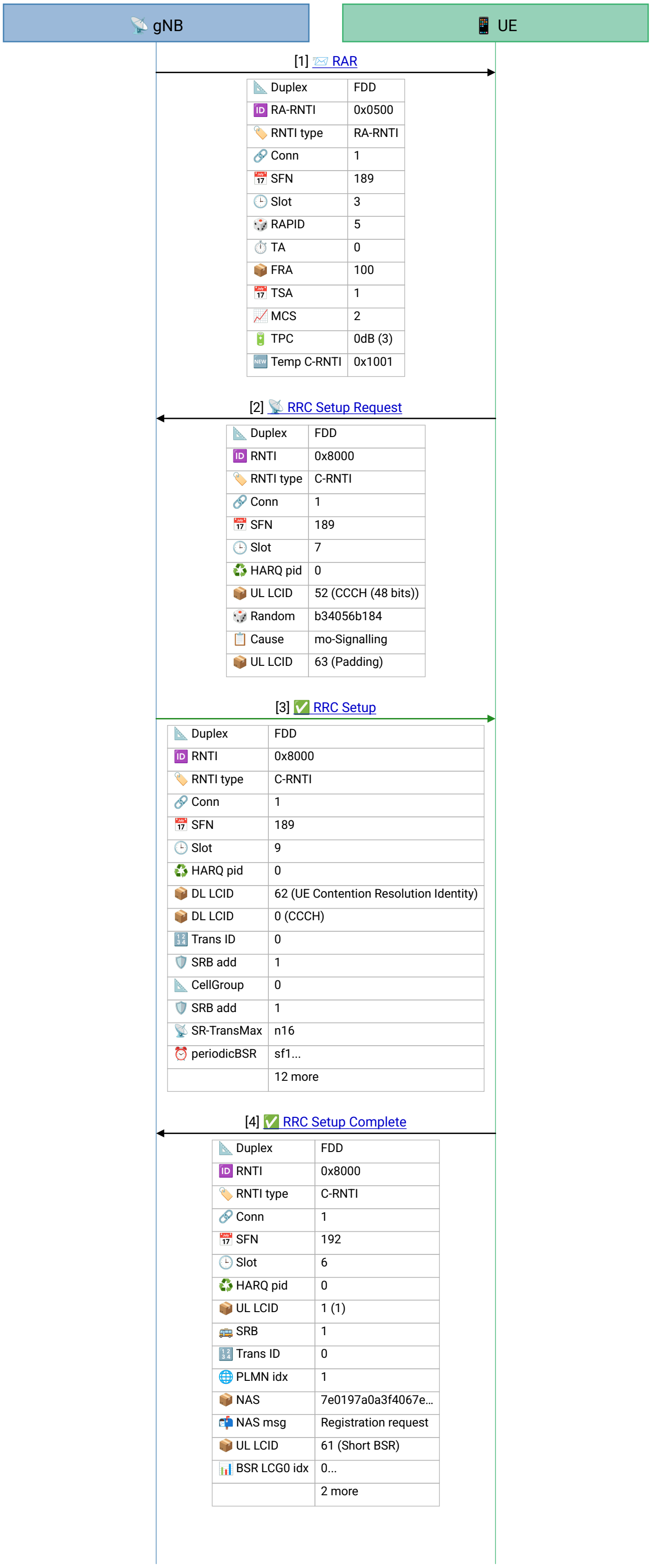
nr-attach-air-interface.annotated



[Frame 1] Phase 1 — getting onto the cell. Random Access Response (Msg2). The UE has already sent a PRACH preamble on the physical layer (not in this MAC-level capture); the gNB answers here with a Temporary C-RNTI (`0x1001`), a Timing Advance, and the uplink grant the UE will use for Msg3. `RA-RNTI 0x0500` addresses the response to whoever sent that preamble. This is the very first frame of the connection.

[Frame 2] RRC Setup Request (Msg3). The UE asks to open an RRC connection. It has no dedicated identity yet, so it speaks on the Common Control Channel (`CCCH`, uplink `LCID 52`) and includes a 39-bit random value for contention resolution. The establishment cause is `mo-Signalling` — mobile-originated signaling, the UE wanting to talk to the core, not (yet) to move bulk data.

[Frame 3] RRC Setup (Msg4), with contention resolution. Two things happen in one downlink frame. A MAC UE `Contention Resolution Identity` control element (`LCID 62`) echoes the UE's Msg3 back so the UE knows it won the random-access contest. The RRC payload then installs SRB1 (Signaling Radio Bearer 1) and the master cell-group config — the buffer-status and power-headroom reporting rules the UE follows from now on. On receipt the UE enters `RRC_CONNECTED`.

[Frame 4] RRC Setup Complete (Msg5), carrying the first NAS message. The UE confirms on SRB1 (`LCID 1`) and piggybacks a NAS `Registration request` to the core inside the RRC container. This is the hinge of the flow: from here the radio conversation (RRC) and the core-network conversation (NAS) run in parallel, every NAS message tunnelled inside an RRC envelope. The Registration Request arrives *integrity-protected* (NAS security-header type 1), which tells us this UE already holds a NAS security context from a previous visit — a returning UE, not a first-ever power-on.

gNB → UE

[5] RLC AM Status PDU

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	192
Slot	8
HARQ pid	0
DL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
ACK SN	1
E1	A set of NACK_SN, E1, E2 and E3 does not follow
DL LCID	63 (Padding)

[Frame 5] RLC Acknowledged-Mode Status PDU on SRB1 : the receiver reports a cumulative ACK_SN = 1 , confirming the RRC Setup Complete (RLC SN 0) arrived. RLC-AM status reports are the acknowledgment heartbeat that drives retransmissions on the bearer.

[6.1] DL LCID 61 (Timing Advance Command)

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	202
Slot	3
HARQ pid	1
Subheader	TAG=0 TA=31
Subheader	Padding 0 bytes

[Frame 6.1] MAC Timing Advance Command control element (TA = 31) . The gNB keeps the UE's uplink transmissions time-aligned at the base station as radio conditions drift; this is pure link maintenance, not signaling.

[6.2] DL LCID 63 (Padding)

[7] Authentication request

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	205
Slot	6
HARQ pid	2
DL LCID	1 (1)
SRB	1
DL Information Transfer	
DL LCID	63 (Padding)

[Frame 7] Authentication request. The AMF (core) challenges the UE, carried transparently to the UE as an RRC DL `Information Transfer` . NAS security-header type 0 — plaintext — because the fresh authentication run has not yet activated NAS ciphering.

[8] RLC AM Status PDU

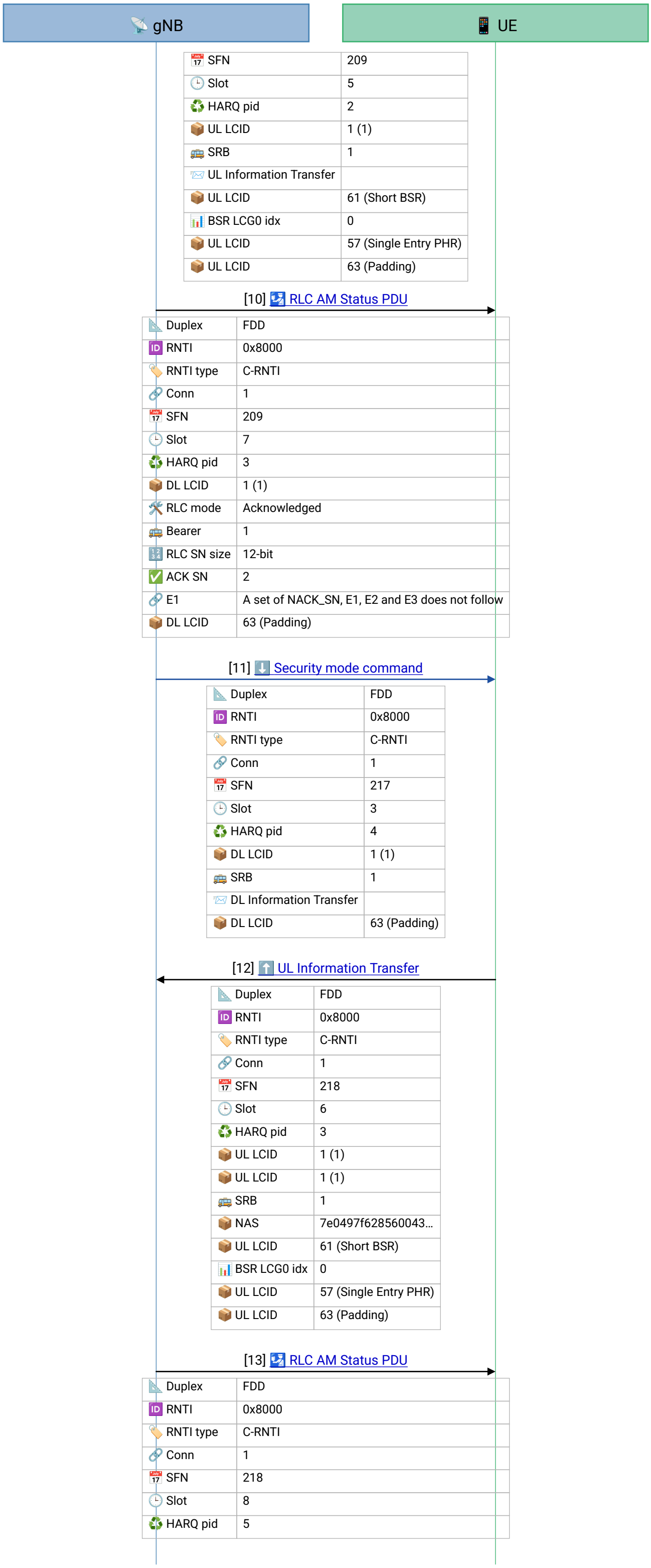
Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	206
Slot	6
HARQ pid	1
UL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
ACK SN	1
E1	A set of NACK_SN, E1, E2 and E3 does not follow
UL LCID	61 (Short BSR)
BSR LCG0 idx	0...
	2 more

[Frame 8] RLC-AM Status PDU on SRB1 , ACK_SN = 1 in the uplink direction — ARQ runs independently per direction on the same bearer.

[9] Authentication response

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1

[Frame 9] Authentication response. The UE answers the challenge (RRC UL `Information Transfer`) . A matching response is what lets the network trust the UE and derive fresh keys.

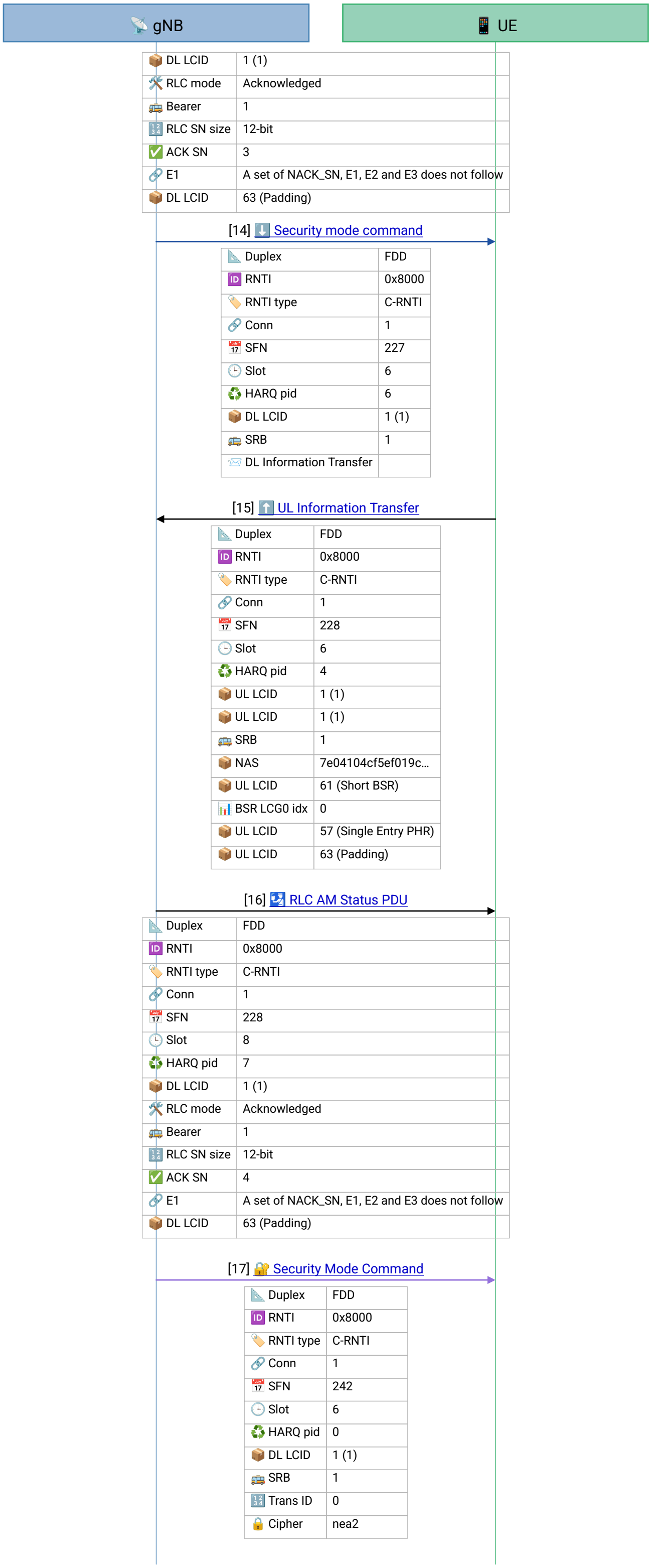


[Frame 10] RLC-AM Status PDU, ACK_SN = 2 — the gNB has now taken the Authentication response.

[Frame 11] Phase 2 — NAS (core-network) security. NAS `Security mode command` from the AMF (security-header type 3, "integrity protected with a new 5G NAS security context"). This activates *NAS-layer* ciphering and integrity — a security context that is entirely separate from the radio-layer one the gNB will set up later. Keep that separation in mind: it is the reason parts of this trace stay unreadable even after we apply the radio keys.

[Frame 12] NAS `Security mode complete` from the UE (security-header type 4, "integrity protected and ciphered with a new NAS context"). This is the first *NAS-ciphered* message in the capture. Its body is encrypted with the NAS keys — which we do **not** have — so the inner message type is opaque here.

[Frame 13] RLC-AM Status PDU on SRB1, ACK_SN = 3.



[Frame 14] A **second** NAS `Security mode command` (again security-header type 3, new context). The AMF runs the NAS security-mode procedure twice back-to-back — the first exchange (frames 11-12) is followed immediately by this one. A second run re-keys the NAS context; in a lab trace like this it is most likely the rig re-establishing NAS security rather than a fault, but it is a genuine second procedure, not a retransmission (the UE's Complete in frame 12 arrived in between).

[Frame 15] NAS `Security mode complete` for the second procedure (security-header type 4, ciphered). Body opaque, as in frame 12.

[Frame 16] RLC-AM Status PDU on `SRB1`, `ACK_SN = 4`.

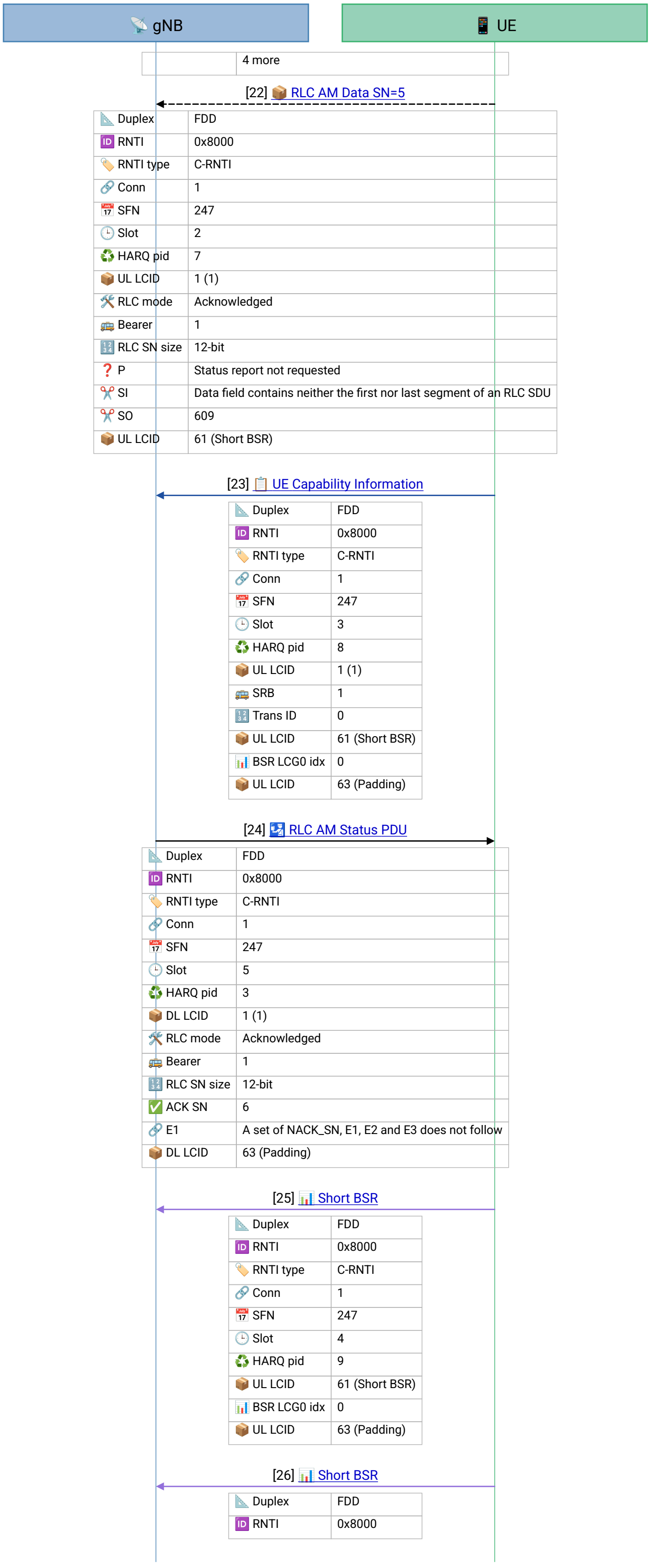
[Frame 17] Phase 3 — Access-Stratum (radio) security. RRC `Security Mode Command` from the gNB. This is the *other* security context — the radio one, applied at the PDCP layer. It selects ciphering `nea2` (AES) and integrity `nia2` (AES-CMAC). From here, PDCP on every SRB and DRB is ciphered and integrity-protected. These are the `nea2` keys the work-item-19757 issue publishes, and applying them is what deciphers the rest of this capture.

[Frame 18] RRC `Security Mode Complete`. The UE confirms under the new AS keys; radio security is now mutually active. Note the layering: two Security Mode procedures, NAS (frames 11-16) and AS (here), securing two independent contexts.

[Frame 19] RLC-AM Status PDU on SRB1, `ACK_SN = 5`.

[Frame 20] Phase 4 — UE capabilities. `UE Capability Enquiry`: the gNB asks the UE to report what it supports — bands, MIMO layers, modulation orders, ROHC profiles — before it configures a data bearer around those capabilities.

[Frame 21] RLC-AM Status PDU (uplink), `ACK_SN = 5`, plus a second AM segment starting — the UE Capability Information is large and is being segmented across RLC PDUs.



[Frame 22] RLC-AM Data PDU on SRB1 (SN 5) , a non-first/non-last segment (SO = 609) of the segmented UE Capability Information. RLC-AM splits a large SDU and reassembles it at the receiver using the Segment Offset.

[Frame 23] UE Capability Information. The UE returns its capability set. Among the R16 features it advertises is `loggedMeasurements-r16: supported` — the UE can perform logged Minimization-of-Drive-Tests measurements. (Only the *capability* appears; the network never configures an actual MDT logging session in this trace.)

[Frame 24] RLC-AM Status PDU, ACK_SN = 6 — the gNB has reassembled the capability report.

[Frame 25] Short Buffer Status Report: the UE tells the scheduler how much uplink data is queued for one Logical Channel Group. Index 0 here means the buffer has effectively drained.

[Frame 26] Short BSR — buffer-status housekeeping as the UE's uplink queue empties.

📡 gNB | 📱 UE

🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	247
🕒 Slot	5
♻️ HARQ pid	10
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[27] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	247
🕒 Slot	6
♻️ HARQ pid	11
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	57 (Single Entry PHR)
📦 UL LCID	63 (Padding)

[Frame 27] Short BSR (with a Power Headroom Report multiplexed in) — routine scheduling feedback.

[28] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	247
🕒 Slot	7
♻️ HARQ pid	12
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[Frame 28] Short BSR — routine scheduling feedback.

[29] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	247
🕒 Slot	8
♻️ HARQ pid	13
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[Frame 29] Short BSR — routine scheduling feedback.

[30] ⬇️ DL Information Transfer

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	253
🕒 Slot	1
♻️ HARQ pid	4
📦 DL LCID	1 (1)
🚌 SRB	1
🔢 Trans ID	0
📦 NAS	7e026b39d3f8026d…

[Frame 30] RRC `DL Information Transfer` carrying a NAS message from the core. Its NAS security-header is type 2 (integrity-protected **and ciphered** under the established NAS context), so the body is opaque to us — this is very likely a Registration Accept or a session-management message, but we cannot read it without the NAS keys.

[31] ⬆️ UL Information Transfer

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	254

[Frame 31] RRC `UL Information Transfer`, NAS-ciphered (type 2) — the UE's reply to frame 30. Opaque body.

gNB | UE

Slot	6
HARQ pid	14
UL LCID	1 (1)
UL LCID	1 (1)
SRB	1
NAS	7e027bc1bd1102c8…
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	57 (Single Entry PHR)
UL LCID	63 (Padding)

[32] RLC AM Status PDU

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	254
Slot	8
HARQ pid	5
DL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
ACK SN	7
E1	A set of NACK_SN, E1, E2 and E3 does not follow
DL LCID	63 (Padding)

[Frame 32] RLC-AM Status PDU on SRB1, `ACK_SN = 7`.

[33.1] DL LCID 61 (Timing Advance Command)

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	262
Slot	3
HARQ pid	6
Subheader	TAG=0 TA=31
Subheader	Padding 0 bytes

[Frame 33.1] MAC Timing Advance Command — link maintenance during a lull in signaling.

[33.2] DL LCID 63 (Padding)

[34.1] DL LCID 61 (Timing Advance Command)

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	322
Slot	3
HARQ pid	7
Subheader	TAG=0 TA=31
Subheader	Padding 0 bytes

[Frame 34.1] MAC Timing Advance Command. The ~0.6 s spacing between these is the gNB's periodic TA upkeep while little else is happening.

[34.2] DL LCID 63 (Padding)

[35.1] DL LCID 61 (Timing Advance Command)

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	382
Slot	3
HARQ pid	0
Subheader	TAG=0 TA=31
Subheader	Padding 0 bytes

[Frame 35.1] MAC Timing Advance Command — periodic upkeep.

[35.2] DL LCID 63 (Padding)

[36] UL Information Transfer

[Frame 36] RRC UL `Information Transfer`, NAS-ciphered (type 2). Another opaque NAS exchange as

gNB | UE

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	391
Slot	5
HARQ pid	15
UL LCID	1 (1)
SRB	1
NAS	7e0235b37a520354...
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	57 (Single Entry PHR)
UL LCID	63 (Padding)

the core-network procedures continue behind NAS encryption.

[37] RLC AM Status PDU →

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	391
Slot	7
HARQ pid	1
DL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
ACK SN	8
E1	A set of NACK_SN, E1, E2 and E3 does not follow
DL LCID	63 (Padding)

[Frame 37] RLC-AM Status PDU on SRB1, `ACK_SN = 8`.

[38] RRC Reconfiguration →

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	421
Slot	8
HARQ pid	2
DL LCID	1 (1)
SRB	1
Trans ID	0
SRB add	2
PDU Session	1
SDAP DL	absent
SDAP UL	present
Default DRB	True...
	18 more

[Frame 38] Phase 5 — building the data radio bearer. RRC `Reconfiguration`, the pivotal control frame. It adds SRB2 and a data radio bearer DRB 1 on `LCID 4`, and maps a PDU session's QoS flow onto it: `sdap-Config` with the SDAP downlink header **absent** and the uplink header **present,** default DRB, `QFI 2`. PDCP uses an 18-bit sequence number in both directions, ROHC off; RLC-AM is configured with `t-PollRetransmit = 80 ms`, `pollPDU = 32768`, `pollByte = 750 kB`. It also carries a piggybacked NAS message — but that NAS PDU is type 2 (NAS-ciphered), so its contents stay opaque even though the RRC around it is now readable.

[39] RRC Reconfiguration Complete ←

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	423
Slot	5
HARQ pid	0
UL LCID	1 (1)
UL LCID	1 (1)
SRB	1
Trans ID	0
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	57 (Single Entry PHR)
UL LCID	63 (Padding)

[Frame 39] RRC `Reconfiguration Complete`. The UE has applied the new bearer configuration; DRB 1 is live and user data can now flow.

gNB | UE

[40] RLC AM Status PDU

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	423
Slot	7
HARQ pid	3
DL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
ACK SN	9
E1	A set of NACK_SN, E1, E2 and E3 does not follow
DL LCID	63 (Padding)

[Frame 40] RLC-AM Status PDU on SRB1, `ACK_SN = 9` — acknowledging the reconfiguration exchange.

[41] UL SDAP -> QFI 2

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	433
Slot	5
HARQ pid	1
UL LCID	4 (4)
RLC SN=0	
DRB	1
PDCP SN=0	
SDAP PDU	Data PDU
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	57 (Single Entry PHR)...
	1 more

[Frame 41] Phase 6 — user-plane data on the DRB. The first uplink SDAP Data PDU on DRB 1. The one-byte SDAP header (TS 37.324) carries the `QFI = 2` the UE stamped on its IP packet, so the network knows which QoS flow this belongs to. This — and everything below the SDAP header — only becomes visible because the AS keys deciphered PDCP; without them this is an opaque ciphertext blob. Underneath sits IPv6 (here the start of IPv6 setup); the deeper look at what the user plane actually carries is the subject of the companion decryption article.

[42] RLC AM Status PDU

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	433
Slot	7
HARQ pid	4
DL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
ACK SN	1
E1	A set of NACK_SN, E1, E2 and E3 does not follow
DL LCID	63 (Padding)

[Frame 42] RLC-AM Status PDU on the DRB (`ACK_SN = 1`, 18-bit SN) — the data bearer has its own ARQ, distinct from SRB1 's.

[43] RLC AM Data SN=0

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	435
Slot	3
HARQ pid	5
DL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
P	Status report is requested
SI	Data field contains all bytes of an RLC SDU

[Frame 43] Downlink RLC-AM Data PDU on DRB 1 (`SN 0`), a complete SDU, with the Poll bit set to demand an immediate Status PDU back.

gNB | UE

[44] RLC AM Status PDU

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	436
Slot	6
HARQ pid	2
UL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
ACK SN	1
E1	A set of NACK_SN, E1, E2 and E3 does not follow
UL LCID	61 (Short BSR)
BSR LCG0 idx	0...
	2 more

[Frame 44] RLC-AM Status PDU (uplink), ACK_SN = 1 on the DRB — the UE confirms the downlink data.

[45.1] DL LCID 61 (Timing Advance Command)

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	442
Slot	3
HARQ pid	6
Subheader	TAG=0 TA=31
Subheader	Padding 0 bytes

[Frame 45.1] MAC Timing Advance Command — link upkeep between data bursts.

[45.2] DL LCID 63 (Padding)

[46.1] DL LCID 61 (Timing Advance Command)

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	502
Slot	3
HARQ pid	7
Subheader	TAG=0 TA=31
Subheader	Padding 0 bytes

[Frame 46.1] MAC Timing Advance Command — link upkeep.

[46.2] DL LCID 63 (Padding)

[47] UL SDAP -> QFI 2

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	555
Slot	5
HARQ pid	3
UL LCID	4 (4)
RLC SN=1	
DRB	1
PDCP SN=1	
SDAP PDU	Data PDU
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	57 (Single Entry PHR)...
	1 more

[Frame 47] Uplink SDAP Data PDU on DRB 1, QFI 2 (RLC SN 1, PDCP SN 1). User-plane traffic continues on the deciphered bearer.

[48] RLC AM Status PDU

Duplex	FDD
RNTI	0x8000

[Frame 48] RLC-AM Status PDU on the DRB, ACK_SN = 2.

gNB	UE

RNTI type	C-RNTI
Conn	1
SFN	555
Slot	7
HARQ pid	0
DL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
ACK SN	2
E1	A set of NACK_SN, E1, E2 and E3 does not follow
DL LCID	63 (Padding)

[49] RLC AM Data SN=1

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	556
Slot	2
HARQ pid	1
DL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
P	Status report is requested
SI	Data field contains all bytes of an RLC SDU

[Frame 49] Downlink RLC-AM Data PDU on DRB 1 (SN 1) , Poll bit set.

[50] UL SDAP -> QFI 2

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	557
Slot	5
HARQ pid	4
UL LCID	4 (4)
UL LCID	4 (4)
RLC SN=2	
DRB	1
PDCP SN=2	
SDAP PDU	Data PDU
UL LCID	4 (4)
RLC SN=3...	
	2 more

[Frame 50] Uplink SDAP Data PDU, QFI 2 (RLC SN 2) , with a second AM segment (SN 3) multiplexed into the same transport block.

[51] RLC AM Data SN=3

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	558
Slot	1
HARQ pid	5
UL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
P	Status report not requested
SI	Data field contains neither the first nor last segment of an RLC SDU
SO	539
UL LCID	61 (Short BSR)

[Frame 51] Uplink RLC-AM Data PDU on DRB 1 (SN 3) , a middle segment (SO = 539) of a larger SDU being carried across PDUs.

[52] UL SDAP -> QFI 2

Duplex	FDD

[Frame 52] Uplink SDAP Data PDU, QFI 2 (RLC SN 3 / PDCP SN 3) , with a further segment (SN 4) alongside.

📡 gNB | 📱 UE

🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	558
🕒 Slot	2
♻️ HARQ pid	6
📦 UL LCID	4 (4)
📦 RLC SN=3	
🚌 DRB	1
🔢 PDCP SN=3	
📦 SDAP PDU	Data PDU
📦 UL LCID	4 (4)
📦 RLC SN=4	
📦 UL LCID	61 (Short BSR)

[53] 🔼 UL SDAP -> QFI 2

[Frame 53] Uplink SDAP Data PDU, QFI 2 (RLC SN 4 / PDCP SN 4) .

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	558
🕒 Slot	3
♻️ HARQ pid	7
📦 UL LCID	4 (4)
📦 RLC SN=4	
🚌 DRB	1
🔢 PDCP SN=4	
📦 SDAP PDU	Data PDU
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[54] 📊 Short BSR

[Frame 54] Short BSR — the UE reporting its remaining uplink queue.

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	558
🕒 Slot	4
♻️ HARQ pid	8
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[55] 🔄 RLC AM Status PDU

[Frame 55] RLC-AM Status PDU on the DRB, ACK_SN = 5 .

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	558
🕒 Slot	7
♻️ HARQ pid	2
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
✅ ACK SN	5
🔗 E1	A set of NACK_SN, E1, E2 and E3 does not follow
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged...
	3 more

[56] 📊 Short BSR

[Frame 56] Short BSR — scheduling feedback.

📐 Duplex	FDD
🆔 RNTI	0x8000

📡 gNB | 📱 UE

🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	558
🕒 Slot	6
♻️ HARQ pid	9
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	57 (Single Entry PHR)
📦 UL LCID	63 (Padding)

[57] 📊 Short BSR

[Frame 57] Short BSR — scheduling feedback.

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	558
🕒 Slot	7
♻️ HARQ pid	10
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[58] 📊 Short BSR

[Frame 58] Short BSR — scheduling feedback.

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	558
🕒 Slot	8
♻️ HARQ pid	11
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[59] 🔄 RLC AM Status PDU

[Frame 59] RLC-AM Status PDU (uplink) on the DRB, ACK_SN = 3 .

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	560
🕒 Slot	6
♻️ HARQ pid	12
📦 UL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
✅ ACK SN	3
🔗 E1	A set of NACK_SN, E1, E2 and E3 does not follow
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0...
	2 more

[60.1] 📥 DL LCID 61 (Timing Advance Command)

[Frame 60.1] MAC Timing Advance Command — link upkeep.

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	562
🕒 Slot	3
♻️ HARQ pid	3
📦 Subheader	TAG=0 TA=31
📦 Subheader	Padding 0 bytes

[60.2] 📥 DL LCID 63 (Padding)

gNB | UE

[61.1] DL LCID 61 (Timing Advance Command)

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	622
Slot	3
HARQ pid	4
Subheader	TAG=0 TA=31
Subheader	Padding 0 bytes

[Frame 61.1] MAC Timing Advance Command — link upkeep during a ~0.6 s data lull.

[61.2] DL LCID 63 (Padding)

[62] RLC AM Data SN=3

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	679
Slot	0
HARQ pid	5
DL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
P	Status report is requested
SI	Data field contains all bytes of an RLC SDU
DL LCID	63 (Padding)

[Frame 62] Downlink RLC-AM Data PDU on DRB 1 (SN 3) , complete SDU, Poll set.

[63] UL SDAP -> QFI 2

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	680
Slot	6
HARQ pid	13
UL LCID	4 (4)
UL LCID	4 (4)
RLC SN=5	
DRB	1
PDCP SN=5	
SDAP PDU	Data PDU
UL LCID	61 (Short BSR)
BSR LCG0 idx	0...
	2 more

[Frame 63] Uplink SDAP Data PDU, QFI 2 (RLC SN 5 / PDCP SN 5) .

[64] RLC AM Status PDU

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	680
Slot	8
HARQ pid	6
DL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
ACK SN	6
E1	A set of NACK_SN, E1, E2 and E3 does not follow
DL LCID	63 (Padding)

[Frame 64] RLC-AM Status PDU on the DRB, ACK_SN = 6 .

[65.1] DL LCID 61 (Timing Advance Command)

Duplex	FDD

[Frame 65.1] MAC Timing Advance Command — link upkeep.

📡 gNB | 📱 UE

🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	682
🕒 Slot	3
♻️ HARQ pid	7
📦 Subheader	TAG=0 TA=31
📦 Subheader	Padding 0 bytes

[65.2] 📥 DL LCID 63 (Padding)

[66] 🔼 UL SDAP -> QFI 2

[Frame 66] Uplink SDAP Data PDU, QFI 2 (RLC SN 6 / PDCP SN 6) .

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	689
🕒 Slot	5
♻️ HARQ pid	14
📦 UL LCID	4 (4)
📦 RLC SN=6	
🚌 DRB	1
🔢 PDCP SN=6	
📦 SDAP PDU	Data PDU
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	57 (Single Entry PHR)...
	1 more

[67] 🔄 RLC AM Status PDU

[Frame 67] RLC-AM Status PDU on the DRB, ACK_SN = 7 .

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	689
🕒 Slot	7
♻️ HARQ pid	0
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
✅ ACK SN	7
🔗 E1	A set of NACK_SN, E1, E2 and E3 does not follow
📦 DL LCID	63 (Padding)

[68] 📦 RLC AM Data SN=4

[Frame 68] Downlink RLC-AM Data PDU on DRB 1 (SN 4) , Poll set.

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	690
🕒 Slot	2
♻️ HARQ pid	1
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
❓ P	Status report is requested
✂️ SI	Data field contains all bytes of an RLC SDU
📦 DL LCID	63 (Padding)

[69] 📦 RLC AM Data SN=5

[Frame 69] Downlink RLC-AM Data PDU on DRB 1 (SN 5) , Poll set.

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI

📡 gNB	📱 UE

🔗 Conn	1
📅 SFN	690
🕒 Slot	3
♻️ HARQ pid	2
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
❓ P	Status report is requested
✂️ SI	Data field contains all bytes of an RLC SDU
📦 DL LCID	63 (Padding)

[70] 🔼 UL SDAP -> QFI 2

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	691
🕒 Slot	5
♻️ HARQ pid	15
📦 UL LCID	4 (4)
📦 UL LCID	4 (4)
📦 RLC SN=7	
🚌 DRB	1
🔢 PDCP SN=7	
📦 SDAP PDU	Data PDU
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0...
	2 more

[Frame 70] Uplink SDAP Data PDU, QFI 2 (RLC SN 7 / PDCP SN 7) .

[71] RLC AM Status PDU

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	692
🕒 Slot	7
♻️ HARQ pid	3
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
✅ ACK SN	8
🔗 E1	A set of NACK_SN, E1, E2 and E3 does not follow
📦 DL LCID	63 (Padding)

[Frame 71] RLC-AM Status PDU on the DRB, ACK_SN = 8 .

[72] 🔼 UL SDAP -> QFI 2

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	695
🕒 Slot	5
♻️ HARQ pid	0
📦 UL LCID	4 (4)
📦 RLC SN=8	
🚌 DRB	1
🔢 PDCP SN=8	
📦 SDAP PDU	Data PDU
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	57 (Single Entry PHR)...
	1 more

[Frame 72] Uplink SDAP Data PDU, QFI 2 (RLC SN 8 / PDCP SN 8) . (Work-item-19757 flags this frame for a payload-length warning in the dissector — a decode nit, not a signaling problem.)

[73] RLC AM Status PDU

[Frame 73] RLC-AM Status PDU on the DRB, ACK_SN = 9 .

[Frame 74.1] MAC Timing Advance Command — link upkeep.

[Frame 75] Uplink SDAP Data PDU, `QFI 2` (RLC SN 9 / PDCP SN 9) .

[Frame 76] RLC-AM Status PDU on the DRB, `ACK_SN = 10` .

[Frame 77] Downlink RLC-AM Data PDU on DRB 1 (SN 6) , Poll set.

RNTI type	C-RNTI
Conn	1
SFN	799
Slot	1
HARQ pid	7
DL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
P	Status report is requested
SI	Data field contains all bytes of an RLC SDU
DL LCID	63 (Padding)

[78] UL SDAP -> QFI 2

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	800
Slot	6
HARQ pid	2
UL LCID	4 (4)
UL LCID	4 (4)
RLC SN=10	
DRB	1
PDCP SN=10	
SDAP PDU	Data PDU
UL LCID	4 (4)
RLC SN=11...	
	2 more

[Frame 78] Downlink RLC-AM Data PDU on DRB 1 (SN 5) , a retransmitted complete SDU, Poll set.

[79] RLC AM Data SN=11

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	801
Slot	2
HARQ pid	3
UL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
P	Status report not requested
SI	Data field contains neither the first nor last segment of an RLC SDU
SO	515
UL LCID	61 (Short BSR)

[Frame 79] Uplink SDAP Data PDU, `QFI 2` (RLC SN `10` / PDCP SN `10`) , with a further segment (SN `11`) alongside.

[80] UL SDAP -> QFI 2

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	801
Slot	3
HARQ pid	4
UL LCID	4 (4)
RLC SN=11	
DRB	1
PDCP SN=11	
SDAP PDU	Data PDU
UL LCID	4 (4)
RLC SN=12	
UL LCID	61 (Short BSR)

[Frame 80] Uplink SDAP Data PDU, `QFI 2` (RLC SN `11` / PDCP SN `11`) , plus segment SN `12` .

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[81] 🔼 UL SDAP -> QFI 2

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	801
🕒 Slot	4
♻️ HARQ pid	5
📦 UL LCID	4 (4)
📦 RLC SN=12	
🚌 DRB	1
🔢 PDCP SN=12	
📦 SDAP PDU	Data PDU
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[Frame 81] Uplink SDAP Data PDU, QFI 2 (RLC SN 12 / PDCP SN 12) .

[82] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	801
🕒 Slot	5
♻️ HARQ pid	6
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[Frame 82] Short BSR — scheduling feedback.

[83] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	801
🕒 Slot	6
♻️ HARQ pid	7
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	57 (Single Entry PHR)
📦 UL LCID	63 (Padding)

[Frame 83] Short BSR — scheduling feedback.

[84] RLC AM Status PDU

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	801
🕒 Slot	8
♻️ HARQ pid	0
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
✅ ACK SN	13
🔗 E1	A set of NACK_SN, E1, E2 and E3 does not follow
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged...
	3 more

[Frame 84] RLC-AM Status PDU on the DRB, ACK_SN = 13 .

[85] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI

[Frame 85] Short BSR — scheduling feedback.

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Conn	1
SFN	801
Slot	7
HARQ pid	8
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	63 (Padding)

[86] Short BSR

[Frame 86] Short BSR — scheduling feedback.

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	801
Slot	8
HARQ pid	9
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	63 (Padding)

[87] Short BSR

[Frame 87] Short BSR — scheduling feedback.

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	801
Slot	9
HARQ pid	10
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	63 (Padding)

[88.1] DL LCID 61 (Timing Advance Command)

[Frame 88.1] MAC Timing Advance Command — link upkeep.

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	802
Slot	3
HARQ pid	1
Subheader	TAG=0 TA=31
Subheader	Padding 0 bytes

[88.2] DL LCID 63 (Padding)

[89] RLC AM Status PDU

[Frame 89] RLC-AM Status PDU (uplink) on the DRB, ACK_SN = 8 .

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	803
Slot	5
HARQ pid	11
UL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
ACK SN	8
E1	A set of NACK_SN, E1, E2 and E3 does not follow
UL LCID	61 (Short BSR)
BSR LCG0 idx	0...
	2 more

[90] RLC AM Data SN=8

[Frame 90] Downlink RLC-AM Data PDU on DRB 1 (SN 8) , complete SDU, Poll set.

Duplex	FDD

📡 gNB | 📱 UE

🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	827
🕒 Slot	2
♻️ HARQ pid	2
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
❓ P	Status report is requested
✂️ SI	Data field contains all bytes of an RLC SDU
📦 DL LCID	63 (Padding)

[91] 🔼 UL SDAP -> QFI 2

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	828
🕒 Slot	6
♻️ HARQ pid	12
📦 UL LCID	4 (4)
📦 UL LCID	4 (4)
📦 RLC SN=13	
🚌 DRB	1
🔢 PDCP SN=13	
📦 SDAP PDU	Data PDU
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0...
	2 more

[Frame 91] Uplink SDAP Data PDU, QFI 2 (RLC SN 13 / PDCP SN 13) .

[92] 🔄 RLC AM Status PDU

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	828
🕒 Slot	8
♻️ HARQ pid	3
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
✅ ACK SN	14
🔗 E1	A set of NACK_SN, E1, E2 and E3 does not follow
📦 DL LCID	63 (Padding)

[Frame 92] RLC-AM Status PDU on the DRB, ACK_SN = 14 .

[93.1] 📥 DL LCID 61 (Timing Advance Command)

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	862
🕒 Slot	3
♻️ HARQ pid	4
📦 Subheader	TAG=0 TA=31
📦 Subheader	Padding 0 bytes

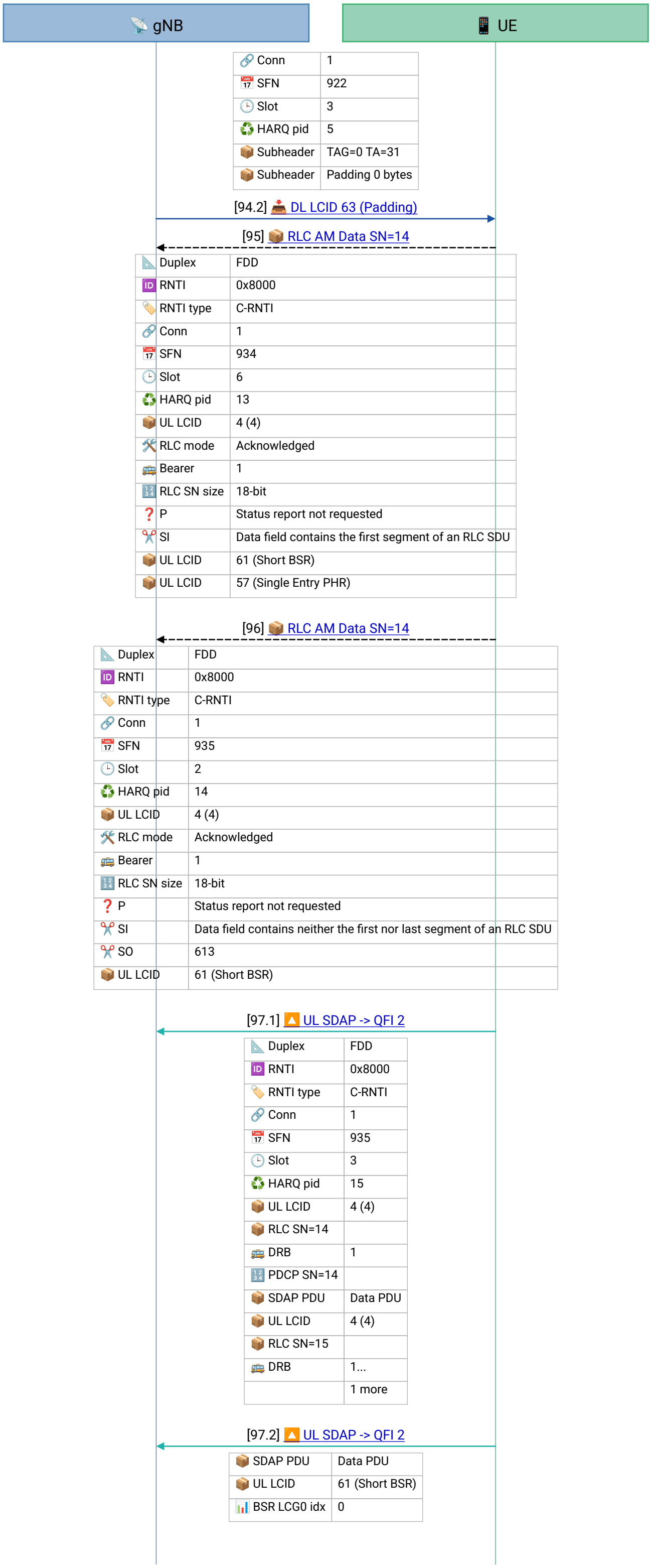
[Frame 93.1] MAC Timing Advance Command — link upkeep.

[93.2] 📥 DL LCID 63 (Padding)

[94.1] 📥 DL LCID 61 (Timing Advance Command)

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI

[Frame 94.1] MAC Timing Advance Command — link upkeep.



[Frame 95] Uplink RLC-AM Data PDU on DRB 1 (SN 14) , the *first* segment of a larger SDU.

[Frame 96] Uplink RLC-AM Data PDU on DRB 1 (SN 14) , a middle segment (SO = 613) of that SDU.

[Frame 97.1] Uplink SDAP Data PDU, QFI 2 , carrying RLC SN 14 (PDCP SN 14) and SN 15 (PDCP SN 15) — the reassembled SDU and the next one.

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UL LCID	63 (Padding)

[98] RLC AM Status PDU

[Frame 98] RLC-AM Status PDU on the DRB, ACK_SN = 16 .

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	935
Slot	5
HARQ pid	6
DL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
ACK SN	16
E1	A set of NACK_SN, E1, E2 and E3 does not follow
DL LCID	63 (Padding)

[99] Short BSR

[Frame 99] Short BSR — scheduling feedback.

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	935
Slot	4
HARQ pid	0
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	63 (Padding)

[100] Short BSR

[Frame 100] Short BSR — scheduling feedback.

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	935
Slot	5
HARQ pid	1
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	63 (Padding)

[101] Short BSR

[Frame 101] Short BSR — scheduling feedback.

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	935
Slot	6
HARQ pid	2
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	57 (Single Entry PHR)
UL LCID	63 (Padding)

[102] RLC AM Data SN=9

[Frame 102] Downlink RLC-AM Data PDU on DRB 1 (SN 9) , complete SDU, Poll set.

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	935
Slot	8
HARQ pid	7
DL LCID	4 (4)
RLC mode	Acknowledged

📡 gNB | 📱 UE

🚌 Bearer	1
🔢 RLC SN size	18-bit
❓ P	Status report is requested
✂️ SI	Data field contains all bytes of an RLC SDU

[103] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	935
🕒 Slot	7
♻️ HARQ pid	3
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[Frame 103] Short BSR — scheduling feedback.

[104] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	935
🕒 Slot	8
♻️ HARQ pid	4
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[Frame 104] Short BSR — scheduling feedback.

[105] 🔄 RLC AM Status PDU

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	937
🕒 Slot	5
♻️ HARQ pid	5
📦 UL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
✅ ACK SN	10
🔗 E1	A set of NACK_SN, E1, E2 and E3 does not follow
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0...
	2 more

[Frame 105] RLC-AM Status PDU (uplink) on the DRB, `ACK_SN = 10`.

[106] 📦 RLC AM Data SN=10

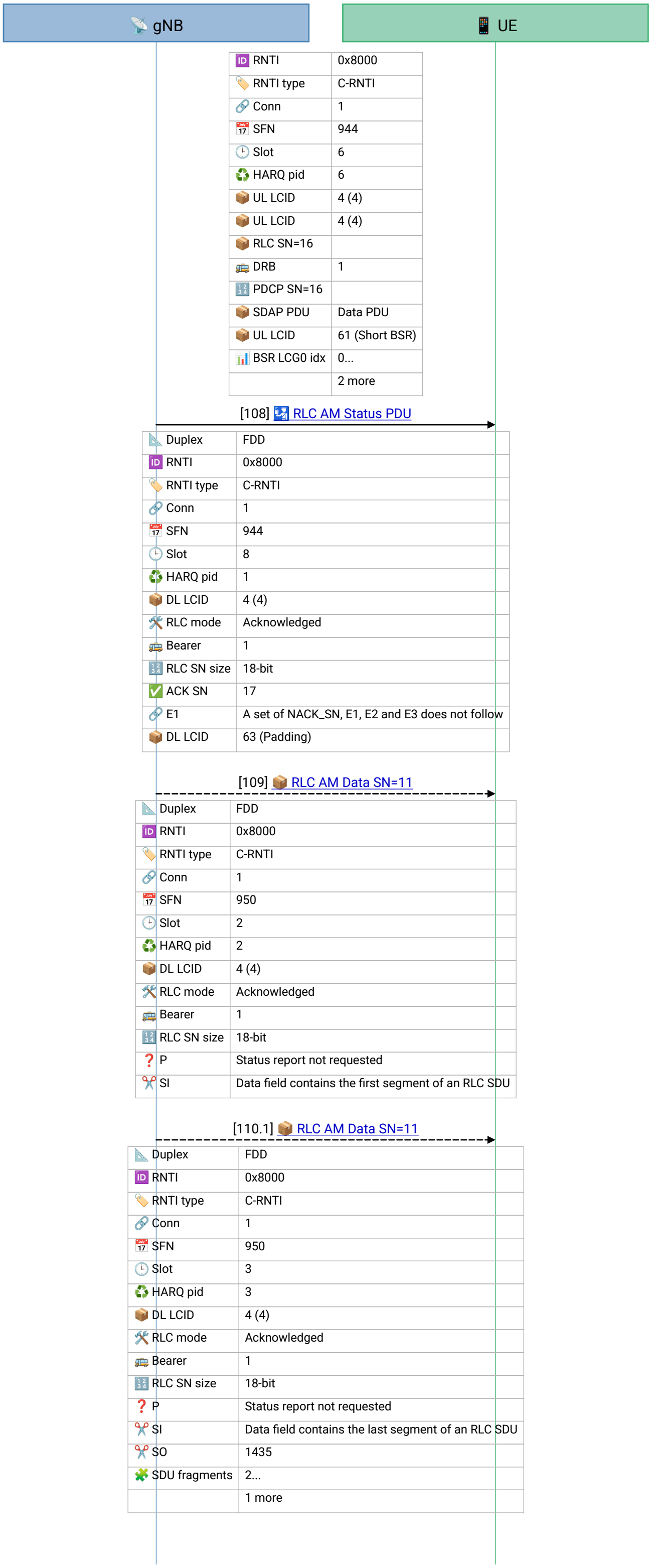
📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	943
🕒 Slot	6
♻️ HARQ pid	0
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
❓ P	Status report is requested
✂️ SI	Data field contains all bytes of an RLC SDU
📦 DL LCID	63 (Padding)

[Frame 106] Downlink RLC-AM Data PDU on DRB 1 (SN `10`), complete SDU, Poll set.

[107] 🔼 UL SDAP -> QFI 2

📐 Duplex	FDD

[Frame 107] Uplink SDAP Data PDU, `QFI 2` (RLC SN 16 / PDCP SN 16) .



[Frame 108] RLC-AM Status PDU on the DRB, ACK_SN = 17 .

[Frame 109] Downlink RLC-AM Data PDU on DRB 1 (SN 11) , first segment of a larger SDU.

[Frame 110.1] Downlink RLC-AM Data PDU on DRB 1 : the last segment of SN 11 (SO = 1435 , reassembled from 2 fragments) plus the first segment of SN 12 — two SDUs' fragments multiplexed into one transport block.

gNB | UE

[110.2] RLC AM Data SN=12

RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
P	Status report not requested
SI	Data field contains the first segment of an RLC SDU

[111.1] RLC AM Data SN=12

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	950
Slot	4
HARQ pid	4
DL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
P	Status report not requested
SI	Data field contains the last segment of an RLC SDU
SO	1364
SDU fragments	2...
	1 more

[Frame 111.1] Downlink RLC-AM Data PDU on DRB 1 : the last segment of SN 12 (SO = 1364 , 2 fragments) plus a complete SN 13 , Poll set.

[111.2] RLC AM Data SN=13

RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
P	Status report is requested
SI	Data field contains all bytes of an RLC SDU
DL LCID	63 (Padding)

[112] RLC AM Status PDU

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	951
Slot	5
HARQ pid	7
UL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
ACK SN	14
E1	A set of NACK_SN, E1, E2 and E3 does not follow
UL LCID	61 (Short BSR)
BSR LCG0 idx	0...
	2 more

[Frame 112] RLC-AM Status PDU (uplink) on the DRB, ACK_SN = 14 .

[113] RLC AM Data SN=17

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	1
SFN	955
Slot	5
HARQ pid	8
UL LCID	4 (4)
RLC mode	Acknowledged
Bearer	1
RLC SN size	18-bit
P	Status report not requested
SI	Data field contains the first segment of an RLC SDU

[Frame 113] Uplink RLC-AM Data PDU on DRB 1 (SN 17) , first segment of a larger SDU.

📡 gNB | 📱 UE

📦 UL LCID	61 (Short BSR)
📦 UL LCID	57 (Single Entry PHR)

[114] 🔼 UL SDAP -> QFI 2

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	956
🕒 Slot	1
♻️ HARQ pid	9
📦 UL LCID	4 (4)
📦 RLC SN=17	
🚌 DRB	1
🔢 PDCP SN=17	
📦 SDAP PDU	Data PDU
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[Frame 114] Uplink SDAP Data PDU, QFI 2 (RLC SN 17 / PDCP SN 17) — the reassembled SDU.

[115] 🚦 RLC AM Status PDU

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	956
🕒 Slot	3
♻️ HARQ pid	5
📦 DL LCID	4 (4)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	18-bit
✅ ACK SN	18
🔗 E1	A set of NACK_SN, E1, E2 and E3 does not follow
📦 DL LCID	63 (Padding)

[Frame 115] RLC-AM Status PDU on the DRB, ACK_SN = 18 .

[116] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	956
🕒 Slot	2
♻️ HARQ pid	10
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[Frame 116] Short BSR — scheduling feedback.

[117] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	956
🕒 Slot	3
♻️ HARQ pid	11
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[Frame 117] Short BSR — scheduling feedback.

[118] 📊 Short BSR

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1

[Frame 118] Short BSR — scheduling feedback.

📡 gNB | 📱 UE

📅 SFN	956
🕒 Slot	4
♻️ HARQ pid	12
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	63 (Padding)

[119] 📊 Short BSR

[Frame 119] Short BSR — scheduling feedback.

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	956
🕒 Slot	6
♻️ HARQ pid	13
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0
📦 UL LCID	57 (Single Entry PHR)
📦 UL LCID	63 (Padding)

[120.1] 📥 DL LCID 61 (Timing Advance Command)

[Frame 120.1] MAC Timing Advance Command — link upkeep. Note the System Frame Number wraps (1023 -> 0) around here; the SFN is a 10-bit counter, so this is normal roll-over, not a gap.

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	982
🕒 Slot	3
♻️ HARQ pid	6
📦 Subheader	TAG=0 TA=31
📦 Subheader	Padding 0 bytes

[120.2] 📥 DL LCID 63 (Padding)

[121.1] 📥 DL LCID 61 (Timing Advance Command)

[Frame 121.1] MAC Timing Advance Command — link upkeep.

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	18
🕒 Slot	3
♻️ HARQ pid	7
📦 Subheader	TAG=0 TA=31
📦 Subheader	Padding 0 bytes

[121.2] 📥 DL LCID 63 (Padding)

[122.1] 📥 DL LCID 61 (Timing Advance Command)

[Frame 122.1] MAC Timing Advance Command — link upkeep.

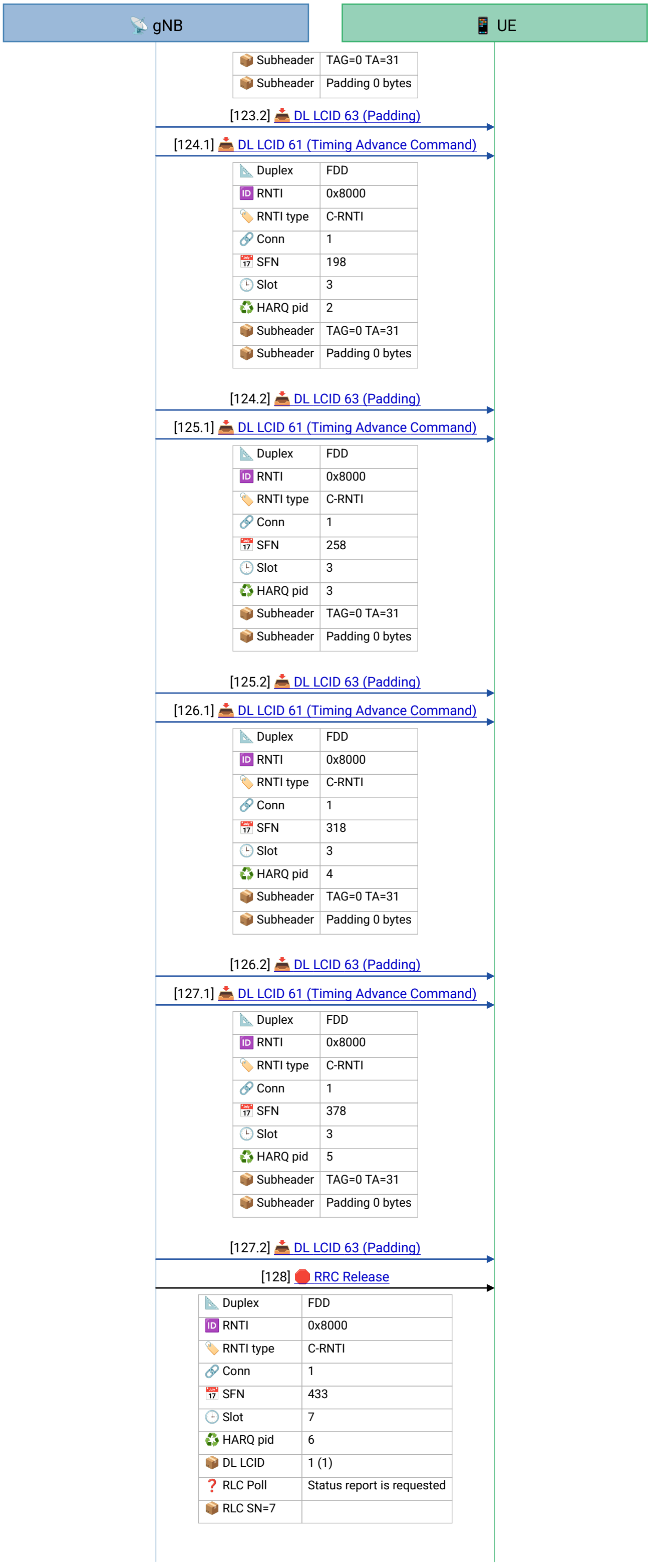
📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	78
🕒 Slot	3
♻️ HARQ pid	0
📦 Subheader	TAG=0 TA=31
📦 Subheader	Padding 0 bytes

[122.2] 📥 DL LCID 63 (Padding)

[123.1] 📥 DL LCID 61 (Timing Advance Command)

[Frame 123.1] MAC Timing Advance Command — link upkeep.

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	138
🕒 Slot	3
♻️ HARQ pid	1



[Frame 124.1] MAC Timing Advance Command — link upkeep.

[Frame 125.1] MAC Timing Advance Command — link upkeep.

[Frame 126.1] MAC Timing Advance Command — link upkeep.

[Frame 127.1] MAC Timing Advance Command — the last of the periodic upkeep before the connection is torn down.

[Frame 128] Phase 7 — releasing the connection. RRC `Release` on SRB1 (PDCP SN `7`, `COUNT 7`, integrity tag `MAC-I = 0xa48652fc`), with the RLC Poll bit set so the gNB expects a Status PDU confirming delivery. There is no `suspendConfig`, so the UE is sent to `RRC_IDLE` (a full release, not the suspended `RRC_INACTIVE` state).

📡 gNB | 📱 UE

🚌 SRB	1
🔢 PDCP COUNT	7
🔢 PDCP SN=7	
🔢 Trans ID	0
🛡️ MAC-I	0xa48652fc

[129] 🛑 RRC Release →

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	1
📅 SFN	438
🕒 Slot	2
♻️ HARQ pid	7
📦 DL LCID	1 (1)
❓ RLC Poll	Status report is requested
📦 RLC SN=7	
🚌 SRB	1
🔢 PDCP COUNT	7
🔢 PDCP SN=7	
🔁 RLC retx (dup PDCP SN 7)	
🔢 Trans ID	0...
	1 more

[Frame 129] The **same** RRC Release again — byte-identical (PDCP SN `7`, `MAC-I` `0xa48652fc`), flagged as a duplicate. The UE did not acknowledge the first copy in time, so `t-PollRetransmit` fired and RLC re-sent it. One retransmission here — a far cry from a storm; the identical SN and `MAC-I` are the tell that it is one message resent, not a new command.

[130] 📨 RAR →

📐 Duplex	FDD
🆔 RA-RNTI	0x0500
🏷️ RNTI type	RA-RNTI
🔗 Conn	2
📅 SFN	757
🕒 Slot	3
🎲 RAPID	0
⏱️ TA	0
📦 FRA	100
📅 TSA	1
📈 MCS	2
🔋 TPC	0dB (3)
🆕 Temp C-RNTI	0x1001

[Frame 130] Phase 8 — a mobile-terminated return (connection 2). A fresh Random Access Response (Conn 2) after a ~3 s idle gap. The UE is coming back onto the cell for a new connection.

[131] 📡 RRC Setup Request ←

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	2
📅 SFN	757
🕒 Slot	7
♻️ HARQ pid	0
📦 UL LCID	52 (CCCH (48 bits))
📋 Cause	mt-Access
📦 UL LCID	63 (Padding)

[Frame 131] RRC `Setup Request` (Msg3), this time with establishment cause `mt-Access` — *mobile-terminated* access. Something in the network (an incoming call, an SMS, downlink data) is reaching for the UE, and it responds by re-establishing an RRC connection.

[132] ✅ RRC Setup →

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	2
📅 SFN	757
🕒 Slot	9
♻️ HARQ pid	0
📦 DL LCID	62 (UE Contention Resolution Identity)
📦 DL LCID	0 (CCCH)
🔢 Trans ID	0
🛡️ SRB add	1
📐 CellGroup	0
🛡️ SRB add	1

[Frame 132] RRC `Setup` (Msg4) with contention resolution and a fresh SRB1 / cell-group config — the same Msg4 role as frame 3, for the new connection.

📡 gNB | 📱 UE

📡 SR-TransMax	n16
⏰ periodicBSR	sf1...
	12 more

[133] ✅ RRC Setup Complete

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	2
📅 SFN	760
🕒 Slot	6
♻️ HARQ pid	0
📦 UL LCID	1 (1)
🚌 SRB	1
🔢 Trans ID	0
🌐 PLMN idx	1
📦 NAS	7e01b98305d2047e...
📬 NAS msg	Service request
📦 UL LCID	61 (Short BSR)
📊 BSR LCG0 idx	0...
	2 more

[Frame 133] RRC `Setup Complete` piggybacking a NAS `Service request` (integrity-protected, type 1). Service Request is the NAS procedure a UE in `CM-IDLE` uses to re-enter connected mode and resume its sessions — the natural response to mobile-terminated paging.

[134] 🛂 RLC AM Status PDU

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	2
📅 SFN	760
🕒 Slot	8
♻️ HARQ pid	0
📦 DL LCID	1 (1)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	12-bit
✅ ACK SN	1
🔗 E1	A set of NACK_SN, E1, E2 and E3 does not follow
📦 DL LCID	63 (Padding)

[Frame 134] RLC-AM Status PDU on SRB1 , `ACK_SN` = 1 (connection 2).

[135.1] 📥 DL LCID 61 (Timing Advance Command)

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	2
📅 SFN	763
🕒 Slot	2
♻️ HARQ pid	1
📦 Subheader	TAG=0 TA=31
📦 Subheader	Padding 0 bytes

[Frame 135.1] MAC Timing Advance Command — link upkeep on the new connection.

[135.2] 📥 DL LCID 63 (Padding)

[136] 🔐 Security Mode Command

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	2
📅 SFN	770
🕒 Slot	3
♻️ HARQ pid	2
📦 DL LCID	1 (1)
🚌 SRB	1
🔢 Trans ID	0
🔒 Cipher	nea2
🛡️ Integrity	nia2
📦 DL LCID	63 (Padding)

[Frame 136] RRC `Security Mode Command` for connection 2 — AS security re-established from scratch (`nea2` / `nia2`) for this new radio connection. Each RRC connection negotiates its own AS keys.

gNB | UE

[137] Security Mode Complete

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	2
SFN	771
Slot	5
HARQ pid	1
UL LCID	1 (1)
UL LCID	1 (1)
SRB	1
Trans ID	0
UL LCID	61 (Short BSR)
BSR LCG0 idx	0
UL LCID	57 (Single Entry PHR)
UL LCID	63 (Padding)

[Frame 137] RRC `Security Mode Complete` — the UE confirms AS security for connection 2.

[138] RLC AM Status PDU

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	2
SFN	771
Slot	7
HARQ pid	3
DL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
ACK SN	2
E1	A set of NACK_SN, E1, E2 and E3 does not follow
DL LCID	63 (Padding)

[Frame 138] RLC-AM Status PDU on SRB1 , `ACK_SN = 2` (connection 2).

[139] RLC AM Data SN=1

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	2
SFN	789
Slot	0
HARQ pid	4
DL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
P	Status report is requested
SI	Data field contains all bytes of an RLC SDU
DL LCID	63 (Padding)

[Frame 139] Downlink RLC-AM Data PDU on SRB1 (SN 1) , complete SDU, Poll set — post-security signaling on connection 2.

[140] RLC AM Status PDU

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	2
SFN	790
Slot	6
HARQ pid	2
UL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
ACK SN	2
E1	A set of NACK_SN, E1, E2 and E3 does not follow
UL LCID	1 (1)

[Frame 140] RLC-AM Status PDU (uplink), `ACK_SN = 2` , with a second AM segment beginning.

gNB | UE

RLC mode	Acknowledged...
	6 more

[141] RLC AM Status PDU →

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	2
SFN	790
Slot	8
HARQ pid	5
DL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
ACK SN	3
E1	A set of NACK_SN, E1, E2 and E3 does not follow
DL LCID	63 (Padding)

[Frame 141] RLC-AM Status PDU on SRB1 , ACK_SN = 3 .

[142] RLC AM Data SN=2 ⇢

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	2
SFN	805
Slot	7
HARQ pid	6
DL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
P	Status report is requested
SI	Data field contains all bytes of an RLC SDU
DL LCID	63 (Padding)

[Frame 142] Downlink RLC-AM Data PDU on SRB1 (SN 2) , complete SDU, Poll set.

[143] RLC AM Status PDU ←

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	2
SFN	807
Slot	5
HARQ pid	3
UL LCID	1 (1)
RLC mode	Acknowledged
Bearer	1
RLC SN size	12-bit
ACK SN	3
E1	A set of NACK_SN, E1, E2 and E3 does not follow
UL LCID	61 (Short BSR)
BSR LCG0 idx	0...
	2 more

[Frame 143] RLC-AM Status PDU (uplink) on SRB1 , ACK_SN = 3 .

[144.1] DL LCID 61 (Timing Advance Command) →

Duplex	FDD
RNTI	0x8000
RNTI type	C-RNTI
Conn	2
SFN	823
Slot	2
HARQ pid	7
Subheader	TAG=0 TA=31
Subheader	Padding 0 bytes

[144.2] DL LCID 63 (Padding) →

[Frame 144.1] MAC Timing Advance Command — link upkeep.

📡 gNB | 📱 UE

[145] 📦 RLC AM Data SN=3

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	2
📅 SFN	835
🕒 Slot	7
♻️ HARQ pid	0
📦 DL LCID	1 (1)
🛠️ RLC mode	Acknowledged
🚌 Bearer	1
🔢 RLC SN size	12-bit
❓ P	Status report is requested
✂️ SI	Data field contains all bytes of an RLC SDU

[Frame 145] Downlink RLC-AM Data PDU on SRB1 (SN 3) , complete SDU, Poll set.

[146] 🔁 RLC retx (dup PDCP SN 3)

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	2
📅 SFN	840
🕒 Slot	2
♻️ HARQ pid	1
📦 DL LCID	1 (1)
🚌 Bearer	1
❓ P	Status report is requested
📦 RLC SN=3	

[Frame 146] RLC-AM retransmission on SRB1 (duplicate PDCP SN 3) , Poll set. With no NACKs anywhere in the capture, this is a poll-retransmit-timer resend of a PDU the UE has not acknowledged — the same pattern as the release retransmission in frame 129.

[147] 📨 RAR

📐 Duplex	FDD
🆔 RA-RNTI	0x0500
🏷️ RNTI type	RA-RNTI
🔗 Conn	3
📅 SFN	1013
🕒 Slot	3
🎲 RAPID	3
⏱️ TA	0
📦 FRA	100
📅 TSA	1
📈 MCS	2
🔋 TPC	0dB (3)
🆕 Temp C-RNTI	0x1001

[Frame 147] A third connection. After a ~32 s gap, another Random Access Response (Conn 3) . The capture rig cycles the UE through repeated mobile-terminated accesses.

[148] 📡 RRC Setup Request

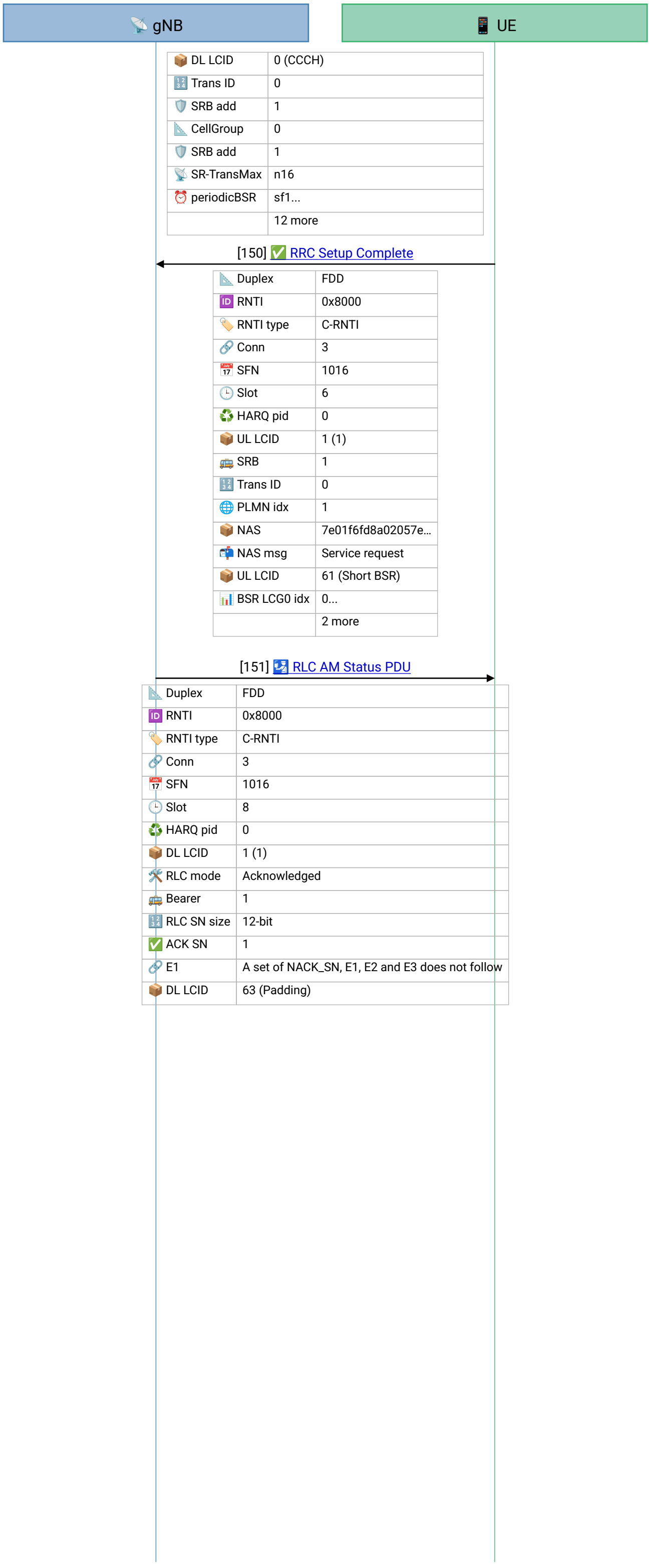
📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	3
📅 SFN	1013
🕒 Slot	7
♻️ HARQ pid	0
📦 UL LCID	52 (CCCH (48 bits))
📋 Cause	mt-Access
📦 UL LCID	63 (Padding)

[Frame 148] RRC `Setup Request` (Msg3), establishment cause `mt-Access` again — a second mobile-terminated return.

[149] ✅ RRC Setup

📐 Duplex	FDD
🆔 RNTI	0x8000
🏷️ RNTI type	C-RNTI
🔗 Conn	3
📅 SFN	1013
🕒 Slot	9
♻️ HARQ pid	0
📦 DL LCID	62 (UE Contention Resolution Identity)

[Frame 149] RRC `Setup` (Msg4) for connection 3 — contention resolution and a fresh SRB1 / cell-group config.



[Frame 150] RRC `Setup Complete` piggybacking a NAS `Service request` (integrity-protected) — the same idle-to-connected resume as connection 2.

[Frame 151] RLC-AM Status PDU on SRB1 , `ACK_SN = 1` (connection 3) — and the capture ends here, mid-setup, before AS security is re-established for this third connection.