

Best Practices for DNS Service Parameters when you Apply "new-call policy reject" at GGSN

Contents

[Introduction](#)

[Problem: DNS Service Parameters Configuration when you Apply Newcall Policy Reject at GGSN](#)

[Solution](#)

[How newcall policy reject works?](#)

[How SGSN chooses the GGSN?](#)

[Example Configuration](#)

Introduction

This document describes a scenario that is encountered on the Cisco Aggregated Services Router (ASR) 5x00 Series that acts as a Gateway General Packet Radio Service (GPRS) Support Node (GGSN) where newcall policy reject fails and some precautions which need to be kept in mind when you design the Domain Name System (DNS) network to avoid service outage.

Contributed by Parthasarathy M and Anthony Fajri, Cisco TAC Engineers.

Problem: DNS Service Parameters Configuration when you Apply Newcall Policy Reject at GGSN

During GGSN Software upgrades, to avoid the service impact to subscribers, as a practise, **new-call policy reject** is applied on GGSN. Expectation is that Serving GPRS Support Node (SGSN) should send traffic to the next available GGSNs as per new call policy.

However, this is not the case in some instances. **newcall policy reject** didn't work as expected and service degradation is seen when you upgrade the procedure.

Solution

How newcall policy reject works?

Once the **newcall policy reject** is applied on GGSN;

```
[local]ASR5K_LAB# newcall policy ggsn-service all reject
```

GGSN rejects the new incoming Create Packet Data Protocol (PDP) Context Request (CPC-R) with **No resource available** so that SGSN can select next available GGSN and thus it minimizes the service disturbance at the time of the upgrade maintenance window.

Lab result of newcall policy reject:

SGSN Configuration:

In this example, **newcall policy reject** is applied on GGSN1. When the call arrives, SGSN sends the CPC Request to GGSN1, which in turn rejects the call and then SGSN sends the request to GGSN2.

Monitor Subscriber Trace Output:

```
==>GPRS Mobility/Session Management Message (2 Bytes)
Protocol Discriminator : GMM message
Message : Attach Complete
```

```
INBOUND>>>> 05:34:35:320 Eventid:88112(0)
==>GPRS Mobility/Session Management Message (34 Bytes)
Protocol Discriminator : SM message
Message : Activate PDP Context Request
  Requested NSAPI
  Requested LLC SAPI
  Requested Qos
    Length of Qos: 14
  Requested PDP address
    Length : 2
  Access Point Name
    Length: 10
```

```
<<<<OUTBOUND 05:34:35:323 Eventid:116004(3)
GTPC Tx PDU, from 192.168.2.2:19002 to 192.168.2.1:2123 (110)
TEID: 0x00000000, Message type: GTP_CREATE_PDP_CONTEXT_REQ_MSG (0x10) >>>>>>>>> to GGSN1
Sequence Number:: 0x00CC (204)
GTP HEADER FOLLOWS:
```

```
  Version number: 1
  Protocol type: 1 (GTP C/U)
  Extended header flag: Not present
  Sequence number flag: Present
  NPDU number flag: Not present
  Message Type: 0x10 (GTP_CREATE_PDP_CONTEXT_REQ_MSG)
  Message Length: 0x0066 (102)
  Tunnel ID: 0x00000000
  Sequence Number: 0x00CC (204)
```

GTP HEADER ENDS.

INFORMATION ELEMENTS FOLLOW:

```
  IMSI: 123450040000000
  Recovery: 0x09 (9)
  Selection Mode: 0x0 (MS or network provided APN, subscribed verified (Subscribed))
  Tunnel ID Data I: 0x8000C002
  Tunnel ID Control I: 0x8000C002
  NSAPI: 0x05 (5)
```

END USER ADDRESS FOLLOWS:

```
  PDP Type Organisation: IETF
  PDP Type Number: IPv4
  Address: Empty
```

END USER ADDRESS ENDS.

```
  Access Point Name: sitt1.com
  GSN Address I: 0xC0A80202 (192.168.2.2)
  GSN Address II: 0xC0A80203 (192.168.2.3)
  MSISDN: 128612345678901
  QOS Profile: 0x0223421F72967373440DFFFF00
```

COMMON FLAGS FOLLOW:


```

        GSN Address II: 0xC0A80203 (192.168.2.3)
            MSISDN: 128612345678901
            QoS Profile: 0x0223421F72967373440DFFFF00
COMMON FLAGS FOLLOW:
Prohibit Payload Compression: no
        MBMS Service Type: Multicast Service
        RAN Procedures Ready: no
        MBMS Counting Information: no
            No QoS negotiation: no
                NRSN: yes
        Upgrade QoS Supported: no
        Dual Address Bearer Flag: no
COMMON FLAGS END.
        Radio Access Technology: GERAN
            MS Time Zone: -4:00
            Daylight Saving Time: +1 hour
INFORMATION ELEMENTS END.

INBOUND>>>> 05:34:35:337 Eventid:116003(3)
GTPC Rx PDU, from 192.168.2.128:2123 to 192.168.2.2:19002 (72)
TEID: 0x8000C002, Message type: GTP_CREATE_PDP_CONTEXT_RES_MSG (0x11)
Sequence Number:: 0x00CD (205)
GTP HEADER FOLLOWS:
        Version number: 1
        Protocol type: 1 (GTP C/U)
        Extended header flag: Not present
        Sequence number flag: Present
        NPDU number flag: Not present
        Message Type: 0x11 (GTP_CREATE_PDP_CONTEXT_RES_MSG)
        Message Length: 0x0040 (64)
        Tunnel ID: 0x8000C002
        Sequence Number: 0x00CD (205)
GTP HEADER ENDS.
INFORMATION ELEMENTS FOLLOW:
        Cause: 0x80 (GTP_REQUEST_ACCEPTED)
        Reorder Required: 0x0 (Not present)
        Tunnel ID Data I: 0xFFFFFFFF8
        Tunnel ID Control I: 0xFFFFFFFF8
        Charging ID: 0x00000007
END USER ADDRESS FOLLOWS:
        PDP Type Organisation: IETF
        PDP Type Number: IPv4
        IPv4 Address: 12.0.0.6
END USER ADDRESS ENDS.
        GSN Address I: 0xC0A80280 (192.168.2.128)
        GSN Address II: 0xC0A80280 (192.168.2.128)
        QoS Profile: 0x0222421F7296D1FE460D03FE004A4A
INFORMATION ELEMENTS END.

```

How SGSN chooses the GGSN?

Under apn-profile configuration, there is a command **apn-resolve-dns-query snaptr**.

apn-resolve-dns-query snaptr [epc-ue | non-epc-ue]

SNAPTR filters based on the EPC-capability of the User Equipment (UE). Use this command to enable SNAPTR type DNS query for APN resolution for 3G subscribers with EPC subscription. Configuration in this mode promotes control of this feature per APN.

If neither of the keywords are included with the configuration, then S-NAPTR query is applicable to all UE, both EPC-capable UE and non-EPC capable UE. By default, this functionality is not

enabled.

This means that SGSN sends the DNS query in Name Authority Pointer (NAPTR) format (sitt1.com.apn.epc.mnc090.mcc262.3gppnetwork.org) to choose the GGSN.

In case NAPTR query fails then SGSN fallback to query-type A (sitt1.mnc045.mcc123.gprs) to get the GGSN ip address.

Lab result:

SGSN Configuration:

```
apn-profile default
```

```
apn-resolve-dns-query snaptr
```

Monitor Protocol Trace:

```
*** Verbosity Level ( 2) ***
```

```
*** Verbosity Level ( 3) ***
```

```
<<<<OUTBOUND 05:42:24:667 Eventid:5957(3)
```

```
DNS PDU Tx
```

```
from : 192.168.2.1 : 49351
```

```
to : 192.168.1.254 : 53
```

```
bytes : 76
```

```
Query ID : 6366
```

```
Type : Query
```

```
Question : NAPTR ? sitt1.com.apn.epc.mnc045.mcc123.3gppnetwork.org.
```

```
Additional :
```

```
Name : .
```

```
Ext-RCODE : 0
```

```
Type : OPT
```

```
UDPsize : 4096
```

```
INBOUND>>>> 05:42:24:750 Eventid:5956(3)
```

```
DNS PDU Rx
```

```
from : 192.168.1.254 : 53
```

```
to : 192.168.2.1 : 49351
```

```
bytes : 76
```

```
Query ID : 6366
```

```
Type : Response
```

```
Authoritative Answer : No
```

```
Response code : ServFail
```

```
Question : NAPTR ? sitt1.com.apn.epc.mnc045.mcc123.3gppnetwork.org.
```

```
Additional :
```

```
Name : .
```

```
Ext-RCODE : 0
```

```
Type : OPT
```

```
UDPsize : 4096
```

```
<<<<OUTBOUND 05:42:24:752 Eventid:5957(3)
```

```
DNS PDU Tx
```

```
from : 192.168.2.1 : 51619
```

```
to : 192.168.1.254 : 53
```

```
bytes : 57
```

```
Query ID : 16777
```

```
Type : Query
```

```
Question : A? sitt1.com.MNC045.MCC123.GPRS.
```

```
Additional      :
Name           : .
Ext-RCODE     : 0
Type          : OPT
UDPsize       : 4096
```

```
INBOUND>>>> 05:42:24:781 Eventid:5956(3)
```

```
DNS PDU Rx
```

```
from : 192.168.1.254 : 53
to   : 192.168.2.1   : 51619
bytes : 57
```

```
Query ID      : 16777
Type         : Response
Authoritative Answer : No
Response code : Success
Question     : A? sitt1.com.MNC045.MCC123.GPRS.
Additional   :
Name        : .
Ext-RCODE  : 0
Type       : OPT
UDPsize    : 4096
```

Example Configuration

If you configure DNS with these service parameters:

```
Flags: A           Service: x-3gpp-pgw:x-s5-gtp:x-s8-gtp:x-gn:x-gp
```

When a Non Evolved Packet Core (EPC) capable UE tries to connect, based on DNS Answer service type, SGSN decided to fallback to A query or not.

For example:

SGSN checks the DNS Answer service type and if it is not able to find the keyword x-3gpp-ggsn:x-gn and x-3gpp-ggsn:x-gp then SGSN fallback into A query type.

```
Query Name: sitt1.com.apn.epc.mnc045.mcc123.3gppnetwork.org
```

```
Answer:
```

```
Order: 10           Preference: 10
Flags: A           Service: x-3gpp-pgw:x-s5-gtp:x-s8-gtp:x-gn:x-gp
Regular Expression:
Replacement: TOPON.S5.GGSN1.NODES.EPC.MNC090.MCC262.3GPPNETWORK.ORG
```

```
Query Name: sitt1.mnc045.mcc123.gprs
```

```
Query Type: A       TTL: 48993 seconds
```

```
Answer:
```

```
IP Address: 192.168.2.1
```

Suppose, if you configure only a single GGSN ip address for A record in DNS, then SGSN cannot redirect to next available GGSNs and as a result it degrades the service.

As per SGSN Admin Guide:

The Gn SGSN supports and helps select a co-located Packet Data Network (PDN) Gateway (P-GW)/GGSN node for Evolved Packet Core (EPC) capable UEs and performs a DNS Straightforward NAPTR (SNAPTR) lookup for APN Fully Qualified Domain Name (FQDN) for the service parameter **x-3gpp-pgw:x-gn / x-3gpp-pgw:x-gp**. Interfaces in the service parameters **x-**

3gpp-ggsn:x-gn and **x-3gpp-ggsn:x-gp** are also used to select standalone GGSNs.

So when you design the DNS records, you can include service parameter like:

Flags: A Service: x-3gpp-pgw:x-s5-gtp:x-s8-gtp:x-gn:x-gp:x-3gpp-ggsn:x-gn:x-gp

After this, DNS starts to return multiple Gateway (GW) addresses for non-EPC capable UE.

Query Name: sitt1.com.apn.epc.mnc045.mcc123.3gppnetwork.org
Query Type: NAPTR TTL: 42755 seconds
Answer:
Order: 40 Preference: 40
Flags: A Service: x-3gpp-pgw:x-s5-gtp:x-s8-gtp:x-gn:x-gp:x-3gpp-ggsn:x-gn:x-gp
Regular Expression:
Replacement: TOPON.S5.GGSN03.NODES.EPC.mnc045.mcc123.3GPPNETWORK.ORG

Query Name: sitt1.com.apn.epc.mnc045.mcc123.3gppnetwork.org
Query Type: NAPTR TTL: 42755 seconds
Answer:
Order: 10 Preference: 10
Flags: A Service: x-3gpp-pgw:x-s5-gtp:x-s8-gtp:x-gn:x-gp:x-3gpp-ggsn:x-gn:x-gp
Regular Expression:
Replacement: TOPON.S5.GGSN02.NODES.EPC.mnc045.mcc123.3GPPNETWORK.ORG

Query Name: sitt1.com.apn.epc.mnc045.mcc123.3gppnetwork.org
Query Type: NAPTR TTL: 42755 seconds
Answer:
Order: 20 Preference: 20
Flags: A Service: x-3gpp-pgw:x-s5-gtp:x-s8-gtp:x-gn:x-gp:x-3gpp-ggsn:x-gn:x-gp
Regular Expression:
Replacement: TOPON.S5.GGSN05.NODES.EPC.mnc045.mcc123.3GPPNETWORK.ORG

Query Name: sitt1.com.apn.epc.mnc045.mcc123.3gppnetwork.org
Query Type: NAPTR TTL: 42755 seconds
Answer:
Order: 30 Preference: 30
Flags: A Service: x-3gpp-pgw:x-s5-gtp:x-s8-gtp:x-gn:x-gp:x-3gpp-ggsn:x-gn:x-gp
Regular Expression:
Replacement: TOPON.S5.GGSN04.NODES.EPC.mnc045.mcc123.3GPPNETWORK.ORG

Query Name: TOPON.S5.GGSN04.NODES.EPC.mnc045.mcc123.3GPPNETWORK.ORG
Query Type: NAPTR TTL: 48993 seconds
Answer:
IP Address: 192.168.2.22

Query Name: TOPON.S5.GGSN03.NODES.EPC.mnc045.mcc123.3GPPNETWORK.ORG
Query Type: NAPTR TTL: 48993 seconds
Answer:
IP Address: 192.168.2.18

Query Name: TOPON.S5.GGSN05.NODES.EPC.mnc045.mcc123.3GPPNETWORK.ORG
Query Type: NAPTR TTL: 48993 seconds
Answer:
IP Address: 192.168.2.23

Query Name: TOPON.S5.GGSN02.NODES.EPC.mnc045.mcc123.3GPPNETWORK.ORG
Query Type: NAPTR TTL: 48993 seconds
Answer:
IP Address: 192.168.2.21

In summary, ensure that your DNS is configured like **x-3gpp-pgw:x-s5-gtp:x-s8-gtp:x-gn:x-gp:x-3gpp-ggsn:x-gn:x-gp** to avoid service disturbance when you have multiple GGSNs to support

geo-redundancy.