl.No	Description	Format information	Range
1	smgr_number	Number	1 up to 1023
2	sequence_no	Number	1 up to 4294967295
3	Time	YYYY-MMM-DD+HH:MM:SS	
4	event-idenity	enum: Attach; Detach; TAU; Handover ; Service Request; Paging; PDN Connect/Disconnect; Bearer Activation/Deactivation; CSFB and SRVCC procedures.	
5	Result	enum: 0-Success; 1-failure; 2-Aborted;3-eps_only	
6	mme-address	Dotted-string	
7	Msisdn	String of decimal digits	
8	imsi	String of decimal digits	1 - 15 digits
9	Imei (sv)	String of decimal digits	14 or 16 digits
10	old-guti	mcc: mnc: mmegroup: mmecode: mtmsi	
11	old-guti-type	Enumeration [0 - native, 1 - mapped]	
12	guti	mcc: mnc: mmegroup: mmecode: mtmsi	0 up to 65535
13	Ecgi	mcc: mnc: cellid	
14	current-tac	Tac	
15	enodeB-id	20 bit value	1 - 1048574
16	disc-reason	Number	0 up to 65535
17	ebi	Number	5-15
18	linked-ebi	Number	
19	apn	String	
20	pdn-type	Number	1-4
21	ipv4-address	Dotted String	
22	ipv6-address	Dotted String	
23	pti	Number	1-255
24	qci	Number	1-9,65,66, 69,70,128-254

Sl.No	Description	Format information	Range
25	arp	Number	1-255
26	qos-change	Enum [0-No, 1-Yes]	0/1
27	lai	mcc-mnc-lac	

If a particular information is not relevant for the procedure being logged or if particular information isn't available, the event record is left blank. For example, if the IMEI is unavailable after the completion of an Attach procedure, the event record is left blank.

Important All enumerations will be listed by Cisco for every software release. The external server is designed to be aware of the same listing and to interpret the number accordingly. The event records contain 0-based index value of such enumerations to save space and processing overhead.

The Event IDs that are tracked as part of the EDR logging is shown in the below table:

Events	ENUM Value
Attach Procedures	
MME_EDR_EVENT_ID_EPS_ATTACH	1
MME_EDR_EVENT_ID_EMERGENCY_ATTACH	2
MME_EDR_EVENT_ID_COMBINED_ATTACH	3
MME_EDR_EVENT_ID_EPS_HO_ATTACH	4
MME_EDR_EVENT_ID_ATTACH_TYPE_MAX	
Detach Procedures	
MME_EDR_EVENT_ID_UE_INITIATED_DETACH	51
MME_EDR_EVENT_ID_NW_INITIATED_DETACH	52
MME_EDR_EVENT_ID_HSS_INITIATED_DETACH	53
MME_EDR_EVENT_ID_CSFB_UE_INIT_IMSI_DETACH	54
MME_EDR_EVENT_ID_CSFB_NW_INIT_IMSI_DETACH	55
MME_EDR_EVENT_ID_DETACH_TYPE_MAX	
TAU Procedures	
MME_EDR_EVENT_ID_TAU_SGW_RELOC	101
MME_EDR_EVENT_ID_TAU_NO_SGW_RELOC	102
MME_EDR_EVENT_ID_TAU_COMBINED_SGW_RELOC	103

Events	ENUM Value
MME_EDR_EVENT_ID_TAU_COMBINED_NO_SGW_RELOC	104
MME_EDR_EVENT_ID_TAU_PERIODIC	105
MME_EDR_EVENT_ID_TAU_ATTACH_SGW_RELOC	106
MME_EDR_EVENT_ID_TAU_ATTACH_NO_SGW_RELOC	107
MME_EDR_EVENT_ID_TAU_ATTACH_COMBINED_SGW_RELOC	108
MME_EDR_EVENT_ID_TAU_ATTACH_COMBINED_NO_SGW_RELOC	109
MME_EDR_EVENT_ID_TAU_TYPE_MAX	
Handover Procedures	
MME_EDR_EVENT_ID_S1_HO_SGW_RELOC	151
MME_EDR_EVENT_ID_S1_HO_NO_SGW_RELOC	152
MME_EDR_EVENT_ID_X2_HO_SGW_RELOC	153
MME_EDR_EVENT_ID_X2_HO_NO_SGW_RELOC	154
MME_EDR_EVENT_ID_INBOUND_S10_HO_SGW_RELOC	155
MME_EDR_EVENT_ID_INBOUND_S10_HO_NO_SGW_RELOC	156
MME_EDR_EVENT_ID_INBOUND_S3_HO_SGW_RELOC	157
MME_EDR_EVENT_ID_INBOUND_S3_HO_NO_SGW_RELOC	158
MME_EDR_EVENT_ID_INBOUND_GNGP_HO	159
MME_EDR_EVENT_ID_OUTBOUND_S10_HO	160
MME_EDR_EVENT_ID_OUTBOUND_S3_HO	161
MME_EDR_EVENT_ID_OUTBOUND_GNGP_HO	162
MME_EDR_EVENT_ID_HO_TYPE_MAX	
Service Request Procedures	
MME_EDR_EVENT_ID_SERV_REQ_UE_INITIATED	201
MME_EDR_EVENT_ID_SERV_REQ_NW_INIT_PROC	202
MME_EDR_EVENT_ID_SERV_REQ_EXTENDED	203
MME_EDR_EVENT_ID_SERV_REQ_TYPE_MAX	
Paging Procedures	
MME_EDR_EVENT_ID_PAGING_DDN_TRIGGER	251

Events	ENUM Value
MME_EDR_EVENT_ID_PAGING_DETACH_TRIGGER	252
MME_EDR_EVENT_ID_PAGING_BRR_TRIGGER	253
MME_EDR_EVENT_ID_PAGING_IDR_QUERY_TRIGGER	254
MME_EDR_EVENT_ID_PAGING_PCSCF_RESTORATION	255
MME_EDR_EVENT_ID_PAGING_UE_OFFLOAD_TRIGGER	256
MME_EDR_EVENT_ID_PAGING_SGS_TRIGGER	257
MME_EDR_EVENT_ID_PAGING_GMLC_TRIGGER	258
MME_EDR_EVENT_ID_PAGING_PGW_NODE_RESTORATION	259
MME_EDR_EVENT_ID_PAGING_S102_TRIGGER	260
MME_EDR_EVENT_ID_PAGING_IPNE_QUERY_TRIGGER	261
MME_EDR_EVENT_ID_PAGING_TYPE_MAX	
PDN Connectivity Requests	
MME_EDR_EVENT_ID_PDN_CONN_REQ	301
MME_EDR_EVENT_ID_PDN_EMERGENCY_CONN_REQ	302
MME_EDR_EVENT_ID_PDN_CONN_TYPE_MAX	
UE and Network Initiated PDN Detach	
MME_EDR_EVENT_ID_UE_PDN_DISCONN_REQ	351
MME_EDR_EVENT_ID_MME_PDN_DISCONN_REQ	352
MME_EDR_EVENT_ID_HSS_PDN_DISCONN_REQ	353
MME_EDR_EVENT_ID_NW_PDN_DISCONN_REQ	354
MME_EDR_EVENT_ID_PDN_DISCONN_TYPE_MAX	
Dedicated Bearer Activation Requests	
MME_EDR_EVENT_ID_DED_BEARER_ACT_REQ	401
MME_EDR_EVENT_ID_DED_BEARER_ACT_MAX	
Dedicated Bearer Deactivation Requests	
MME_EDR_EVENT_ID_UE_DED_BEARER_DEACT_REQ	451
MME_EDR_EVENT_ID_MME_DED_BEARER_DEACT_REQ	452
MME_EDR_EVENT_ID_PGW_DED_BEARER_DEACT_REQ	453

Events	ENUM Value
MME_EDR_EVENT_ID_DED_BEARER_DEACT_MAX	
Bearer Modification Requests	
MME_EDR_EVENT_ID_NW_BEARER_MODIF	501
MME_EDR_EVENT_ID_HSS_BEARER_MODIF	502
MME_EDR_EVENT_ID_BEARER_MODIF_TYPE_MAX	
CSFB Prodecures	
MME_EDR_EVENT_ID_CSFB_MO_CALL	551
MME_EDR_EVENT_ID_CSFB_MT_CALL	552
MME_EDR_EVENT_ID_CSFB_MO_PRIORITY_CALL	553
MME_EDR_EVENT_ID_CSFB_MT_PRIORITY_CALL	554
MME_EDR_EVENT_ID_CSFB_MO_EMERGENCY_CALL	555
MME_EDR_EVENT_ID_CSFB_MO_SMS	556
MME_EDR_EVENT_ID_CSFB_MT_SMS	557
MME_EDR_EVENT_ID_ECSFB_MO_CALL	561
MME_EDR_EVENT_ID_ECSFB_MT_CALL	562
MME_EDR_EVENT_ID_ECSFB_EMERGENCY	563
SRVCC Procedures	
MME_EDR_EVENT_ID_SRVCC_SV_CSPS	601
MME_EDR_EVENT_ID_SRVCC_SV_CS	602
MME_EDR_EVENT_ID_SRVCC_SV_NO_DTM	603
MME_EDR_EVENT_ID_SRVCC_1XRTT	604
MME_EDR_EVENT_ID_SRVCC_MAX	

The status of each event is as shown in the table given below:

Table 2: Event Status

Sl No.	Format Information	ENUM Value
1	MME_EDR_EVENT_RESULT_SUCCESS	0
2	MME_EDR_EVENT_RESULT_FAILURE	1
3	MME_EDR_EVENT_RESULT_ABORT	2

Sl No.	Format Information	ENUM Value
4	MME_EDR_EVENT_RESULT_EPS_ONLY	3

Limitations

The reliability of event generation is limited by the CDRMOD framework – particularly in the following ways:

- Any reboot of the chassis, will result in loss of records that are not yet flushed to the hard-disk or an external server
- In case of overload of the CDRMOD, the SESSMGR ignores event records if the queue is full.
- EDR sequence numbers are within the scope of the Session Manager. If a different Session Manager is selected, the EDR sequence number may reset or continue from the last sequence number allocated in that Session Manager.
- The statistics are key parameters for logging EDRs, if the statistics have any discrepancies the EDRs are not generated. Listed below are some scenarios where the EDRs are not generated due to discrepancies in statistics:
  - Network or MME initiated dedicated bearer de-activation during SRVCC procedures.
  - HSS initiated modification failures.
  - HSS initiated PDN disconnect failures.

Relationship with Other Products

The SGSN has a similar function, GMM-SM Event Logging. For information about this functionality refer to the *SGSN Administration Guide.*

Configuring Event Logging

The following configurations are discussed in this section for Event Data Records (EDRs):

Enabling Event Logging

The following CLI configuration is executed in the Call Control Profile mode to enable Event Logging on the MME.

```
config
 call-control-profile profile_name
 reporting-action mme-event-record
         exit
```

Notes:

- The call-control-profile configuration enables Event Logging for MME, provided this profile is associated to the **mme-service** through operator policy and subscriber map.
- **reporting-action** enables procedure reports.

- **mme-event-record** reports MME procedures in the form of event records using CDRMOD.

Enabling EDR Logs

The CDRMOD proclet writes the individual records into a single file received from several session managers. The CDRMOD proclet is enabled with the configuration below.

```
config
 context context_name
 edr-module active-charging-service reporting
                  cdr { push-interval interval_time | remove-file-transfer
| use-harddisk | transfer-mode { pull | push primary { encrypted-url |
url } url [ secondary { encrypted-secondary | secondary-url } url_ ]  } [
module-only ] }
                end
```

Configuring File Parameters

File parameters can be configured using the configuration given below.

```
config
 context context_name
 session-event-module
                file name file_name current-prefix current_file_prefix rotation
 volume file_rotation_size rotation time file_rotation_time  field-separator
underscore sequence-number padded charging-service-name include compression
 gzip }
              end
```

EDR Profile Association

The Call Control Profile configuration enables event Logging for MME, provided the EDR profile is associated to the MME-Service through Operator Policy and Subscriber Map (LTE-Policy).

```
config
 operator-policy name  policy_name
 associate call-control-profile edr_profile_name
          exit
 lte-policy
 subscriber-map map_name
 precedence precedence_value match-criteria all operator-policy-name policy_name

              exit
          exit
 context context_name
 mme-service service_name
 associate subscriber-map map_name
              end
```

Verifying the Event Logging Configuration

The following commands are used to verify the parameters for Event Logging.

- **show call-control-profile full all**
- **show operator-policy full all**
- **show lte-policy subscriber-map name sub1**
- **show mme-service all**

Monitoring and Troubleshooting Event Logging

This section provides information on how to monitor Event Logging.

Event Logging Show Command(s) and/or Outputs

This section provides information regarding show commands and/or their outputs in support of Event Logging.

The show commands in this section are available in support of the Event Logging.

show call-control-profile full all

```
Call Control Profile Name = TEST
SAMOG Home PLMN                                          : Not configured
Accounting Mode (SGW/SaMOG)                    : None
Accounting stop-trigger (SGW)                : Not configured
Accounting Policy (SaMOG)                       : Not configured
Event Data Records (MME)                         : Enabled
```

show cdr statistics

On running the above command , the following statistics are displayed:

```
EDR-UDR file Statistics:
CDRMOD Instance Id: 2
    Overall Statistics:
      Files rotated:
          30
      Files rotated due to volume limit:                                    0
      Files rotated due to time limit:                                        3
      Files rotated due to tariff-time:                                     0
      Files rotated due to records limit:                             11
      File rotation failures:
   0
      Files deleted:
            7
      Records deleted:
          0
      Records received:
 23754
      Current open files:
       0

Time of last file deletion:                            Sunday November 08 23:32:53 EST
2015
Session-Event Record Specific Statistics:
Session-Event files rotated:                                                  30
Session-Event files rotated due to volume limit:                 0
```

```
Session-Event files rotated due to time limit:                      3
Session-Event files rotated due to tariff-time:                    0
Session-Event files rotated due to records limit:              11
    Session-Event file rotation failures:                                  0
    Session-Event files deleted:                                                  7
    Session-Event records deleted:                                              0
    Session-Event records received:                                     23754
    Current open Session-Event files:                                         0
Time of last Event file deletion:               Sunday November 08 23:32:53 EST 2015
```