GMM-SM Event Logging

With the introduction of this feature, the SGSN now supports limited use of event data records (EDRs). This chapters details the SGSN's event logging feature, with the use of EDRs, which is intended to facilitate subscriber-level troubleshooting. This feature is relevant for StarOS Release 12.0 (and higher) software supporting SGSN services within GPRS and UMTS networks.

This chapter provides the following information:

Feature Description

Feature Overview

At any one time, the SGSN handles a large number of mobile stations (MS). In order to efficiently troubleshoot any issue for a single subscriber, it is necessary to know the events that have happened for that subscriber. Prior to this event logging feature, the SGSN did not support a debugging method that was event-based per subscriber.

The debugging framework will allow operators to troubleshoot problems related to a particular IMSI. The event logging feature will capture procedure-level information per subscriber. Upon completing a procedure, either successfully or unsuccessfully, the SGSN generates a procedure-summary or event report logging the event.

The SGSN uses the event reports to generate event data record (EDR) files comprised of logged information in comma-separated ASCII values - CSV format. The SGSN sends one ASCII formatted CSV record per line. The CSV records are stored in a file and are optionally compressed before sending to an external server. The storage space is limited, and therefore the CSV records need to be SFTed to an external server periodically. The transfer of the CSV record file from the SGSN and to the external server can be based on configurable PULL or PUSH models. In case of PUSH, the time-interval can be configured at the SGSN.

Events to be Logged

The following subscriber events will be logged:

- Attaches
- Activation of PDP Context

- Routing Area Update (RAU)
- Inter-SGSN RAU (ISRAU)
- Deactivation of PDP Context
- Detaches
- Authentications
- PDP Modifications

Event Record Fields

The EDRs include the following information in CSV format.

Important If particular information is not relevant or is unavailable for the procedure being logged, then the field is left blank.

Table 1: Event Record Fields for GMM/SM Event Logging

Field	Field Content	Field Information
1	header-field-1	Number from 1 to 512.
2	header-field-2	Number from 0 to 4294967295.
3	time	Format: YYYY-MMM-DD+HH:MM:SS
4	event-identity	Enumeration: Attach(0); Activate(1); LOCAL-RAU (2); NEW-ISRAU (3); OLD-ISRAU (4); Deactivation (5); Detach (6); Authentication (7); Modification (8).
5	result	Enumeration: Success (0); Reject (1); Aborted (2).
6	radio type	Enumeration: UTRAN (0); GERAN (1).
7	ATT type	Enumeration: GPRS-only; Comb.
8	RAU type	Enumeration: GPRS-only (0); Comb (1); Comb-IMSI-Attach(2); Periodic (3).
9	intra-RAU type	Enumeration: 2G -> 3G (-); 3G -> 2G (1); 2G -> 2G [Diff Serv] (2); 3G -> 3G [Diff Serv] (3); Local 2G (4); Local 3G (5).
10	origin-of-deactivation	Enumeration: HLR (0); GGSN (1); LOCAL (2); MS (3) .
11	cause-prot-indicator	Enumeration: GMM(0); GSM(1).

Field	Field Content	Field Information
12	gmm-cause/gsm-cause	Number between 0 and 255 to identify failure cause code. Refer to the 3GPP TS 24.008 specification, sections 10.5.5.14 (GMM cause codes) and 10.5.6.6 (SM cause codes) for an up-to-date listing.
13	disc-reason	Number 0 to 500 identifies Cisco proprietary detailed reason for session failure. To see the explanation for the SGSN-only disconnect reasons, see the *Statistics and Counters Reference*.
14	RAI	Routing area identifier in the format: ddd-ddd-xxxx-xx (d = decimal; x = hex).
15	Cell ID or SAI	One or the other, depends whether the event is generated in 3G or 2G. An integer between 0 and 65535.
16	SAC	Service area code, an integer between 0 and 65535.
17	MSISDN	Mobile subscriber's ISDN number consisting of 7 to 16 digits.
18	IMSI	Unique international mobile subscriber identity comprised of 1 to 15 digits.
19	P-TMSI	The packet-temporary mobile subscriber identity, an integer between 1 and 4294967295.
20	IMEISV	Unique 16 digit integer that indicates the IMEI with the software version to identify the equipment identity retrieval type.
21	HLR-number	16 digit integer that identifies a specific HLR.
22	APN-size	Number 1 to 128.
23	APN	Dotted alphanumeric string, typically includes the network identifier or the operator identifier to identify the access point node (APN).
24	GGSN IP/P-GW IP	Dotted string
25	Old SGSN IP	Dotted string
26	Old RAI	Routing area identifier in the format: ddd-ddd-xxxx-xx (d = decimal; x = hex)

Field	Field Content	Field Information
27	Number of PDP contexts transferred	Number from 1 to 11.
28	Number of PDP contexts dropped	Number from 1 to 11.
29	Requested QoS	Hex-digits. Refer to TS 24.008 for encoding.
30	Negotiated QoS	Hex-digits. Refer to TS 24.008 for encoding.
31	SGSN-IP-address	Dotted string
32	NSAPI	Added as part of the Activation EDR.
33	PDN-Info	Consists of nsapi, ggsn-address, ipv4-pdp-address, ipv6-pdp-address and are added as a part of the ISRAU EDR.
34	Service-Request-Trigger	Indicates the origin of the service request.
35	Service-Type	Indicates the type of service requested. The service type is classified as follows: • 0: Signalling. This Service type is triggered only from the Mobile Station. • 1: Data. This Service type is triggered only from the Mobile Station • 2: Page Response. This Service Type is triggered from either HLR, GGSN or SGSN.
36	Paging Attempts	Indicates the number of paging requests

The following table contains the availability of each field in each of the different event types:

- Type 1 - Attach
- Type 2 - Activate
- Type 3 - Local RAU
- Type 4 - New-ISRAU
- Type 5 - Old-ISRAU
- Type 6 - Deactivation
- Type 7 - Detach
- Type 8 - Authentication
- Type 9 - Modification

Table 2: Occurrence of Fields in Various Event Types

Field	Type1	Type2	Type3	Type4	Type5	Type6	Type7	Type8	Type9	Type10
SGSN_NUMBER	X	X	X	X	X	X	X	X	X	X
SEQUENCE_NO	X	X	X	X	X	X	X	X	X	X
TIME	X	X	X	X	X	X	X	X	X	X
EVENT_IDENTITY	X	X	X	X	X	X	X	X	X	X
RESULT	X	X	X	X	X	X	X	X	X	X
RAU_TYPE	X	X	X	X	X	X	X	X	X	X
ATT-TYPE	X									
RAU-TYPE			X	X						
INTRA_RAU_TYPE			X							
CHARGING_CHARACTERISTICS						X			X	
CAUSE_FOR_INDICATOR	C4	C5	C4	C4	C4	C5	C4	C4	C5	C4
GMM_CAUSE / GSM_CAUSE	C4	C5	C4	C4	C4	C5	C4	C4	C5	C4
DIAG_REASON	C1	C1	C1	C1	C1	C1	C1	C1	C1	C1
RAI	X	X	X	X	X	X	X	X	X	X
CELL-ID	C2	C2	C2	C2	C2	C2	C2	C2	C2	C2
SAC	C2	C2	C2	C2	C2	C2	C2	C2	C2	C2
MSISDN	C3	X	X	C3	X	X	C3	X	X	X
IMSI	X	X	X	X	X	X	X	X	X	X
PTMSI	C3	X	X	C3	X	X	C3	C3	X	X
IMEISV	C3	C3	C3	C3	C3	C3	C3	C3	C3	C3
HLR_NUMBER	C3	X	X	X	X	X	C3	C3	X	X
APN-SIZE		X				X			X	
APN		X				X			X	
GGSN-IP		C3		X					X	
OLD_SGSN_IP				X						

Field	Type1	Type2	Type3	Type4	Type5	Type6	Type7	Type8	Type9	Type10
OLD-RAI	X		X	X						
[illegible]				X						
[illegible]				X						
RequestedQoS		X							X	
NegotiatedQoS		X							X	
Self SGSN IP	X	X	X	X	X	X	X	X	X	
NSAPI		X								
PDN-Info			X	X	X					
[illegible]										X
Service-Type										X
Paging Attempts										X

Notes:

- C1:
  - event disc-reason will be empty for successful attach/new-rau/local-rau/activation/modification procedures.
  - disc-reason will be included for all old-rau/detach/deactivation.
  - disc-reason will be available for rejected/aborted attach/new-rau/local-rau/activation/modification procedures.
- C2: cell ID for 2G, SAC for 3G
- C3: information provided if available
- C4:
  - attach/new-rau/local/rau/detach will have reject case if an attach-reject or accept was sent with the cause value.
  - for authentication, only sync and mac failures will be logged if they are present - otherwise, the value will be left blank.
- C5:
  - cause is present only for activate-reject or modify-reject
  - deactivation will always have a cause
  - activate-accept might have a cause sent (e.g., single address bearers only allowed)

EDR Storage

The EDRs are stored in CSV format on an external server. The external server relieves the SGSN of the storage overhead and the post-processing overhead while the SGSN continues to perform call processing.

Architecture

The primary components of the feature architecture include:

- Session Manager (SessMgr) - reports events to the CDRMOD
- CDRMOD - stores EDR file in RAMDisk
- HardDisk Controller - transfers EDR files from RAMDisk to hard disk

Limitations

The reliability of event generation is limited by the CDRMOD framework, specifically:

- Any SessMgr death will result in the loss of event records that are not yet released to the CDRMOD.
- Any death of the CDRMOD proclet will result in the loss of records that are not yet written to the RAMDisk.
- Any reboot of the chassis will result in the loss of records that are not yet flushed to the hard disk or to an external server.
- In the case of overload of the CDRMOD, the SessMgr will ignore event records when its queue is full.
- The IMSI of the subscriber should be available while generating the EDR. Procedures which couldn't be associated with any particular IMSI will not generate EDRs, for example, the inter-SGSN-RAU being rejected because of its inability to contact the old-SGSN.
- GMM-SM Event Logging is not supported for 2G S4-SGSN.

Configuration

The following commands enable the SGSN to log GMM/SM events in EDR files for 3G services:

```
configure
     context ctx_name
          sgsn-service srvc_name
               [ default | no ] reporting-action event-record
```

Where:

- [default | no] - disables the logging function.

The following commands enable the SGSN to log GMM/SM events in EDR files for 2G services:

```
config
     context ctx_name
          gprs-service srvc_name
               [ default | no ] reporting-action event-record
```

Where:

- [default | no] - disables the logging function.

The following commands access the EDR module configuration mode commands to enable the operator to configure logging and file parameters and to configure file-transfer parameters.

```
config
     context ctx_name
          [ no ] edr-module active-charging-service
```

Where:

- no - disables the configured EDR logging and file parameters for the services in the context.

```
          [ default | no ] cdr [ push-interval | push-trigger |
remove-file-after-transfer | transfer-mode | use-harddisk ]
```

Where:

- cdr - configures the EDR transfer parameters
- default - restores default parameter values
- no - disables the configuration

```
          [ default | no ] file [ charging-service-name | compression |
current-prefix |  delete-timeout | directory | edr-format-name |
exclude-checksum-record | field-separator | file-sequence-number | headers
 | name | reset-indicator | rotation | sequence-number | storage-limit |
 time-stamp | trailing-text | trap-on-file-delete | xor-final-record
```

Where:

- file - configures file creation properties for the records
- default - restores the default file creation properties
- no - disables the configuration