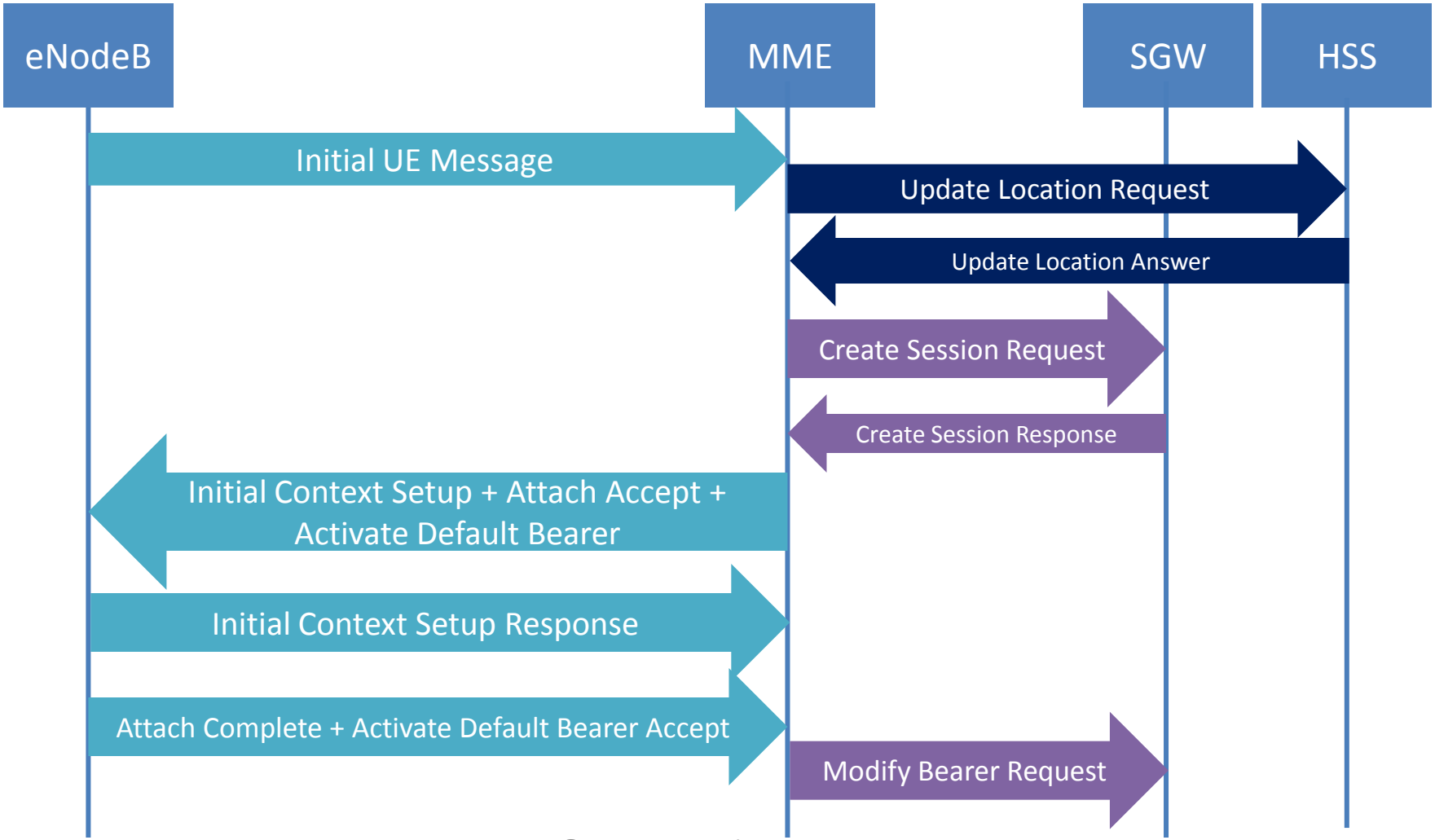
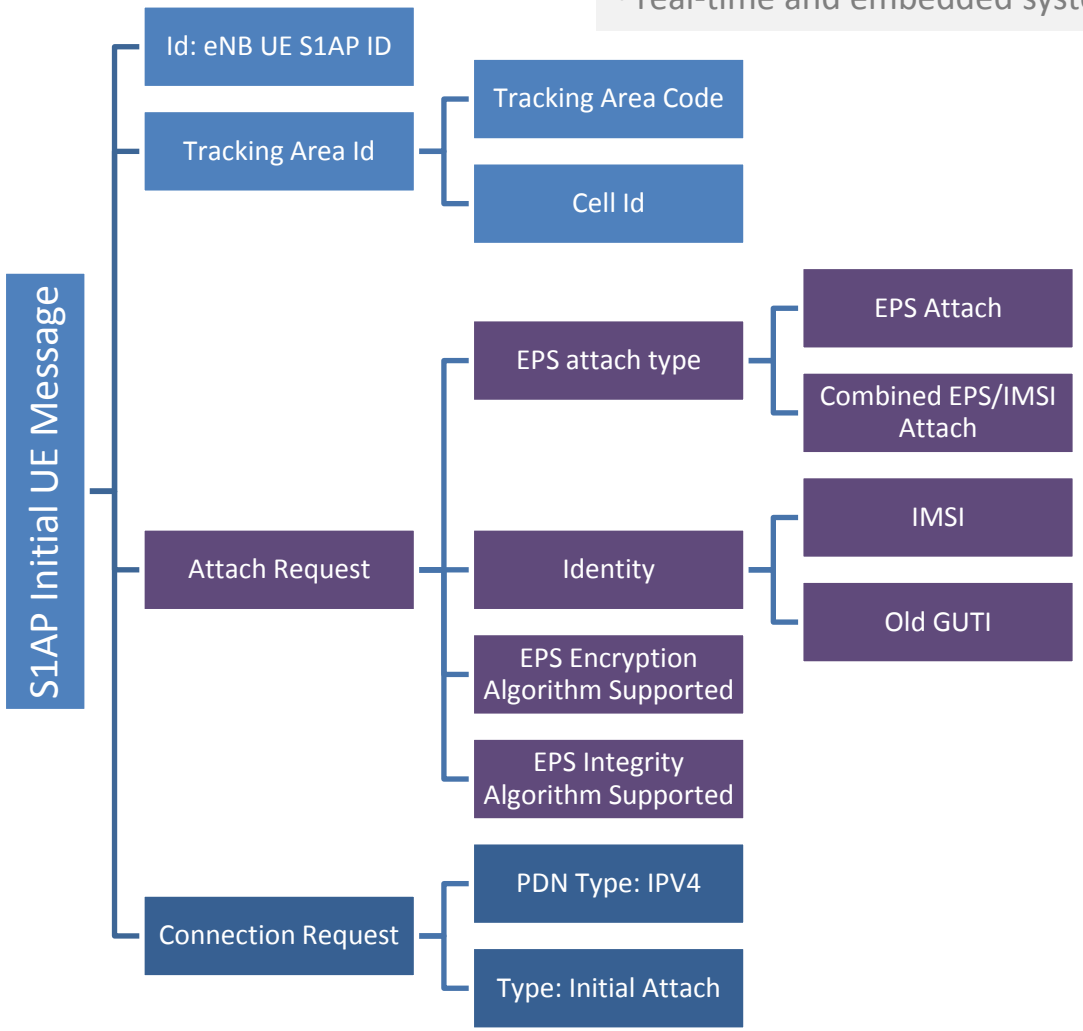
LTE Attach and Default Bearer Setup Messaging

LTE Attach Message Sequence Chart



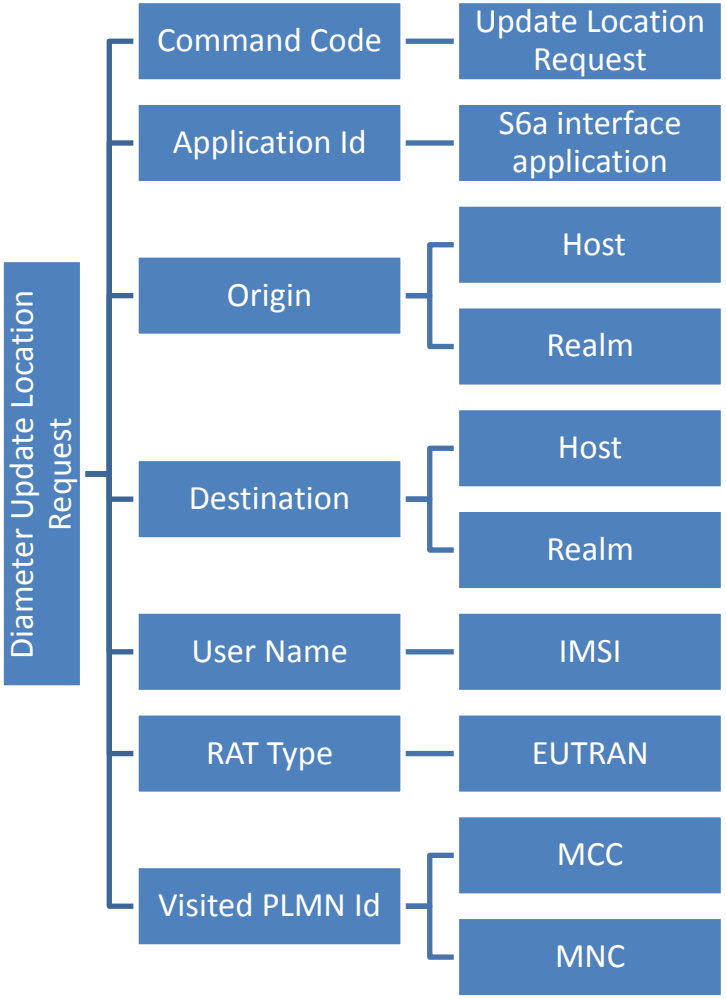
S1AP: eNodeB → MME
S1AP Initial UE Message

- Initial UE Message is the first message sent to the MME to establish a connection
- The eNode uses the eNB-UE-S1AP-ID to uniquely identify the UE
- EPS attach type may be:
  - **EPS Attach:** UE is attaching only to the 4G LTE network
  - **Combined EPS/IMSI Attach:**
- The UE identity is specified is:
  - **IMSI:** If the UE has is not registered with the network
  - **Old GUTI:** Subsequent attach requests identify the UE with the Old GUTI



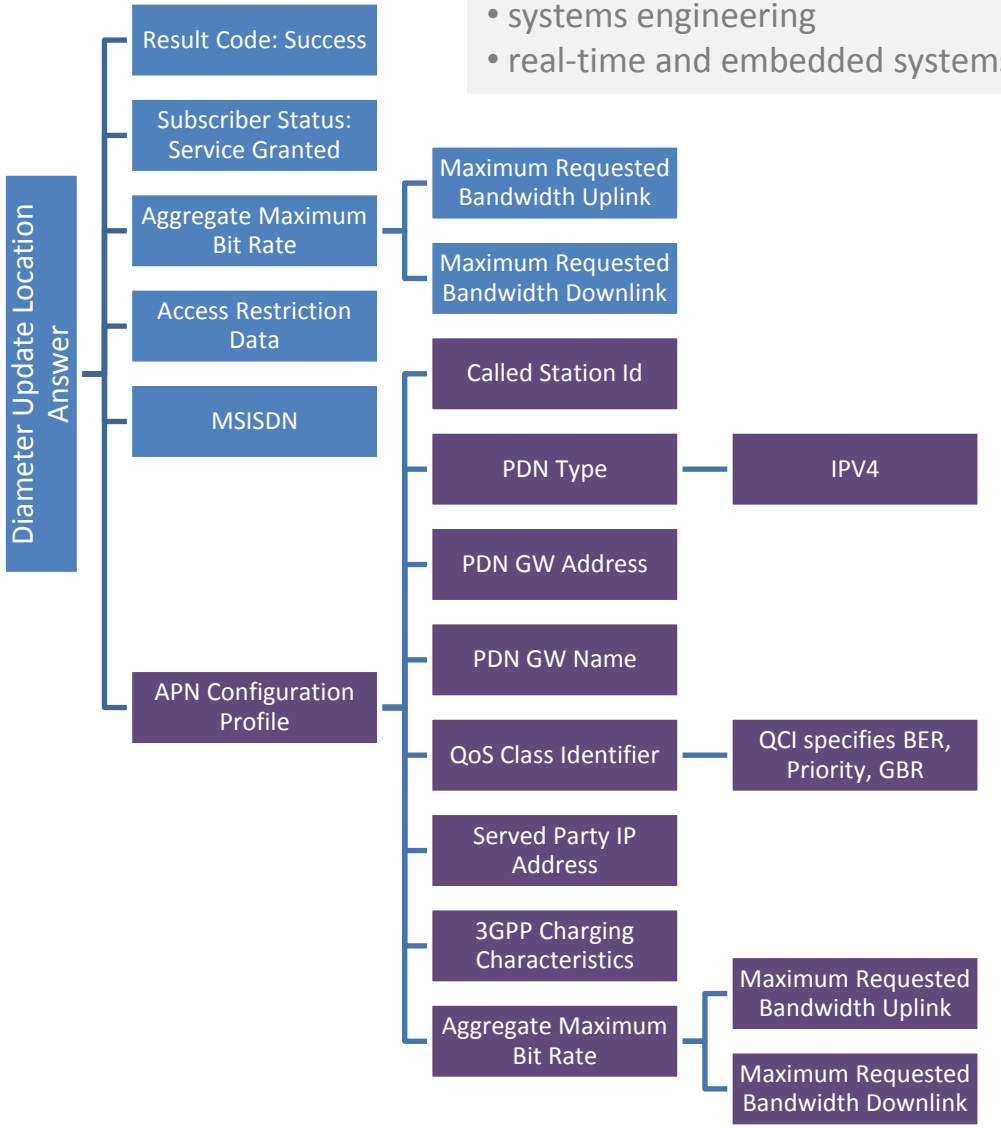
S6A: MME → HSS Diameter Update Location Request

- MME updates the UE location with the HSS
- Origin and Destination are specified as Host and Realm (domain)
- The user name in the request is set to IMSI
- The Radio Access Technology is specified in the RAT Type
  - It will be set to EUTRAN for LTE access
- The Visited PLMN is also included in the message

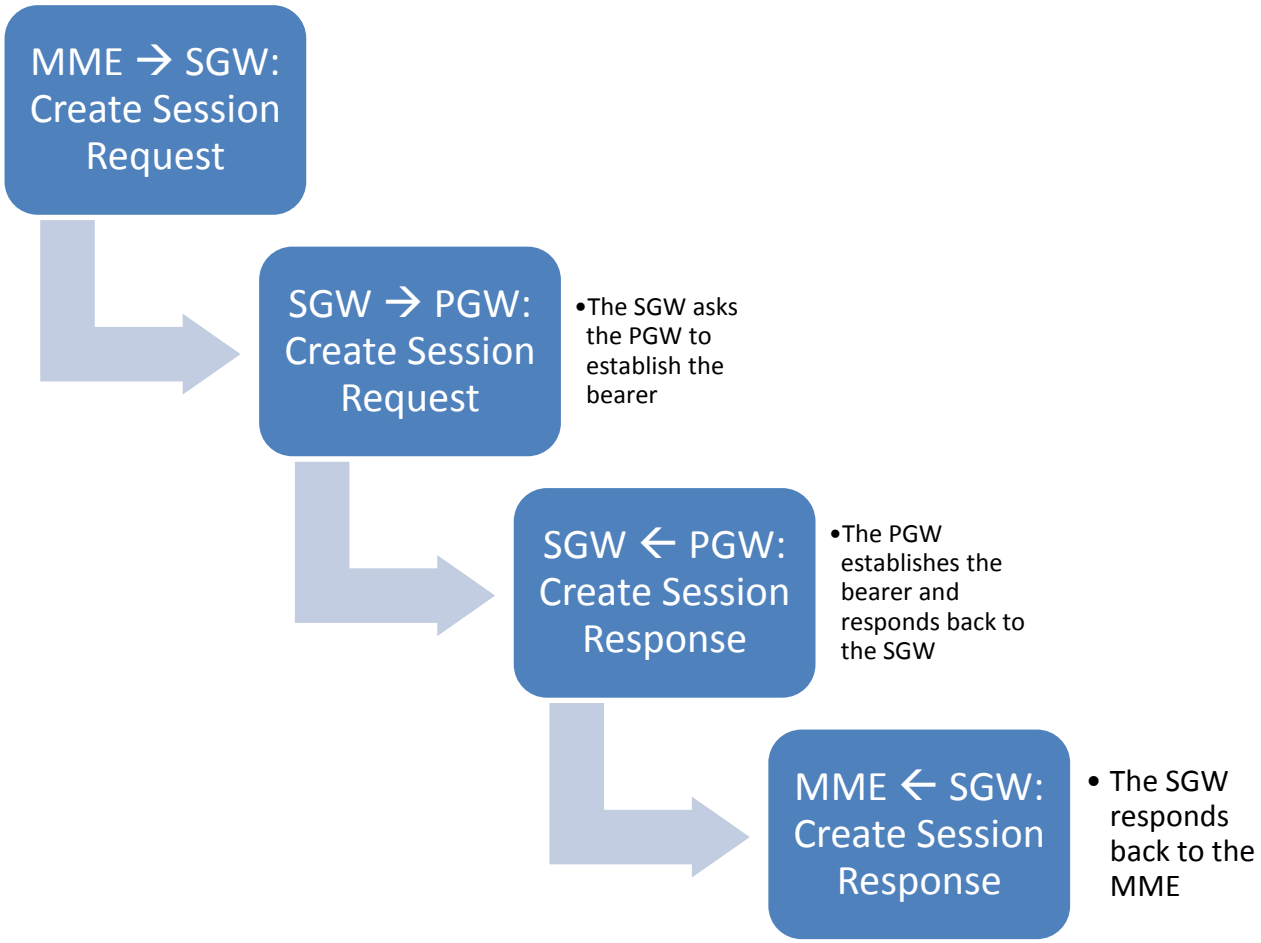


S6A: MME ← HSS Diameter Update Location Answer

- The HSS accesses the database and responds with user information to the MME
- The Aggregate Maximum Bit Rate (AMBR) occurs twice in the message:
  - The first occurrence specifies the maximum bit rate for the default PDP context
  - The second occurrence specifies the data maximum data limit via the APN. These limits are specified by the PDN
- APN configuration also includes:
  - IP address of the PDN Gateway. This address is used to determine the default route for the traffic towards the Internet
  - IP address assigned to the UE (Served Party IP Address)

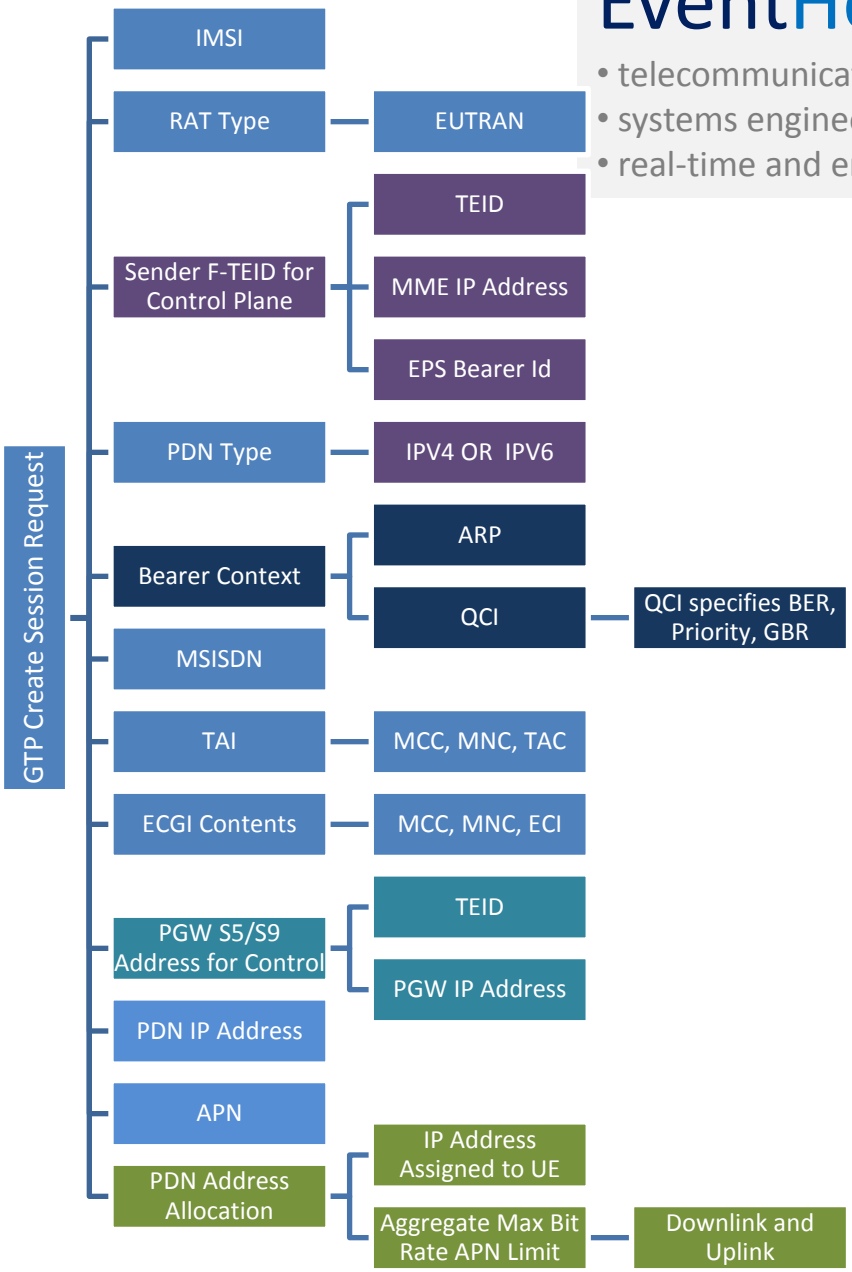


Default Bearer Establishment



S11: MME → SGW GTP Create Session Request

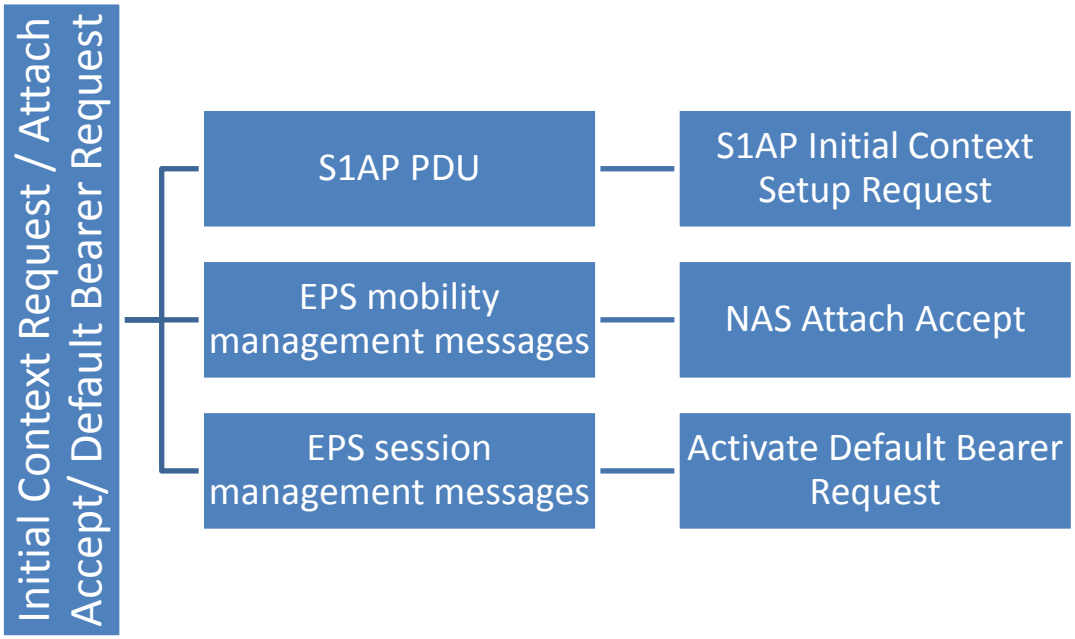
- MME initiates the default route establishment by asking the SGW to create a GTP tunnel
- The source is identified by the fully qualified endpoint identifier with the Tunnel Endpoint Identifier (TEID) and the MME IP Address
- The IP Address assigned to the UE is also included along with the downlink and uplink maximum data rates allowed at the APN level
- The TAI and ECGI (E-UTRAN Cell Group Identifier) information identify the current location of the user



S1AP: eNodeB ← MME
S1AP Initial Context Setup Request
NAS Attach Accept
Activate Default Bearer Request

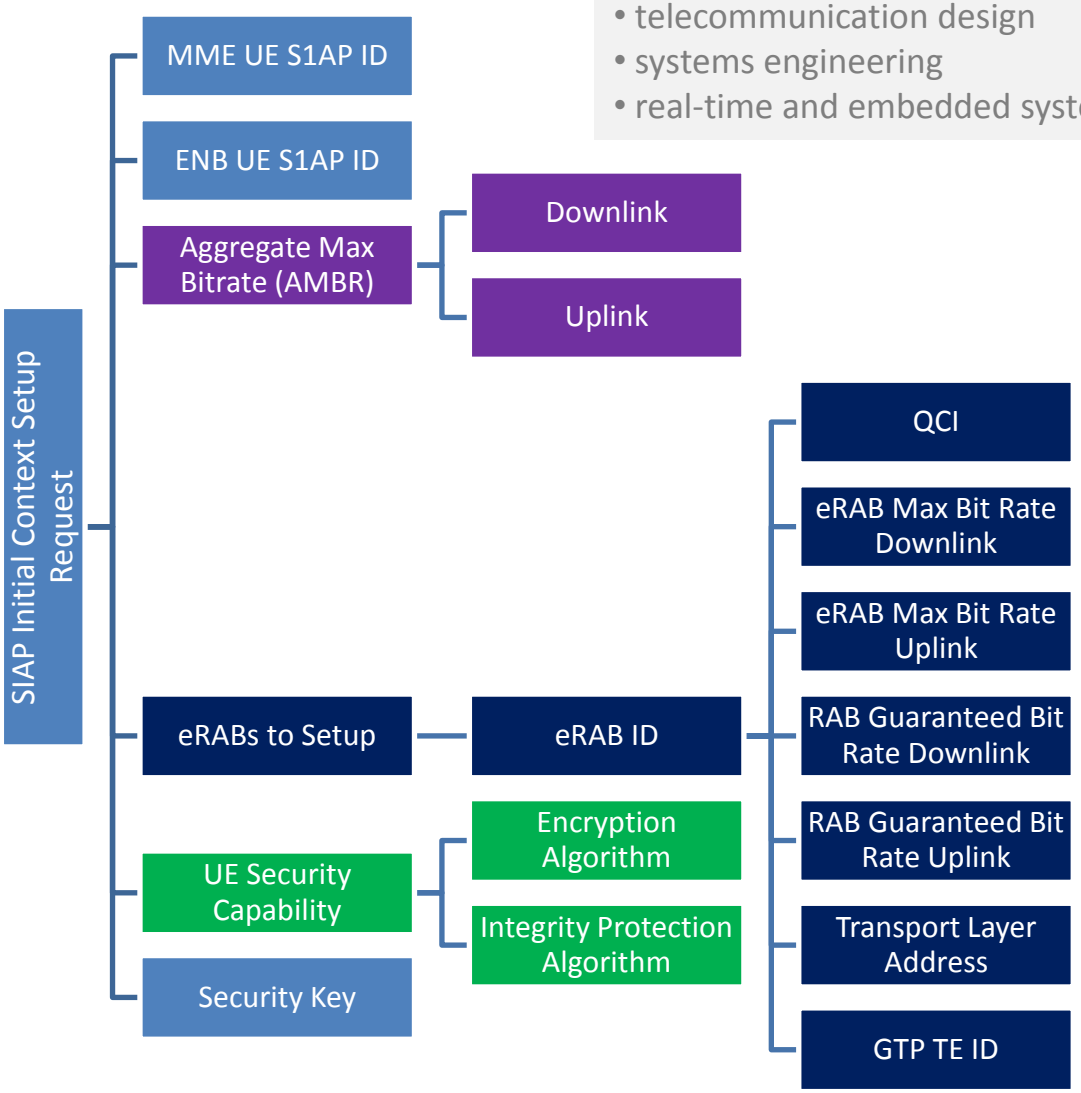
The next message from the MME is really a three-in-one. The message contains:

- **SIAP Initial Context Setup Request**
  - A request to establish a context between the MME and eNodeB
  - The message contains SGW tunneling information
- **NAS Attach Accept**
  - This message acknowledges the successful Attach to the UE.
  - The eNodeB will pass this message to the UE
- **Activate Default Bearer Request**
  - The message initiates the default bearer setup on the UE
  - The eNodeB will pass this message to the UE



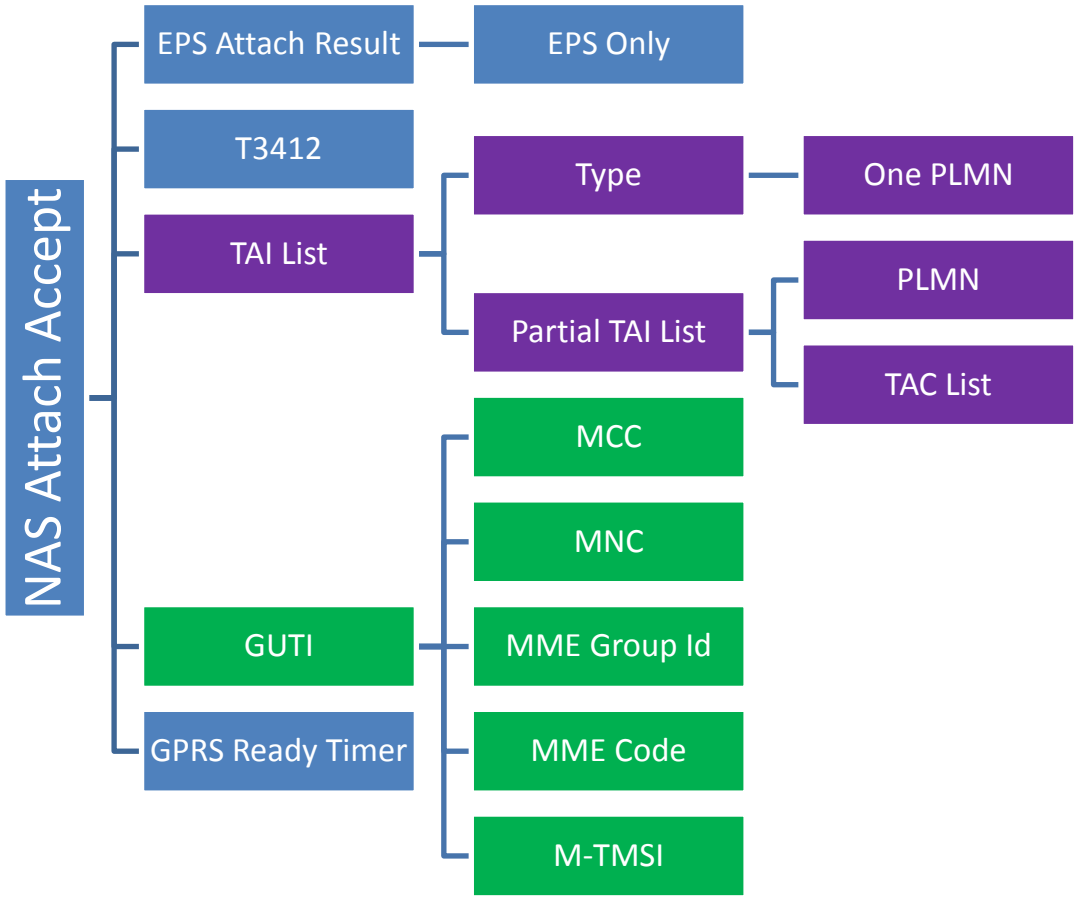
S1AP: eNodeB ← MME S1AP Initial Context Setup Request

- The MME responds with MME UE S1AP ID that was received from the eNodeB in the initial UE message
- The message also contains the MME UE S1AP ID
- The message contains the maximum aggregate bit rate information.
- The message also contains the information about the default eRAB.
  - QCI to assign session priority
  - The maximum bit rate for the eRAB
  - Guaranteed bit rate for the eRAB
  - Transport Layer Address assigns the IP Address for the user plane entity on the S-GW
  - GTP TE ID identifies the S-GW end of the user plane tunnel
- The security capabilities specify the encryption and integrity protection algorithm to be used for the UE session



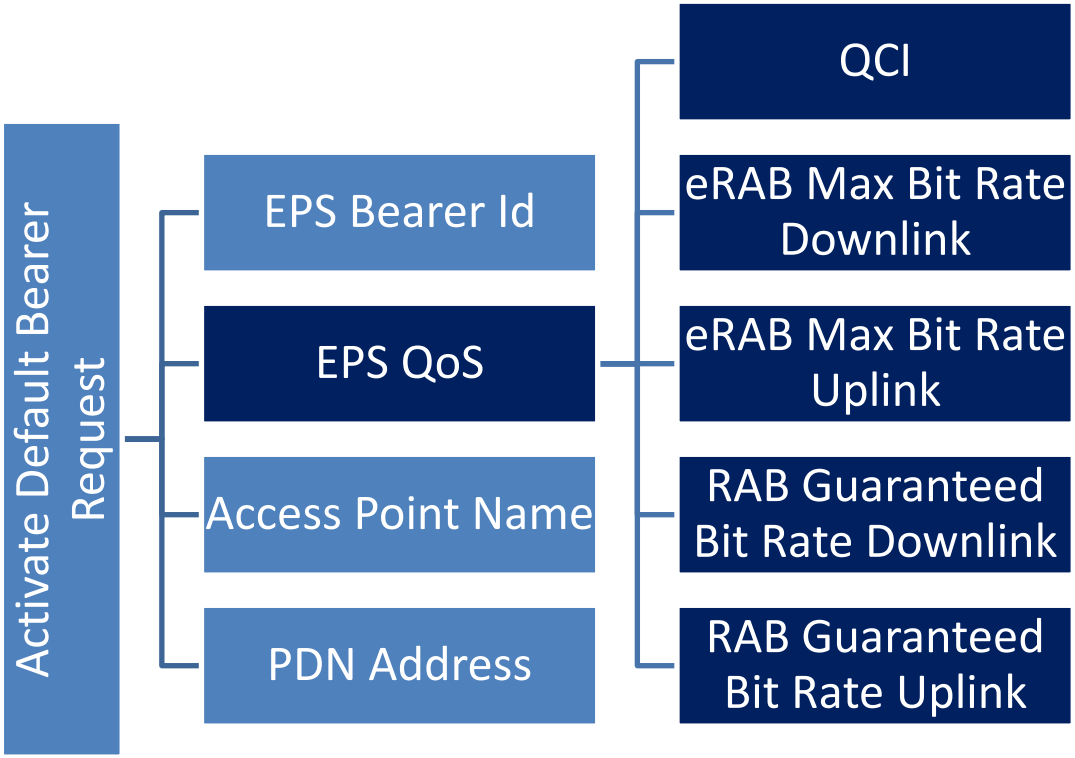
eNodeB ← MME
UE ← eNodeB
NAS Attach Accept

- The Attach Accept is carried as NAS payload in the Initial Context Setup Request
- The message specifies that the attach has been successful. The terminal is attached to the EPS only (i.e. LTE only, no SGSN registration)
- The T3412 timer specifies the maximum time between tracking area updates from the terminal
- The TAI list in the message specifies the PLMN and the Tracking Area Codes for all the registered tracking areas
- The message contains GUTI. GUTI uniquely identifies the UE with PLMN, MME Group, MMC code and the M-TMSI
- Finally, the GPRS Ready timer is included in the message.
  - The UE will be transitioned to IDLE if no activity is detected for this period



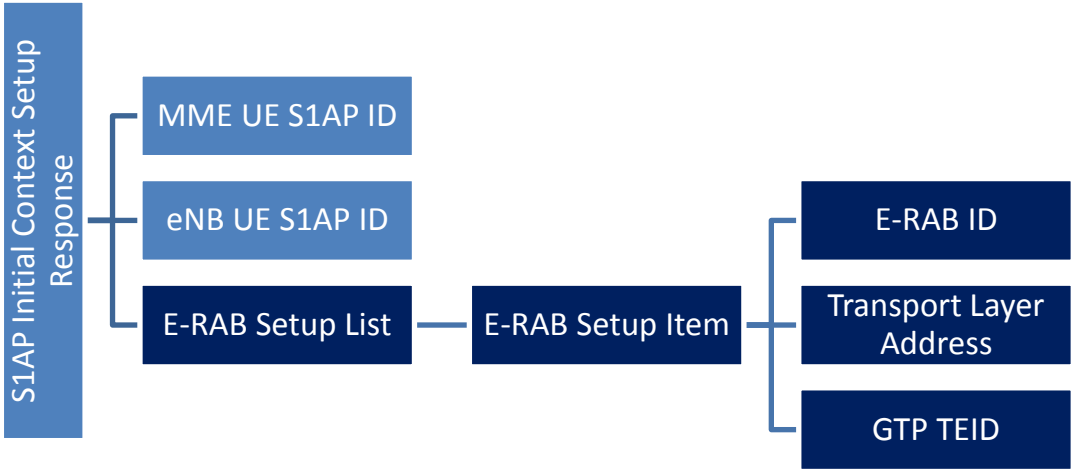
eNodeB ← MME
UE ← eNodeB
Activate Default Bearer Request

- The Attach Accept is carried as NAS payload in the Initial Context Setup Request
- The EPS Bearer id identifies the bearer that needs to be activated
- The EPS QoS carries quality of service information:
  - QCI to assign session priority
  - The maximum bit rate for the bearer
  - Guaranteed bit rate for the bearer
- The Access Point Name (APN) is included in the message
- The PDN IP address assigned by the HSS is passed to the UE



eNodeB → MME Initial Context Setup Response

- The eNodeB sends the Initial Context Setup Response message to the MME.
- The message confirms the establishment of the GTP tunnel on the S1-U interface
- The message contains information about the RABs that are being established at startup.
- The following information is present for each RAB
  - The E-RAB ID
  - The transport layer IP address on the eNodeB.
  - The eNodeB GTP Tunneling ID (TEID) for the eNodeB side.



Completing the Attach and Default Bearer Activation

eNodeB → MME: Attach Complete + Activate Default Bearer Accept

- eNodeB transports Attach Complete and Activate Default Bearer Accept
- The message was received from the UE

MME → SGW: Modify Bearer Request

- Inform SGW about the eNodeB's user plane IP address and GTP TEID

Thank You

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