Troubleshoot Wrong Value in First Octet of ULI Field in PGW CDR for 4G Subscribers

Contents

Introduction

This document describes how to troubleshoot the problem of wrong values in the first octet of the User Location Information (ULI) field in PDN-Gateway (PGW).

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- StarOS

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.

Abbreviations

APN	Access Point Name
CDR	Call Detail Record
CGI	Cell Global Identifier
ECGI	EUTRAN CGI
E-UTRAN	Evolve UTRAN
LSB	Least Significant Bit

MSB	Most Significant Bit
PDN	Packet Data Network
PGW	PDN Gateway
RA	Revenue Assurance
RAI	Routing Area Identity
SAI	Service Area Identifier
TAI	Tracking Area Identity
ULI	User Location Information
UTRAN	Universal Mobile Telecommunications System

Problem

Service Provider raised this issue with concern about the wrong processing of PGW CDRs for some 4G subscribers. The problematic subscriber CDRs were having wrong values in very first octate of ULI field in them.

```
Non-Problematic
===============
userLocationInformation 1804f4790x1x0xfx7x0x2x1x1x

Problematic
===========
userLocationInformation 8204f4790x2x0xfx7x0x4x2x0x
```

Here, the 1st two digits of octet one on ULI field, the values are seen printed as **82**"instead of **18**.

Because of this wrong printing in CDRs, Service Provider's RA team was unable to identify the users' Location type whether they were of e-UTRAN(4G) or GERAN/UTRAN(2G/3G) causing wrong charging issues.

Troubleshoot

Service Provider is any mobile operator that provides Mobile Wireless services to end users to whom they call Mobile subscribers.

User Location Information

```
Non-Problematic
===============
userLocationInformation 1804f4790x1x0xfx7x0x2x1x1x

Problematic
===========
userLocationInformation 8204f4790x2x0xfx7x0x4x2x0x
```

As per 3GPP 29.274v12 section 8.21, the ULI is coded as:

Octets	Bits							
	8	7	6	5	4	3	2	1
1	Type = 86 (decimal)							
2 to 3	Length = n							
4	Spare				Instance			
5	Spare		LAI	ECGI	TAI	RAI	SAI	CGI
a to a+6	CGI							
b to b+6	SAI							
c to c+6	RAI							
d to d+4	TAI							
e to e+6	ECGI							
f to f+4	LAI							
g to (n+4)	These octet(s) is/are present only if explicitly specified							

```
Non-Problematic
===============
userLocationInformation 1804f4790x1x0xfx7x0x2x1x1x

Problematic
===========
userLocationInformation 8204f4790x2x0xfx7x0x4x2x0x
```

Identify the Location Type from ULI

As per the preceding image, the 5th Octet of ULI field represents the location type.

Each octet represents two nibbles, with the same logic, 5th Octet has two nibbles, that is nibble-1 ranges from bit-8 to bit-5 and nibble-2 ranges from bit-4 to bit-1.

Accordingly, whenever the respective flag in these nibbles in set **1**, consider the location type related information present in the next matching fields of ULI.

```
Non-Problematic
===============
userLocationInformation 1804f4790x1x0xfx7x0x2x1x1x

Problematic
===========
userLocationInformation 8204f4790x2x0xfx7x0x4x2x0x
```

	MSB			LSB	MSB			LSB
	Nibble-1				Nibble-2			
Octet-5	Spare	Spare	LAI	ECGI	TAI	RAI	SAI	CGI
			0	1	1	0	0	0
Decimal	2^0 = 1				2^3=8			

So, as per this image, for 4G subscribers having ECGI information in CDR should represent value **18** at the beginning of the ULI field. (But as per the issue reported by you, Cisco PGW prints the value **82** in PGW CDRs, which is wrong as per RA team's claim.)

Sample traces from PGW (on GTPv2) confirms these values are from the S5 interface.

```
<< ULI seen in CSReq>>

        USER LOCATION INFO:
            Type: 86  Length: 13  Inst: 0
            Value:
                Location type: TAI
                MCC: 123
                MNC: 456
                TAC: 0x1
                Location type: ECGI
                MCC: 123
                MNC: 456
                ECI: 0x0000001
            Hex: 5600 0D00 1821 6354 0001 2163 5400 0000
                  01
```

In the preceding example, the Hex representation of ULI fields marked in Bold Green (**18**) is the value of the first two nibbles of the 5th octet.

And in this case, PGW CDR also prints proper values of ULI in CDR (printed in CDR output taken on PGW)

```
<< ULI seen in CSReq>>

        USER LOCATION INFO:
            Type: 86  Length: 13  Inst: 0
            Value:
                Location type: TAI
                MCC: 123
                MNC: 456
                TAC: 0x1
                Location type: ECGI
                MCC: 123
                MNC: 456
                ECI: 0x0000001
            Hex: 5600 0D00 1821 6354 0001 2163 5400 0000
                  01
```

Resolution

In case of a problem, similar values in Create Session Request (CSReq) are seen, which gets printed in PGW trace, but the output in CDR for ULI field does not properly reflect the Location. Instead, this is the output:

```
<< ULI seen in CDR >> - - - Problematic scenario

  userLocationInformation              123-456-1-8547
```
The preceding output creates a doubt.

After the configuration is checked from inside the gtpp group for affected APN users, it is found that the gtpp dictionary mapped as custom33

```
    gtpp group <name-default>
```

```
   - -
   gtpp dictionary custom33               - - - > dictionary mapped to this group
   - -
 #exit
```

As per recommendation, for 4G subscribers CDR fields, Service Provider should use an appropriate dictionary that contains all field for 4G. The dictionary value from **custom33** to **custom24** requested to be changed.

```
 gtpp group <name-default>
   - -
   gtpp dictionary custom24               - - - > New dictionary mapped to this group
   - -
 #exit
```

After the preceding dictionary type in gtpp group is changed, your RA team is able to decode the ULI fields properly and the issue is resolved.