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Introduction

This article explains the difference in session counts between show sub and show session progress commands on an HSGW.

Call ID is the entity used on ASR5K platform to represent a call session. On Packet Data Network Gateway (PGW), there is a unique Call ID for each Application Point Name (APN) connection for a particular subscriber International Mobile Session Identifier (IMSI). Conversely, on an eHRPD Serving Gateway (HSGW), all the APNs share the same Call ID for an IMSI. Since show sub commands report on a sub-session basis, the counts from this command properly reflect the total number of APN connections. Conversely, show session progress reports on a Call ID basis, and so counts will be lower than compared with PGW and will not reflect the total number of APNs.

Explanation

On a PGW, APN connections are counted separately from one another for the same IMSI for show subscriber commands and "show session progress". Here is an example of a single subscriber connected over three different APNs, and therefore assigned three separate Call IDs. Note the values for the Call IDs can be close in proximity for a given IMSI.

```
[local]PGW> show sub pgw-only imsi 311480131055555
Tuesday June 09 13:41:24 UTC 2015
+-----Access      (W) - pgw-gtp-ipv4          (Y) - pgw-gtp-ipv6
|       Type:      (Z) - pgw-gtp-ipv4-ipv6    (X) - pgw-pmip-ipv4
|       (U) - pgw-pmip-ipv6          (V) - pgw-pmip-ipv4-ipv6
|       (.) - Unknown
|
+-----Access      (U) - UTRAN          (G) - GERAN
|       Tech:      (W) - WLAN           (N) - GAN
|       (U) - HSPA Evolution        (E) - eUTRAN
|       (H) - eHRPD            (.) - Unknown
|
||+----Call       (C) - Connected        (c) - Connecting
|||       State:     (d) - Disconnecting   (u) - Unknown
|||
|||+---PLMN:      (H) - Home           (V) - Visiting
|||        (R) - Roaming         (u) - Unknown
|||
|||+---Bearer:    (D) - Default         (E) - Dedicated
|||        Type
|||
|||+--Emergency: (A) - Authentic IMSI  (U) - Un-Authentic IMSI
|||        Bearer      (O) - Only IMEI    (N) - Non-Emergency
```

```

||||| Type
|||||
||||| Addr      (L) - Local pool
||||| Type:     (S) - Static (Subscriber Supplied)
|||||           (u) - Unknown
||||| |
||||| |
||||| +-----+
|||||   EBI-----+   |
|||||           |   |
vvvvvvv CALLID    IMSI/IMEI          v   v  IP
APN          TIME-IDLE
-----
YECHDN 4d9c05f3 311480131055555 005 L
2600:5555:8007:71a5:0:4d:9c05:f301 APN1 00h16m27s
ZECHDN 4d9c0c9e 311480131055555 006 L
2600:5555:b02f:6bec:0:4d:9c0c:9e01, 100.123.165.246 APN2 00h00m43s
ZECHDN 4da040b5 311480131055555 007 L
2600:5555:9006:9f:0:4d:a040:b501, 10.150.22.115 APN3 00h00m45s

```

In the following output, Long Term Evolution (LTE) (gtp) and Evolved High Rate Packet Data (eHRPD) (pmip) counts are seen on a PGW. The values can be corroborated between show sub sum and show session progress:

```
[local]PGW> show subscriber summary

Total Subscribers: 3822449

Active: 3822449
Dormant: 0

pdsn-simple-ipv4: 0 pdsn-simple-
ipv6: 0

pdsn-mobile-ip: 0 ha-mobile-
ipv6: 0

hsgw-ipv6: 0 hsgw-
ipv4: 0

hsgw-ipv4-ipv6: 0 pgw-pmip-
ipv6: 258454

pgw-pmip-ipv4: 209 pgw-pmip-ipv4-
ipv6: 220120

pgw-gtp-ipv6: 1793806 pgw-gtp-
ipv4: 6701

pgw-gtp-ipv4-ipv6: 1543679 sgw-gtp-
ipv6: 0
```

```
[local]PGW> show session progress
```

3821347 In-progress calls

6909 In-progress calls @ PDN-TYPE-IPv4 CONNECTED state

2051456 In-progress calls @ PDN-TYPE-IPv6 CONNECTED state

1762878 In-progress calls @ PDN-TYPE-IPv4+IPv6 CONNECTED state

So:

1793806 + 258454 = 2052260

1543679 + 220120 = 1763799

As mentioned, on an HSGW, the same Call ID is shared for all APNs belonging to a given IMSI. The reason for this is that at the time the session is created, when the initial RRQ comes in and initiates the authentication to AAA (over STa), the HSGW only knows about the IMSI. The APN info comes later when PPP VSNCP phase starts. Hence all the APNs (i.e PDN) which belong to the same IMSI are treated as one session on the HSGW.

In this output there are two subscribers each connected via two APNs, and while the APN names are NOT tracked by the HSGW, their IP types (IPv4, IPv6, or IPv4+IPv6) are known and show sub commands properly reflect that:

```
[  
+----Access (S) - pdsn-simple-ip (M) - pdsn-mobile-ip (H) - ha-  
mobile-ip  
| Type: (P) - ggsn-pdp-type-ppp (h) - ha-ipsec (N) - lns-  
12tp  
| (I) - ggsn-pdp-type-ipv4 (A) - asngw-simple-ip (G) - IPSG  
| (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  
| (&) - cgw-gtp-ipv4 (^) - cgw-gtp-ipv6 (*) - cgw-  
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) -
henbgw-ue	(m) - henbgw-henb	(q) - wsg-simple-ip	(r) -
samog-pmip	(D) - bng-simple-ip	(l) - pgw-pmip	(u) -
Unknown	(+) - samog-eogre		
+---Access	(X) - CDMA 1xRTT	(E) - GPRS GERAN	(I) - IP
Tech:	(D) - CDMA EV-DO	(U) - WCDMA UTRAN	(W) -
Wireless LAN	(A) - CDMA EV-DO REV-A	(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	(Q) - WSG	(.) -
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)	(/) - GTPv1 (For SAMOG)	(+) -
GTPv2 (For SAMOG)			

vvvvvv	CALLID	MSID	USERNAME	IP
XLCNDv	00004e76	311286039685555	6311480126445555@nai.epc.mnc480.mcc311.3gppnetwork.org	
	2600:5555:8020:334c:0:e:b6b5:aa01			
XLCNDv	00004e76	311286039685555	6311480126445555@nai.epc.mnc480.mcc311.3gppnetwork.org	
	2600:5555:b027:6f8e:0:e:b6cd:1a01,	100.121.59.239		

XLCNDv 0000501c 311289787584444 6311480085164444@nai.epc.mnc480.mcc311.3gppnetwork.org

2600:5555:8027:c7da:0:20:996b:cd01
XLCNDY 0000501c 311289787584444 6311480085164444@nai.epc.mnc480.mcc311.3gppnetwork.org
2600:5555:b020:1fbc:0:20:996c:4201, 100.82.205.107

Comparing output from "show sub summary" and "show session progress", the latter output reports much lower numbers for SIMPLE-IPv6 than for the analogous hsgw-ipv6 from show sub summary ...

Note that the count for hsgw-ipv4-ipv6 is essentially the same as SIMPLE-IPv4+IPv6, while hsgw-ipv6 is much larger than SIMPLE-IPv6. As it turns out, if a particular IMSI is connected as an IPv4/IPv6-based APN, then it gets counted under SIMPLE-IPv4+IPv6, while if it is ALSO connected as an IPv6-based APN (i.e. the IMS session), then it does NOT also get counted as SIMPLE-IPv6. It only gets counted as SIMPLE-IPv6 if there is no corresponding IPv4+IPv6 (or IPv4) connection. In other words, show session progress will only report one call per IMSI, regardless of the number of APN connections for that IMSI. This ultimately stems from the fact that there is one Call ID per IMSI on HSGW.

[HSGWin] HSGW> show sub summary

Total Subscribers:	460307	
Active:	39756	Dormant:
420551		
hsgw-ipv6:	247972	hsgw-ipv4:
1632		
hsgw-ipv4-ipv6:	209968	pgw-pmip-
ipv6:	0	

[HSGWin] HSGW> show session progress

255045	In-progress calls
20713	In-progress active calls
234332	In-progress dormant calls
811	In-progress calls @ LCP-NEG state
84	In-progress calls @ LCP-UP state
276	In-progress calls @ AUTHENTICATING state
0	In-progress calls @ BCMCS SERVICE AUTHENTICATING state
270	In-progress calls @ AUTHENTICATED state
72	In-progress calls @ SIMPLE-IPv4 CONNECTED state
43944	In-progress calls @ SIMPLE-IPv6 CONNECTED state
209555	In-progress calls @ SIMPLE-IPv4+IPv6 CONNECTED state

The above is made clearer when looking at the output from a combo HSGW-PGW LAB node with one only connected IMSI with three APNs. show sub summary reports ALL six sub-sessions, three for HSGW and three for PGW. The underlying difference is that the HSGW sessions all share the same Call ID, while for the PGW the Call IDs are unique.

Meanwhile for "show session progress", four calls are reported, three for the APNs on PGW, and one for the IPv4+IPv6 APN on the HSGW which effectively represents ALL three HSGW APNs, giving a total of four sessions instead of the actual six reported by show sub commands.

```
[local]ASR# show sub summary

Total Subscribers: 6
Active: 6 Dormant: 0
hsgw-ipv6: 1      hsgw-ipv4: 1
hsgw-ipv4-ipv6: 1 pgw-pmip-ipv6: 1
pgw-pmip-ipv4: 1      pgw-pmip-ipv4-ipv6: 1

[local]ASR# show session progress

4 In-progress calls
 4 In-progress active calls

1 In-progress calls @ SIMPLE-IPv4+IPv6 CONNECTED state << Accounts for
HSGW session

1 In-progress calls @ PDN-TYPE-IPv4 CONNECTED state
1 In-progress calls @ PDN-TYPE-IPv6 CONNECTED state
1 In-progress calls @ PDN-TYPE-IPv4+IPv6 CONNECTED state
```