

A decorative header consisting of a series of overlapping, semi-transparent geometric shapes in various colors including red, purple, blue, cyan, and green, arranged in a horizontal sequence.

# **Bosch Views and Priorities for Rel-19**

3GPP RAN Release 19 Workshop

15<sup>th</sup> and 16<sup>th</sup> June 2023, Taipei

**RWS-230467**

# Bosch Views on Rel-19 for Automotive Services/Sector

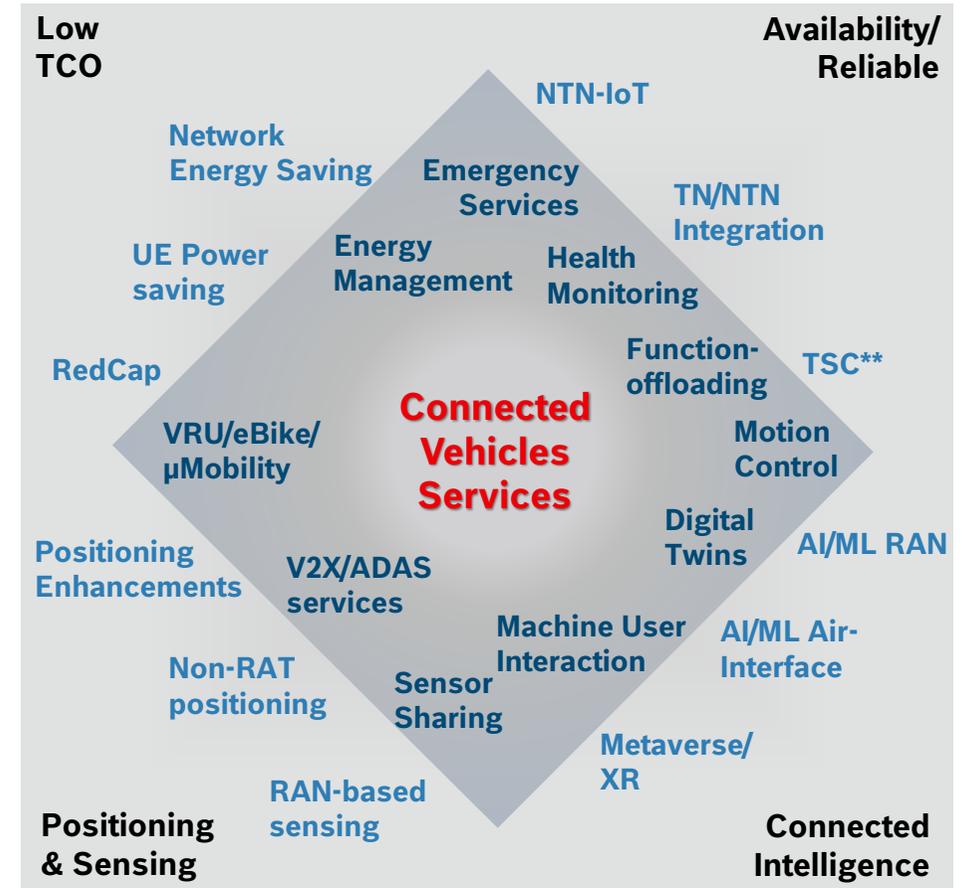
## Connected Vehicles Services and 5G Advanced Evolution

Enabling future connected vehicles services: e.g., ADAS, function-offloading (e.g., in Edge/cloud), motion control, etc., via:

- **Availability/Reliability:** considering resilient, predictable and Ubiquitous connectivity for safe and reliable services
- **Precise Positioning:** enhancing RAN positioning via integrating RAT independent positioning techniques
- **Integrated Sensing:** Enabling RAN-based sensing techniques
- **Connected Intelligence:** AI/ML mechanisms to enhance overall system performance utilizing vehicles' collected data/awareness information
- **Low TCO\*:** Further reduced cost, complexity, energy, and simplified network operation of different 5G-advanced technology

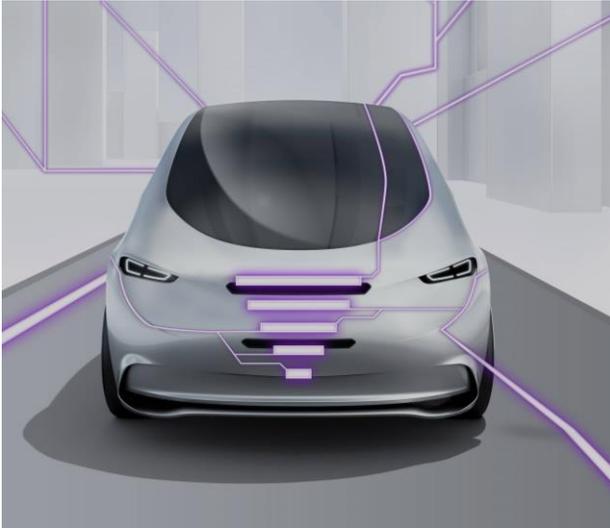
\* Total cost of ownership

\*\* Time sensitive communication (TSC) requirements



# Bosch Views and Priorities for Rel-19

## Bosch Prioritized Topics for RAN SIs/WIs in Rel-19



### SL Stabilization

Stabilize SL Enhancements and enabling SL V2X deployment phase

### Positioning Enhancements

Further Enhanced Positioning (Uu/PC5) and evolution towards integrating non-RAT dependent positioning

### Study ISAC

Study possible mechanisms to enable integrated sensing and communication (ISAC) in RAN

### NR NTN for Automotive

Ubiquitous connectivity and availability via, e.g., TN and NTN tight integration, enhanced reliability, etc.

### AI/ML Introduction

AI/ML 3GPP Air-Interface and further RAN enhancements

# Bosch Views and Priorities for Rel-19

## Additional Sidelink Enhancements for Rel-19

- ✓ Rel-16, 17, 18, SL has a very good foundation to be deployed for V2X and non-V2X use case in FR1
- ✓ Rel-17 introduced further reliability enhancements and power saving mechanisms (e.g., for VRU)



Figure: VRU/V2X connected scenario

### Enhanced V2X and Sidelink Operation

- Specification effort is needed for FR2 based on the outcome of Rel-18 study
  - FFS: FR1+FR2 simultaneous operation if needed
- Based on Rel-18 outcome, if further SL CA enhancement is needed (e.g., CA for Mode 1 operation, multi-carrier operation in FR1 + FR2, Lic- + Unlic. bands CA, etc.), consider only with smooth backward compatibility to Rel-18/17/16 is guaranteed
- Open to discuss: possible TSC enhancements for SL (as considered by 5G-ACIA) and discuss possible relevance to V2X

SL enhancements focus on FR2 specifications and, if needed, further CA enhancements with efficient backward compatibility

# Bosch Views and Priorities for Rel-19

## Possible Extension of Positioning Framework (RWS-230468)

- ✓ Rel-17 offers precise positioning for IIoT use case and Rel-18 offers positioning framework for Uu and PC5

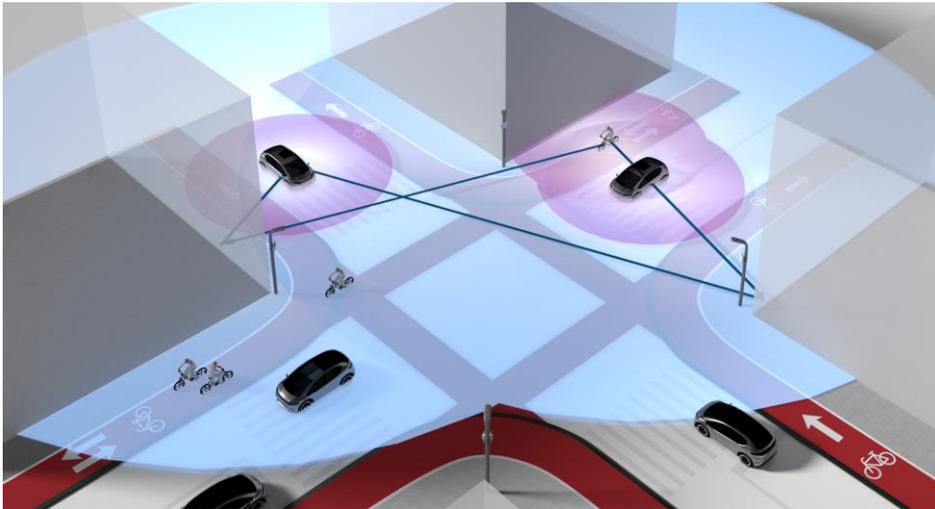


Figure: Positioning for V2X –Urban VRU Protection

### Enhanced Positioning for V2X

- Demanding positioning requirements for V2X (e.g., Set 3 in TR 38.845) could not be achieved in Rel-18 in realistic evaluation scenarios (considering bandwidth, RSU deployment etc.)
- VRUs and vehicles are equipped with different positioning technologies that may be utilized to enhance 3GPP positioning accuracy
- Rel-19 should finalize open positioning topics (e.g., SLP FR2, SLP in unlicensed bands, etc.) to overcome performance limitation in Rel-18.

### Proposals for Further Enhanced Positioning WI:

General Aspects

Multi-Panel Positioning

SLP Enhancements

SLP Multi-Band/CA

SLP Unlic. Bands

SLP FR2

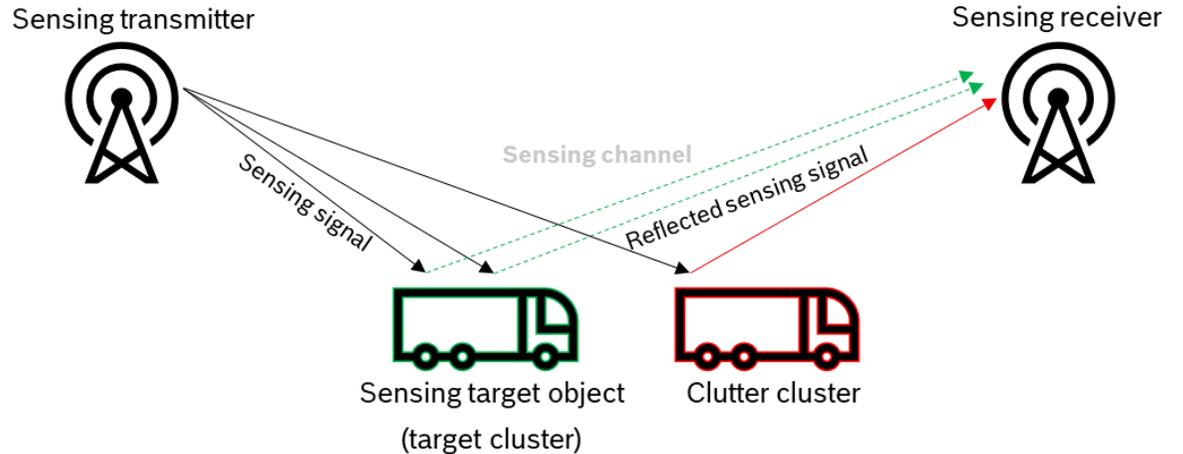
LPP/SLPP Extension

Further enhanced RAT independent positioning

# Bosch Views and Priorities for Rel-19

## Integrated Sensing and Communication in Rel-19 (RWS-230469)

### Proposal: RAN Study Item in Rel-19 for Integrated Sensing and Communication



#### Proposal to consider a feasibility study for ISAC in Rel-19, focusing on:

- Sensing channel modeling for performance evaluation, with initial study on spectral requirements
- Discussion on appropriate sensing modes (combinations between gNB and UE mono/bi-static sensing) and prioritization based on:
  - specification impact and feasibility
  - analysis of existing architecture and signaling to support sensing
- Prioritization of use cases (from SA-1) to be used as reference in RAN

# Bosch Views and Priorities for Rel-19

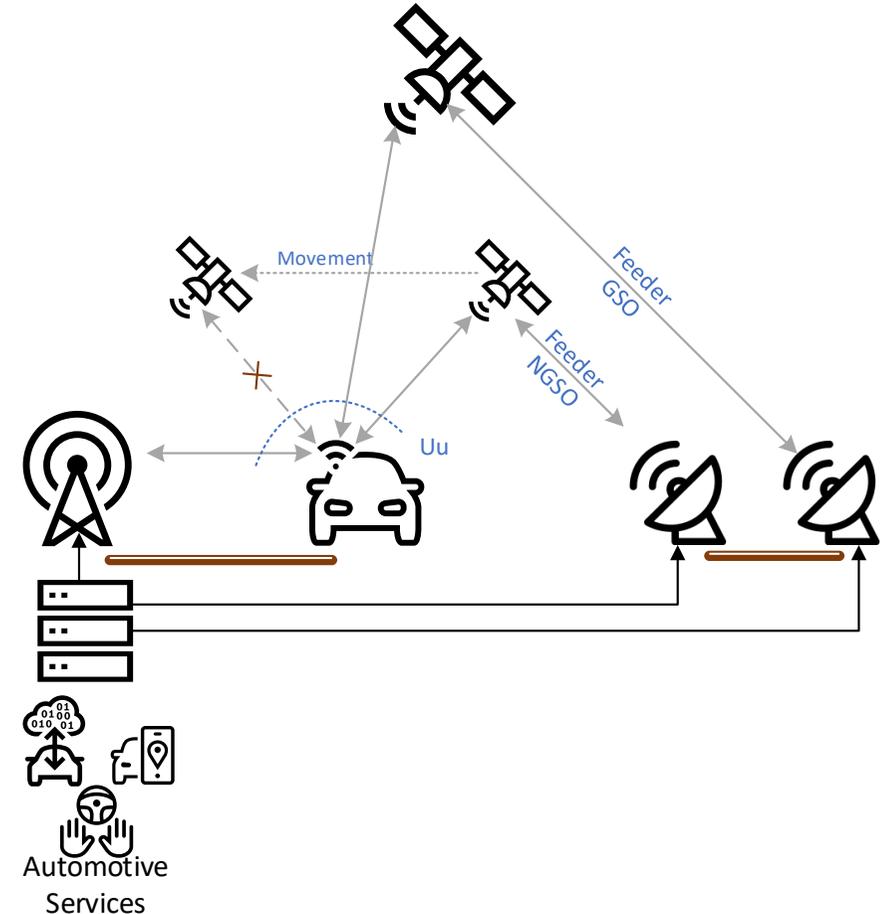
## NR NTN Further Enhancements for Automotive Sectors

### Further Enhancements for NR NTN

- Automotive services require ubiquitous connectivity and coverage
- Automotive requirements differ from existing NR NTN requirements in Rel-17/18 (e.g., regarding UE Types, antenna models, UE power, required throughputs, required mobility and use cases/services)
- Tighter integration between TN/NTN still requires further enhancements for automotive (e.g., further enhanced (connected-mode) mobility and better support of service continuity)

### Possible further new NR NTN enhancements including, e.g.:

- Introduce different UE Types, i.e., vehicle UE (whether impacts beyond RAN4 are required)
- Further Mobility Enhancement for connected devices (TN/NTN)
- Support of discontinuous coverage (to overcoming coverage limitation during initial deployment phase)
- Asynchronous multi-connectivity for different services (e.g., between NTN/TN and between two satellite access (i.e., NGSO and GSO))



# Bosch Views and Priorities for Rel-19

## AI/ML Air-Interface Normative Phase in Rel-19

### Views on AI/ML Air-Interface Study and Normative Phase

- AI/ML SI in Rel-18 identified multiple performance enhancements for the 3 studied use cases, i.e., positioning, CSI, and beam management
- AI/ML SI in Rel-18 identified a feasible AI/ML framework with multiple aspects that can be specified in Rel-19
- Support specifying AI/ML in 3GPP air-interface starting from Rel-19 (possibly after a short study phase)

### Possible recommendation for AI/ML development in Rel-19:

- Based on Rel-18 outcome, support studying and specification of a general AI/ML framework to enable further use case integration in future releases
- Studied use cases (in Rel-18) can be specified in AI/ML normative phase, i.e., AI/ML for CSI/beam-management in MIMO, Positioning in Pos. WI, etc.
- Further AI/ML Air-Interface use cases can be specified in Rel-19 after a short study phase, e.g., mobility enhancements

# Thank you!

