3GPP TSG RAN Meeting #78
Lisbon, Portugal, December 18 - 21, 2017
Agenda item: 9.1.1

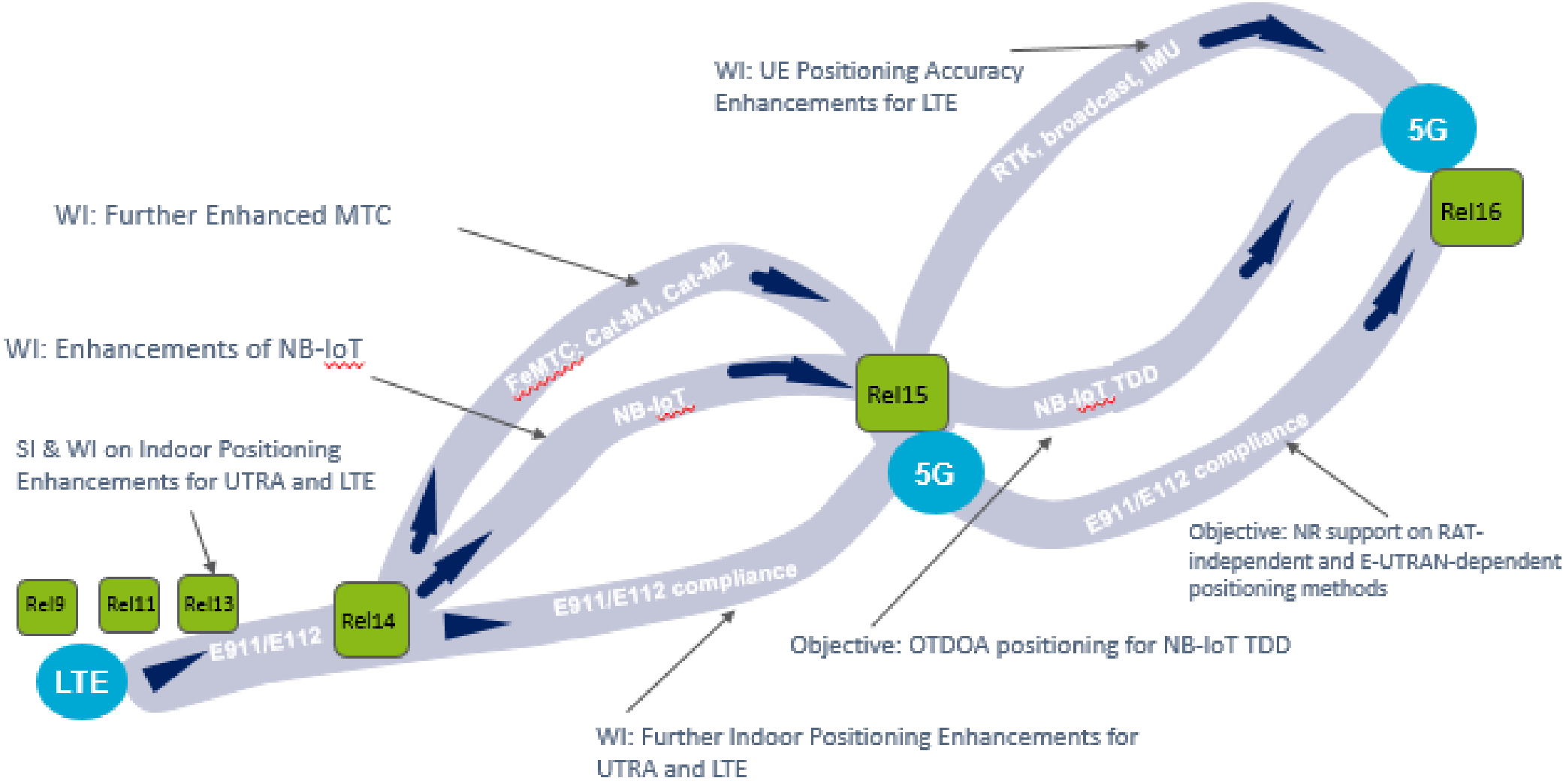
RP-172553

ERICSSON

MOTIVATION FOR NEW SI ON HIGH ACCURACY/LOW LATENCY NR POSITIONING

Ericsson

POSITIONING STANDARDIZATION WORK BACKGROUND



NR REQUIREMENTS

TS 22.862 Feasibility Study on New Services and Markets Technology Enablers for Critical Communications

Potential requirements:

The 3GPP system shall support higher accuracy location capability less than [3 m] at [80 %] of occasions.

- In for services requiring a lower position accuracy (e.g., deliver dense packages from a warehouse to a delivery truck then to a delivery location), the 3GPP system should support high positioning accuracy (e.g., 0.5 m) in both outdoor and indoor, along with high density of the location tracing devices up to (e.g., 1 million devices per km2), and high mobility at minimum of 100 km/h.

NOTE: [80%] of occasions means the probability of achieving the accuracy in total sampling.

The 3GPP system shall support location estimation of UE in less than [10] seconds when the information is requested by user.

The 3GPP system shall support different configuration for accuracy according to different service requirements.

Power consumption due to the continuous use of positioning service shall be minimized.

The 3GPP system shall support co-existence with legacy 3GPP positioning service and migration to higher accuracy positioning service.

NR POSITIONING REQUIREMENTS

TR 38.913 Study on Scenarios and Requirements for Next Generation Access Technologies

The NR should enable, and improve if suitable, state-of-art positioning techniques, such as RAN-embedded (Cell-ID, E-Cell ID, OTDOA, UTDOA, etc.) and RAN-external (GNSS, Bluetooth, WLAN, Terrestrial Beacon Systems (TBS), sensors, etc.).
Additionally, potential D2D based positioning techniques should be considered.
The NR positioning shall exploit high bandwidth, massive antenna systems, network architecture/ functionalities (e.g. heterogeneous networks, broadcast, MBMS) and deployment of massive number of devices. NR positioning shall support indoors and outdoors use cases.

NR shall support regulatory positioning requirements.
NR design targets for commercial positioning use cases include:

1. Support for range of accuracy levels, latency levels and device categories
2. Support accuracy and latency as defined in TR 22.862 for some use cases
3. Reduced network complexity
3. Reduced device cost
4. Reduced device power consumption
5. Efficient signalling over the air interface and in the network
6. Support for hybrid positioning methods
7. Scalability (support for large number of devices)
8. High security
9. High availability
10. Support UE speed as defined in TR 22.862

JUSTIFICATION

- Demand for accurate positioning is part of most of the emerging applications and use-cases discussed for 5G networks.
- While NR provides potentials for obtaining higher positioning accuracy, the requirements of positioning accuracy and latency to target certain use-cases impose more stringent requirements.
- Some potential NR benefits in terms of positioning:
  - wider bandwidths expect to provide better time of arrival (TOA) resolution
  - massive antenna systems, beam angles and TOA triangulation
  - flexible NR network architecture
- The accurate GNSS positioning support introduced in Rel. 15 is accurate where available. Therefore, it is reasonable to investigate hybrid positioning solutions to ensure seamless support for accurate positioning.

SCENARIOS FOR LINK/SYSTEM LEVEL SIMULATION

› Define evaluation models based on available scenarios defined in 3GPP TR 38.901 for sub 6GHz channel models [RAN1]

- Indoor Office scenario as an explicit example for indoor deployment
- UMi-street canyon and UMa scenario as an explicit example for outdoor deployment
- Previously studied scenarios in TR 37.857 can be optionally considered.

ANALYZING NR NUMEROLOGIES

› Evaluate physical layer design options, wide signal bandwidths, suitable frequency carriers via link level simulations [RAN1]

- Down-select to a subset of signals/measurements/procedure for system simulation evaluation
- For the performance evaluations consider specifically: location accuracy (horizontal and vertical), latency, time to first fix, and corresponding uncertainty

SCALABILITY/ EFFICIENCY ASPECTS

› Investigate efficient signalling over the air interface and in the network [RAN2, RAN3, RAN1]

- For scalability and load evaluations, consider specifically radio resource costs
- On-demand positioning reference signal transmission

HYBRID POSITIONING

› Study hybrid positioning solutions [RAN1]

- Hybrid GNSS-3GPP positioning in relevant scenario deployment (e.g. below rooftop urban deployment)

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