Learn about 4G&5G QoS Parameters and UE Identities

Optimization

Technology

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Content

4G & 5G QoS Common Parameters

4G Parameter	5G Parameter	non-GBR	GBR	New in 5G Delay Critical GBR
QoS Class Identifier (QCI)	5G QoS Identifier (5QI)	✓	✓	✓
ARP	ARP	✓	✓	✓
Guaranteed bit Rate	Guaranteed Flow bit Rate	✗	✓	✓
Maximum bit Rate	Maximum bit Rate	✗	✓	✓
APN Aggregate Maximum Bit Rate	Session Aggregate Maximum Bit Rate	✓	✗	✗
UE Aggregate Maximum Bit Rate (UE-AMBR)	UE Aggregate Maximum Bit Rate (UE-AMBR)	✓	✗	✗

ARP: Allocation & Retention Priority

4G & 5G QoS Parameters (UE AMBR Vs. APN AMBR)

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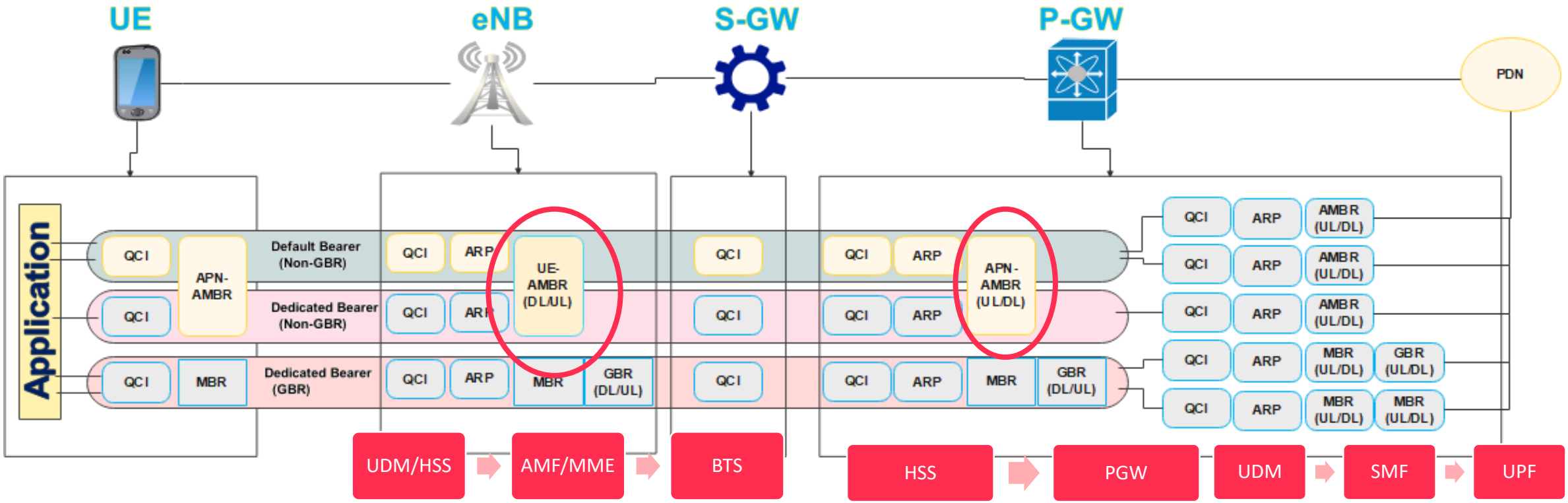

- The APN-AMBR is a subscription parameter stored per APN in the HSS. It limits the aggregate bit rate that can be expected to be provided across all non-GBR bearers and across all PDN connections of the same APN.
- The UE-AMBR limits the aggregate bit rate that can be expected to be provided across all non-GBR bearers of a UE

	Scenario1	Scenario2
APN	200	80
UE AMBR	50	150
Final UE-AMBR	**50**	**80**

UE-AMBR = min(Sum{APN-AMBR}, Subscribed UE-AMBR)

[3GPP 23.401] – 4.7.3 Bearer level QoS parameters

How to check QoS Parameters from Logs

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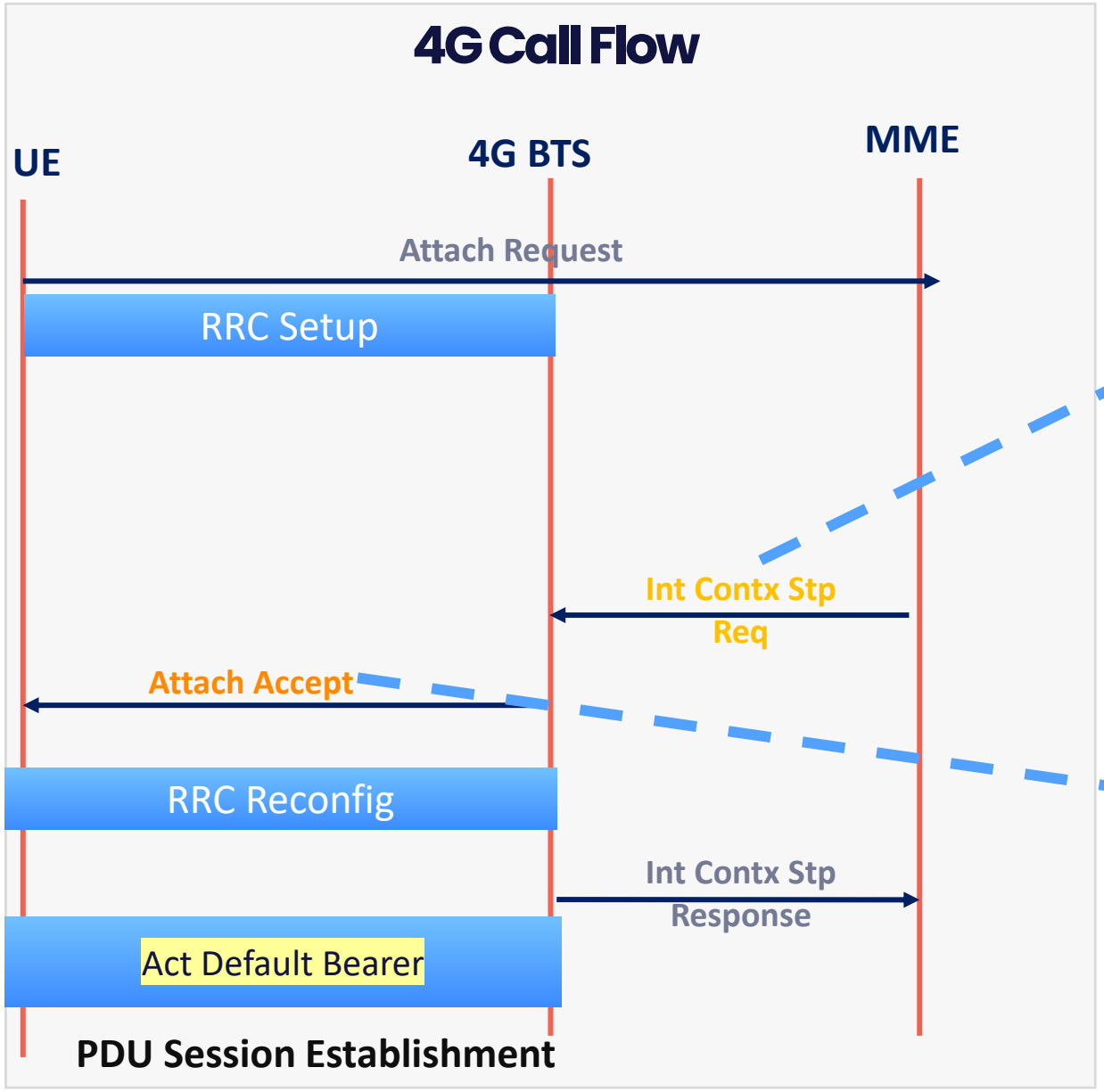
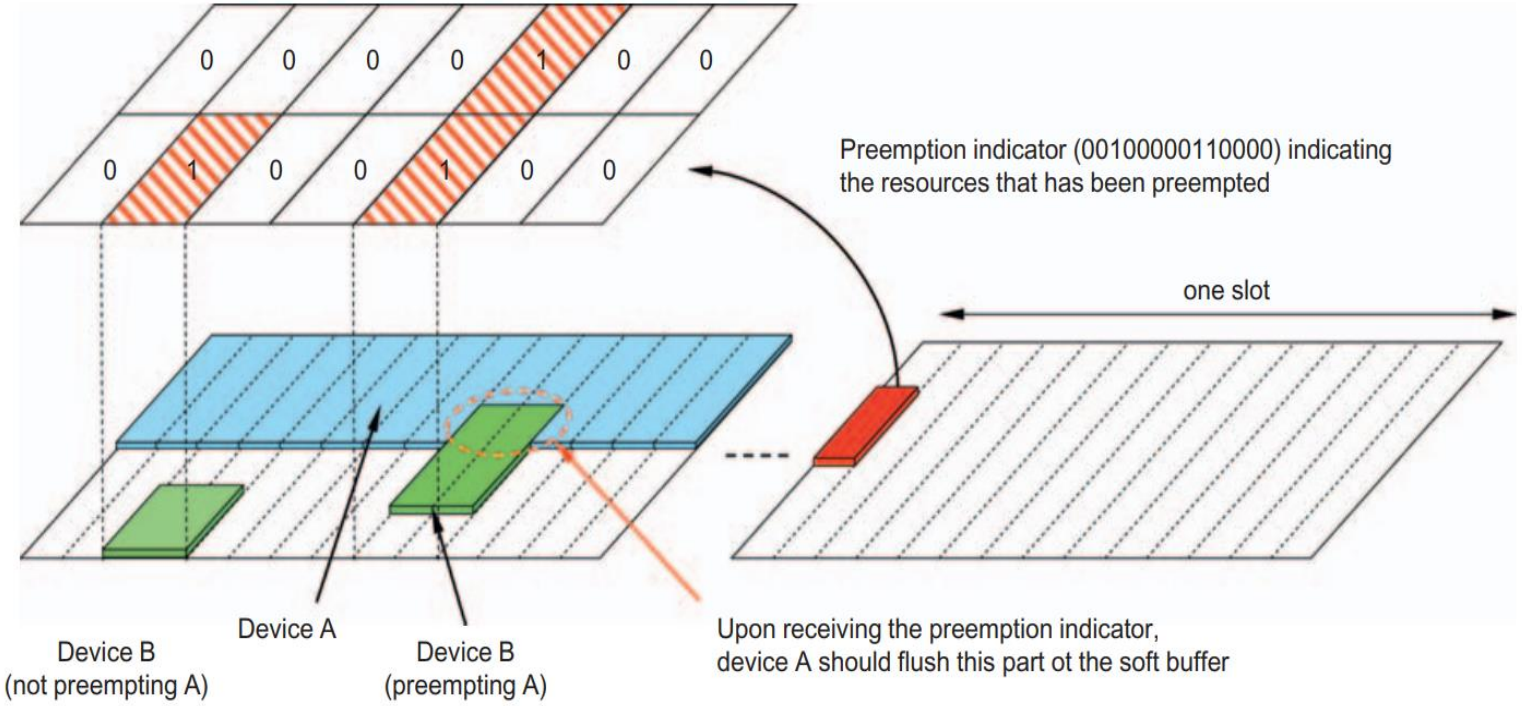


S1ap-Msg
..initiatingMessage
....value
.....initialContextSetupRequest
.....value
.....uEAggregateMaximumBitrate
.....uEaggregateMaximumBitRateDL --- 0x773d6400(2Gbps)
.....uEaggregateMaximumBitRateUL --- 0x773d6400(2Gbps)

.....aPN-AMBR
.....aPN-AMBR-for-downlink:0xfe (3 Gbps)
.....aPN-AMBR-for-uplink:0xfe (3 Gbps)

4G & 5G QoS Parameters (Allocation & Retention Priority)

- Device A has been scheduled with a downlink transmission spanning one slot.
- During the transmission to device A, latency-critical data for device B arrives at the gNB, which immediately schedules transmission to device B.
- Typically, if frequency resources are available, the transmission to device B is scheduled using resources not overlapping with the ongoing transmission to device A.
- However, in the case of a high load in the network, this may not be possible, and there is no choice but to use (some of) the resources originally intended for device A for the latency-critical transmission to device B.
- This is referred to as the transmission to device B preempting the transmission to device A, which obviously will suffer an impact as a consequence of some of the resources device A assumes contains data for it suddenly containing data for device B.



[3GPP 23.401] - 4.7.3 Bearer level QoS parameters

*Data Source: 5G NR _ the next-generation wireless access technology

Learn about UE Identities (4G-GUTI Vs. 5G-GUTI)

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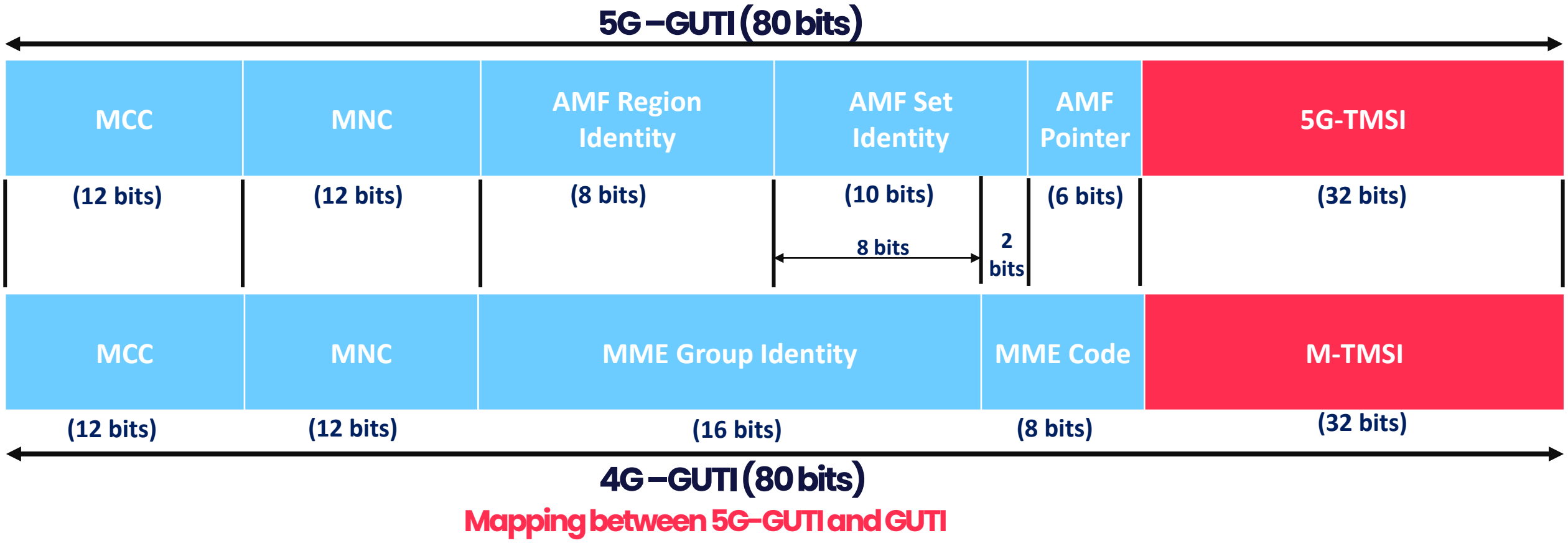
- GUTI is used instead of the IMSI to identify the UE. When the UE attaches the network as first time IMSI is used, thereafter GUTI is used to avoid any security issues in air interface.

- 3GPP has specified a mapping between the 5G-GUIT and the 4G GUIT. This mapping is used when a UE moves between technologies. For example, when a UE moves from 5G to 4G and is required to send a GUTI to the MME, then the UE maps the 5G-GUTI onto the 4G GUTI and forwards it to the MME. The MME can then complete the reverse mapping to identify the AMF it needs to contact to retrieve the UE context.



Mapping between 5G-GUTI and GUTI

*Globally Unique Temporary identifier

Learn about UE Identities (4G TMSI Vs. 5G TMSI)

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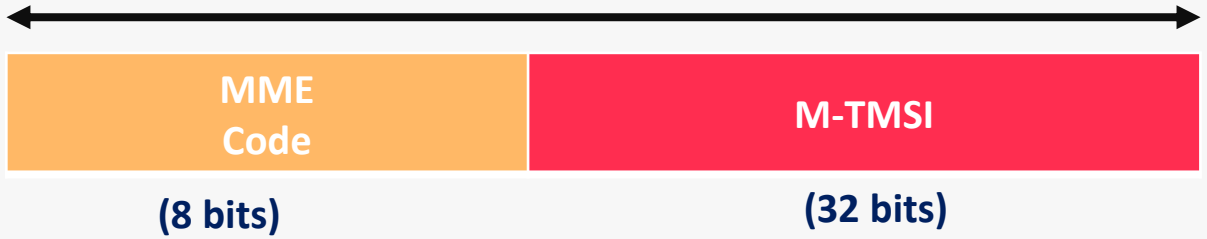
4G S-TMSI

(40 bits)

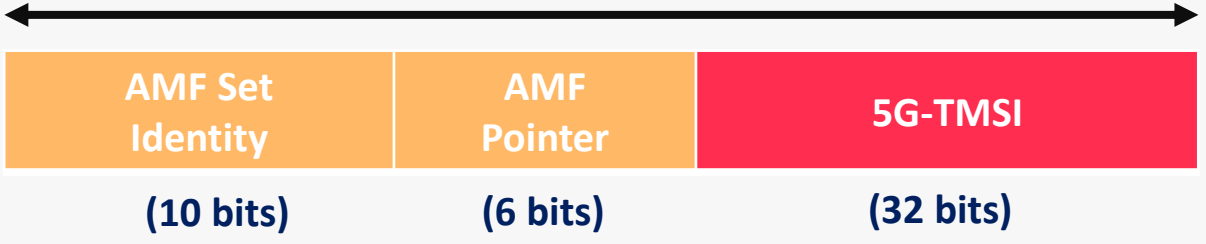


- 4G S-TMSI can be used to identify a UE within a specific MME Pool.
- It is included in RRCSetupRequest, Paging, and Initial UE Message

***M-TMSI (MME-Temporary Mobile Subscriber Identity)**
***S-TMSI (SAE- Temporary Mobile Subscriber Identity)**

5G S-TMSI

(48 bits)



- 5G S-TMSI can be used to identify a UE within a specific AMF Region.
- It is included in RRCSetupRequest, Paging, Registration request, and Initial UE Message

***TMSI (Temporary Mobile Subscriber Identity)**
***AMF (Access and Mobility Function).**

4G & 5G SA Call Flow Overview

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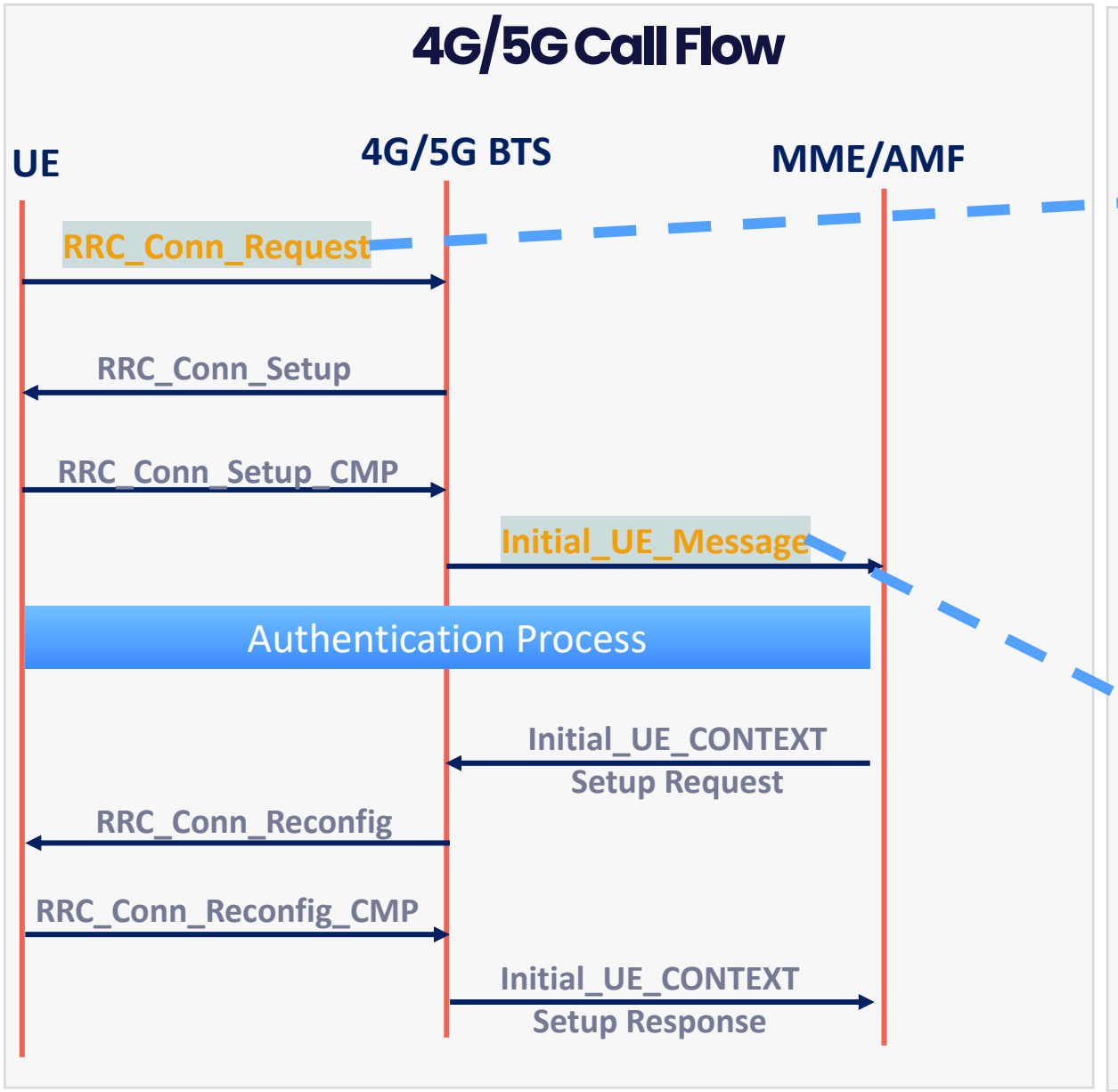

RRC Connection Request

```
RRC-MSG
..msg
....struUL-CCCH-Message
......struUL-CCCH-Message
........ulCcchMessage
..........rrcConnectionRequest
............criticalExtensions
..............rrcConnectionRequest-r8
................ue-Identity
6>   F6  1111----  ..................randomValue:01011010001011010000010011111001111101111(5A 2D 04 F9 EF)
       ----011-  ..................establishmentCause:mo-Signalling (3)
       -------0  ..................spare:0(00)
```

This Value will be replaced by S-TMSI If the UE is registered in the Tracking Area which the current cell belongs

Initial UE Message

```
S1ap-Msg
..initiatingMessage
..........value
............s-TMSI
..............mMEC --- 0x38
..............m-TMSI --- 0xD8891F01
```

Indicates 4G/5G S-TMSI

```
..........aMF-Set-ID:0x10 (16)
........aMF-Pointer:0x2 (2)
..............nR-TMSI:0x0 (0)
```