Smarter technology for all

3GPP TSG RAN Rel-18 workshop
Electronic Meeting, Jun 28 – July 2, 2021

RWS-210418

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Positioning: On General Evolution and Relative Positioning

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NR Positioning: General Evolution

Rel-16

Use Cases:
Regulatory & Commercial

Target Requirements:
Horizontal Accuracies: < (3-10) m
Vertical Accuracies: < 3 m

Features:
Support for DL-based, UL-based & both DL and UL positioning techniques using NR:

- Measurement Framework
- Supporting interfaces, signalling and procedures

Rel-17

Use Cases:
IIoT & Commercial

Target Requirements:
Horizontal Accuracies: < (0.2-1) m
Vertical Accuracies: < 1-3 m
E2E Latency: < 100ms

Features:

- Enhanced accuracy (e.g., mitigation of Tx/Rx delays, enhancements to DL-AoD/UL-AoA, NLOS multipath mitigation)
- Reduced latency (signalling enhancements)
- Improved device and network efficiency (e.g., on-demand PRS, RRC_INACTIVE positioning)
- Enabling Integrity determination of GNSS methods

Rel-18

Potential Use Cases:
IIoT, UAVs

Potential Features:

- Exploit **large bandwidths using multi-carrier techniques** for enhanced positioning accuracy
- Further **Ultra Low Latency Positioning Enhancements**:
  - LMF Functionality in NG-RAN
- Enable **large amount of concurrent UEs** performing positioning
- Positioning **Integrity and Reliability for RAT-dependent methods**

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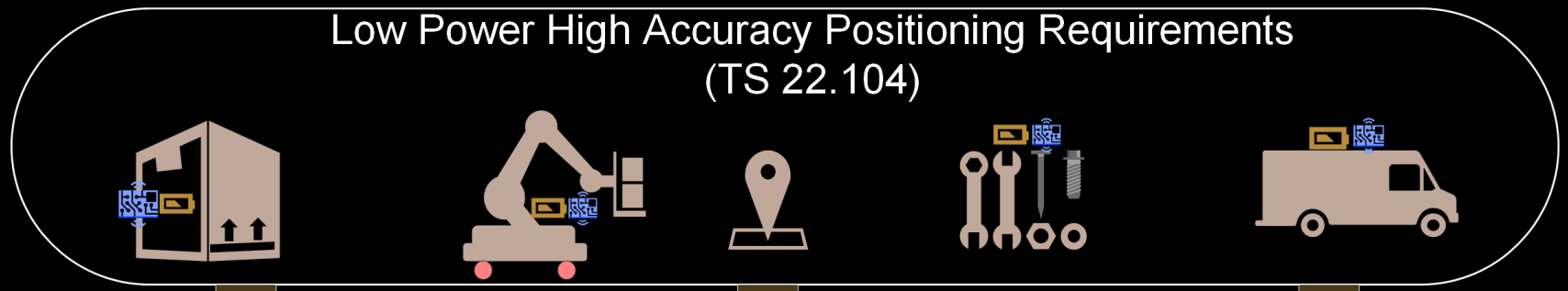
Low Power High Accuracy Positioning for IIoT

- **Low power high accuracy positioning** is critical for IIoT use cases.
- Support efficient configurations and procedures for low power positioning.
- Indoor factory settings can leverage wider bandwidths using licensed (NPN) and unlicensed spectrum.



Horizontal Accuracies
(0,3 – 10 m)
e.g. Tool assignment

Battery Life
(6 months – 8 Years)
e.g. AGV positioning for monitoring up to 8 years

Support different Positioning Update intervals
250 ms – 15 min
e.g. Palette tracking up to 15 minutes

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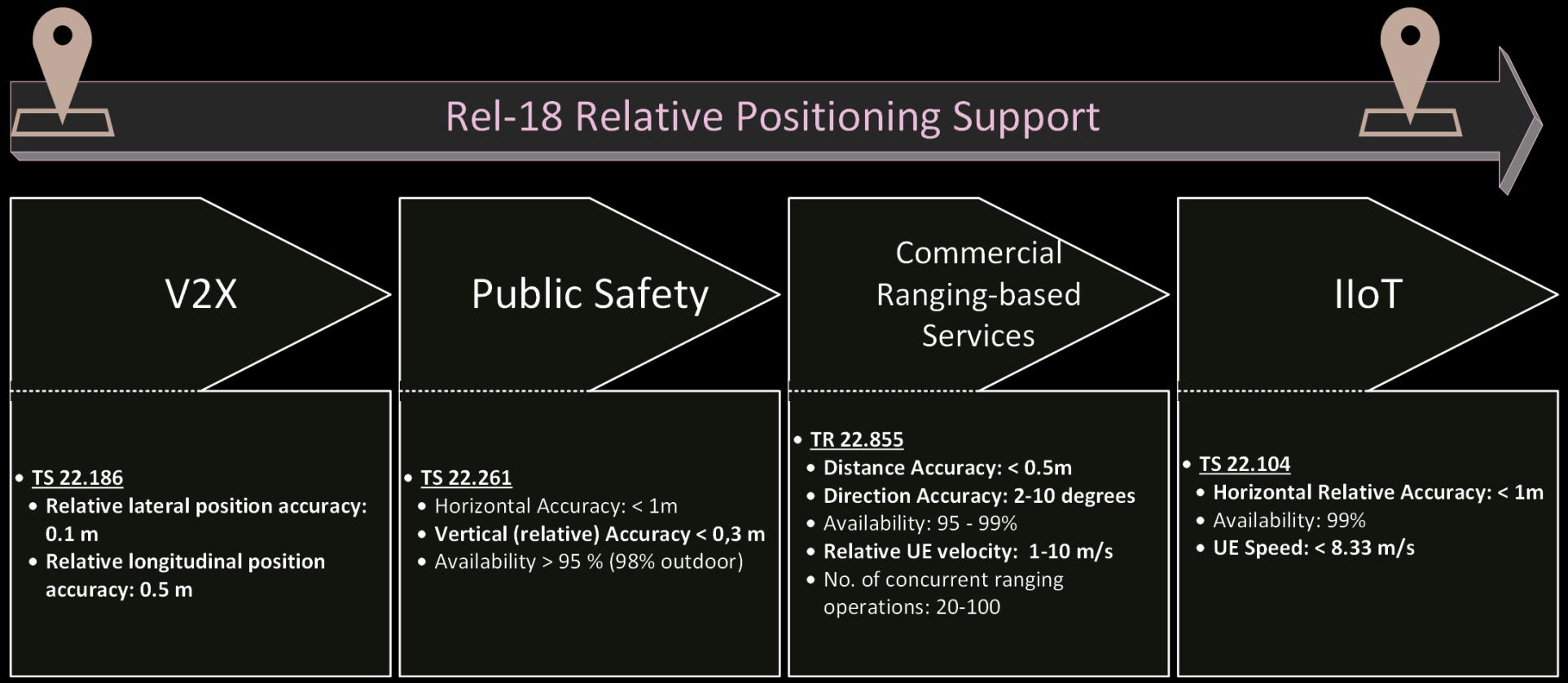
Motivations and Requirements for Relative Positioning



- 3GPP can extend NR positioning towards supporting:
  - **Partial and out-of-coverage network** scenarios
  - Positioning support for determining **relative location information between one or more device pairs.**
    - E.g., distance and angular orientation determination between UE pairs
- The current LPP positioning framework is mainly designed for absolute positioning use cases.

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Relative Positioning Considerations

- Enabling UE-to-UE Positioning
  - Measure and report the **distance and angle/orientation relative to other UE(s)/device(s) in the network**.
- Exploit operational deployments in ITS (V2X), Licensed and Unlicensed bands.
  - Different deployments can cater to different positioning use cases.
- Fulfill target and unified relative positioning requirements including but not limited to:
  - Relative distance/range and orientation/attitude accuracy
  - Low latency procedures to support rapid time to first fix (including range estimation)
  - Stringent availability
  - High number of concurrent UEs able to perform positioning
- Can leverage a combination of network-assisted and UE-based positioning methods.
- Should cater to UEs with limited power/energy requirements, e.g., VRUs, ProSe UEs.
- Close coordination between SA and RAN WGs on a unified CN and RAN positioning architecture.

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Relative Positioning Study

- Support ongoing RAN use case & requirement study with potential solutions using sidelink (SL).
- Investigate feasibility of supporting absolute and relative positioning of UEs for in-coverage, partial coverage and out-of-coverage scenarios to address the different positioning requirements.
- The potential Rel-18 positioning study should at least focus on the following key areas:
  - Feasibility study on the PRS design for SL.
  - Supporting various types of positioning initiation and configuration procedures.
  - Resource allocation mechanisms for SL positioning.
  - Cooperative positioning procedures using network-assisted and UE-based positioning techniques.
  - Positioning QoS, Integrity and reliability of absolute and relative location estimates.

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thanks.

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