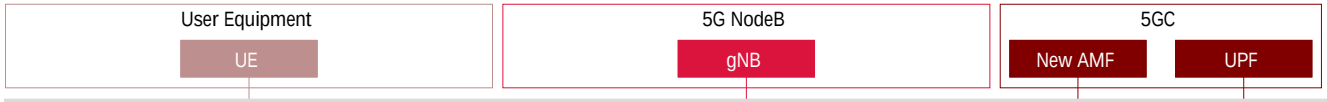
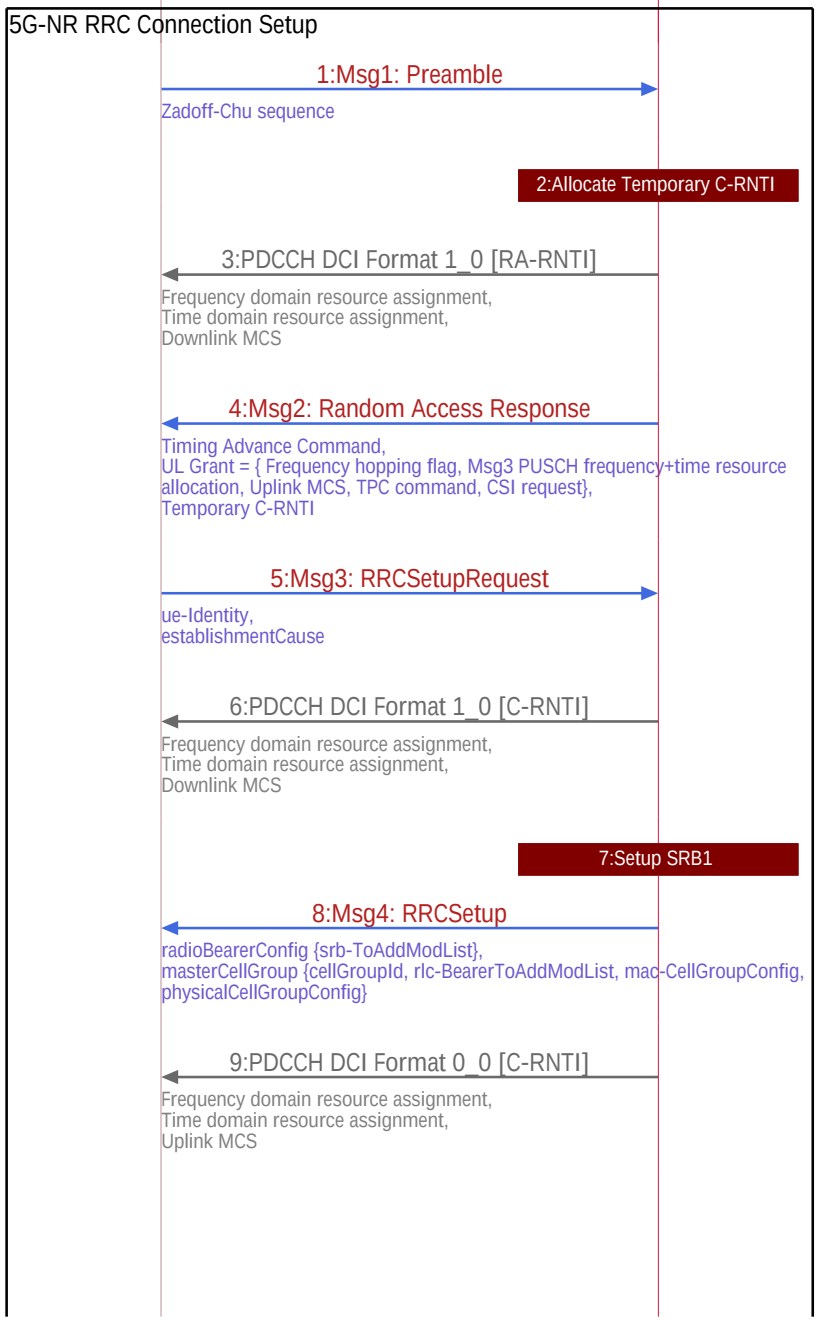


gNB Interactions: 5G Standalone Access Registration



The UE picks a random preamble. The preamble is referenced with the Random Access Preamble Id (RAPID). The preamble transmission is a Zadoff-Chu sequence.

The Temporary C-RNTI assignment will be signaled to the UE in the Random Access Response message.

The RA-RNTI scrambled DCI message signals the frequency and time resources assigned for the transmission of the Transport Block containing the Random Access Response message.

The UE detects a DCI Format 1_0 with CRC scrambled by the corresponding RA-RNTI and receives a transport block in a corresponding PDSCH. The RAR carries the timing advance, uplink grant and the Temporary C-RNTI assignment.

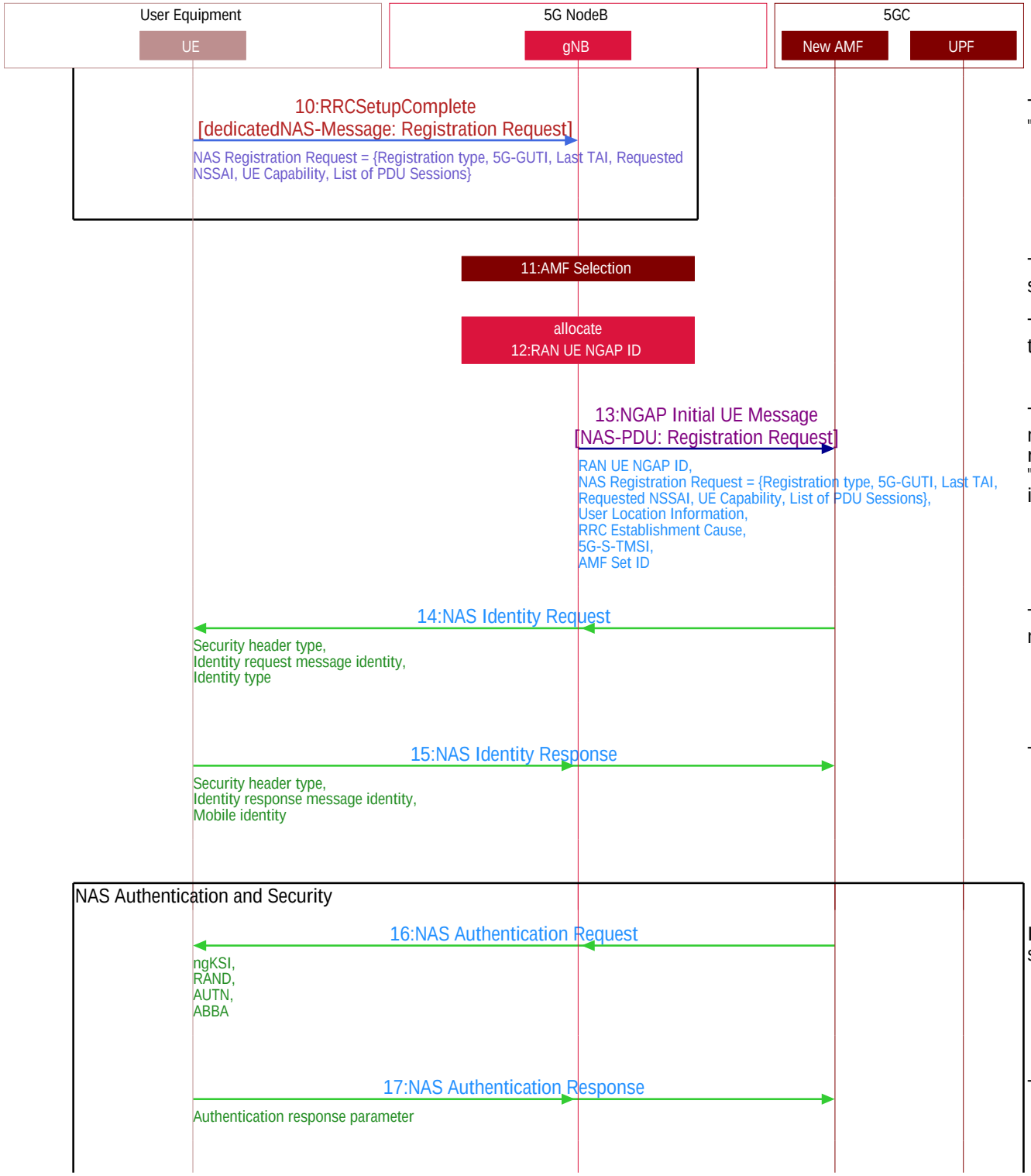
The RRC Setup Request is sent with the random ue-Identity and an establishment cause.

The C-RNTI scrambled DCI message signals the frequency and time resources assigned for the transmission of the Transport Block containing the RRC Setup message.

Signaling Radio Bearer 1 is configured.

The RRC Setup message is sent to setup SRB1 and the master cell. The message carries the radioBearerConfig and masterCellGroup information elements.

The gNB assigns uplink resource to the UE so that it can send the RRC Setup Complete message.



The UE sends the RRC Setup Complete message with a "Registration Request" in the dedicatedNAS-Message field.

The gNB selects the Access and Mobility Function (AMF) for this session.

The gNB allocates a "RAN UE NGAP ID". The AMF will use this id to address the UE context on the gNB.

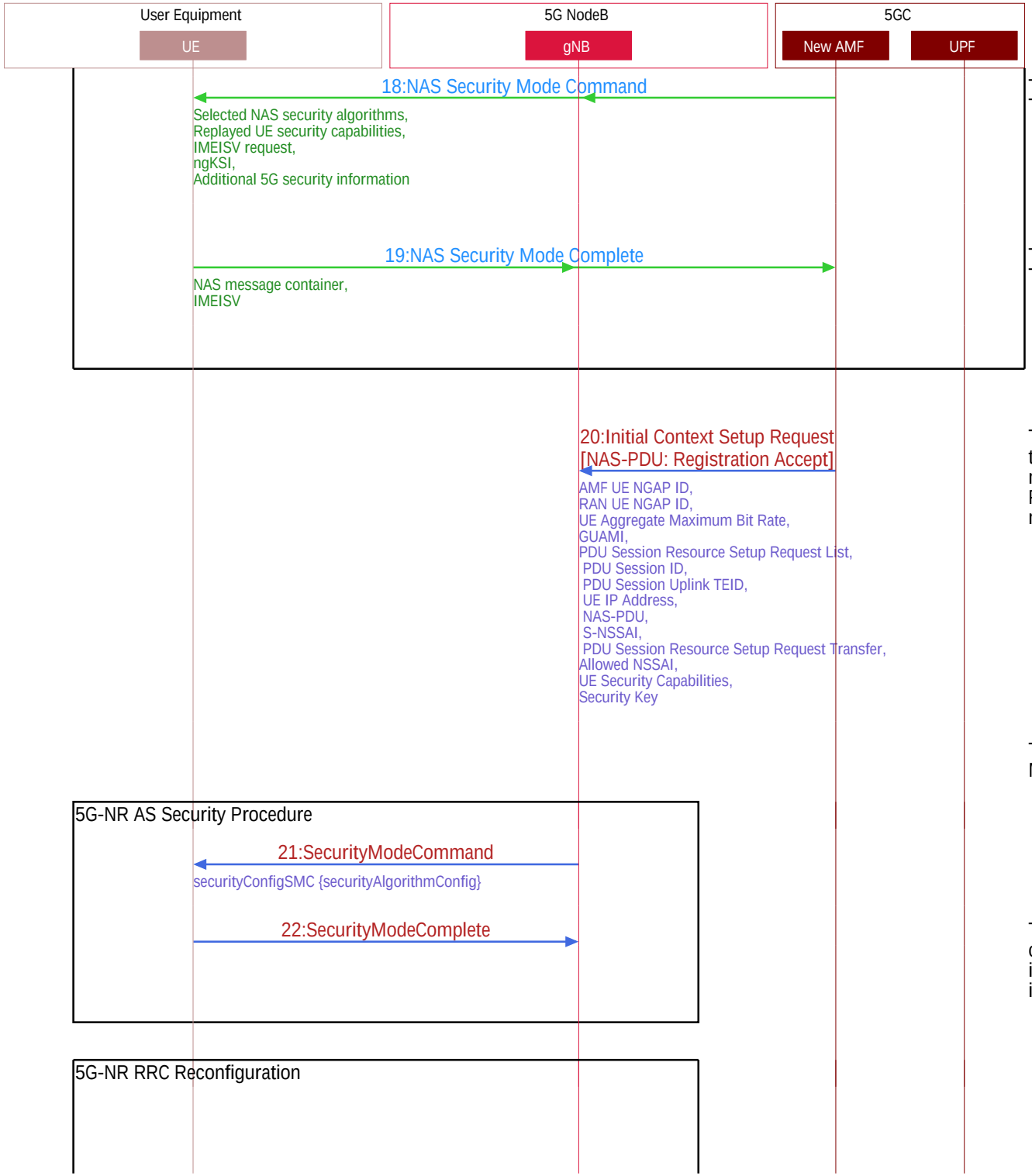
The gNB sends the Initial UE Message to the selected AMF. The message carries the "Registration Request" message that was received from the UE in the RRC Setup Complete message. The "RAN UE NGAP ID" and the "RRC Establishment Cause" are also included in the message.

The New AMF requests UE Identity (SUCI) from the UE via a NAS message.

The UE responds to the Identity Request.

Initiate the authentication procedure with the UE. Send the key selector, RAND and AUTN to the UE.

The UE responds to the authentication challenge.



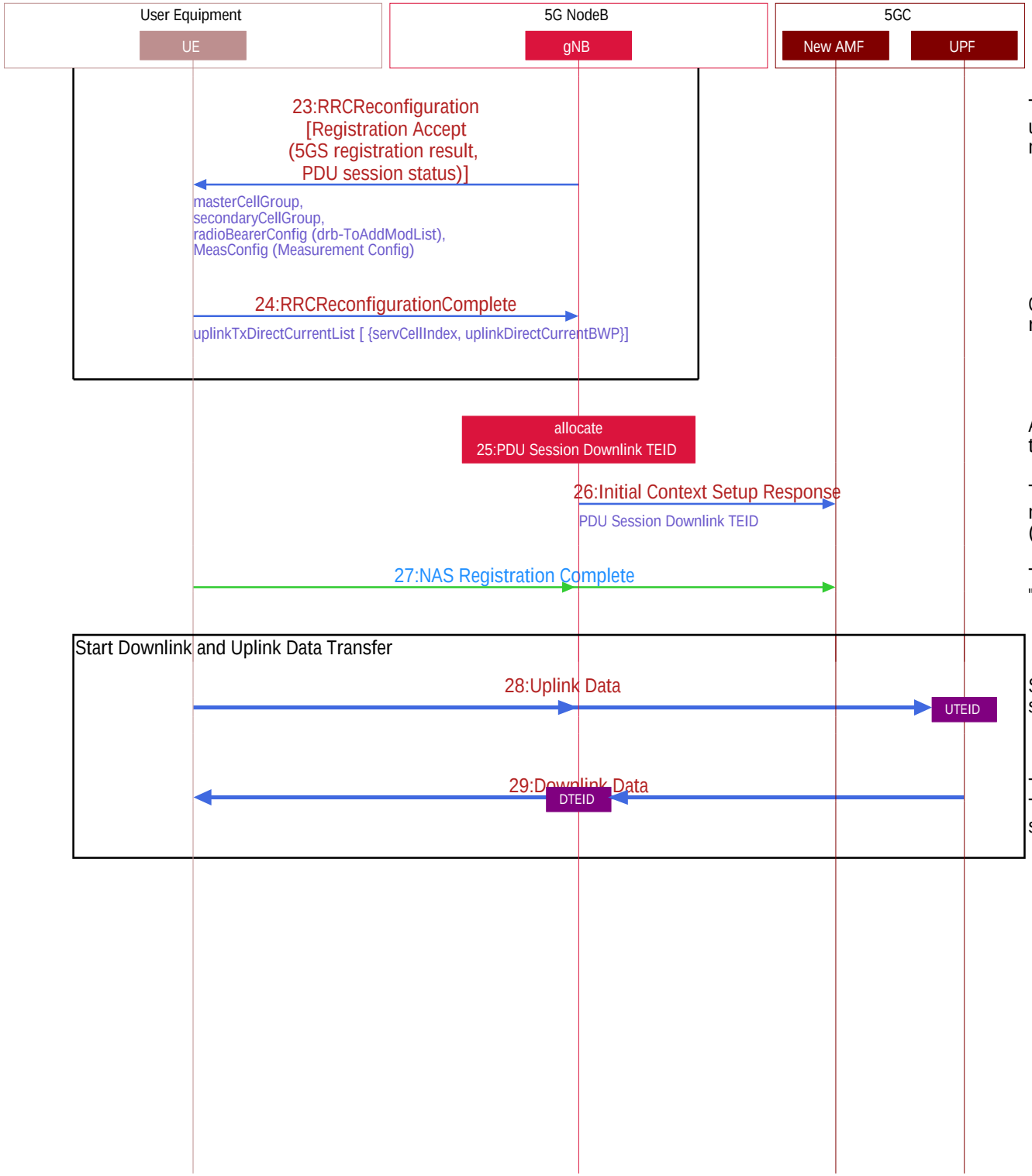
The AMF signals the selected NAS security algorithm to the UE. The AMF also requests the IMEISV from the UE.

The UE signals the completion of the NAS security procedure. The message contains the IMEISV.

The AMF initiates a session setup with the gNB. The message typically contains the Registration Accept NAS message. The message carries one or more PDU Session setup requests. Each PDU session is addressed with the "PDU Session ID". The message also carries the uplink TEID for every PDU session.

The message also carries the "AMF UE NGAP ID", "UE Aggregate Maximum Bit Rate", UE security capabilities and security key.

The security mode complete message confirms the successful completion of the security mode command. This message is integrity protected but not ciphered. Ciphering will start immediately after sending this message.



The RRC Reconfiguration message is sent to the UE for setting up radio bearers, setup a secondary cell and initiate UE measurements.

Confirm the successful completion of an RRC connection reconfiguration.

Allocate the TEID that the UPF will use to send downlink data to the gNB.

The gNB signals the successful setup of PDU sessions. The message also carries the Downlink TEID that should be used (specified per PDU session).

The UE signals the completion of the registration via the "Registration Complete" message to the AMF.

Since the uplink path has been setup completely, the UE starts sending data. The gNB sends the UE data to the Uplink TEID.

The UPF sends the buffered data to the gNB using the Downlink TEID for the PDU session. All new downlink data also takes the same path.