

# ASR5x00 Series: IP Allocation Failure Upon PDP Request Creation



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Contributed by Karuna Jha, Cisco TAC Engineer.  
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## Introduction

This document describes an IP address allocation failure that happens due to an unknown Packet Data Protocol (PDP) Type or PDP Type errors in GTP\_CREATE\_PDP\_RESPONSE. This problem is reported on Cisco Aggregation Services Router (ASR) 5x00 Series that works as a Gateway GPRS Support Node (GGSN).

## Problem

The User Equipment (UE) requests a static IP address <x.x.x.x>.

The user has static IP address allocation from Home Location Register (HLR)/Home Subscriber Server (HSS) for a particular Access Point Name (APN), so the end user is not supposed to be allocated with an IP address dynamically from GGSN.

This error was observed from the monitor subscriber which resulted in failure of the establishing session:

```
#Monitor subscriber Imsi <> (enable options x, a, y, verbosity 4)
```

```
-----  
Incoming Call:  
-----
```

```
MSID/IMSI : <>           Callid : <>  
IMEI : <>             MSISDN : <>  
Username : <>          SessionType : ggsn-pdp-type-ipv4  
Status : Active       Service Name: GGSN_SVC  
Src Context : <>  
-----
```

```
INBOUND>>>> 21:50:38:497 Eventid:47000(3)  
GTPC Rx PDU, from <IP>:34273 to <IP>:2123 (213)  
TEID: 0x00000000, Message type: GTP_CREATE_PDP_CONTEXT_REQ_MSG  
(0x10) >>>1st Create PDP Request  
Sequence Number:: 0x7B16 (31510)
```

```
<<<<OUTBOUND 21:50:38:501 Eventid:47001(3)  
GTPC Tx PDU, from <IP>:2123 to <IP>:34273 (103)  
TEID:0x179E3645, Message type: GTP_CREATE_PDP_CONTEXT_RES_MSG  
(0x11) >>>1st Create PDP Response
```

Sequence Number:: 0x7B16 (31510)

-----  
(Switching Trace) - New Incoming Call:  
-----

MSID/IMSI : <> Callid : <>  
IMEI : <> MSISDN : <>  
Username : <> SessionType : ggsn-pdp-type-ipv4  
Status : Active Service Name: GGSN\_SVC  
Src Context : <>  
-----

INBOUND>>>> 21:50:41:346 Eventid:47000(3)  
GTPC Rx PDU, from <IP>:34273 to <IP>:2123 (213)  
TEID: 0x00000000, Message type: GTP\_CREATE\_PDP\_CONTEXT\_REQ\_MSG  
(0x10) >>>2nd PDP Request  
Sequence Number:: 0x7B20 (31520)

\*\*\*CONTROL\*\*\* 21:50:41:360 Eventid:10083  
Sessmgr-80 Failed to allocate static IPv4 address <IP> mask 0xffffffff poolname  
<Pool\_name> for call (errcode=VPN\_MSG\_STATUS\_DUPLICATE\_INSTANCE)

<<<<OUTBOUND 21:50:41:363 Eventid:47001(3)  
GTPC Tx PDU, from <IP>:2123 to <IP>:34273 (103)  
TEID: 0x179E36C5, Message type: GTP\_CREATE\_PDP\_CONTEXT\_RES\_MSG  
(0x11) >>>2nd PDP Response  
Sequence Number:: 0x7B20 (31520)

INBOUND>>>> 21:58:04:155 Eventid:47000(3)  
GTPC Rx PDU, from <IP>:34273 to <IP>:2123 (16)  
TEID: 0x9D052050, Message type: GTP\_DELETE\_PDP\_CONTEXT\_REQ\_MSG (0x14)  
Sequence Number:: 0x801F (32799)

<<<<OUTBOUND 21:58:04:156 Eventid:47001(3)  
GTPC Tx PDU, from <IP>:2123 to <IP>:34273 (14)  
TEID: 0x179E36C5, Message type: GTP\_DELETE\_PDP\_CONTEXT\_RES\_MSG (0x15)  
Sequence Number:: 0x801F (32799)

\*\*\*CONTROL\*\*\* 21:58:04:170 Eventid:10285  
CALL STATS: msisdn <>, apn <apn\_name>, imsi <>, Call-Duration(sec): 443  
input pkts: 7 output pkts: 19  
input bytes: 301 output bytes: 928  
input bytes dropped: 0 output bytes dropped: 0  
input pkts dropped: 0 output pkts dropped: 0  
pk rate from user(bps): 0 pk rate to user(bps): 53  
ave rate from user(bps): 0 ave rate to user(bps): 26  
sust rate from user(bps): 0 sust rate to user(bps): 27  
pk rate from user(pps): 0 pk rate to user(pps): 0  
ave rate from user(pps): 0 ave rate to user(pps): 0  
sust rate from user(pps): 0 sust rate to user(pps): 0  
link online/active percent: 100  
ipv4 bad hdr: 0 ipv4 ttl exceeded: 0  
ipv4 fragments sent: 0 ipv4 could not fragment: 0  
ipv4 input acl drop: 0 ipv4 output acl drop: 0  
ipv4 bad length trim: 0  
ipv4 input non-mip drop: 0 ipv4 output non-mip drop: 0  
ipv4 input css drop: 0 ipv4 output css drop: 0  
output gre xoff pkts drop: 0 output gre xoff bytes drop: 0  
ipv4 output no-flow drop: 0  
ipv4 source violations: 0 ipv4 early pdu drop: 0

```

ipv4 proxy-dns redirect: 0
ipv4 proxy-dns drop: 0
ipv6 bad hdr: 0
ip source violation no acct: 0
dlnk pkts exceeded bw: 0
uplnk pkts exceeded bw: 0
Disconnect Reason: Remote-disconnect
Last Progress State: PDP-Type-IPv4-Connected
ipv4 proxy-dns pass-thru: 0
ipv4 proxy-dns redirect tcp connection: 0
ipv6 bad length trim: 0
ip source violation ignored: 0
dlnk pkts violated bw: 0
uplnk pkts violated bw: 0

```

When the error "Failed to allocate static IPv4 address <x.x.x.x> mask 0xffffffff poolname <pool\_name > for call (***errcode=VPN\_MSG\_STATUS\_DUPLICATE\_INSTANCE***)" occurred and the session creation failed, there was no Mobile Station (MS)/UE allocated with same IP address. This was verified with the ***show subscribers ip-address <x.x.x.x>*** command.

```

[local]ASR5x00#show subscribers ip-address <x.x.x.x>
No subscribers match the specified criteria

```

For every successful create PDP for the same user, the output of the ***show subscriber ip-address <x.x.x.x>*** command shows that the IP x.x.x.x was mapped with same International Mobile Subscriber Identity (IMSI).

```

[local]ASR5x00# show subscribers ip-address <x.x.x.x>

Sunday October 12 21:51:36 PDT 2014

+-----Access (S) - pdsn-simple-ip (M) - pdsn-mobile-ip (H) - ha-mobile-ip
|
|   Type: (P) - ggsn-pdp-type-ppp (h) - ha-ipsec (N) - lns-l2tp
|
|   (I) - ggsn-pdp-type-ipv4 (A) - asngw-simple-ip (G) - IPSP
|
|   (V) - ggsn-pdp-type-ipv6 (B) - asngw-mobile-ip (C) - cscf-sip
|
|   (z) - ggsn-pdp-type-ipv4v6
|
|   (R) - sgw-gtp-ipv4 (O) - sgw-gtp-ipv6 (Q) - sgw-gtp-ipv4-ipv6
|
|   (W) - pgw-gtp-ipv4 (Y) - pgw-gtp-ipv6 (Z) - pgw-gtp-ipv4-ipv6
|
|   (@) - saegw-gtp-ipv4 (#) - saegw-gtp-ipv6 ($) - saegw-gtp-ipv4-ipv6
|
|   (p) - sgsn-pdp-type-ppp (s) - sgsn (4) - sgsn-pdp-type-ip
|
|   (6) - sgsn-pdp-type-ipv6 (2) - sgsn-pdp-type-ipv4-ipv6
|
|   (L) - pdif-simple-ip (K) - pdif-mobile-ip (o) - femto-ip
|
|   (F) - standalone-fa (J) - asngw-non-anchor
|
|   (e) - ggsn-mbms-ue (i) - asnpc (U) - pdg-ipsec-ipv4
|
|   (E) - ha-mobile-ipv6 (T) - pdg-ssl (v) - pdg-ipsec-ipv6
|
|   (f) - hnbgw-hnb (g) - hnbgw-iu (x) - s1-mme
|
|   (a) - phsgw-simple-ip (b) - phsgw-mobile-ip (y) - asngw-auth-only
|
|   (j) - phsgw-non-anchor (c) - phspc (k) - PCC
|
|   (X) - HSGW (n) - ePDG (t) - hnbgw-ue
|
|   (m) - hnbgw-sg
|
|   (D) - bng-simple-ip (l) - pgw-pmip (u) - Unknown

```

```

|
|+----Access (X) - CDMA 1xRTT (E) - GPRS GERAN (I) - IP
|| Tech: (D) - CDMA EV-DO (U) - WCDMA UTRAN (W) - Wireless LAN
|| (A) - CDMA EV-DO REVA (G) - GPRS Other (M) - WiMax
|| (C) - CDMA Other (N) - GAN (O) - Femto IPsec
|| (P) - PDIF (S) - HSPA (L) - eHRPD
|| (T) - eUTRAN (B) - PPPoE (F) - FEMTO UTRAN
|| (H) - PHS (.) - Other/Unknown
||

```

```

||+----Call (C) - Connected (c) - Connecting
||| State: (d) - Disconnecting (u) - Unknown
||| (r) - CSCF-Registering (R) - CSCF-Registered
||| (U) - CSCF-Unregistered
|||

```

```

|||+---Access (A) - Attached (N) - Not Attached

```

```

|||| CSCF (.) - Not Applicable

```

```

|||| Status:

```

```

||||+--Link (A) - Online/Active (D) - Dormant/Idle

```

```

||||| Status:

```

```

|||||+Network (I) - IP (M) - Mobile-IP (L) - L2TP

```

```

||||||Type: (P) - Proxy-Mobile-IP (i) - IP-in-IP (G) - GRE

```

```

|||||| (V) - IPv6-in-IPv4 (S) - IPSEC (C) - GTP

```

```

|||||| (A) - R4 (IP-GRE) (T) - IPv6 (u) - Unknown

```

```

|||||| (W) - PMIPv6(IPv4) (Y) - PMIPv6(IPv4+IPv6) (R) - IPv4+IPv6

```

```

|||||| (v) - PMIPv6(IPv6)

```

```

vvvvvv CALLID MSID USERNAME IP TIME-IDLE
-----

```

```

IECNAI <> <> name@apn_name x.x.x.x 00h00m57s

```

From the traces it was observed that there was a very short time (~20ms) between the deletion and creation of the PDP. This is why the gateway rejected the PDP with the error code

## ***VPN\_MSG\_STATUS\_DUPLICATE\_INSTANCE.***

### Initial APN Configuration

```
apn apn_name

    bearer-control-mode mixed

    selection-mode subscribed sent-by-ms chosen-by-sgsn

    accounting-mode none

    gtpv group CGF1 accounting-context <context_name>
    gtpv group CGF2 accounting-context <context_name>
    gtpv group CGF3 accounting-context <context_name>
    gtpv group CGF4 accounting-context <context_name>

    idle-timeout-activity ignore-downlink

    apn-ambr rate-limit direction downlink burst-size auto-readjust
duration 1 violate-action drop

    apn-ambr rate-limit direction uplink burst-size auto-readjust
duration 1 violate-action drop

    ims-auth-service <service name>

    timeout idle 14400

    ip access-group onegas.com in
    ip access-group onegas.com out

    ip source-violation check drop-limit 0

    ip context-name <context name>

    ip address pool name <pool name>

    active-charging rulebase <Rulebase>

exit
```

One thought is to reduce the address-hold-timer, but the concept of "address-hold-timer" is applicable only for Dynamic IP address allocation and not for static allocation.

This was checked in the lab also:

```
[Gi](config-ctx)#
    ip pool SIMPLE-POOL a.b.c.d 255.255.0.0 static address-hold-timer 100
```

Failure: Hold timer can not be configured for this pool

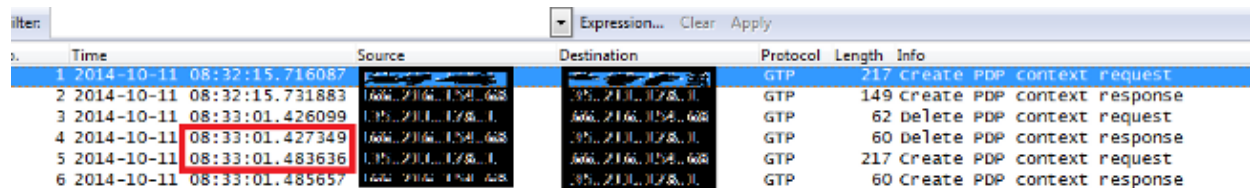
**Note:** When the "address-hold-timer" is enabled and an active subscriber is disconnected, the IP address is held or considered still in use and is not returned to the free state until the address-hold-timer expires. This enables subscribers who reconnect within the length of time specified (in seconds) to obtain the same IP address from the IP pool.

## Root Cause

When there is a small time gap between the Delete PDP Request (DPR) and the Create PDP Request (CPR) for the same IMSI, the Radius Server returns the same static address.

When DPR is received by the ASR 5x00 it processes the DPR and accepts a new CPR, but meanwhile it still holds the static IP address and takes some time (250ms) for the vpnmgr to release/flush the address. Since the new CPR comes before this flush completes, the ASR 5x00 rejects the new CPR.

In this case, the time gap between deletion of the PDP and creation of the PDP is very small.



No.	Time	Source	Destination	Protocol	Length	Info
1	2014-10-11 08:32:15.716087			GTP	217	Create PDP context request
2	2014-10-11 08:32:15.731883	100.210.128.68	35.211.128.1	GTP	149	Create PDP context response
3	2014-10-11 08:33:01.426099	100.210.128.1	100.210.128.68	GTP	62	Delete PDP context request
4	2014-10-11 08:33:01.427349	100.210.128.68	35.211.128.1	GTP	60	Delete PDP context response
5	2014-10-11 08:33:01.483636	100.210.128.1	100.210.128.68	GTP	217	Create PDP context request
6	2014-10-11 08:33:01.485657	100.210.128.68	35.211.128.1	GTP	60	Create PDP context response

In the packet capture diagram, you can see that the time gap (shown in the red block) between delete PDP and create PDP is very small.

You should expect a delay of 250 ms between deletion and creation for the IP address allocation for the same address to be successful.

This is the design requirement for the distributed architecture. See the workaround in the Solution section in order to avoid any impact for the static address allocation.

## Solution

See this configuration workaround applied on the gateway.

```
config
    context <>
        ggsn-service <>
            newcall duplicate-subscriber-requested-address accept
        exit
```

This command enables or disables new call connections, when the UE is not able to gracefully disconnect from the enterprise Packet Data Network (PDN) before it attempts to reconnect via another access method. When enabled, this command tears down the old session in order to accept the new connection with the same IP address assignment.

This command also allows the GGSN to accept a request for a static subscriber address, even if the address is already used by another session. If this feature is not enabled, a new request with the same IP address for another session will be rejected.