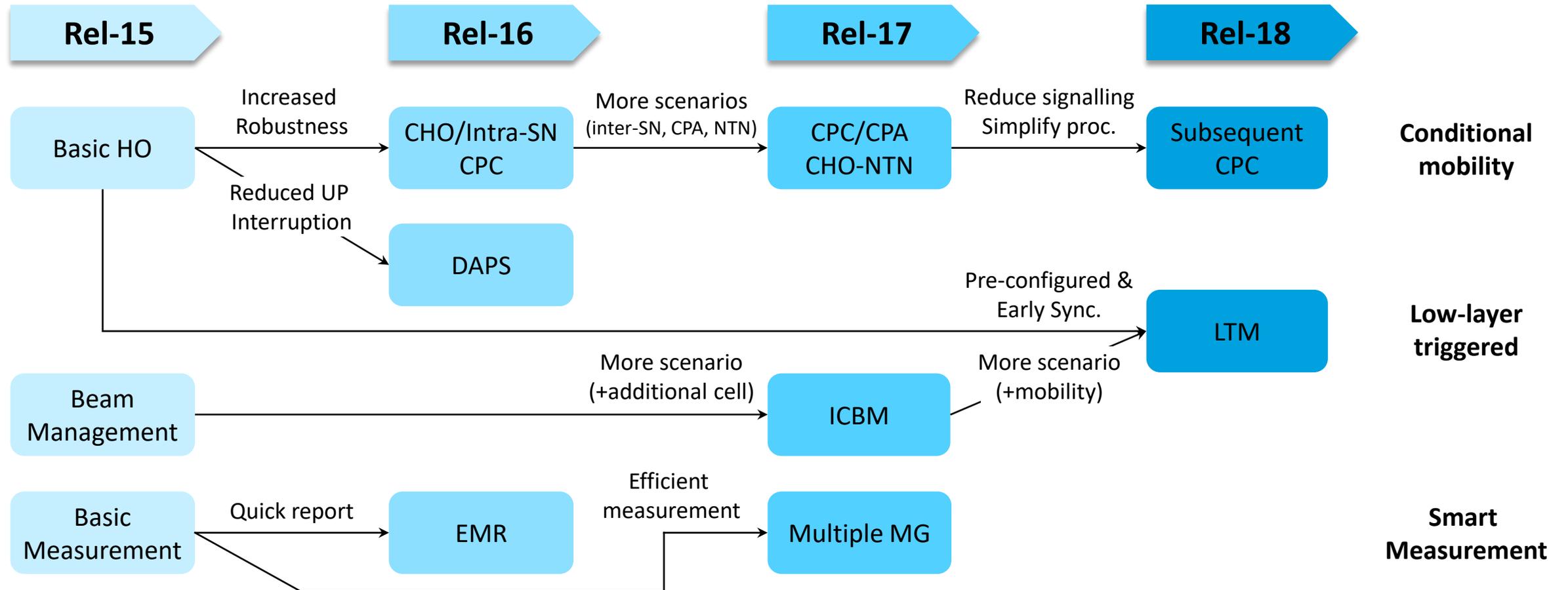


[RAN2-led] Additional Mobility Enhancements

WI

NR Mobility

Rel-15 through Rel-18



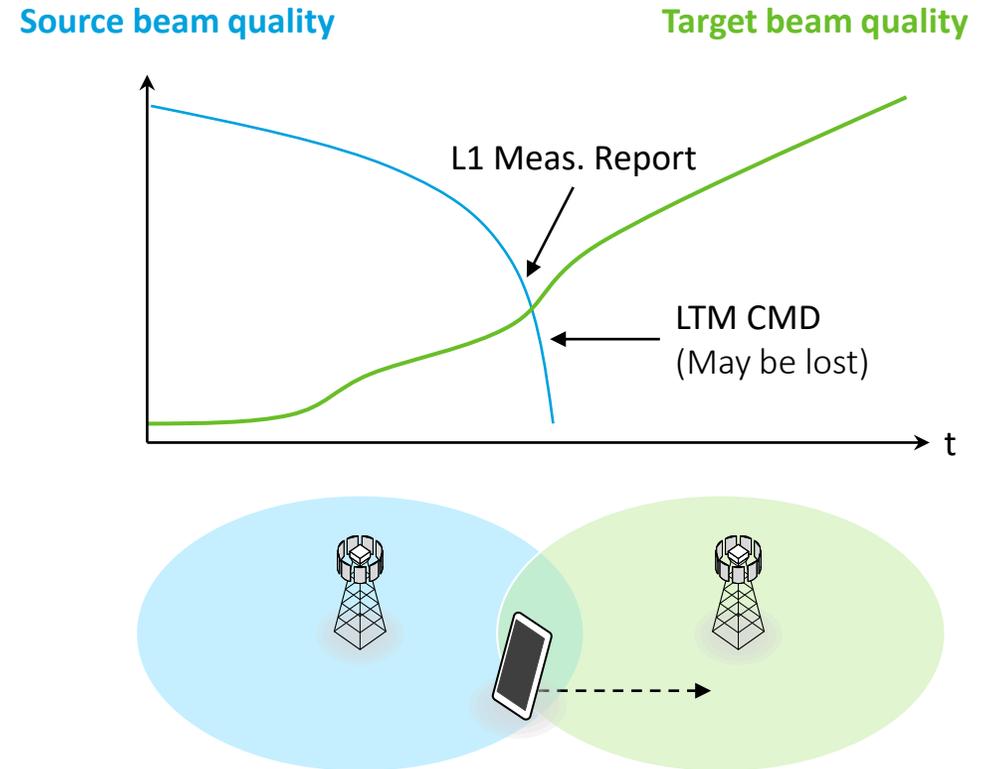
Outline

- [LTM Enhancement](#) (Motivation and Proposal)
- [Measurement Improvement](#) (Motivation and Proposal)
- [Objectives](#)
- [TU](#)

Motivation

LTM enhancement

- Rel-18 introduces LTM (L1/L2-Triggered Mobility) to reduce handover interruption via candidate configuration and early L1 sync
- LTM procedure is triggered by **network command**
 - Robustness: May suffer from **loss of HO CMD** if DL quality drops rapidly.
 - Signaling overhead: May require **more frequent L1 measurement report**
- Combining LTM with CHO can enable a more robust, low-interruption mobility flow



Motivation

LTM enhancement

[2/3]

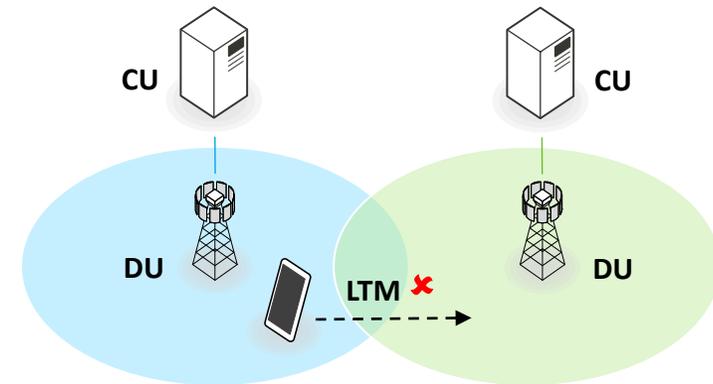
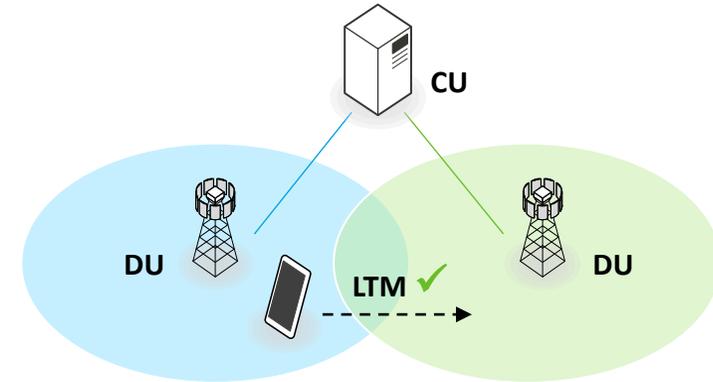
- LTM Time of Stay is much shorter than legacy handover and cell switch execution number is a dozen times higher than legacy handover.
- **Data loss rate** due to HARQ reset at LTM cell switch reaches several percent.
 - Data loss due to LTM should be minimized even for UM bearer

	Legacy HO (2db A3offset, 0 TTT)	LTM (Without filtering)	LTM (With filtering)
HO attempts	455	2024	976
No. Total DL transmission	330534	331619	366959
No. Lost transmission	2493	12956	6363
Data loss rate	0.7%	3.9%	1.7%

Motivation

LTM enhancement

- Rel-18 LTM is only supported intra-CU
 - Simplified design
 - But limitation of use cases
- Generalization of LTM procedure is necessary to ensure **low-interruption handover in all scenarios**
 - i.e. intra-CU and inter-CU



Rel-18 LTM limitation

Proposal

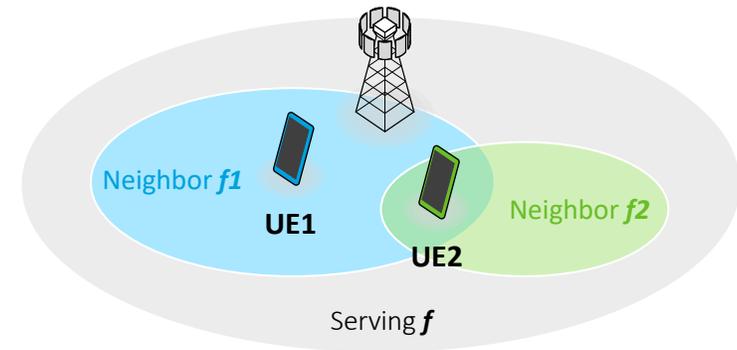
LTM enhancements

- Conditional LTM
 - LTM procedure is triggered by the UE based on network-configured condition
 - The condition could be some L1 measurement result
 - Support RACH-less (as Rel-18 LTM)
- HARQ Continuation
 - HARQ new transmission and retransmission of a TB in source cell and target cell addressed by the same HARQ ID
 - Support both dynamic scheduling and configured scheduling
- Inter-CU LTM procedure
 - Inter-CU coord. for LTM pre-configurations
 - Handling of security configuration change for different CU
 - NOTE: Assuming no inter-DU direct interface as in Rel-18.

Motivation

Measurement improvement

- Unnecessary measurement
 - L1 measurement¹ of an LTM target is a *waste of measurement resource* if the corresponding quality of L3 meas. (coarse beam) is low
 - Measuring all frequencies expected to be of the same quality *wastes UE power*
- Inefficient measurement and reporting
 - The UE measurement and reporting treat each candidate with *equal priority*.
 - The UE may first report the less-preferred targets and result in *performance loss*
- Improving measurement efficiency is necessary:
 - Measurement on importance, and only if needed



- Current Serving Frequency
- Neighbor *f1*: (low prio.)
- Neighbor *f2*: (high prio., NW preferred target, better perf.)

Intended behavior

- UE2 to report *f2* first
- UE1 to report *f1*

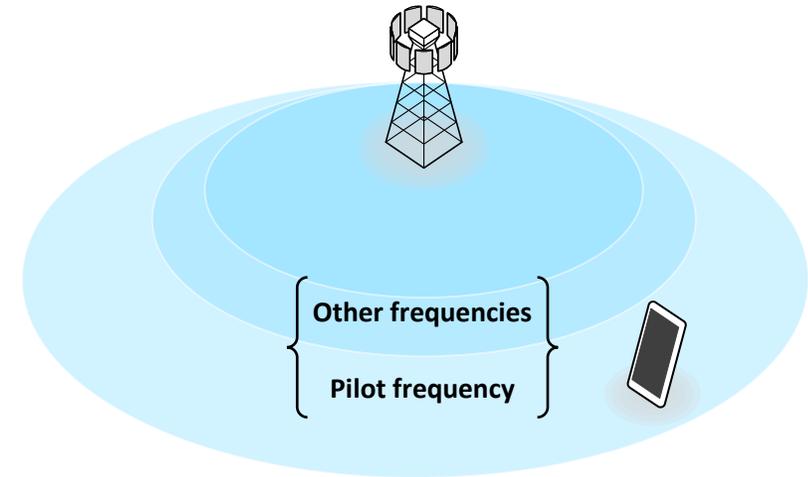
NOTE 1: Fine time tracking and fine beam measurement

Proposal

Measurement improvement

[1/2]

- Conditional L3 meas. according to Pilot Frequency quality
 1. Frequency group configured by the network incl.
 - Pilot Frequency and associated quality Threshold
 - Other frequencies
 2. UE measures the Pilot frequency in the group
 3. UE can skip measurement for all other frequencies in the same group if the strongest cell in the pilot frequency is *lower* than the Threshold.
- Conditional L1 LTM meas. according to L3 meas. result
 1. Network-configured quality threshold
 2. UE to perform L1 LTM measurement only if quality of L3 measurement is higher than the threshold
 - NOTE: There may be some Rel-18 leftovers for LTM measurement



No need to measure other frequencies
if Pilot quality is too low

Proposal

Measurement improvement

- Weighted measurement (CONNECTED mode)
 - Current RAN4 requirement: **Equal delay requirement** on detection and measurement of each neighbor freq.
 - **Proposal: Weighted measurement** based on NW controlled priorities
 - Weight configured per frequency (per MO)
 - High priority frequency will have high weighted value (Assuming two-level weighting is enough)
- New reporting criterion
 - Current behavior: Less-preferred target is reported while preferred target may satisfy the reporting criterion very soon.
 - **Proposal: New reporting event**
 - The low priority frequency is only reported *if the meas. quality of high priority frequency is lower than a threshold.*
 - NOTE: The proposal is dependent on R18 RAN2 TEI discussion



Proposal

SA/CT Dependency: No

Key Message: Misc. mobility enhancements on LTM (conditional LTM, HARQ, Inter-CU) and Measurement Efficiency

Objective I: LTM enhancement [RAN2/RAN3]

- Conditional LTM where LTM procedure is triggered by the UE based on network-configured condition [RAN2/RAN1/RAN3]
- HARQ Continuation [RAN2/RAN1]
- Inter-CU LTM procedure [RAN2/RAN3]

Objective II: Measurement efficiency improvement [RAN2/RAN4]

- RRM measurement based on network-configured weighting [RAN4/RAN2]
- Additional reporting criterion based on quality of two neighbour frequencies [RAN2]
- Conditional L3 measurement according to pilot frequency quality [RAN2]
- Conditional L1 LTM measurement according to L3 measurement result [RAN2]

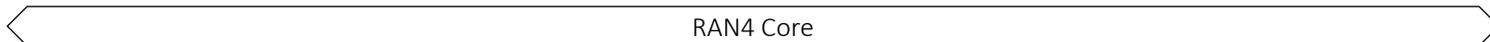
Objective III: Define corresponding RRM core requirements for above objectives, if identified [RAN4]

Expected TU

RAN	2024												2025 [Calendar TBC at the time of writing]												2026		
	Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
	103			104			105			106			107			108			109			110			111		
R1	115b	116		116b	117			118		118b	119		119b	120		120b	121			122		122b	123		123b	124	
R2	124b	125		125b	126			127		127b	128		128b	129		129b	130			131		131b	132				
R3	122b	123		123b	124			125		125b	126		126b	127		127b	128			129		129b	130				
R4	109b	110		110b	111			112		112b	113		113b	114		114b	115			116		116b	117		117b	118	
R1		0		0	0			1		0	1			1		1	0										
R2				1	1			1		1	1			2		1	1			2							
R3				0	1			1		0.5	0.5			1		1	1			1							
R4 RD				0	0.5			0.5		0.5	0.5			1		1	1			1							
R4 RF				0	0			0		0	0			0		0	0			0							

Study TU

Feature TU



Thank you!