**3GPP TSG RAN Meeting #101**
**Bangalore, India, September 11-15, 2023**

RP-231981

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|---|---|
| Agenda Item | : 8A.1 |
| Source | : InterDigital, Inc. |
| Title | : Views on Rel-19 RAN scope |
| Document for | : Discussion |

interdigital

# Overview of proposed items for Rel-19

***RAN1-led***

- Duplex evolution
  - SBFD configuration
  - Resource allocation enhancements
  - Collision handling
  - CLI mitigation/avoidance
  - HARQ-ACK in SBFD symbols
  - UL/DL timing misalignment handling
- Channel modeling
  - FR3
  - ISAC
  - *RIS*
- AI/ML
  - One-sided model framework
  - Beam management, Direct positioning use cases
  - Performance monitoring, fallback to legacy
- Network energy savings
  - Adaptation of common channels/signals
  - On-demand SSB/SIB1 reception
  - UE wake-up request
  - *Multiple cell DTX/DRX configs*
- MIMO evolution
  - STxMP enhancements
  - Robust/low latency beam operation
  - Market-urgent issues
  - *Coherent JT enhancements*
  - *UL frequency-selective precoding*
- Ambient IoT
  - Passive/active devices
  - Support for backscattering, energy harvesting, reduced complexity
- Positioning enhancements
  - SL positioning in unlicensed spectrum
  - *SL positioning integrity (licensed)*
- Coverage enhancements
  - Non-transparent PAR reduction
- Sidelink enhancements
  - NR SL carrier aggregation
  - FR2
- Low-power WUS
  - OOK-1 and OOK-4
  - RRC Idle/Inactive focus
  - Synchronization, measurement offload, activation/deactivation

*Main item*

*Additional item*

# Overview of proposed items for Rel-19

***RAN2-led***

- XR evolution
  - Multi-modal XR traffic support
  - Differentiated handling of PDU sets
  - *MG enhancements*
- Mobility enhancements
  - LTM for inter-gNB
  - L1 reporting enhancements
  - *Conditional LTM execution*
- Non-terrestrial networks
  - DL coverage enhancements
  - Notification channel for NLOS UEs
  - Regenerative payload
  - Mobility enhancements (paging, QoS-based network selection)
  - (NR) Discontinuous coverage
  - *IoT cell reselection enhancements*
- Sidelink relay evolution
  - Multihop U2N and U2U relaying
  - *Multipath U2N relaying*
- UAV
  - Height-triggered CHO
  - UAV-specific LTM enhancements
  - Enhanced flightpath reporting
  - *No-transmit zones*

*Main item*

*Additional item*

# Proposed additional items for Rel-19

- Sidelink evolution
- Positioning evolution
- Low-power wake-up signal
- Coverage enhancements
- UAV
- Sidelink relay

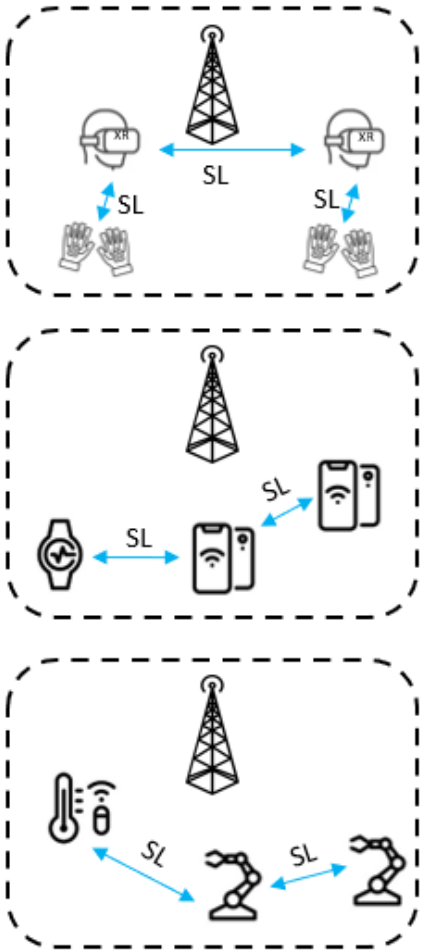
# Sidelink Evolution

## *Motivation*

- New use cases (XR, gaming, personal IoT, IIoT) impose higher data throughput, higher reliability, lower latency, lower battery consumption to sidelink operation.
  - Example: a few Gbps data rate with <10 ms latency and 99.99% reliability for AR/VR applications with online XR gaming (TS22.261)
- Enable large bandwidth sidelink operation to achieve high throughput and reliability performance for indoor commercial use cases
- Expand sidelink support to low latency and high reliability applications (IIoT, XR)

## *Proposed R19 scope*

- Carrier aggregation with NR-specific enhancements (e.g., HARQ, RA)
- Sidelink FR2 normative work based on conclusions of R18 study
  - Beam management, beam failure recovery, CSI enhancements



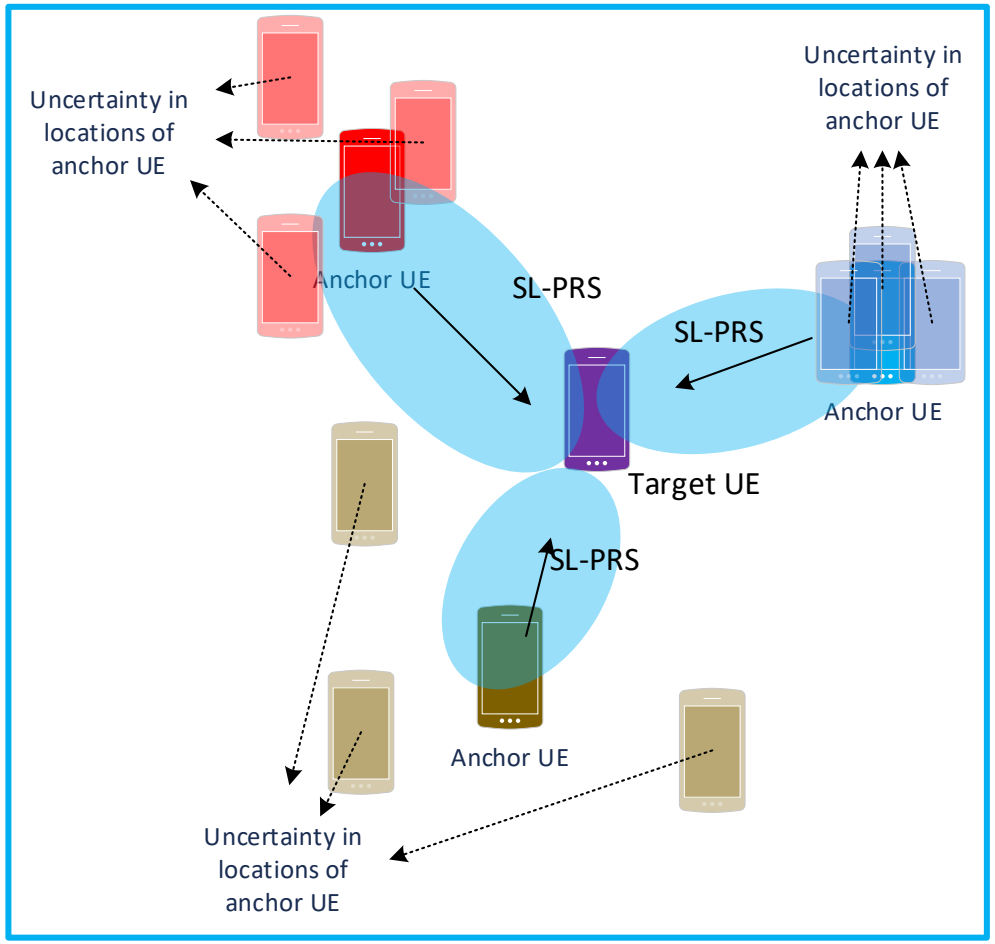
# Positioning Evolution

## *Motivation*

- Meet sub-1 meter accuracy (e.g. Set B for IIoT in TR 38.859)
- Use of wider bandwidth improves the positioning accuracy
- Ensure positioning integrity for industrial (IIoT) applications

## *Proposed R19 scope*

- Sidelink positioning in unlicensed bands
  - Leverage additional bandwidth from unlicensed bands to improve accuracy and reliability of sidelink positioning
  - Study and specify channel access mechanism for positioning signals
- Integrity for sidelink positioning
  - Study error sources for sidelink positioning
  - Specify signaling mechanisms to support UE/network-based integrity




Examples of anchor UE location as error sources

# Low Power – Wake Up Signal

- ***Motivation***
  - Support identified LP-WUS designs and structures which have significant benefits
- ***Potential WI scope for R19***
  - LP-WUS design
    - OOK based single bit/multi-bit per OFDM symbol shown to provide best performance
  - Support RRC Idle/Inactive modes
  - RRM measurement offloading using LP-SS
    - Maintain main radio ultra-deep-sleep by avoiding RRM measurement
  - Activation/deactivation of LP-WUS
    - Address scenario where LP-WUS coverage is worse than main radio
    - Duty cycled monitoring procedure provides best performance

# Coverage enhancements

- ***Motivation***
  - Bring additional coverage gains from PAPR reduction over FDSS without spectrum extension (Rel-18)
- ***Potential WI scope for R19***
  - Specify FDSS-SE and/or tone reservation for PAPR reduction

| RB | 700 MHz Inner | 700 MHz Outer | 4 GHz Inner | 4 GHz Outer |
|---|---|---|---|---|
| 8 | 0.46 | 0.89 | 0.57 | 0.78 |
| 16 | 0.44 | 0.24 | 0.51 | 0.45 |
| 24 | 0.70 | 1.12 | 0.73 | 1.14 |
| 32 | 0.74 | 0.38 | 1.2 | 0.54 |
| 40 | 0.20 | 1.03 | 0.79 | 0.85 |

Gain of FDSS-SE over transparent FDSS (dB) – average between companies
Source: R4-2310303

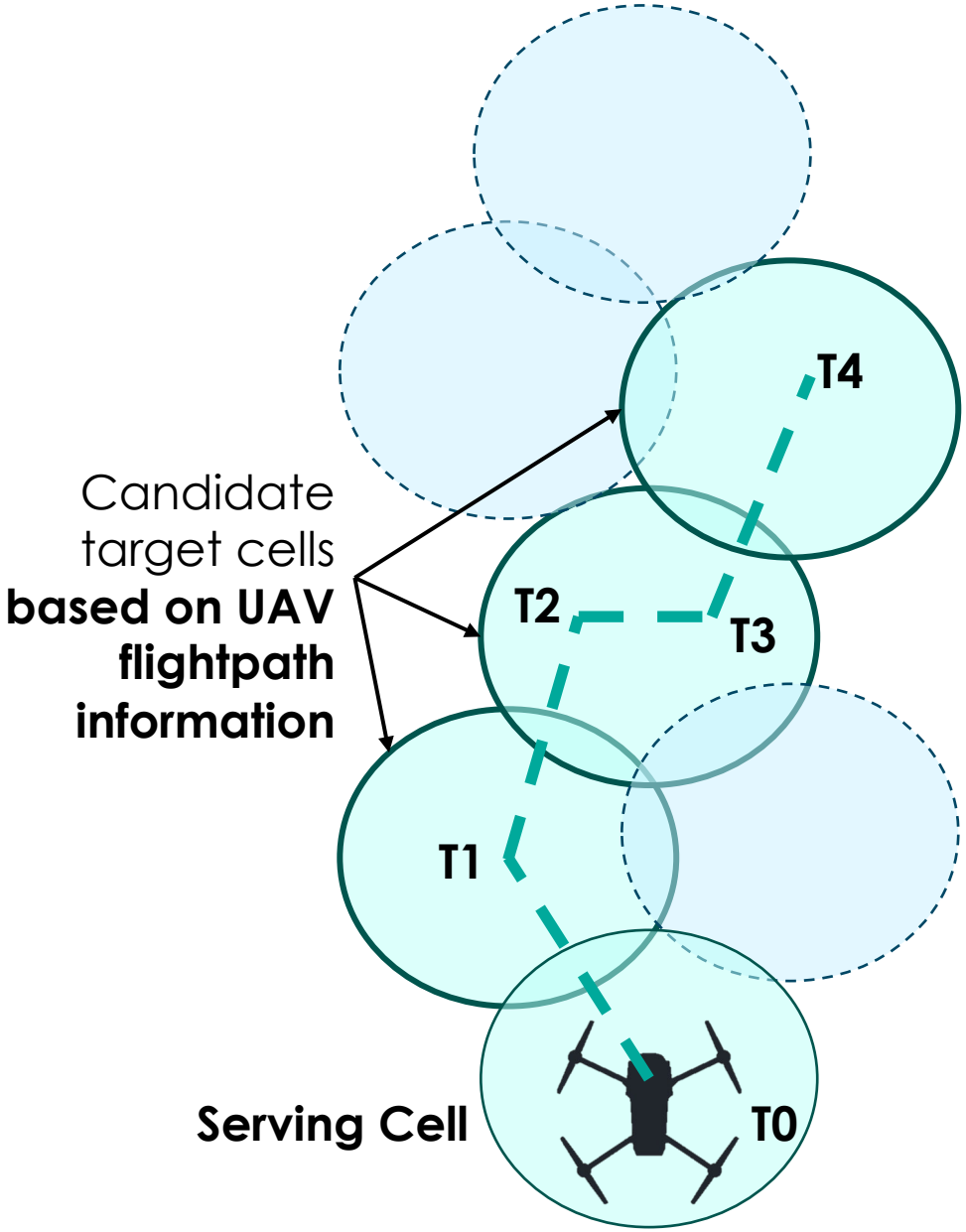
# UAV

## *Motivation*

- Improve mobility and flightpath reporting for uncrewed aerial vehicles (UAV)
- Facilitate compliance with regulatory requirements on spectrum operational restrictions

## *Proposed R19 scope*

- Mobility enhancements for UAV
  - Conditional handover based on height trigger
  - LTM enhancements for UAV – using flightpath information for LTM candidate preparation/synchronization
- Enhancements to flightpath reporting
  - Partial flightpart update (to reduce overhead)
  - Multiple candidate flightpart reporting (network can indicate preferred route from mobility perspective)
- Support for no-transmit zones
  - Compliance with ECC decision 22(07) beyond using cell barring

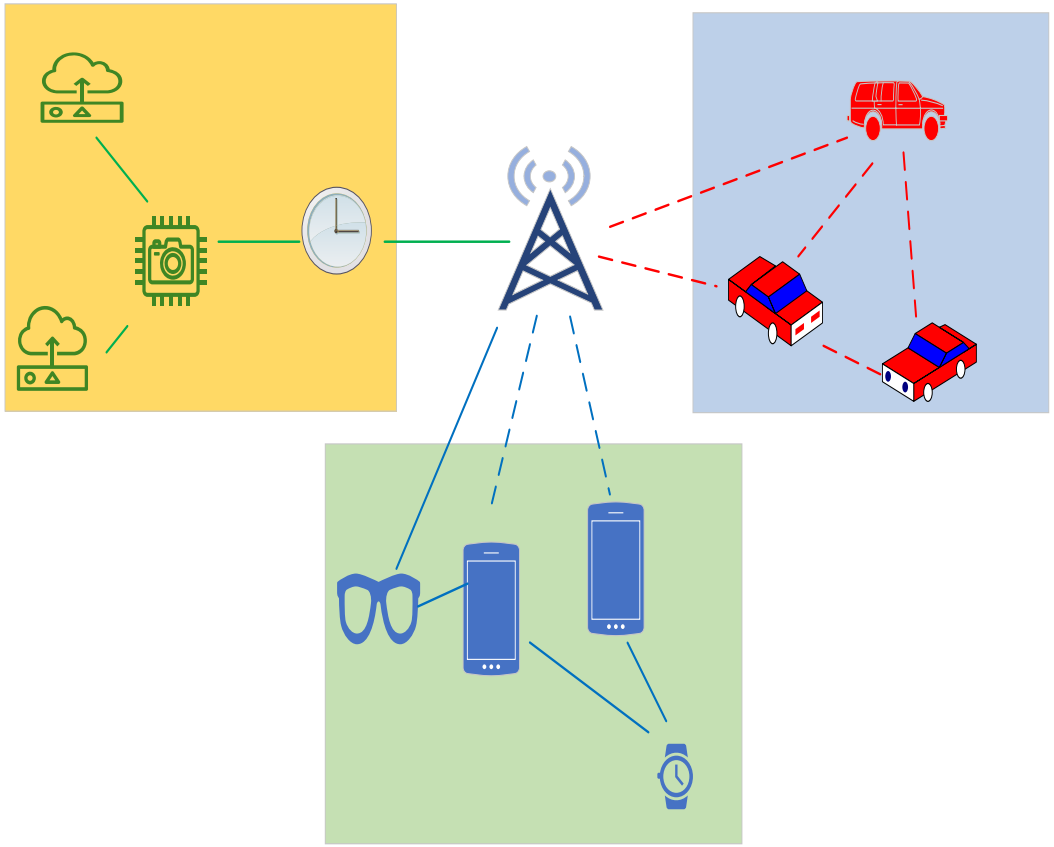



Target cell pre-configuration based on UAV flightpath information.

# Sidelink Relay

## *Motivation*

- Rel18 SL Relays have several limitations that limit their applicable use cases
  - Only UEs close to in-coverage relay can be served (extension to service deep coverage holes would be needed)
  - Multipath feature is only available to in-coverage UEs

## *Proposed R19 scope*

- Multihop enhancements (UE-to-NW and UE-to-UE)
  - Benefits for wearables, IoT devices for factory sensors, smart metering, containers, etc. (TS 22.261)
  - Support discovery/(re)selection for L2 and L3 relaying
- Multipath support for additional scenarios
  - Bring throughput and reliability benefit of multipath to out-of-coverage remote UE
  - UE connected to different gNBs using direct path + indirect path
  - UE connected to same/different gNBs using two indirect paths (e.g. via U2N relay or another UE)