

Troubleshoot Missing EPS-Location-Information AVP under Insert-Subscriber-Data-Answer Message

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Introduction

This document describes how to troubleshoot the missing EPS-Location-Information AVP under Insert-Subscriber-Data-Answer message.

Prerequisites

3GPP Technical Specifications - 29.272

Requirements

Cisco recommends that you have knowledge of the StarOS-Mobility Management Entity (MME) admin guide.

Components Used

This document is not restricted to specific software and hardware versions.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Overview

Insert-Subscriber-Data Request (ISDR) and Insert-Subscriber-Data Answer (ISDA) are messages defined over the S6a/S6d interface in 3GPP networks. These messages enable the Home Subscriber Server (HSS) to

push updated subscriber data to the MME (S6a) or SGSN (S6d) without requiring a request from the access network.

The Insert-Subscriber-Data procedure is used when the HSS needs to update subscriber information stored in the MME or SGSN (Serving GPRS Support Node). Unlike other Diameter procedures, this one is initiated by the HSS, not the MME/SGSN.

Typical Scenarios for ISDR Usage:

1. Administrative Updates: Triggered by changes in user subscription data stored in HSS (for example, new or modified subscriptions).
2. Operator Determined Barring: Used when barring rules are applied, changed, or removed by the operator.
3. Subscriber Tracing: Enables or updates subscriber tracing in the MME/SGSN.
4. UE Reachability: Informs MME/SGSN that HSS wants to be notified when the UE becomes reachable.
5. T-ADS (Terminating Access Domain Support) Support: Requests data needed for Traffic Steering at Application Layer (T-ADS).
6. Location/State Retrieval: Fetches UE location or state information from MME/SGSN.
7. Local Time Zone Info: Retrieves time zone details of the UE (User Equipment) current location.
8. STN-SR (Session Transfer Number for SRVCC) Update: Updates the SRVCC (Single Radio Voice Call Continuity) routing number due to interactions with SCC-AS (Service Centralization and Continuity Application Server).
9. PDN (Packet Data Network) GW (Gateway) Info (Non-3GPP): Updates MME/SGSN with PDN Gateway identities for non-3GPP access, including emergency services.
10. SMS (Short Message Service) Deregistration: Notifies MME that it has been deregistered for SMS services.
11. P-CSCF (Proxy Call Session Control Function) Restoration: Triggers restoration as per HSS instructions (per 3GPP TS 23.380).
12. Monitoring Event Configuration: Requests configuration/reporting or deletion of monitoring events.
13. Active Time Update: Sends desired PSM (Power Saving Mode) Active Time to MME.

Message Format of ISDR-ISDA

```
< Insert-Subscriber-Data-Request > ::= < Diameter Header: 319, REQ, PXY, 16777251 >
    < Session-Id >
    [ DRMP ]
    [ Vendor-Specific-Application-Id ]
    { Auth-Session-State }
    { Origin-Host }
    { Origin-Realm }
    { Destination-Host }
    { Destination-Realm }
    { User-Name }
    *[ Supported-Features ]
    { Subscription-Data }
    [ IDR-Flags ]
    *[ Reset-ID ]
    *[ AVP ]
    *[ Proxy-Info ]
    *[ Route-Record ]

< Insert-Subscriber-Data-Answer > ::= < Diameter Header: 319, PXY, 16777251 >
    < Session-Id >
    [ DRMP ]
```

```

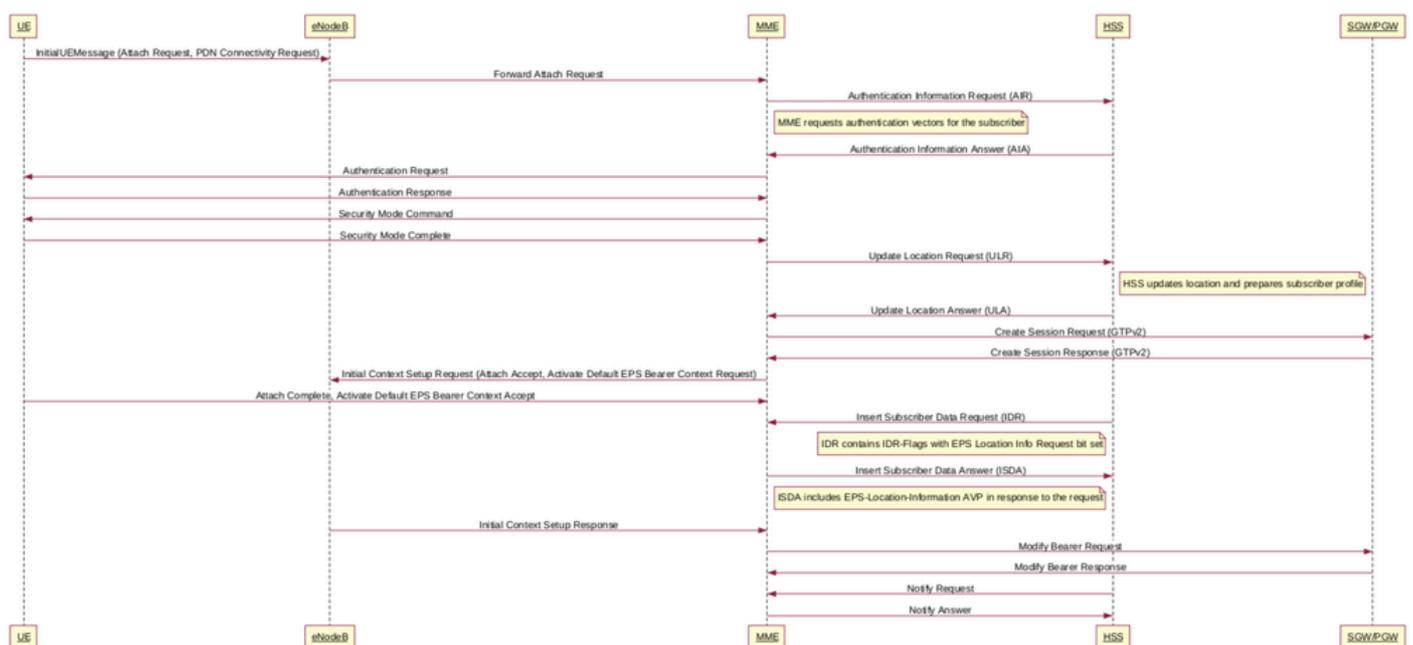
[ Vendor-Specific-Application-Id ]
*[ Supported-Features ]
[ Result-Code ]
[ Experimental-Result ]
{ Auth-Session-State }
{ Origin-Host }
{ Origin-Realm }
[ IMS-Voice-Over-PS-Sessions-Supported ]
ETSI
3GPP TS 29.272 version 15.4.0 Release 15 70 ETSI TS 129 272 V15.4.0
[ Last-UE-Activity-Time ]
[ RAT-Type ]
[ IDA-Flags ]
[ EPS-User-State ]
[ EPS-Location-Information ]
[Local-Time-Zone ]
[ Supported-Services ]
*[ Monitoring-Event-Report ]
*[ Monitoring-Event-Config-Status ]
*[ AVP ]
[ Failed-AVP ]
*[ Proxy-Info ]
*[ Route-Record ]

```

What is the Role of EPS-Location-Information AVP?

The EPS-Location-Information AVP under the Insert Subscriber Data procedure in 3GPP is used to provide information about the user location relevant for Evolved Packet System (EPS) operations. Specifically, it allows the HSS to request the MME for the subscriber current location details. This can include the TAC (Tracking Area Code) and eNB (evolved NodeB) ID of the cell serving the subscriber. The primary purpose of this AVP is for the HSS to retrieve location information about a subscriber.

Call Flow



1. HSS initiates ISDR:

The HSS, responsible for storing and managing subscriber data, initiates an ISDR message (with EPS Location Info Request set to 1 under the IDR-Flags AVP) to the MME or SGSN. This is triggered by events like a subscriber subscription profile being modified or a location update.

2. MME/SGSN receives ISDR:

The MME or SGSN receives the ISDR message and extracts the subscriber data.

3. MME/SGSN performs actions:

The MME or SGSN uses the received subscriber location data to update its local database and potentially trigger other procedures, like location updates or service activations.

4. MME/SGSN sends ISDA:

Once the MME or SGSN has processed the ISDR and updated its data, it sends an ISDA message which contains EPS Location Information AVP (under which there are the required 3 AVPs- Cell Id, TAC, Age-of-Location-Info) back to the HSS to acknowledge the completion of the process.

5. HSS receives ISDA:

The HSS receives the ISDA message and verifies that the data was successfully inserted in the MME or SGSN.

Troubleshoot

- The primary aspect is to check if the 'Update-Dictionary-Avps' is present across all the 'HSS services'. In this case it is 'NA'. You can check the same by executing this CLI:

```
***** show hss-peer-service service all *****
```

```
Service name           : hss<>
Notify Request Message : Enable
Service name           : hss<>
Notify Request Message : Enable

Update-Dictionary-Avps : N/A
```

- Once, this is checked, you can ask for these logs in order to troubleshoot the issue further:

1. Request "show config verbose"

2. Monitor Subscriber with all the required options:

```
monitor subscriber <imsi>, along with 19,33,34,35,A,S,X,Y,+++
```

3. Debug logs:

```
logging filter active facility diameter level debug
logging filter active facility sessmgr level debug
logging filter active facility mme-app level debug
logging active
```

no logging active // to deactivate

4. Logging monitor:

```
configure
logging monitor msid <imsi>
exit
```

5. Request syslogs which captures the issue.

Problematic Scenario

In the problematic pcap shown (packet 1), you can see that 'EPS location information AVP' is requested/set to '1' in the Insert-subscriber-Data Request (ISDR) and there is no 'EPS information' present in the Insert-subscriber-data Answer (ISDA) (Packet 2) though it was requested.

The image shows a Wireshark packet capture analysis. The top section displays a list of packets:

No.	Time	Info
1	2024-11-12 06:20:30.195754	cmd=3GPP-Insert-Subscriber-Data Request(319) flags=RP-- appl=3GPP S6a/S6d(1...
2	2024-11-12 06:20:30.197956	SACK (Ack=0, Arwnd=262144) cmd=3GPP-Insert-Subscriber-Data Answer(319) flag...

The main analysis pane shows the details of the selected packet (Frame 1):

- Linux cooked capture v1
- Internet Protocol Version 4, [redacted]
- Stream Control Transmission Protocol, Src Port: [redacted]
- Diameter Protocol
 - Version: 0x01
 - Length: 1032
 - Flags: 0xc0, Request, Proxyable
 - Command Code: 3GPP-Insert-Subscriber-Data (319)
 - ApplicationId: 3GPP S6a/S6d (16777251)
 - Hop-by-Hop Identifier: 0xe6e09fca
 - End-to-End Identifier: 0x0062ee81
 - [Answer In: 2]
 - AVP: Session-Id(263) l=71 f=...
 - AVP: Vendor-Specific-Applic...
 - AVP: Auth-Session-State(277) l=...
 - AVP: Origin-Host(264) l=57
 - AVP: Origin-Realm(296) l=41
 - AVP: Destination-Host(293)
 - AVP: Destination-Realm(283)
 - AVP: User-Name(1) l=23 f=...
 - AVP: Subscription-Data(1400) l=644 f=VM- vnd=TGPP
 - AVP: IDR-Flags(1490) l=16 f=VM- vnd=TGPP val=8
 - AVP Code: 1490 IDR-Flags
 - AVP Flags: 0xc0, Vendor-Specific: Set, Mandatory: Set
 - AVP Length: 16
 - AVP Vendor Id: 3GPP (10415)
 - IDR Flags: 0x00000008
 - 0000 0000 0000 0000 0000 000. = Spare: 0x000000
 - 0 = P-CSCF Restoration Request: Not set
 - 0... = RAT-Type Requested: Not set
 - 0.. = Remove SMS Registration: Not set
 - 0. = Local Time Zone Request: Not set
 - 0 = Current Location Request: Not set
 - 1... = EPS Location Information Request: Set
 - 0.. = EPS User State Request: Not set
 - 0. = T-ADS Data Request: Not set
 - 0 = UE Reachability Request: Not set

No.	Time	Info
1	2024-11-12 06:20:30.195754	cmd=3GPP-Insert-Subscriber-Data Request(319) flags=RP-- appl=3GPP S6a/S6d(1...
2	2024-11-12 06:20:30.197956	SACK (Ack=0, Arwnd=262144) cmd=3GPP-Insert-Subscriber-Data Answer(319) flag...


```

> Frame 2: 360 bytes on wire (2880 bits), 376 bytes captured (3008 bits)
> Linux cooked capture v1
> Internet Protocol Version 4, Src: [redacted]
> Stream Control Transmission Protocol
> Diameter Protocol
  Version: 0x01
  Length: 280
  Flags: 0x40, Proxyable
  Command Code: 3GPP-Insert-Subscriber-Data (319)
  ApplicationId: 3GPP S6a/S6d (16777251)
  Hop-by-Hop Identifier: 0xe6e09fca
  End-to-End Identifier: 0x0062ee81
  [Request In: 1]
  [Response Time: 0.002202000 seconds]
  > AVP: Session-Id(263) l=71
  > AVP: Supported-Features(6) l=1
  > AVP: Result-Code(268) l=1
  > AVP: Auth-Session-State(2) l=1
  > AVP: Origin-Host(264) l=6
  > AVP: Origin-Realm(296) l=

```

In order to further troubleshoot the issue, you must ensure that you proceed through all the requested logs.

As mentioned earlier, first you must check the **hss-peer-service** configuration of the problematic node.

Reference configuration:

```

hss-peer-service <>
  diameter hss-endpoint <>
  no diameter update-dictionary-avps
  --- more lines ---
exit

```

In this configuration, you can see there was 'no diameter update-dictionary-avps'.

Hence, it was updated to the latest release as per the StarOS admin guide in order to rectify the issue, which is release 11.

Here is the reference configuration:

```
<#root>
```

```
Mode
```

```
Exec > Global Configuration > Context Configuration > HSS Peer Service Configuration
```

```
configure > context
```

```
context_name
```

```
> hss-peer-service
```

```
service_name
```

Entering the above command sequence results in the following prompt:

```
[context_name]host_name(config-hss-peer-service)#
```

Syntax

```
diameter update-dictionary-avps { 3gpp-r10 | 3gpp-r11 | 3gpp-r9 }
```

```
no diameter update-dictionary-avps
```

```
no
```

Sets the command to the default value where Release 8 ('standard') dictionary is used for backward comp

```
3gpp-r10
```

Configures the MME /SGSN to signal additional AVPs to HSS in support of Release 10 of 3GPP 29.272.

```
3gpp-r11
```

Configures the MME /SGSN to signal additional AVPs to HSS in support of Release 11 of 3GPP 29.272.

Using this keyword is necessary to enable the MME to fully support inclusion of the Additional Mobile S

```
a-msisdn
```

command in the Call-Control Profile configuration mode.

```
3gpp-r9
```

Configures the MME/SGSN to signal Release 9 AVPs to HSS.

Usage Guidelines

Use this command to configure the 3GPP release that should be supported for this HSS peer service.

This command is only applicable for the 'standard' diameter dictionary as defined in the

```
diameter hss-dictionary
```

command.

Solution

Once the suggested CLI is implemented, here is the successful trace, that is, 'EPS location information' present in the ISDA.

```
20 2024-11-13 07:58:10.431000 192.168.1.100 10.1.30.1 DIAMETER cmd=3GPP-Insert-Subscriber-Data Request(319) flags=RP-- appl=3GPP S6a/S6d(16777251)
AVP: Origin-Host(264) l=24 f=-M- val=hss1.caliper.com
AVP: Origin-Realm(296) l=19 f=-M- val=caliper.com
AVP: Destination-Host(293) l=15 f=-M- val=sim-s6a
AVP: Destination-Realm(283) l=17 f=-M- val=cisco.com
AVP: User-Name(1) l=23 f=-M- val=123456001000000
AVP: Vendor-Specific-Application-Id(260) l=32 f=-M-
AVP: Supported-Features(628) l=56 f=VM- vnd=TGPP
AVP: Auth-Session-State(277) l=12 f=-M- val=NO_STATE_MAINTAINED (1)
AVP: IDR-Flags(1490) l=16 f=VM- vnd=TGPP val=8
  AVP Code: 1490 IDR-Flags
  AVP Flags: 0xc0, Vendor-Specific: Set, Mandatory: Set
  AVP Length: 16
  AVP Vendor Id: 3GPP (10415)
  <IDR-Flags: 8>
  IDR Flags: 0x00000008
    0000 0000 0000 0000 0000 0000. .... = Spare: 0x000000
    .... = P-CSCF Restoration Request: Not set
    0... = RAT-Type Requested: Not set
    ..0. = Remove SMS Registration: Not set
    ..0. = Local Time Zone Request: Not set
    ..0. = Current Location Request: Not set
    1... = EPS Location Information Request: Set
    ..0. = EPS User State Request: Not set
    ..0. = T-ADS Data Request: Not set
    ..0. = UE Reachability Request: Not set
AVP: Subscription-Data(1400) l=372 f=VM- vnd=TGPP
```

```
21 2024-11-13 07:58:10.431000 10.1.30.1 192.168.1.100 DIAMETER cmd=3GPP-Insert-Subscriber-Data Answer(319) flags=-P-- appl=3GPP S6a/S6d(16777251)
Command Code: 3GPP-Insert-Subscriber-Data (319)
ApplicationId: 3GPP S6a/S6d (16777251)
Hop-by-Hop Identifier: 0x01b5a208
End-to-End Identifier: 0xa702a208
AVP: Session-Id(263) l=58 f=-M- val=calipers-session-id;1932373212;1496852636;07580813
AVP: Supported-Features(628) l=56 f=V-- vnd=TGPP
AVP: Supported-Features(628) l=56 f=V-- vnd=TGPP
AVP: Result-Code(268) l=12 f=-M- val=DIAMETER_SUCCESS (2001)
AVP: Auth-Session-State(277) l=12 f=-M- val=NO_STATE_MAINTAINED (1)
AVP: Origin-Host(264) l=15 f=-M- val=sim-s6a
AVP: Origin-Realm(296) l=17 f=-M- val=cisco.com
AVP: EPS-Location-Information(1496) l=80 f=V-- vnd=TGPP
  AVP Code: 1496 EPS-Location-Information
  AVP Flags: 0x80, Vendor-Specific: Set
  AVP Length: 80
  AVP Vendor Id: 3GPP (10415)
  EPS-Location-Information: 0000004280000013000028af216354000100010000006438000011000028af2163540929000000000064b800001000028af00000000
  AVP: MME-Location-Information(1600) l=68 f=V-- vnd=TGPP
    AVP Code: 1600 MME-Location-Information
    AVP Flags: 0x80, Vendor-Specific: Set
    AVP Length: 68
    AVP Vendor Id: 3GPP (10415)
    MME-Location-Information: 0000004280000013000028af216354000100010000006438000011000028af2163540929000000000064b800001000028af00000000
      AVP: E-UTRAN-Cell-Global-Identity(1602) l=19 f=V-- vnd=TGPP val=21635400010001
      AVP: Tracking-Area-Identity(1603) l=17 f=V-- vnd=TGPP val=2163540929
      AVP: Age-Of-Location-Information(1611) l=16 f=V-- vnd=TGPP val=0
```