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| **SUMMA HSS 4.1.0 Installation and Casa NSA Solution** |
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# Scope

This document contains MOP (method of procedure) for SUMMA HSS installation, EPC and HSS configuration for 5G NR NSA (Non-Standalone) feature and Spirent landslide simulation of NSA test cases. Also, it provides the information about the 5G NR Non-Standalone (NSA) solution, related components and deployment procedure.

## Software Versions

Following entities used in this NSA test execution.

|  |  |
| --- | --- |
| Network Element | SW Version |
| Suma HSS | V4.1.0 |
| MME | 4.9.3-1623S |
| SAEGW-C | 5.0.0-225 |
| SGW-U | 5.0.0-225 |
| PGW-U | 5.0.0-225 |
| Spirent Landslide | 19.2.0 GA |
| Spirent TAS | 19.2.0.5 |

# Installation and Provisioning of Summa HSS 4.1.0

## Pre-Requisites

This MOP is created for KVM based installation. It is assumed that Ubuntu 16.04, KVM/QEMU, libvirt, virt-manager and bridge utilities and ready to deploy from KVM GUI.

1. Image Location: SharePoint
2. Check md5sum of the image:

**md5sum HSS\_NSA\_08232020.qcow2**

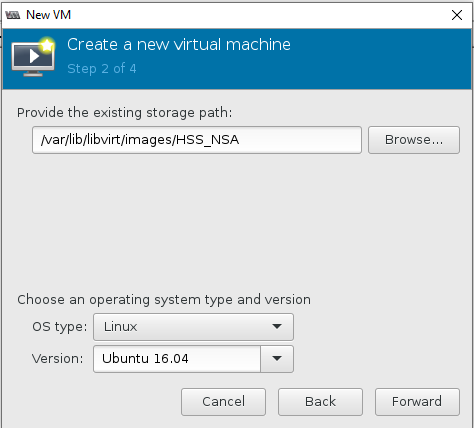
*1d1731c76bfb69139e80d9fe0f8f8266 HSS\_NSA\_08232020.qcow2*

## Installation Steps

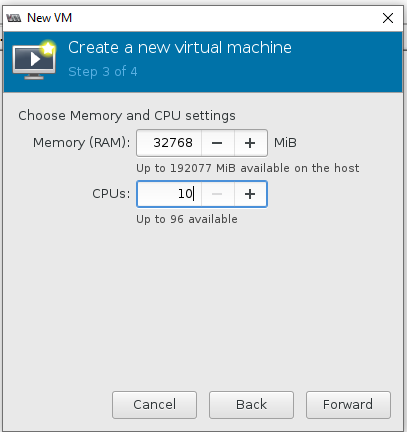
1. Upload HSS\_NSA to /var/lib/libvirt/images.
2. Start creating the new VM on the virt-manager GUI. Select the “Create a new virtual machine” on the virt-manager GUI and “Import existing disk image” to load the corresponding qcow2 file.



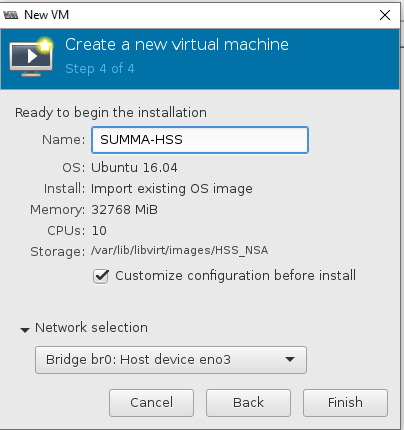
1. Select the appropriate qcow2 file for SUMMA HSS “Linux” as the OS type and “Ubuntu 16.04” as the version.



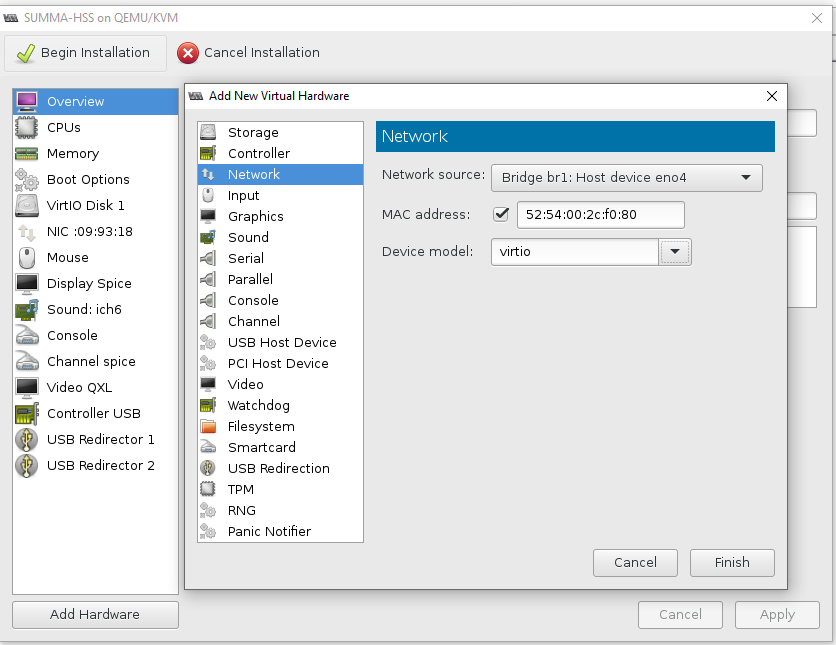
1. Set the appropriate amount of Memory (32768 MB) assigned and vCPU (10) counts. Press “Forward’.



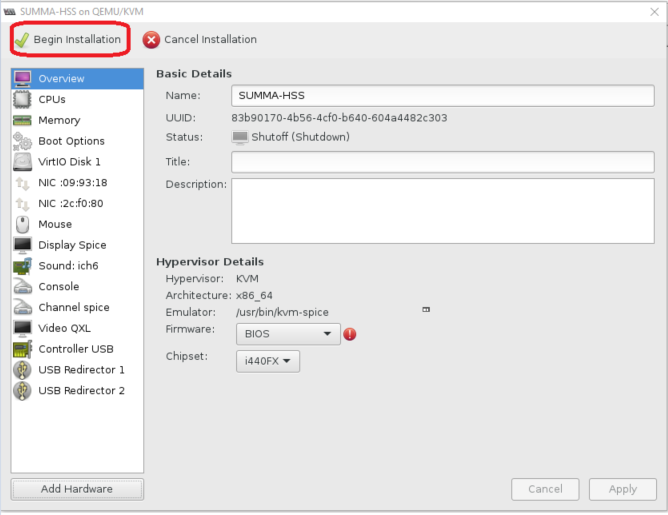
1. Specify the appropriate name (e.g. SUMMA\_HSS\_4.0) and configure the management interface (i.e. Bridge br0: Host device enp0s3) and check “customize configuration before install”. Press ‘Finish’.



6. Add the additional network for each of feature. Select “Add Hardware”  Network  “Bridge br1: Host device enp04” with “virtio” as “Device model and click finish.



1. Select “Begin Installation”.



## HSS Post-Install Configuration

1. Login to the HSS console through KVM to update the OAM IP.

Username: root

Password: casahss

1. Once boot the VM an IP address 10.46.201.121 may come up with the VM, you must change it adding the IP address for management on the guest OS.
2. To identify which network device has been identified during the boot.

***ifconfig -a***

***eth6*** *Link encap:Ethernet HWaddr 52:54:00:70:14:D6*

*inet addr:net Bcast:10.46.201.255 Mask:255.255.255.0*

*inet6 addr: fe80::5054:ff:fe70:14d6/64 Scope:Link*

*UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1*

*RX packets:1008 errors:0 dropped:0 overruns:0 frame:0*

*TX packets:2225 errors:0 dropped:0 overruns:0 carrier:0*

*collisions:0 txqueuelen:1000*

*RX bytes:133127 (130.0 KiB) TX bytes:2551212 (2.4 MiB)*

*Interrupt:11*

***lo*** *Link encap:Local Loopback*

*inet addr:127.0.0.1 Mask:255.0.0.0*

*inet6 addr: ::1/128 Scope:Host*

*UP LOOPBACK RUNNING MTU:65536 Metric:1*

*RX packets:26386 errors:0 dropped:0 overruns:0 frame:0*

*TX packets:26386 errors:0 dropped:0 overruns:0 carrier:0*

*collisions:0 txqueuelen:0*

*RX bytes:12151954 (11.5 MiB) TX bytes:12151954 (11.5 MiB)*

NOTE: see that this VM came up with the device as **eth6**

1. Go to ***cd /******etc/sysconfig/network-scripts/*** and modify the file ifcfg-eth0

*DEVICE=eth6 🡪 Change it to device that came up in the VM.*

*TYPE=Ethernet*

*ONBOOT=yes*

*NM\_CONTROLLED=no*

*BOOTPROTO=static*

*DEFROUTE=yes*

*IPADDR=10.46.200.121 🡪 use the ip address assigned to the HSS VM*

*NETMASK=255.255.255.0 🡪 use the ip address assigned to the HSS VM*

*GATEWAY=10.46.200.240 🡪 use the deauft gtw assigned to the HSS VM*

*DNS1=8.8.8.8 🡪 Set a DNS.*

1. After changing the IP address reboot the VM.
   1. # ***Reboot***
   2. The VM shall come up with the IP assigned in the ifcfg-eth0
2. Login to the HSS using SSH to the MGMT IP that was just configured above as shown below. Password is

Username: root

Password: casahss.

1. Bootstatp the cluster by using below command:

***service mysql bootstrap-pxc***

*Bootstrapping PXC (Percona XtraDB Cluster)MySQL (Percona Xt[FAILED]ster) is not running, but lock file (/var/lock/subsys/mysql) exists*

*Starting MySQL (Percona XtraDB Cluster)....................[ OK ]*

*This command and other services hss-gui-admin and hss-core need to start after every reboot of the VM.*

1. Change app server address in hss.properties file

***cd /opt/summa/hss/config***

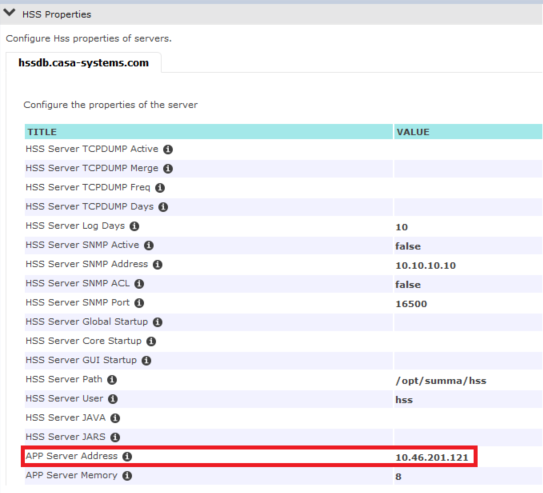
***vi hss.properties***

*# Server properties*

*###########################################################*

*app.server.address=10.46.201.130* *🡪 change it to correct IP address in your deployment*

*System>>Properties Configurator>>HSS Properties*



1. Change diameter host address in diameter.properties file

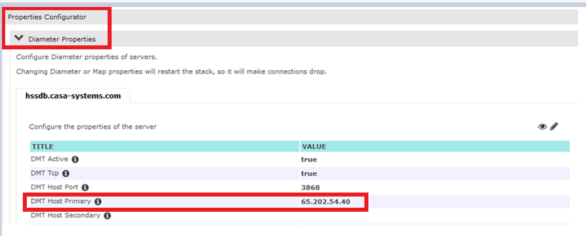
***cd opt/summa/hss/config***

***vi diameter.properties***

*#The primary IP address in which the Diameter stack is configured. Used for both TCP and SCTP.*

*dmt.host.primary=65.202.54.41🡪 change it to correct IP address*

*System>>Properties Configurator>>HSS Properties*



1. Start HSS-core service

***service hss-core start***

*Configuration: Link for web.xml is: OK*

*Configuration: Link for server.xml is: OK*

*Configuration: Link for context is: OK*

*Starting the OS Configuration check.*

*Configuration: Root user is: OK*

*Configuration: sudo command is: OK*

*Configuration: hss user is: OK*

*=================================*

*=================================*

*Summa HSS Service file found: /opt/summa/hss/release/hss-4.1.0.0-SNAPSHOT.jar*

*Summa HSS is starting...*

*[root@hssdb.casa-systems.com:~]Started recording 1.*

*Use jcmd 4580 JFR.dump name=1 to copy recording data to file.*

*SYO-HssApplication():::::::::::: Entering in main*

*SYO-HssApplication(): Configuring log4j using file /opt/summa/hss/config/log4j.xml*

*SYO-HssApplication(): Configured. Testing...*

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1. After execution of step 10, **other services may take about 5 mins to initiate**. Confirm if below services are running.

***service hss-gui-admin status***

***service hss-core status***

***service mysql status***

If GUI does not work,check /var/logs/hss/XXX.log or try restarting HSS-GUI and hss-core services based on the error or check with HSS support team.

***service hss-gui-admin restart***

***service hss-core restart***

## GUI Provisioning and Validation

This section provides information about provisioning and new AVP validation.

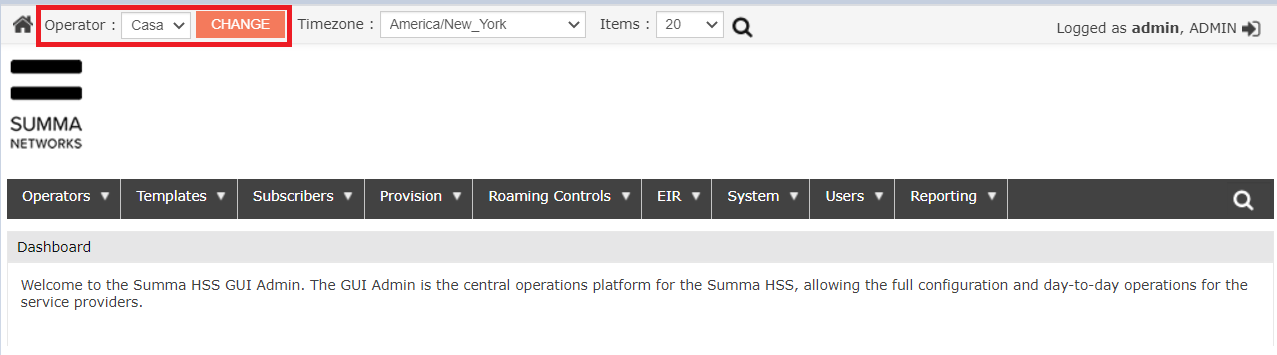
1. Open GUI page in your browser (Mozilla recommended) and access to “http://[management\_IP]:7070/summa-hss-admin/login.html” for provisioning.

E.g: <http://10.46.200.130:7070/summa-hss-admin/login.html>

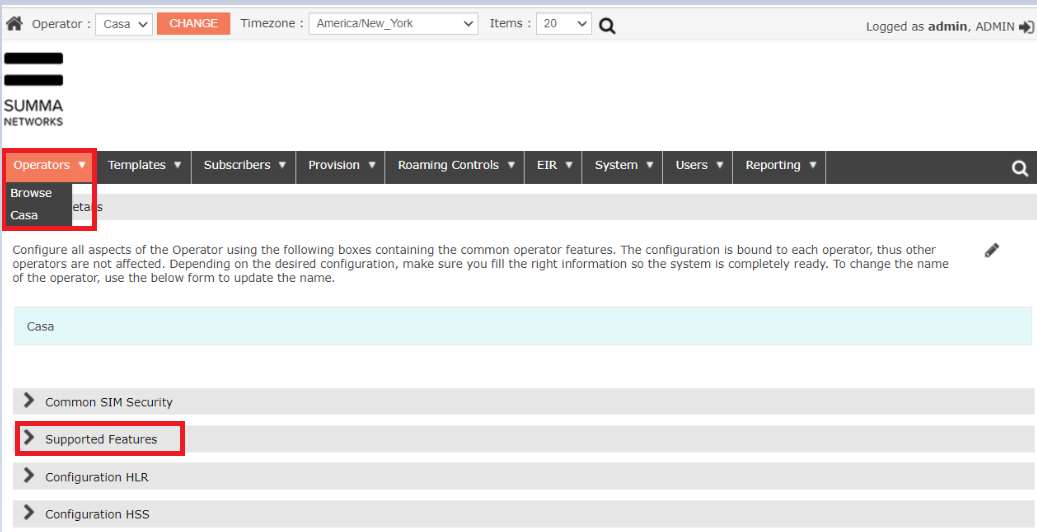
Username: admin

Password: Admin1234

1. On the top of the screen select ‘Operator’ as ‘Casa’ and click ‘CHANGE’.



1. Select ‘Operators’ Casa and then go to ‘Supported Features’.



1. Select ‘S6a Supported Features’ and ensure ‘NR As Secondary RAT’ is checked.



## Subscriber Provisioning and Introduction of new AVPs

1. **Subscriber Templates**: Select Provision>>Provisioning and upload XML files of IMSI-SIM and MSISDN.

**Note: SW version 4.1.0 needs additional line of wlan Template in MSISDN & Subscriptions XML.**

<imsiSubscription>

<imsi>311391920015003</imsi>

<hlrTemplate>HLR\_TPL\_00</hlrTemplate>

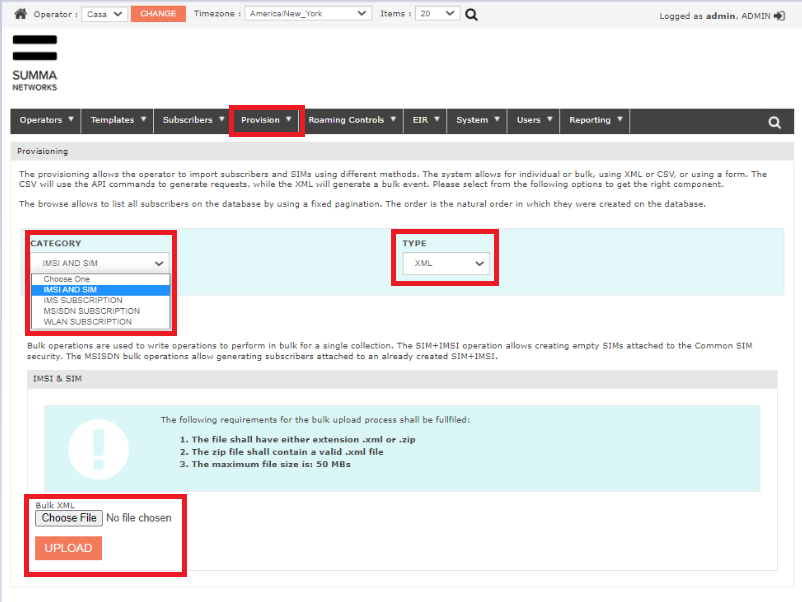
<imsTemplate></imsTemplate>

<lteTemplate>LTE\_TPL</lteTemplate>

**<wlanTemplate></wlanTemplate>**

<roamingProfile>Roam\_PFL</roamingProfile>

</imsiSubscription>



**Sample MSISDN & Subscriptions and SIM-IMSI XMLs**

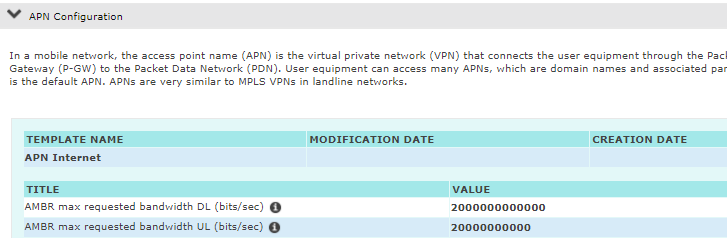
1. ENDC AVPs Configuration:

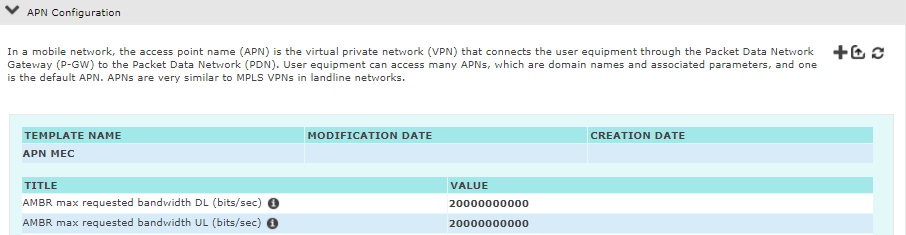
**Extended-Max-Requested-BW-(UL/DL):**As per 3GPP spec 29272 Rel-15, when the maximum bandwidth value to be set for UL (or DL, respectively) traffic is lower than 4294967296 bits per second, the Max-Requested-Bandwidth-UL (or -DL, respectively) AVP shall be present, and set to the requested bandwidth value in bits per second, and the Extended-Max-Requested-BW-UL (or -DL, respectively) AVP shall be absent.

When the maximum bandwidth value to be set for UL (or DL, respectively) traffic is higher than 4294967295 bits per second, the Max-Requested-Bandwidth-UL (or DL, respectively) AVP shall be present, and set to its upper limit 4294967295, and the Extended-Max-Requested-BW-UL (or -DL, respectively) shall be present, and set to the requested bandwidth value in kilobits (1000 bits) per second.

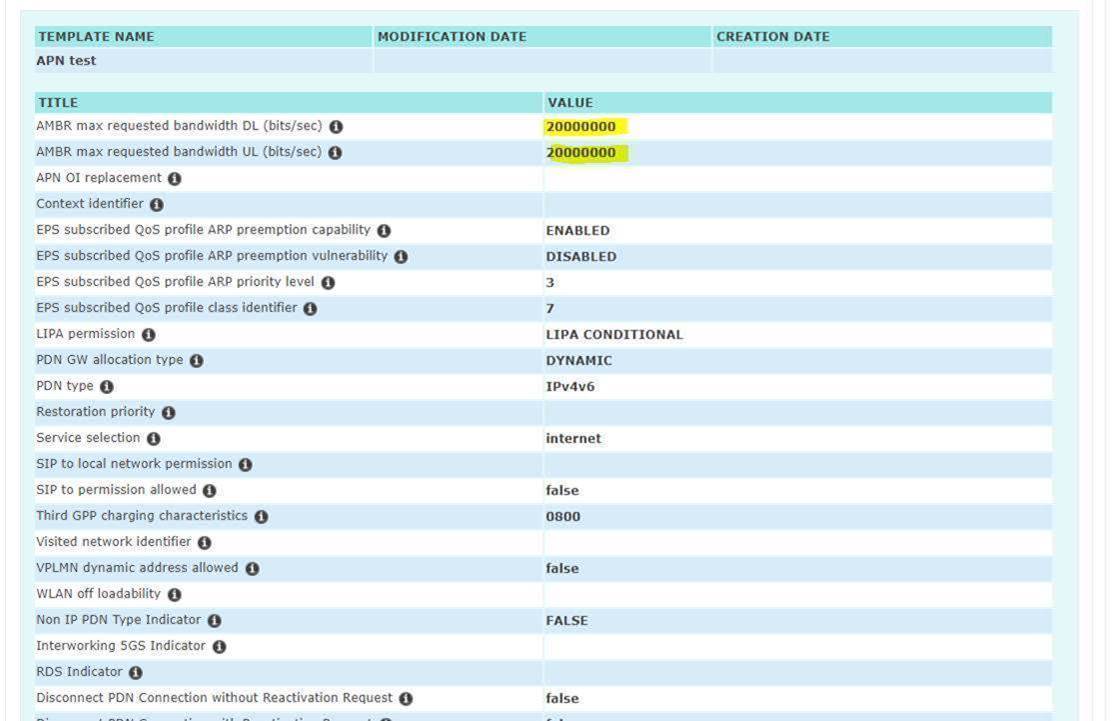
To send Extended-Max-Requested-BW-UL and Extended-Max-Requested-BW-DL in Update Location Answer(ULA) response from HSS to MME, APN AMBR and Subscribed UEAMBR AVPs need to modify with appropriate values.

Templates>>Individual Templates>>APN Configuration

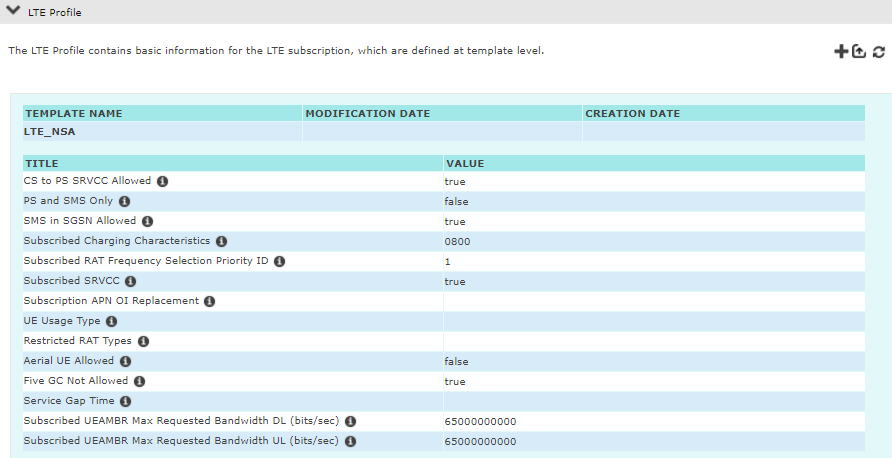




If you change the value in APN configuration as like below then HSS doesn’t send Extended-Max-Requested-BW-UL and DL. This is because APN AMBR max requested bandwidth DL and UL are less than 4294967296 bits/sec.



Templates>>Individual Templates>>LTE Profile



**NR as Secondary RAT:** This feature is applicable to the ULR/ULA over S6a when the MME supports NR as Secondary RAT. If the MME support this feature, the HSS shall send (in ULA) in subscription data related to NR as Secondary RAT.

NR as Secondary RAT needs to enable at each supported PLMN level.

Roaming Controls>>PLMNs>>PLMNs (e.g.31139)>>S6a Supported Features.



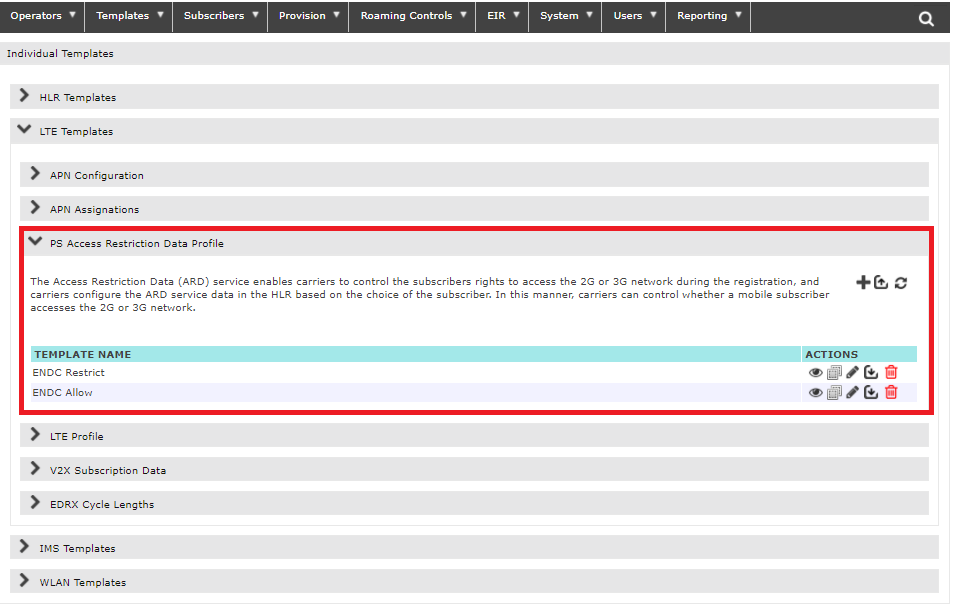
.

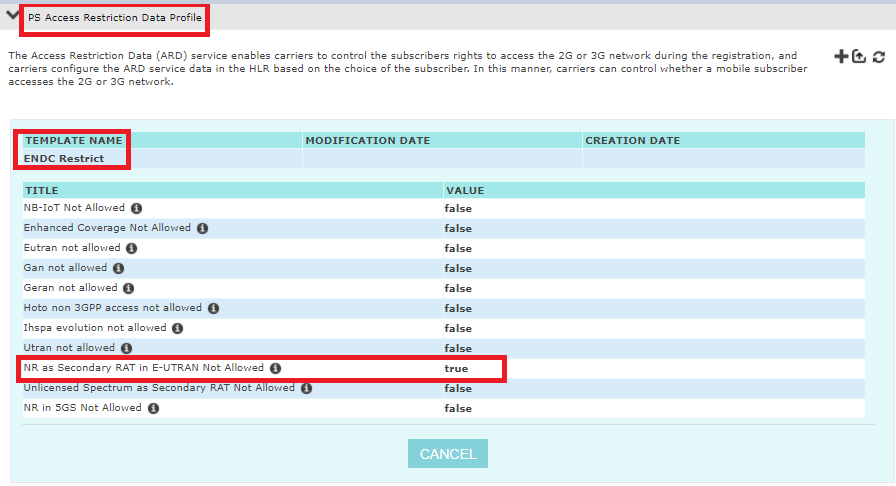
**Access-Restriction-Data (ARD):** The Access-Restriction-Data AVP is of type Unsigned32 and it shall contain a bit mask where each bit when set to 1 indicates a restriction. If the user is not provisioned to support ENDC then HSS should send ‘NR as Secondary RAT Not Allowed’ set to 1. For other users which are provisioned with ENDC, HSS should send’ NR as Secondary RAT Not Allowed’ set to 0.

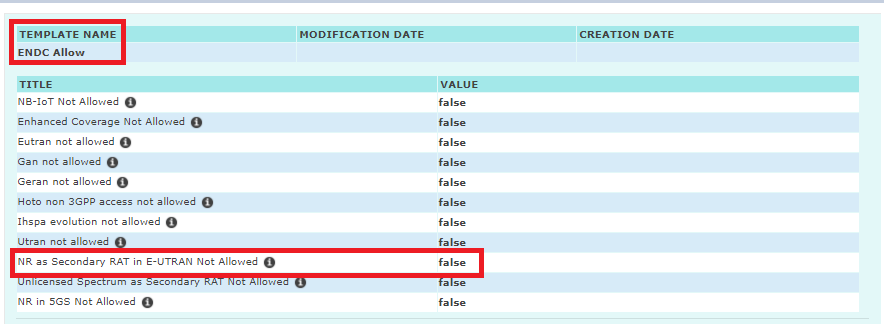
To support this feature, two ‘Access Restriction Data’ profiles need to configure, one is ENDC allowed and another is ENDC restrict. These profiles further need to associate with separate LTE templates.

Individual Templates:

Templates>>Individual Templates>>PS Access Restriction Data Profile

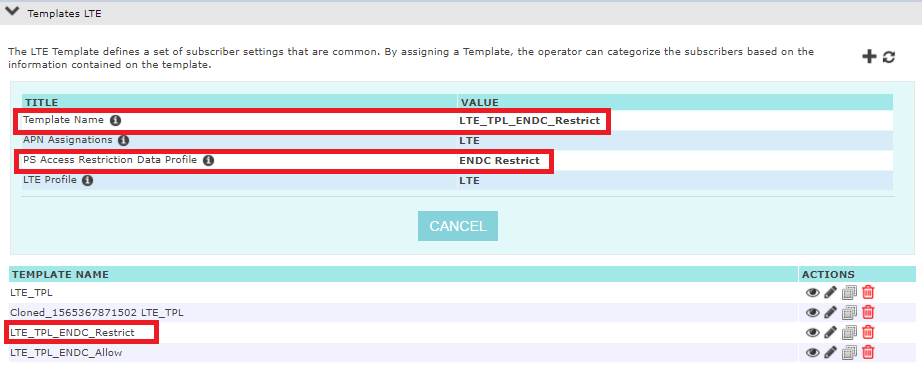


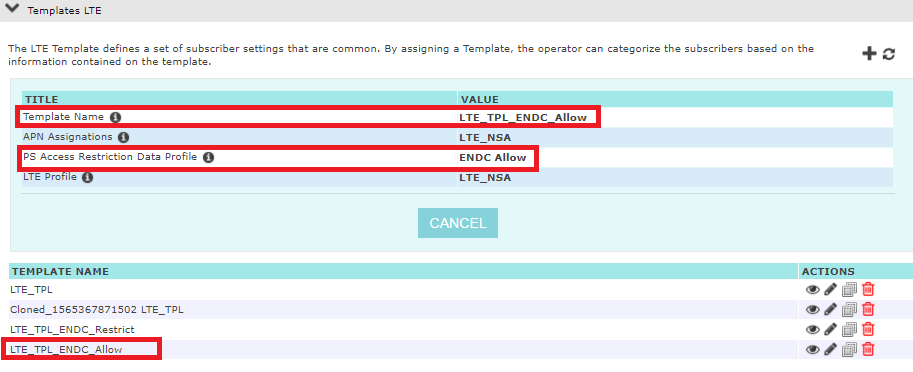




Provisioning Templates:

Templates>>Provisioning Templates>>Templates LTE





**Sample MSISDN & Subscriptions and SIM-IMSI XMLs with ARD profiles associations**

**   **

**How to apply ARD profile to group of subscribers using bulk operations?**

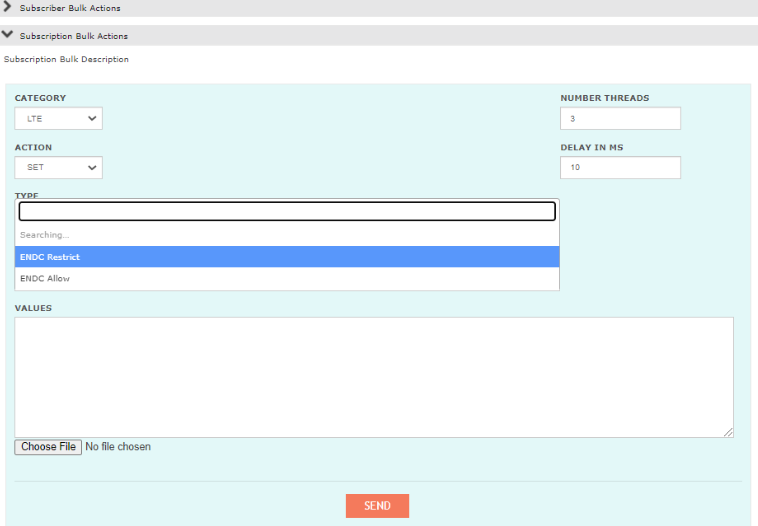
* 1. Identify IMSIs to be provisioned.

mysql -u<user> -p<password> hss -e "select imsi from Imsi" > /tmp/outputfile

e.g. mysql -uhss -pYzMwNjdmNm hss -e "select imsi from Imsi" > /tmp/output

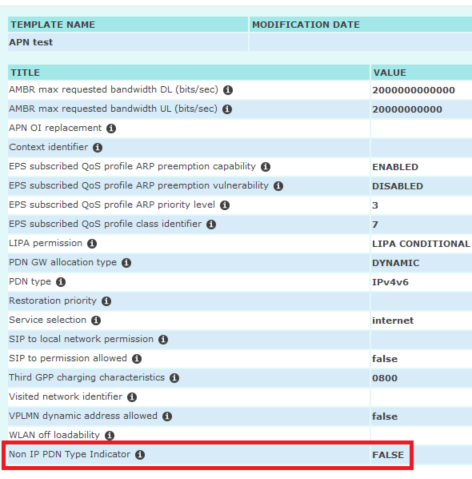
* 1. Use above output file and paste in ‘values’ form in below screenshot (Subscribers>>Bulk Operations>> Subscription Bulk Actions)
  2. Or use below template to upload as csv file.





**Non-IP-PDN-Type-Indicator**: The Non-IP-PDN-Type-Indicator AVP indicates whether the APN has a Non-IP PDN type. Values defined are: FALSE (0) and TRUE (1). This field should set as FALSE if ‘NON-IP PDN Type APNs’ set to 0 in Update Location request (ULR).

Templates>>Individual Templates>> LTE Templates>> APN Configuration



# Casa NSA Solution

## Background

3GPP introduced NSA(Non-Standalone) or ENDC(E-Ultra New Radio Dual Connectivity) and SA(Standalone) architectures for 5G evolution.

**Standalone architecture**: SA comprises of 5G radio (5G-NR) and 5G core (5GC). SA introduced new NEs(AMF, SMF etc.) and network interfaces(NG interface, Xn interface).

**Non-Standalone architecture**:

Casa Systems supports the Non-Standalone (NSA) architecture for 5G evolution as defined by 3GPP. The 5G NSA architecture uses the existing LTE radio network and evolved packet core (EPC) network as an anchor for mobility management and coverage while adding a new 5G carrier. The 5G carrier gNodeB communicates with the EPC using 4G protocols while supporting the 5G Uu air interface towards the user equipment.

The initial deployments of 5G services are based on 5G NSA, also called option 3. The variants of option 3 are option-3, option-3a and option-3x. Option-3/3a/3x are transparent to MME and P-GW, and translates to an E-RAB modification procedure at MME.

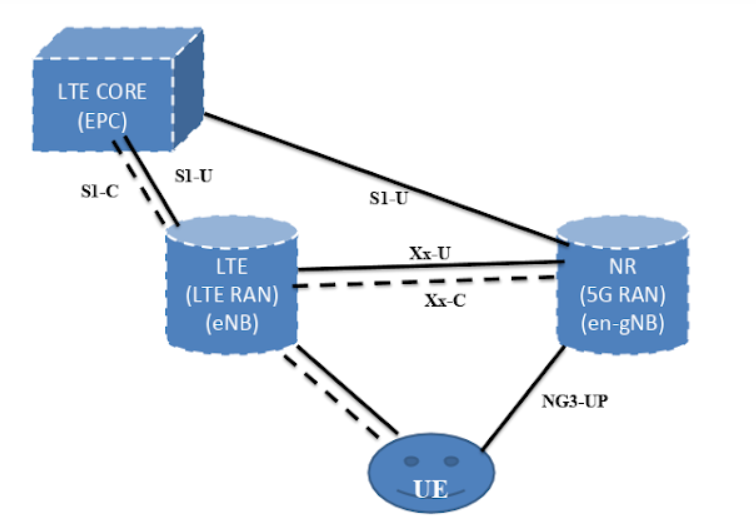
Option 3 needs to establish a Split Bearer Configuration to separate the User Plane and Control Plane to enable the expected 5G data speeds. The SCG (Secondary Cell Group) split bearer configuration allows the S-GW to send separate flows of user plane data to the Master or the Secondary RAN node. The Secondary en-gNB can also split data it receives from the core network and therefore the S-GW is splitting to Master eNB and en-gNB directly to achieve the highest expected data rates.

• Option-3 — Traffic is split across 4G and 5G at eNodeB.

• Option-3A — Traffic is split across 4G and 5G at EPC (S-GW).

• Option-3X — Traffic is split across 4G and 5G at 5G cell.

Test case execution for this solution is based on option 3X. In this configuration, the LTE eNB will act as the Master and will have control over which S1-U bearers are handled by radio of LTE or NR. Based on instructions from LTE eNB, MME will inform S-GW where to establish S1-U bearers, i.e. LTE or NR.



## Casa EPC Architecture NSA Commands

The following commands enables support for dual connectivity for new radio(DC-NR) in a 5G non-standalone (NSA) architecture deployment.

There is no local configuration for UE-AMBR, APN-AMBR, and MBR on the MME. There is also no need to add local configuration for extended UE-AMBR, extended APN-AMBR, and extended MBR.

If the MME does not get the APN-AMBR value from the HSS, the MME sets the APN-AMBR value as a default value of 10 Mbps. If 5G NSA is not restricted, the MME sets the APN-AMBR value to a default value of 20 Gbps.

**dcnr-support**

The dcnr-support command, a subcommand of the call-profile command, enables support for DC-NR in a 5G non-standalone architecture deployment.

Example

call-profile 1

dcnr-support

.

.

.

exit

mme-service mme1

associate call-profile 1

**secondary-rat-data-usage-report-support**

The secondary-rat-data-usage-report-support command, a subcommand of the call-profile command, configures the MME to request a Secondary RAT Data Usage Report from the eNB.

A Secondary RAT Data Usage Report provides information about the used resources of the secondary RAT as specified in TS 23.401. When requested by the MME, the eNB initiates the reporting process by sending a Secondary RAT Data Usage Report message to the MME or includes the Secondary RAT Data Usage Report List IE in some messages. The MME forwards the Secondary RAT Data Usage Report List IE to the SAE-GW.

Example

call-profile 2

dcnr-support

secondary-rat-data-usage-report-support

**pgw <ip\_address> dcnr**

The apn-profile command creates a profile used to select the P-GW to service the UE’s APN. The pgw <ip\_address> dcnr command specifies the IP address of the P-GW that supports DC-NR.

Example

apn-profile profile100

apn-name mec exact-match preference 2

pgw 172.16.0.100

exit

mme-service mme1

associate apn-profile profile100

**Enhanced “show” Command to Support NSA**

MME-NSA#show mme subscribers verbose

subscriber 1

Instance ID: 0

IMSI: 311391009128480

MSISDN: 11234572891

UE network capability: EEA0 EEA1 EEA2 EIA0 EIA1 EIA2 UEA0 UEA1 UIA1 ePCO DCNR <<<<DCNR capable UE

Global eNB ID: mcc 311, mnc 39, macro-enb-id 00000

eRab 5: default

APN: mec.mnc391.mcc311.gprs

PDN Type: IPv4

PDN address: 192.168.254.178

AMBR UL/DL: 20000000/20000000

TFT:

QCI: 80

PVI: 1 PL: 3 PCI: 0

MBR UL/DL: 0/0

GBR UL/DL: 0/0

S1-U:

GTP-U SGW F-TEID: 34.10.2.11/8c001870

GTP-U eNB F-TEID: 34.10.2.40/f4241 <<<<<establish SCG bearer with SeNB

S11-U:

GTP-U SGW F-TEID:

GTP-U MME F-TEID:

eRab 6: default

APN: mec.mnc391.mcc311.gprs

PDN Type: IPv4

PDN address: 192.168.254.177

AMBR UL/DL: 20000000/20000000

TFT:

QCI: 80

PVI: 1 PL: 3 PCI: 0

MBR UL/DL: 0/0

GBR UL/DL: 0/0

S1-U:

GTP-U SGW F-TEID: 34.10.2.11/8c001890

GTP-U eNB F-TEID: 34.10.2.2/f4242 <<<<< establish bearer with MeNB.

S11-U:

GTP-U SGW F-TEID:

GTP-U MME F-TEID:

---------------------------------------------------------------------------------------------------------------------------

total UEs :1

total Connected UEs :1

total bearers :2

total erabs :2

ME-NSA#show mme statistics s1mme-interface s1ap

message\_id received sent failed

E\_RABSETUP\_REQ 0 1 0

E\_RABSETUP\_RESP 1 0 0

INITIAL\_CTXT\_SETUP\_REQ 0 1 0

INITIAL\_CTXT\_SETUP\_RESP 1 0 0

DOWNLINK\_NASTRNSPT 0 4 0

INITIAL\_UEMSG 1 0 0

UPLINK\_NASTRNSPT 6 0 0

S1\_SETUP\_REQ 1 0 0

S1\_SETUP\_RESP 0 1 0

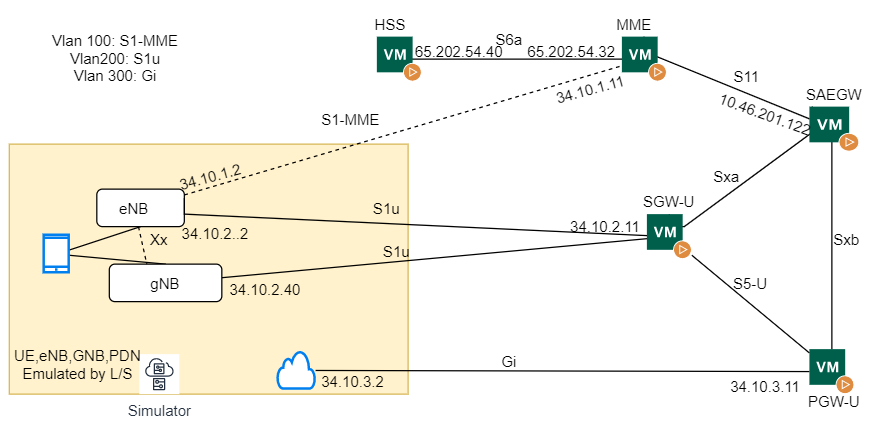
E\_RABMODIFICATION\_IND 1 0 0

E\_RABMODIFICATION\_CONF 0 1 0

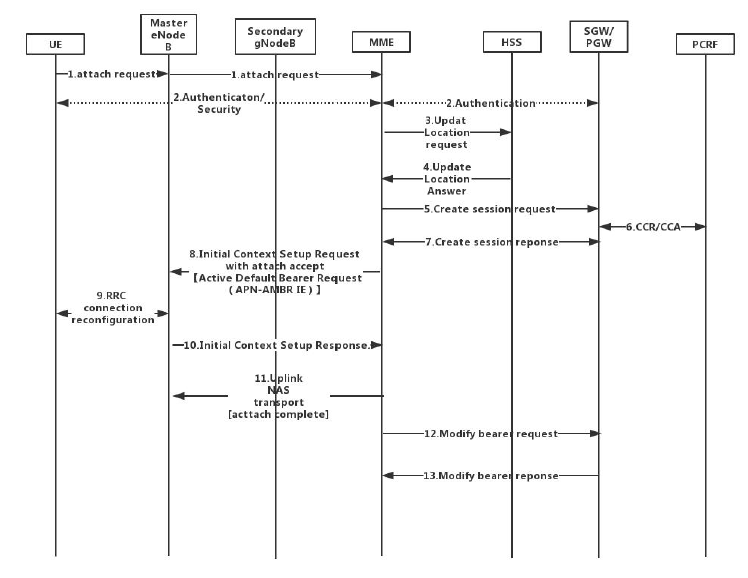
SECONDARY\_RAT\_DATA\_USAGE\_REPORT 27 0 0

## Test Case Validation

## Network Diagram

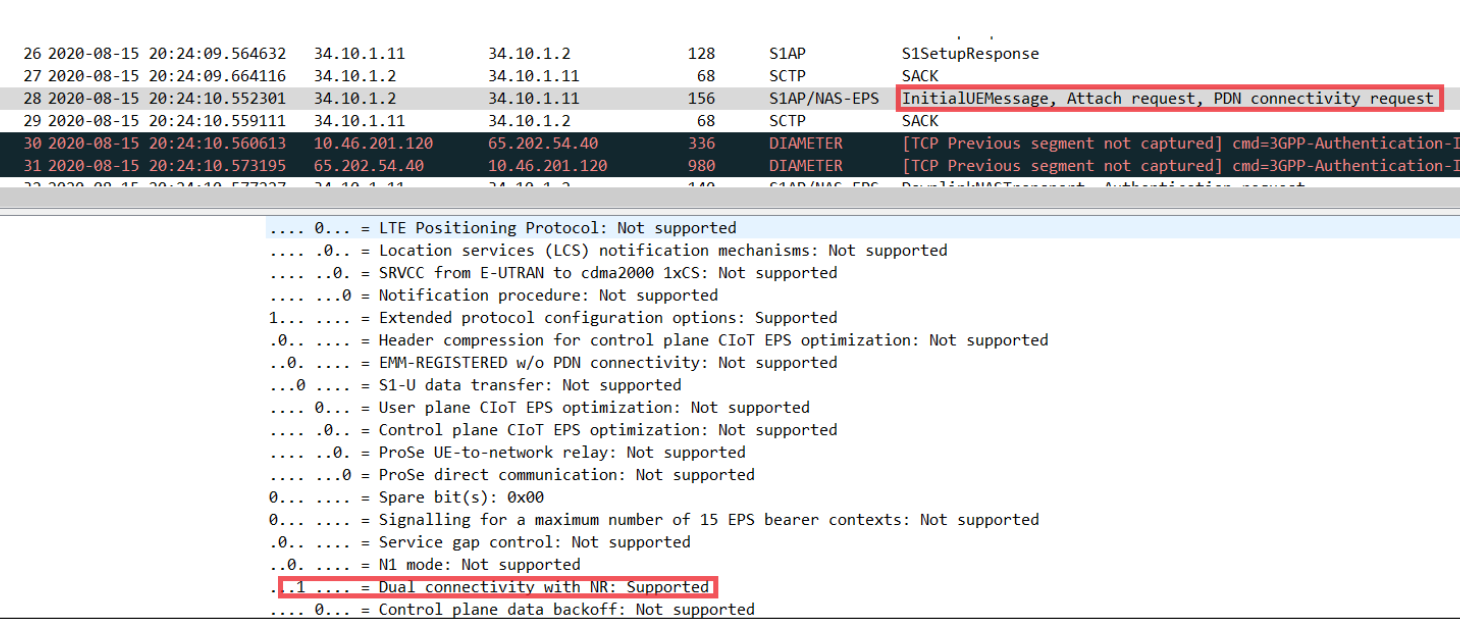


## Initial Registration by DCNR UE



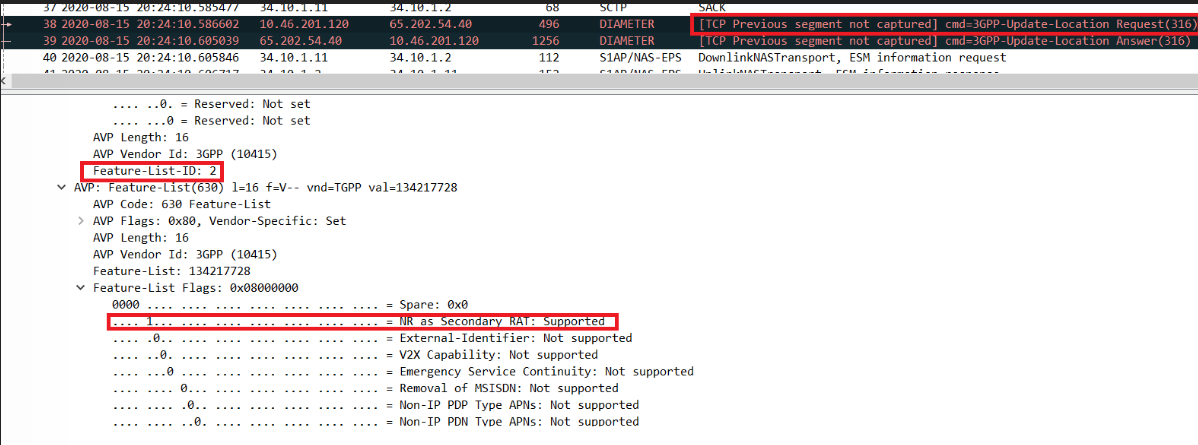
**Description：**

1. If the UE supports dual connectivity with New Radio (NR), then the UE shall set the DCNR bit to "dual connectivity with NR supported" in the UE network capability IE of the ATTACH REQUEST message and shall include the UE additional security capability IE in the ATTACH REQUEST message.

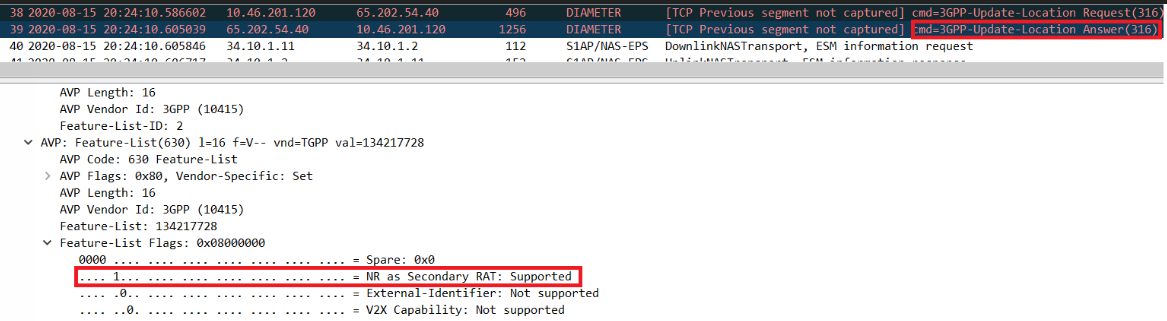


1. MME successfully authenticates the UE.
2. MME advertises the DCNR support by sending “NR as Secondary RAT” feature bit in

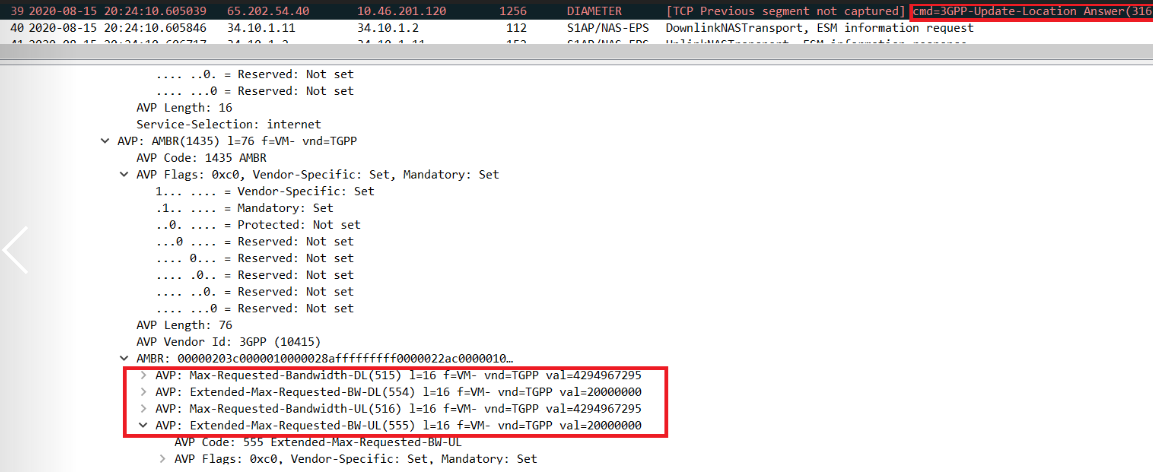
“Feature-List-ID-2” in update location request.



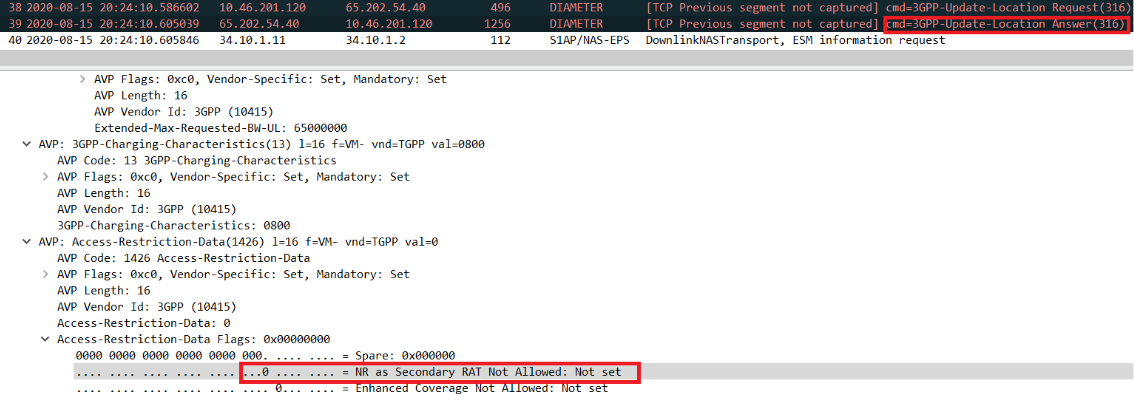
1. HSS sends ULA by advertising the DCNR by sending “NR as Secondary RAT” feature bit in “Feature-List-ID-2”.



For AMBR: When the maximum bandwidth value to be set for UL (or DL, respectively) traffic is higher than 4294967295 bits per second, the Max-Requested-Bandwidth-UL (or DL respectively) AVP shall be present, and set to its upper limit 4294967295, and the Extended-Max-Requested-BW-UL (or -DL, respectively) shall be present, and set to the requested bandwidth value in kilobits (1000 bits) per second.



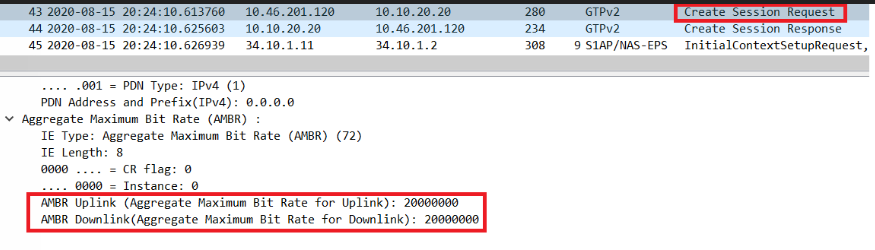
If HSS determines that the UE is not authorized for DCNR services, HSS sends Subscription-Data with “Access-Restriction” carrying “NR as Secondary RAT Not Allowed”.



1. MME sends Create Session Request with the extended APN-AMBR values in existing

AMBR IE. As the APN-AMBR values in GTP-v2 interface are encoded in kbps, existing

AMBR IE handles the 5G-NSA bit rates.

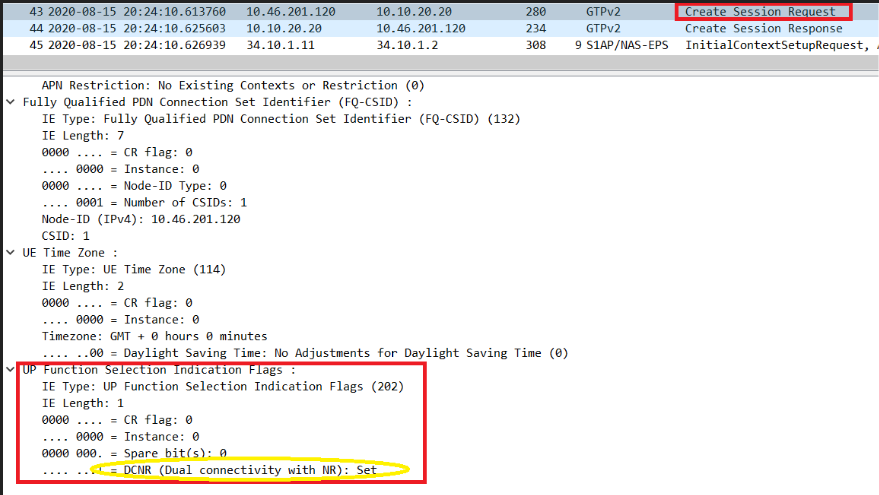


When DCNR capable UE attempts to register in MME and when all DCNR validations are successful, the MME sets “UP Function Selection Indication Flags” IE with DCNR flag set to 1 in

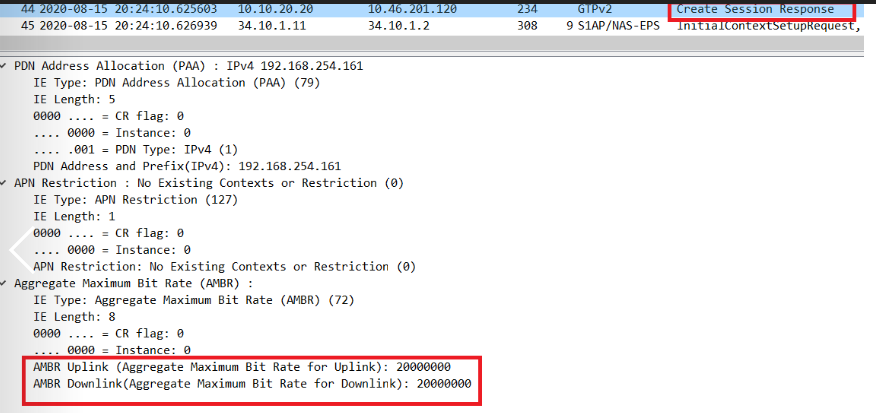
“Create Session Request” message. This feature will be relevant for CUPS architecture to

help SGW-C and PGW-C to select SGW-U and PGW-U which supports dual connectivity

with NR.



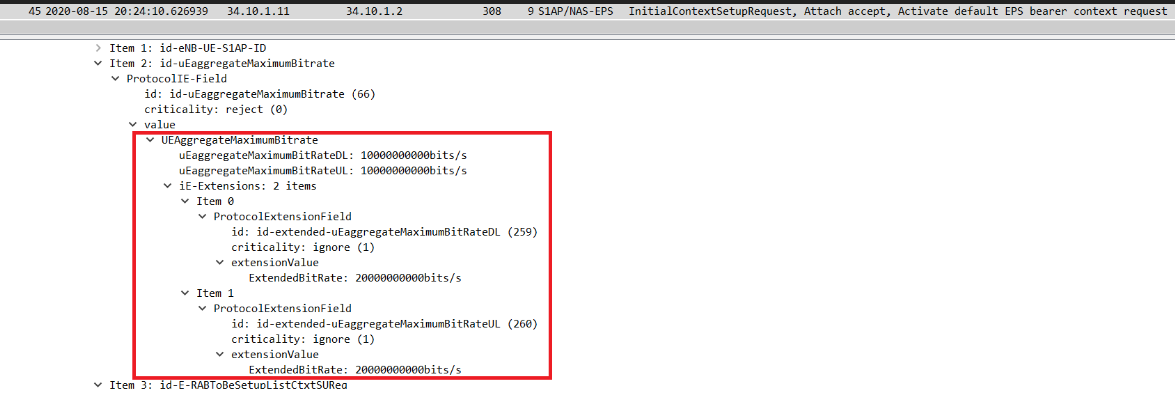
1. P-GW honours the "APN-AMBR" values as offered by PCRF and sends the extended "APN-AMBR" values in existing IE "APN-AMBR" in the Create Session Response.



8. MME computes the UE-AMBR values and sends the extended UE-AMBR values in new

IEs “Extended UE Aggregate Maximum Bit Rate Downlink” and “Extended UE Aggregate

Maximum Bit Rate Uplink” also by setting the legacy “UE AMBR Uplink” and “UE AMBR Downlink” values to the maximum allowed value 10000000000 bps (10 Gbps) in “Initial Context Setup Request”. “Extended UE Aggregate Maximum Bit Rate Downlink” and the scope of “Extended UE Aggregate Maximum Bit Rate Uplink” is 10000000001-4000000000000 bps.

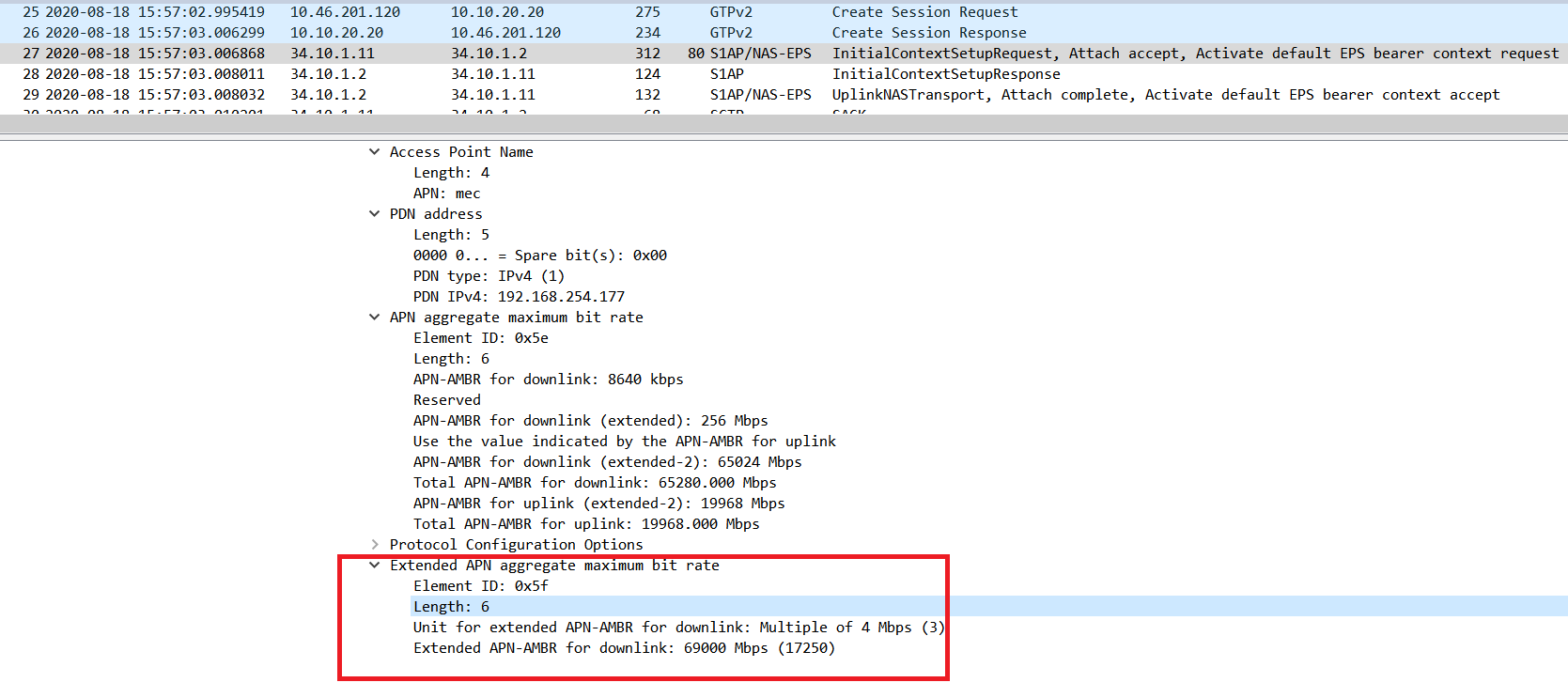


MME sends the "APN-AMBR" values up to 65.2 Gbps in existing IE "APN-AMBR" in

NAS Activate Default EPS Bearer Context Request – Attach Accept. If the "APN-AMBR"

values are beyond 65.2 Gbps, MME sends the extended "APN-AMBR" values in new IE

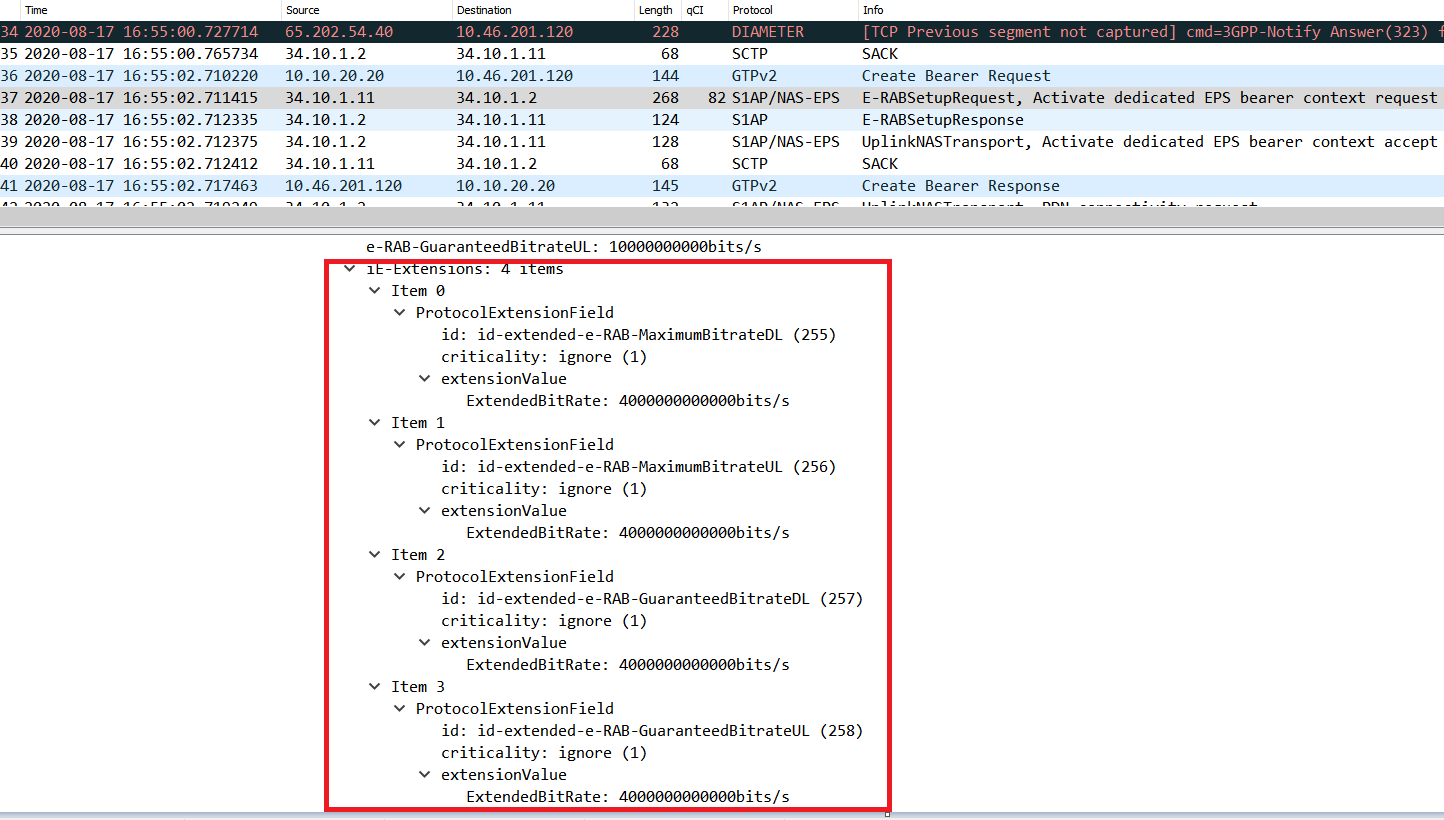
“Extended APN aggregate maximum bit rate”



S1AP interface also introduced new AVPs “Extended E-RAB Maximum Bit Rate

Downlink/Uplink”, “Extended E-RAB Guaranteed Bit Rate Downlink/Uplink” in the grouped

IE “GBR QoS Information”, whose units are bits/second.



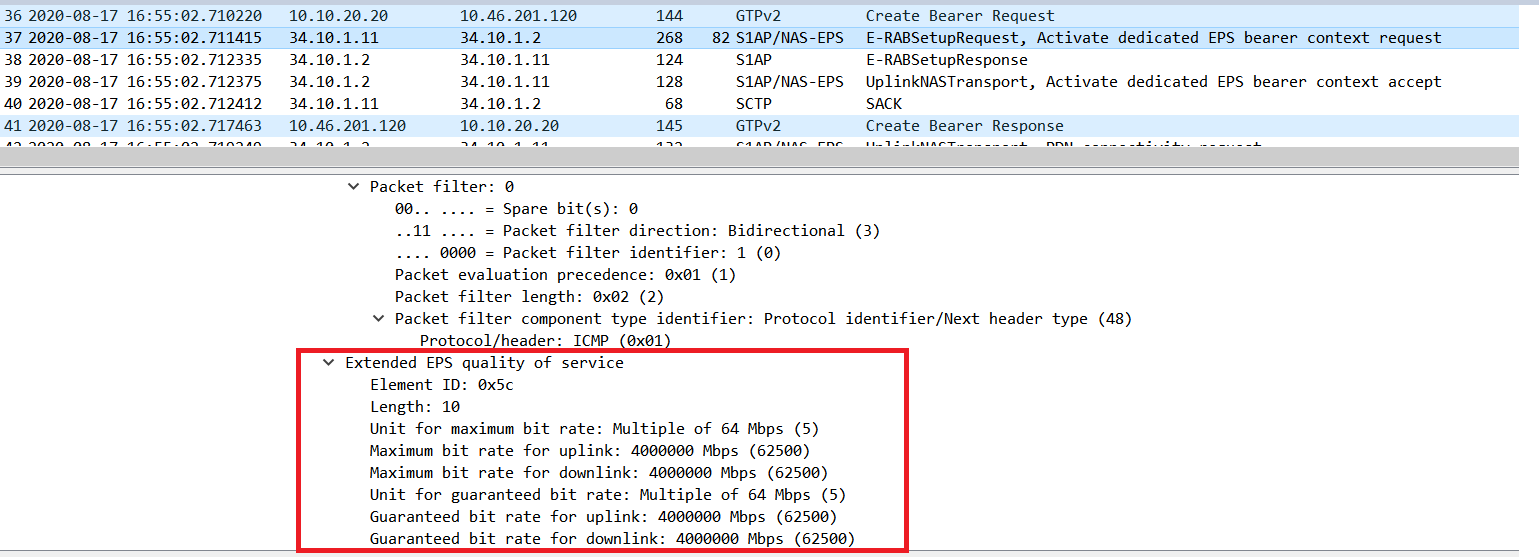
Extended EPS Quality of Service. As the existing IE in NAS “EPS Quality of Service”

supports MBR and GBR values up to 10Gbps, to convey the 5G throughput (beyond 10Gbps)

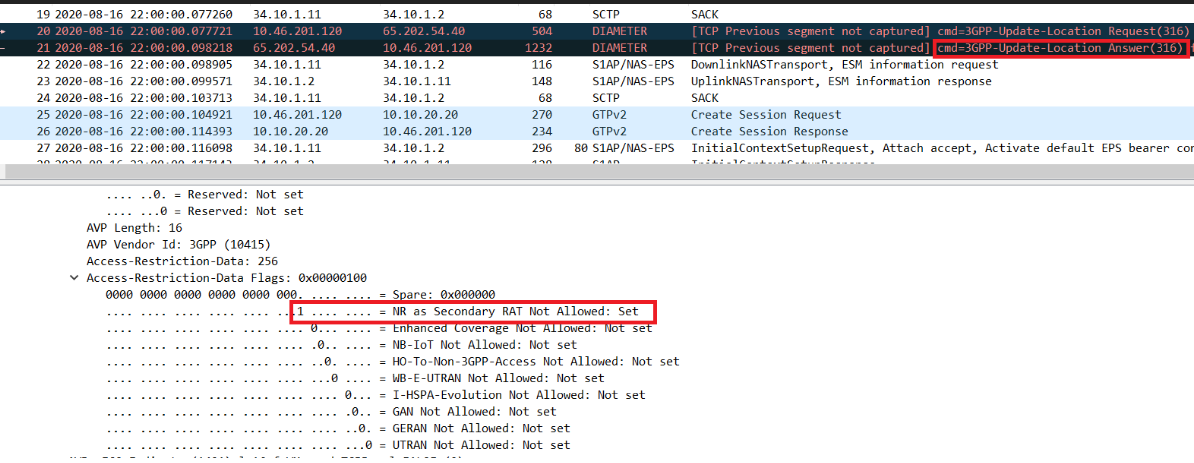
over NAS, a new IE “Extended EPS Quality of Service” has been introduced in all applicable

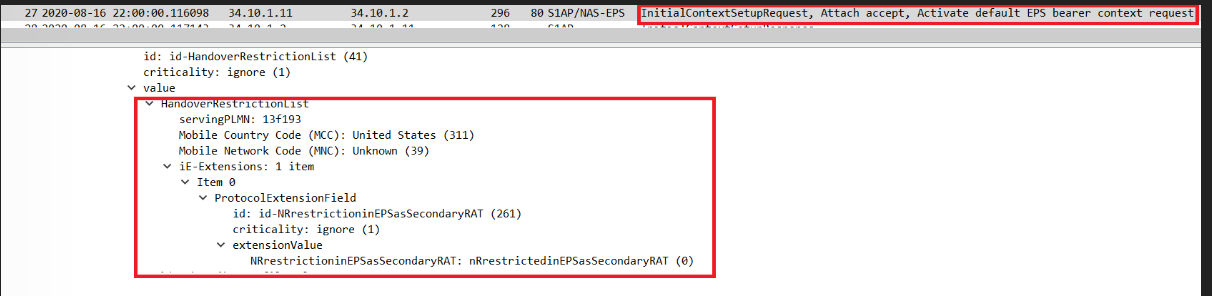
NAS messages. The structure of IE “Extended EPS Quality of Service” and the units for

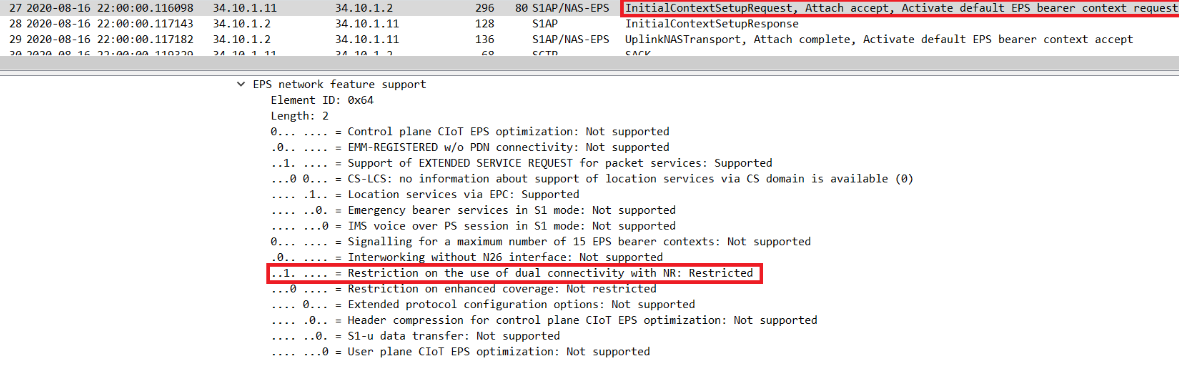
encoding/decoding is displayed below.



If ULA is received with “Access-Restriction” carrying “NR as Secondary RAT Not Allowed”, MME sends the “Initial Context Setup Request” with “NR Restriction” bit set in “Handover Restriction List” IE. MME sets the Restrict DCNR bit to "Use of dual connectivity with NR is restricted" in the EPS network feature support IE of the ATTACH ACCEPT message. Accordingly, UE provides the indication that dual connectivity with NR is restricted to the upper layers.

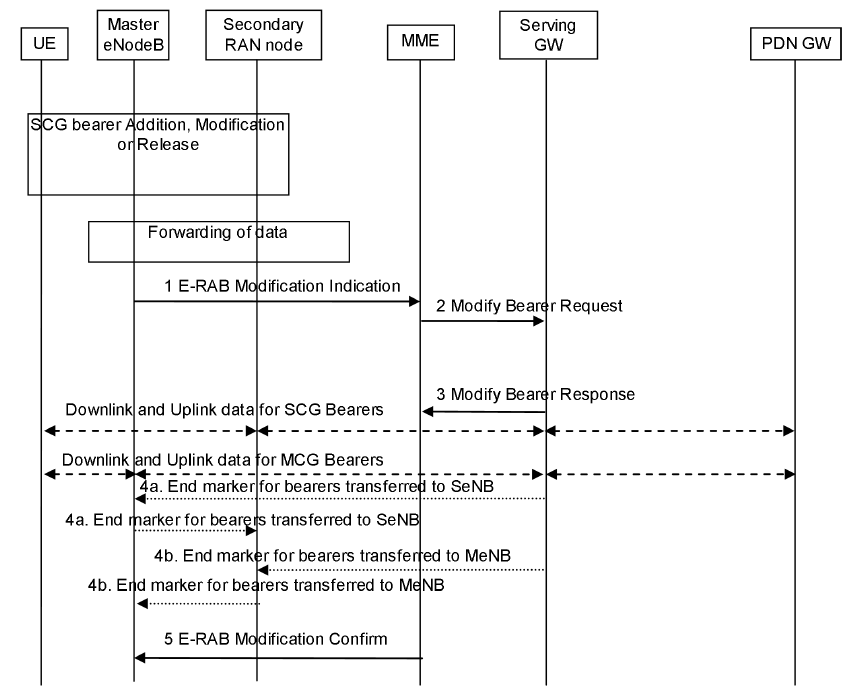




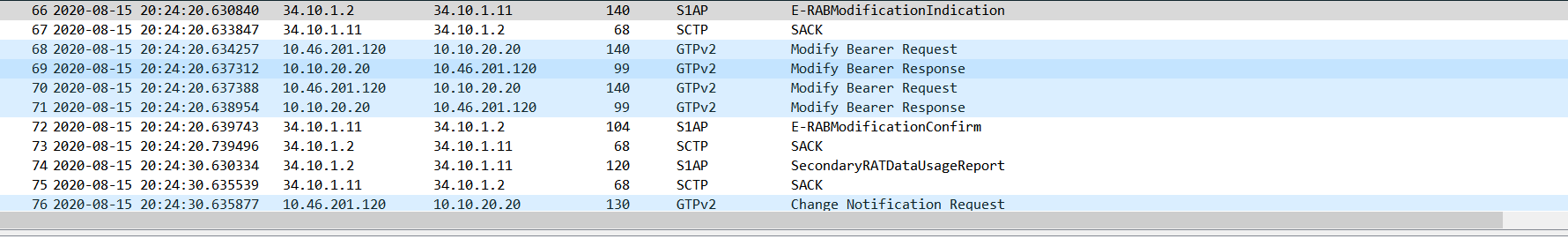


## E-UTRAN initiated E-RAB modification procedure

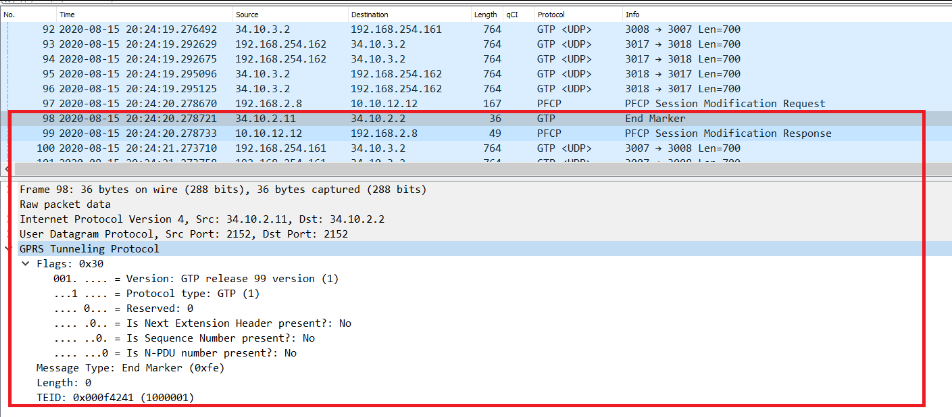
When SCG bearer option is applied to support dual connectivity operation, this procedure is used to transfer bearer contexts to and from Secondary eNodeB (see TS 36.300 [5]) or Secondary gNodeB (see TS 37.340 [85]). During this procedure, both the MME and Serving GW are never relocated.



1. The Master eNodeB sends an E-RAB Modification Indication message (eNodeB address(es) and TEIDs for downlink user plane for all the EPS bearers, CSG Membership Information, Secondary RAT usage data) to the MME. The Master eNB indicates for each bearer whether it is modified or not. If the PLMN has configured secondary RAT usage reporting and the eNodeB has Secondary RAT usage data to report, the Secondary RAT usage data is included.



4. In order to assist the reordering function in the Master eNodeB and/or Secondary RAN nodes, for the bearers that are switched between Master eNodeB and Secondary RAN nodes, the Serving GW shall send one or more "end marker" packets on the old path immediately after switching the path as defined in TS 36.300 [5], clause 10.1.2.2.

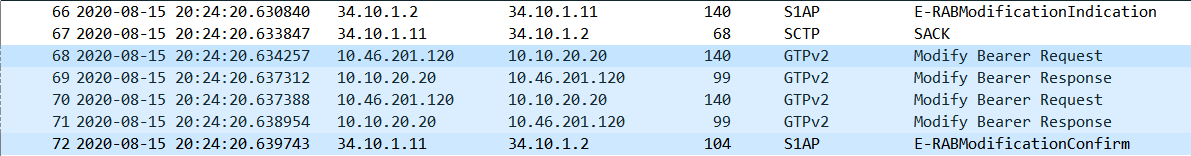


5. The MME confirms the E-RAB modification with the E-RAB Modification Confirm

(CSG Membership Status) message. The MME indicates for each bearer whether it was

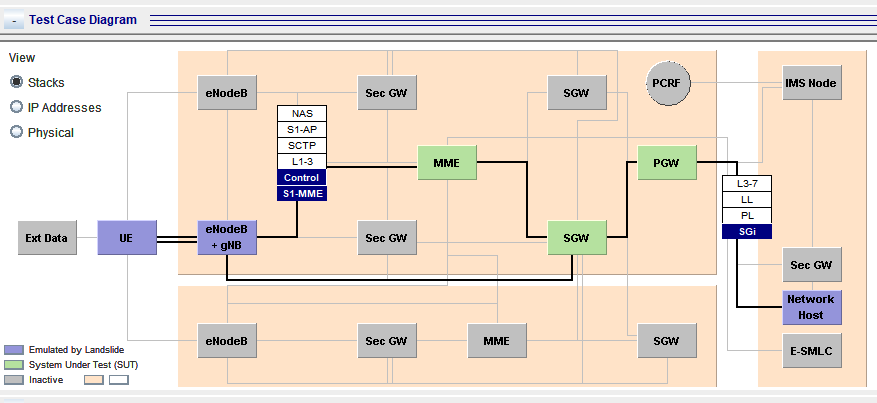
successfully modified, kept unmodified or already released by the EPC as defined in

TS 36.413 [36].

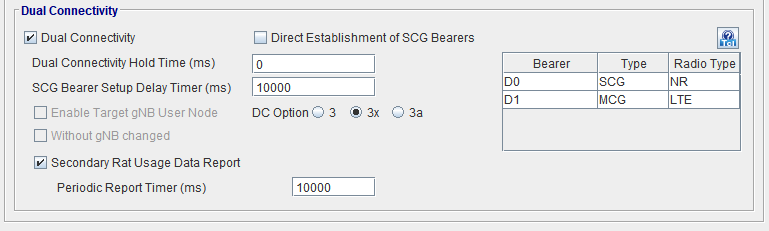


# Spirent Landslide Configuration

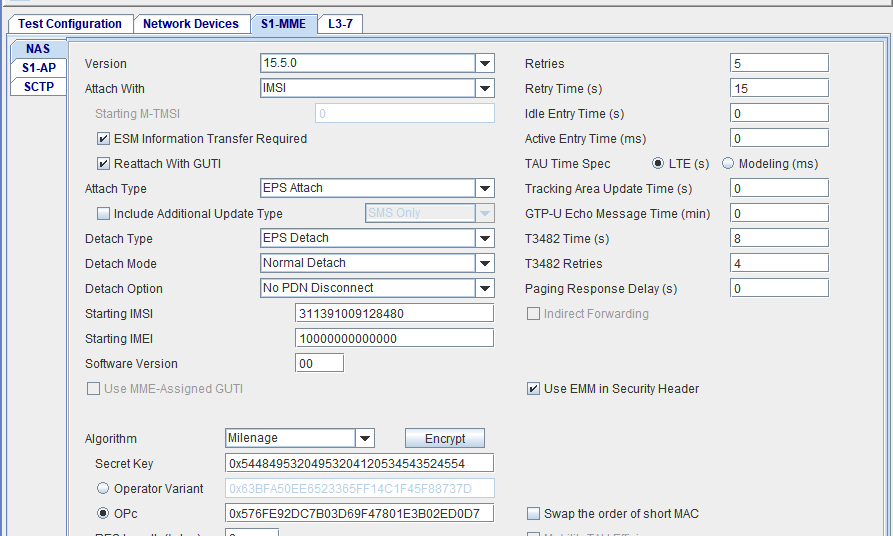
**Test Case Diagram**



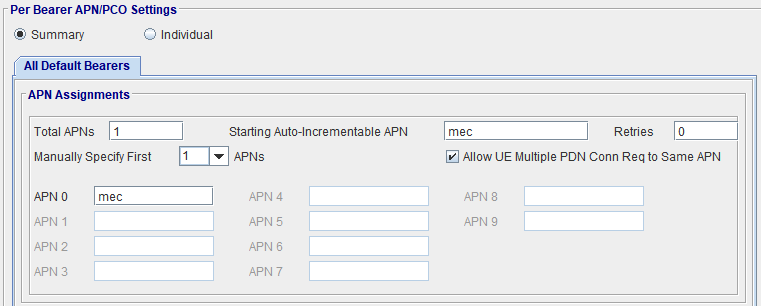
**Dual connectivity**



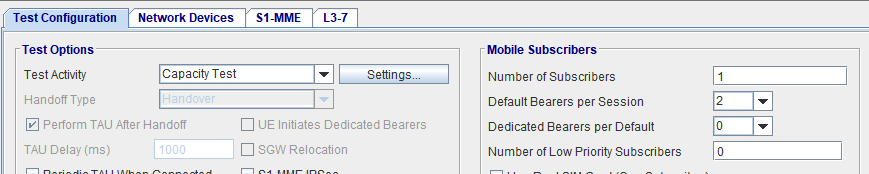
**IMSI Configuration**



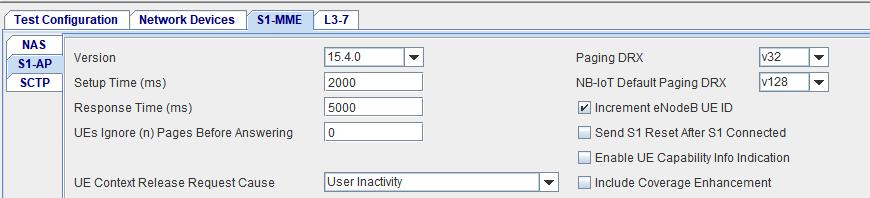
**APN Configuration**



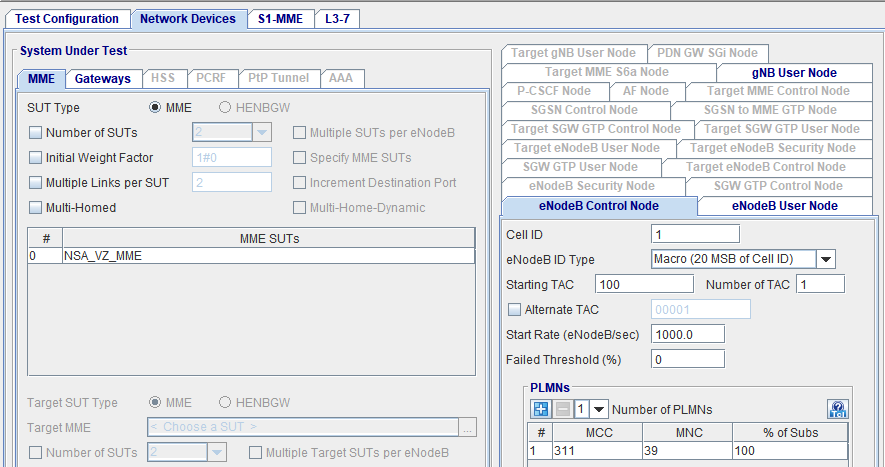
**Subscribers**



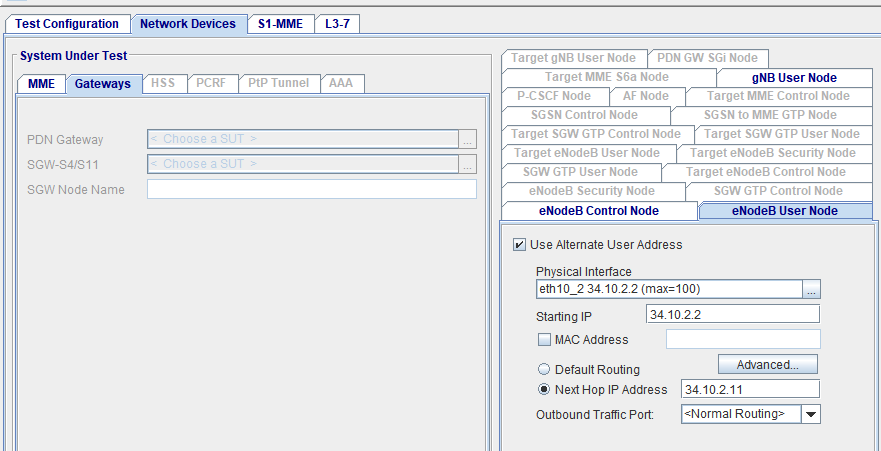
**S1-AP Configuration**



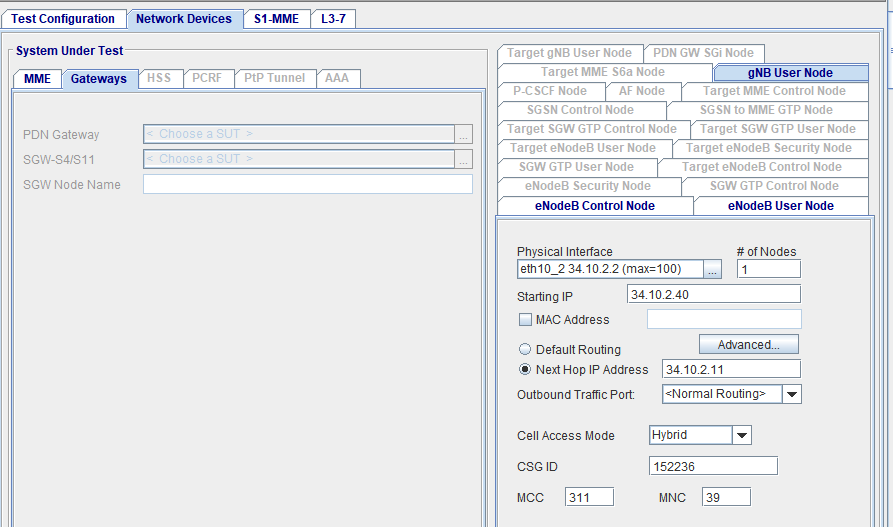
**eNB Control Node**



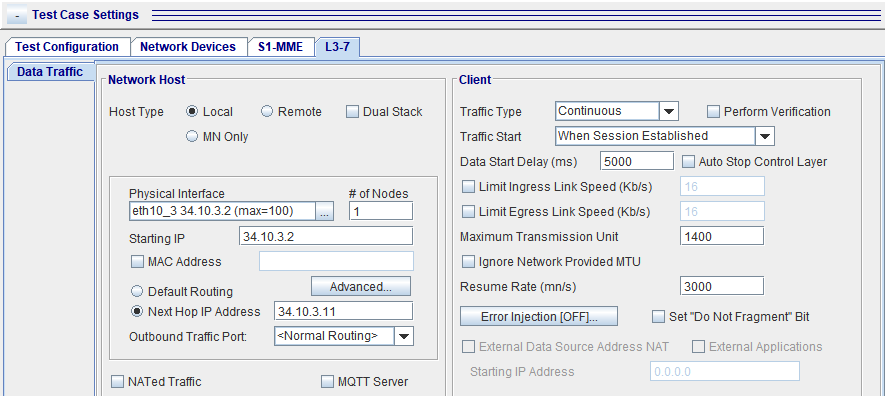
**eNB User Node**



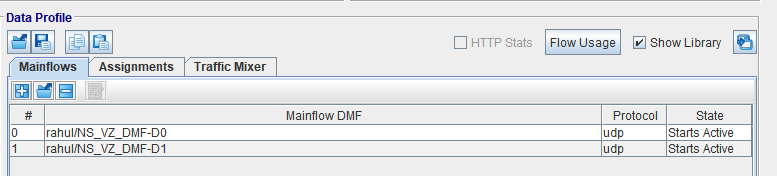
**gNB User Node**

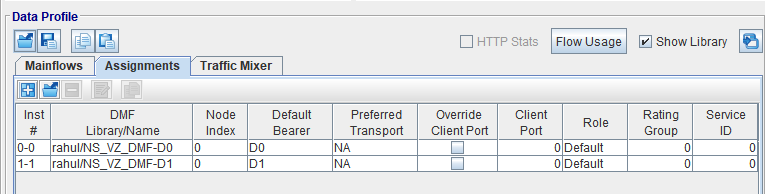


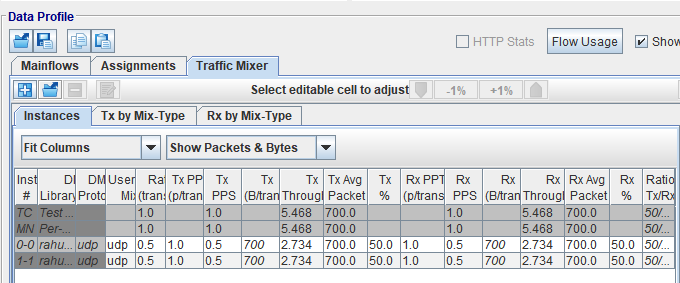
**SGi User Traffic**



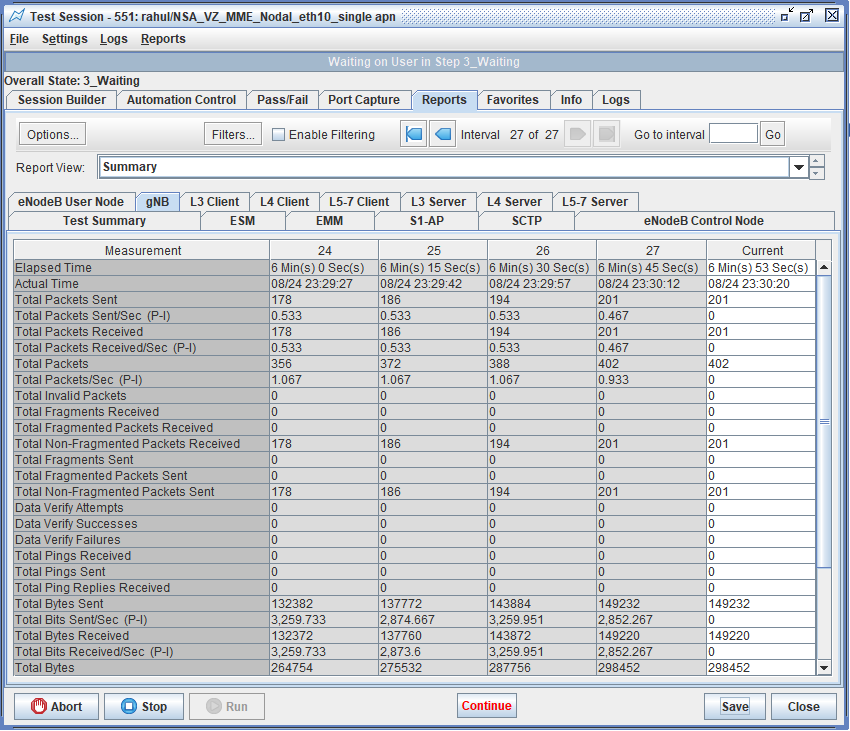
**Data Profile**



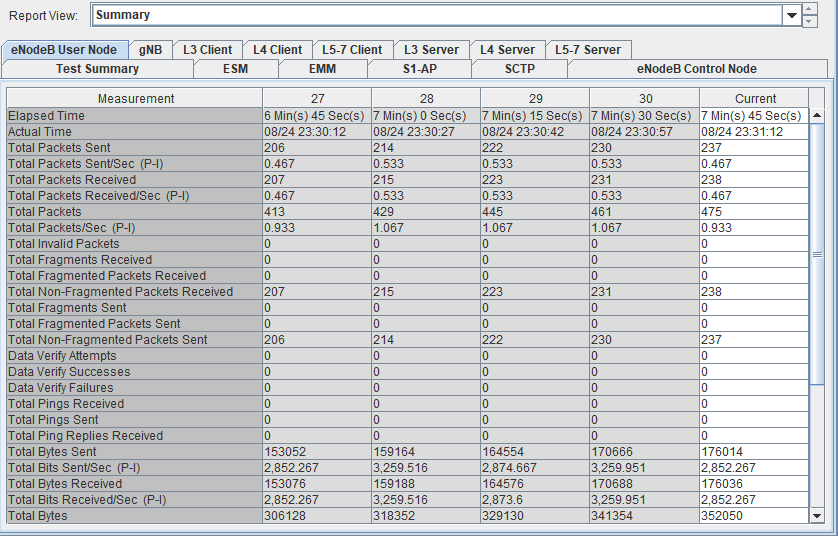




**gNB User report**



**eNB User Report**



# Document History

|  |  |  |  |
| --- | --- | --- | --- |
| **Version** | **Date** | **Author** | **Comments** |
| 1.0 | 08/20/2020 | Rahul Mahadik | 1st Draft |
| 2.0 | 09/03/2020 | Rahul Mahadik | Casa EPC and Landslide Integration |
|  |  |  |  |