

# 4G&5G RLF Detection & Supervision Timers

## Part 1

Optimization



Technology



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# Agenda

**How does the UE detect/Report RLF?**

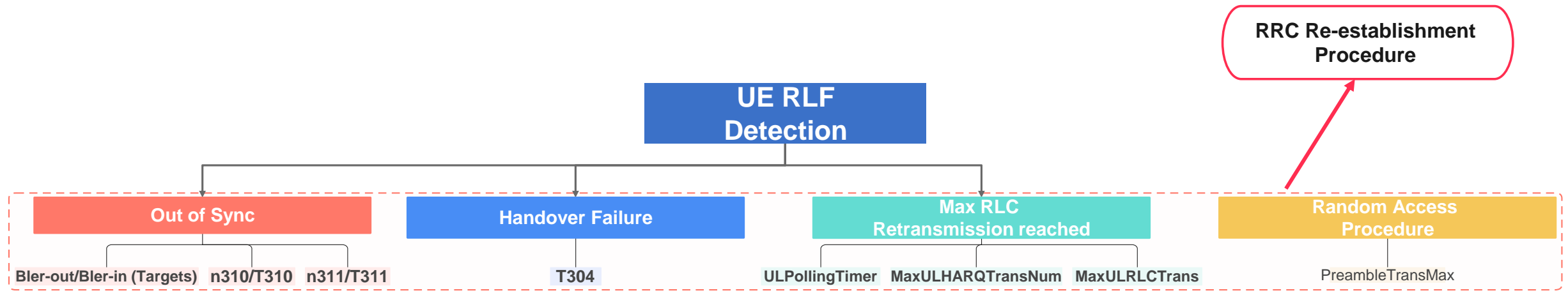
**UE RLF Declaration & Timers detail explanation**

**How to check Related Timers from Layer 3**

**Impact on KPIs**

# How does the UE detect/Report RLF?

- UE may declare a Radio Link Failure” RLF” in several ways, as shown in the figure below.
- The Key timers and relation to RLF will be discussed in detail in the next slides.



RRC Re-establishment Procedure

UE Initiate Out-Of-Sync indications when the radio link quality belonging to all of the monitored RS is worse than  $Q_{out}$ .

Handover Failure will be declared when the maximum waiting time for Successful HO expire.

UE will declare RLF when the maximum RLC Retransmission is reached.

Ra Procedure fails due to reaching the maximum no of *preamble* transmission.

# UE RLF: Out of Synchronization(1)

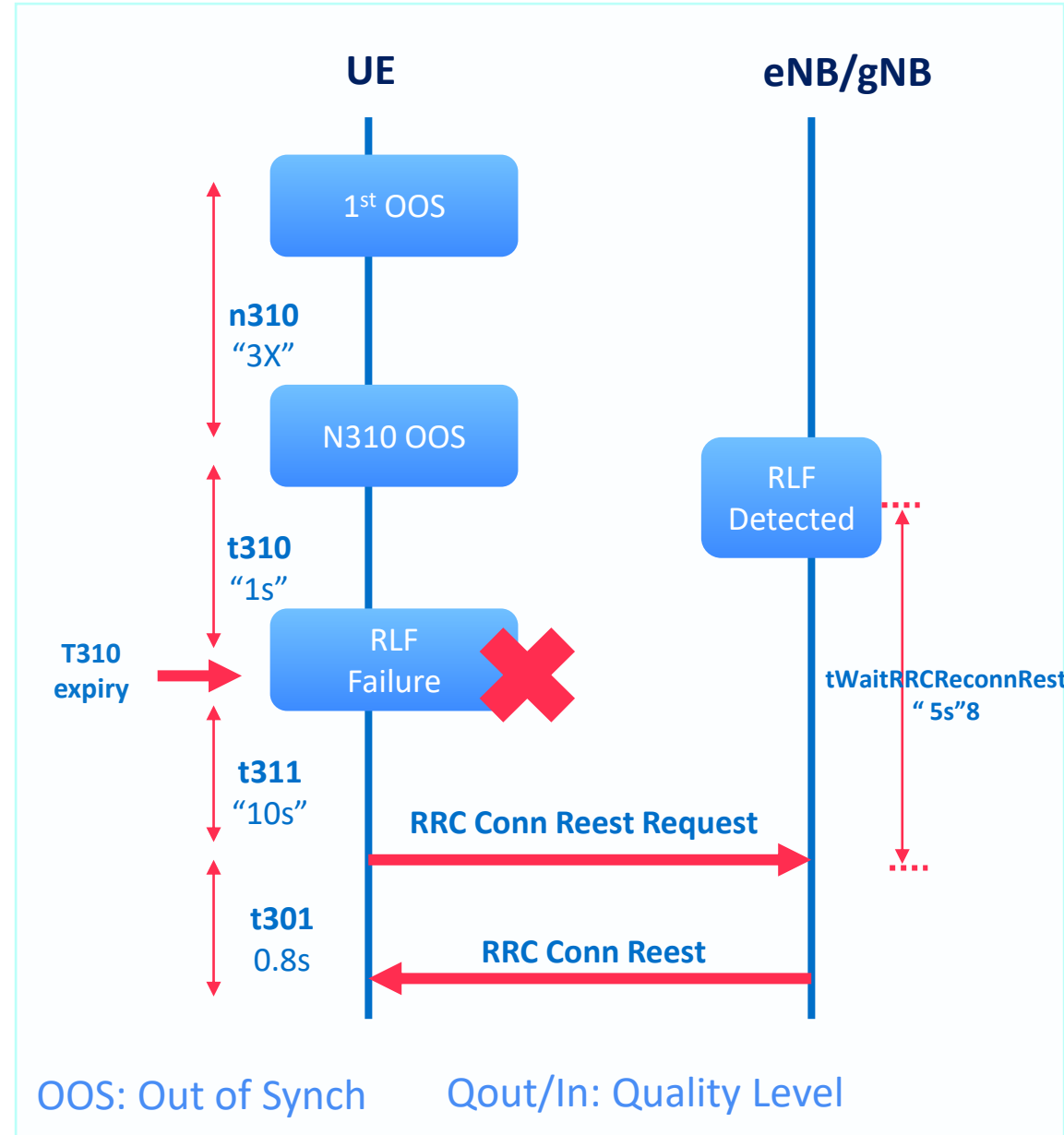
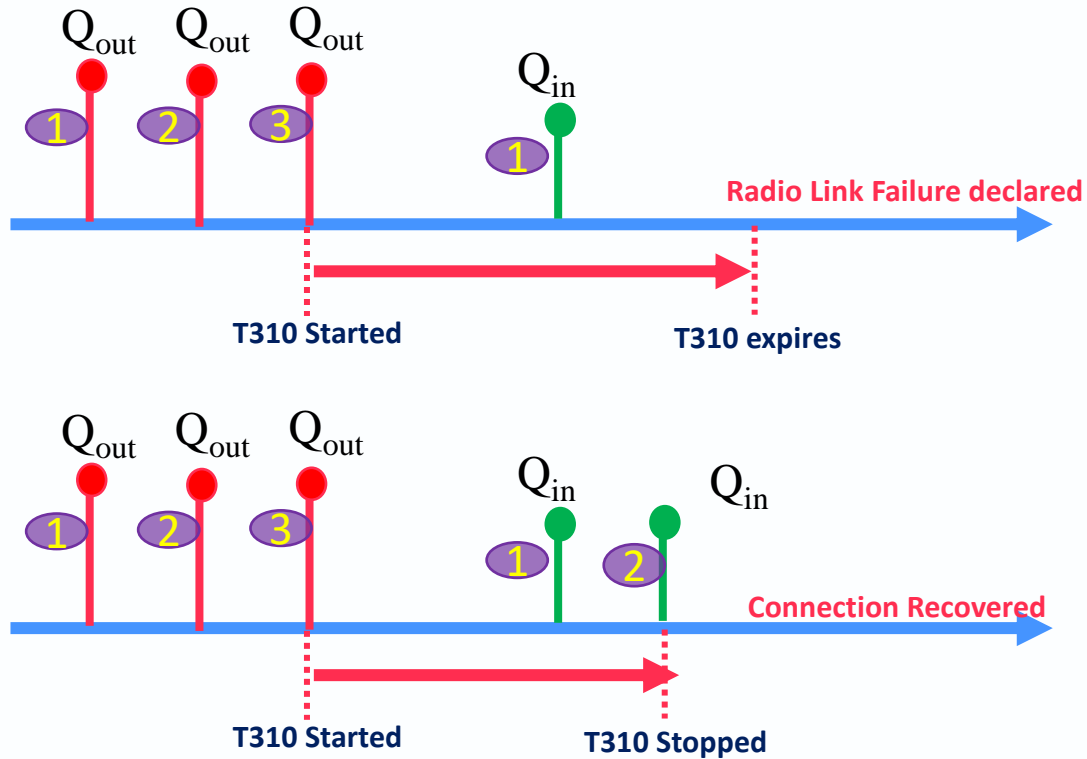
$Q_{out}$  IF PDCCH BLER < 10%

## Radio Link Failure Detection at the RRC Layer

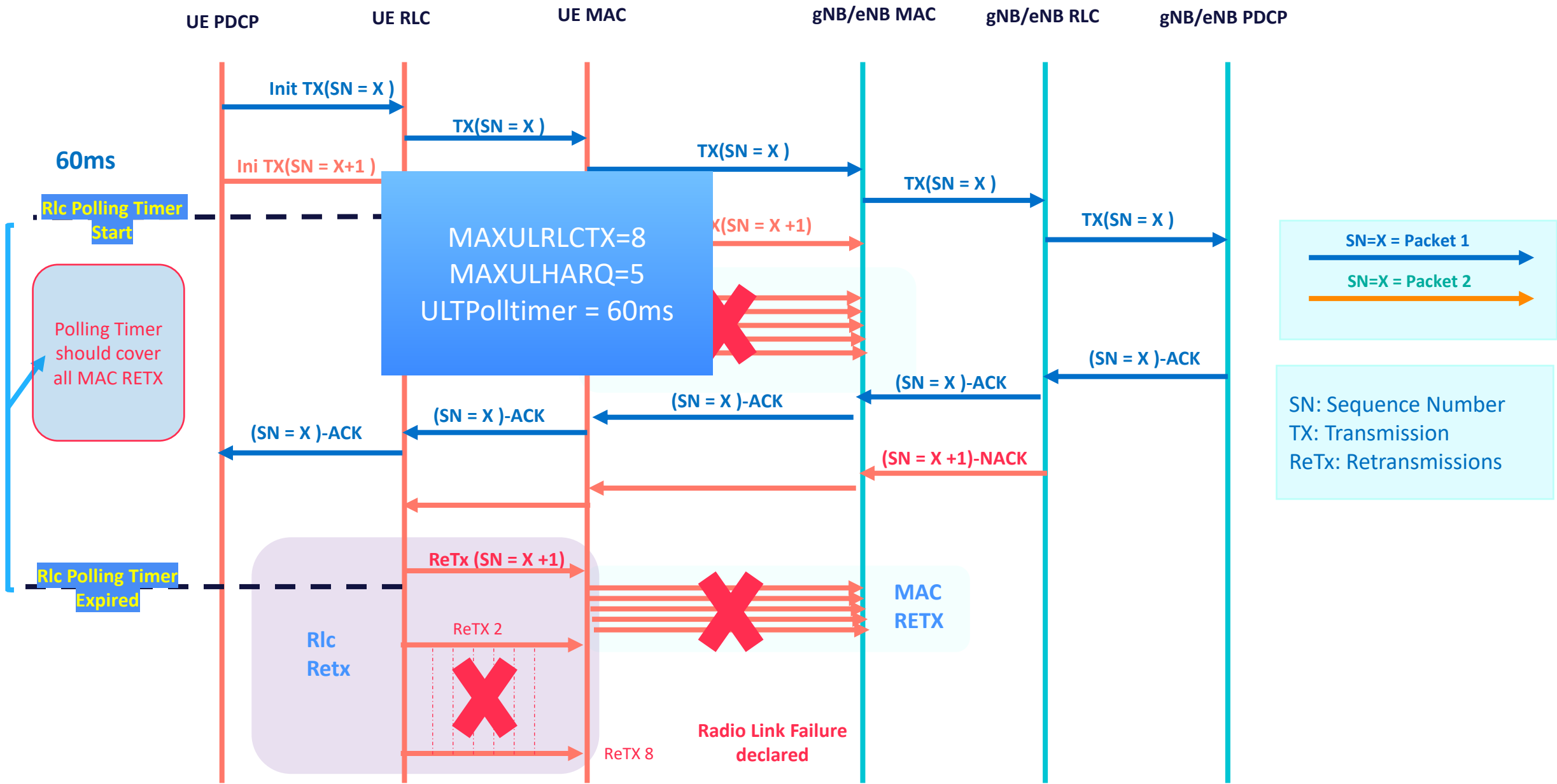
The Physical Layer of the UE generates and reports an 'Out-Of-Sync' indication to the RRC Layer when the radio link quality of all of the monitored RS is worst than  $Q_{out}$ .

Configuration	BLER-out	BLER-in
0	10%	2%

$n310 = 3 X$   
 $n311 = 2 X$   
 $T310 = 1 S$

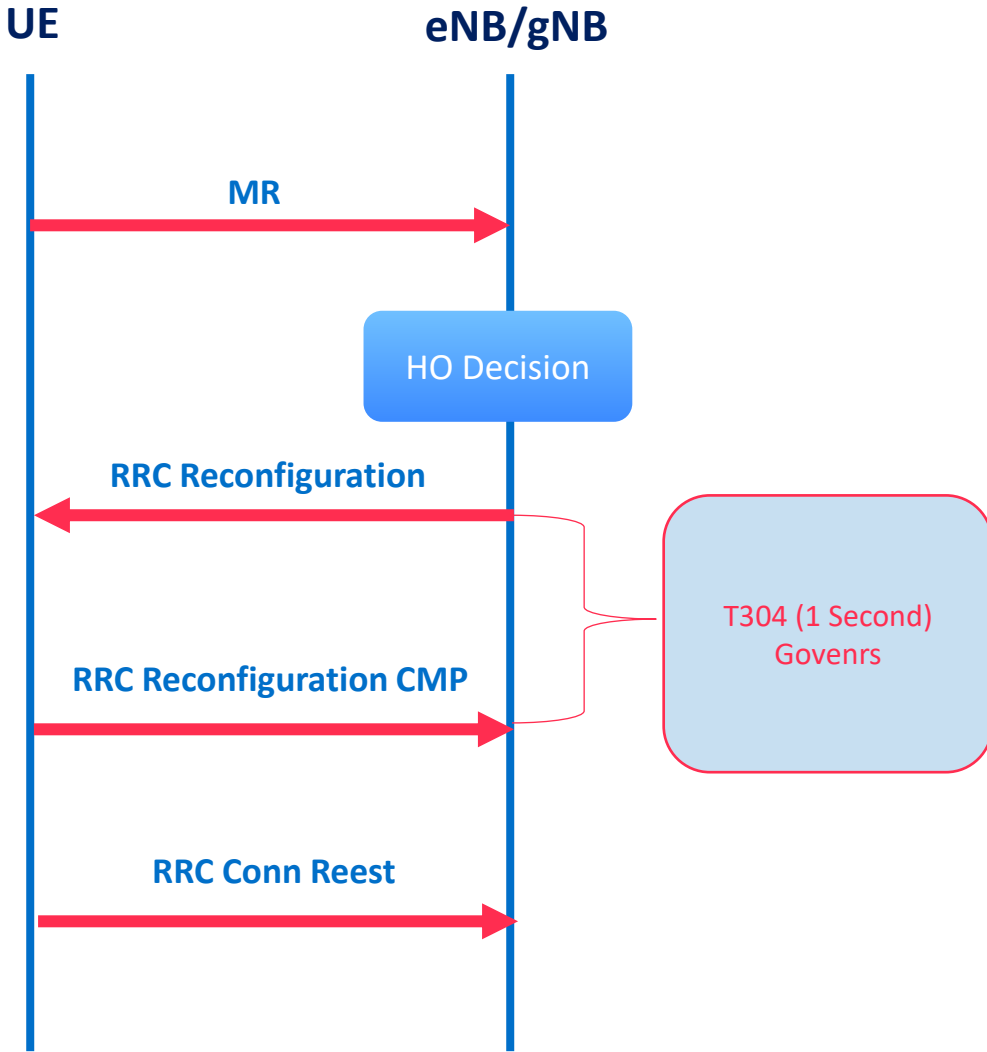


# UE RLF: Max No of RLC Retransmission reached(2)



# UE RLF: Handover Failure(3)

- The T304 timer is specified using a value of 50, 100, 150, 200, 500, 1000 or 2000 ms.
- The UE starts this timer upon receiving the mobility control information. "MobilityControlInfo"
- If T304 expires before the UE MAC successfully completes the random-access procedure on the target cell,
- The UE initiates the RRC Connection Reestablishment



# How to check Related Timers from Layer 3

```

  ▼ ue-TimersAndConstants

  t300:ms1000
  t301:ms200

  t310:ms2000
  n310:n20
  t311:ms10000

  n311:n1
  t319:ms1000
  
```

5G SA SIB1

4G SIB2

5G SA Only

```

  ▼ rrcConnectionReconfiguration-r8

  ▼ mobilityControlInfo

  targetPhysCellId:
  ▼ carrierFreq

  dl-CarrierFreq:0x
  ul-CarrierFreq:0x477d
  additionalSpectrumEmission:
  t304:ms2000
  
```

4G & 5G SA

- UE SIB1 in 5G SA and SIB2 in 4G
- RRC Configuration “spCellConfig” in 5G NSA → T300 & T319 are not included in 5G NSA

- RRC Configuration “MobilityControlInfo” in 5G SA & 4G

# Impact on KPIs

- Extending the timers definitely will improve RLC, RBLER Retransmission, and handover-related KPIs. Still, it might have a negative impact as this will increase interference in the system, Latency, and system capacity.

