3GPP TSG RAN Meeting #93-e

September 13th-17th, 2021

RP-212338

Rel-18 NR Sidelink

Agenda Item:	9.0.2
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NR Sidelink Use Cases & Technology

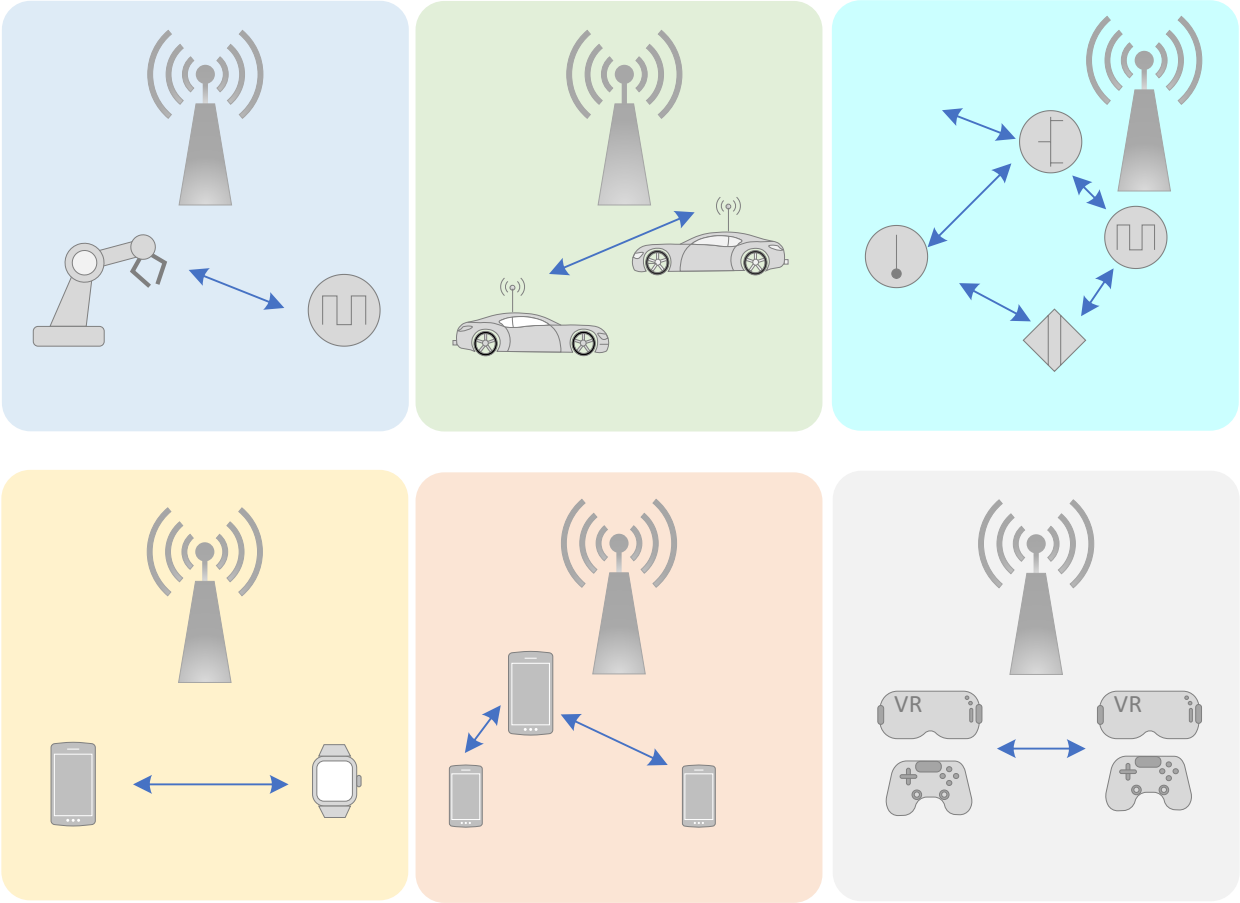
Overview of R16/R17 work

- Sidelink use cases
  - Vehicular services (V2X)
    - ✓ Focus on automotive sector (vehicle, pedestrian, RSU applications)
  - Public safety (PS)
    - ✓ Similar system KPIs as for V2X
  - Commercial
    - ✓ General purpose
    - ✓ NR SL is not optimized for specific applications (same solution as defined for V2X/PS)
- R16/R17 Technology
  - Synchronization
    - ✓ gNB / GNSS / UE sync sources
  - Resource allocation
    - ✓ M1: gNB controlled sidelink transmissions
    - ✓ M2: UE autonomous resource selection
  - Communication
    - ✓ Broadcast, groupcast, unicast
    - ✓ HARQ, CSI feedback, Open loop PC
  - UE-to-NW L2/L3 Relay
- Key KPIs
  - Reliability, latency, UE power saving

NR Sidelink Evolution

Potential use cases for R18+ work

- Evolution of V2X / PS
  - ✓ Leftovers of R17 work
- Industrial IoT applications
  - ✓ Factory automation, cyber physical systems
- Private / personal networks
  - ✓ Enterprise, business, XR, gaming
- Wearables
  - ✓ Emerging low/mid/high end gadgets
- RedCap / LPWA / Sidelink Mesh networks
  - ✓ Smart homes, buildings, IoT



NR Sidelink Evolution

Observations

- Broad set of potential use cases with various requirements
- Demand for sidelink comes from vertical segments
- KPIs & sidelink design are tailored to specifics of vertical applications
- Further sidelink evolution should focus on use cases with good market potential
  - Not limiting design for application to other use cases
- Sidelink-aided design can improve system KPIs
- Industrial-IoT track is attractive for sidelink evolution (on top of V2X/PS)

NR Support for Industrial-IoT

Overview of NR URLLC Development

- URLLC framework
  - NR Uu evolution scope in R16/R17
  - Major design track for Industrial-IoT
- Current work status
  - Uu radio-interface
    - ✓ Mature in terms of URLLC communication and positioning for I-IoT deployments
  - PC5 radio-interface
    - ✓ Benefits of sidelink aided design are not assessed
- Major Uu URLLC radio features
  - Flexible low-latency scheduling options (resource granularity)
  - Intra-& inter- UE service multiplexing
  - Multi-TRP transmission/reception
  - Support of unlicensed spectrum
  - PDCP packet duplication
  - Accurate reference timing delivery

Sidelink Evolution in R18+

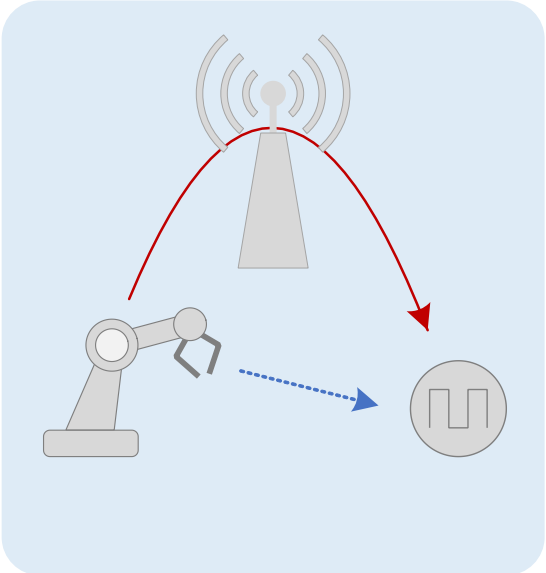
Work Directions for R18+

- Sidelink evolution for V2X/PS in R18
  - Support of sidelink positioning in NR positioning framework
  - Sidelink carrier aggregation and/or BWP adaptation and power saving
  - Sidelink support in unlicensed spectrum FR1
  - Co-channel coexistence of 3GPP SL communication technologies (LTE-PC5/NR-PC5)
  - Sidelink enhancements for communication in FR2
- Additional work directions
  - Sidelink-aided support of I-IoT scenarios (factory, sensor/actuator)
    - ✓ URLLC UEs w/ Uu+PC5 capabilities (minimize sidelink latency, increase communication reliability, …)
  - RedCap sidelink
    - ✓ UEs w/ Uu+PC5 capabilities (power saving, reduced cost, moderate data rates, …)

URLLC Sidelink

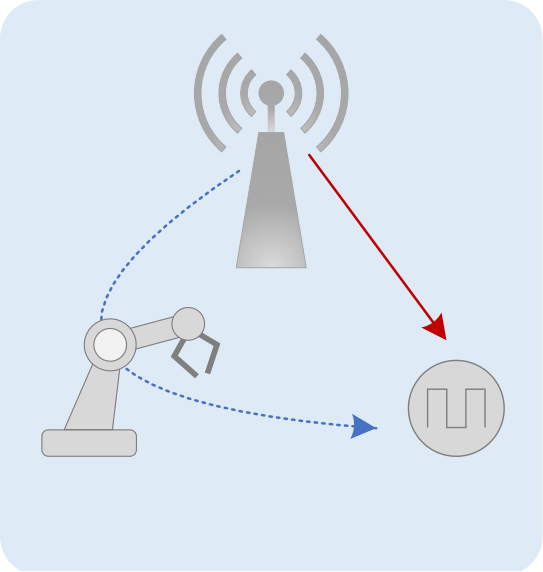
URLLC Uu + Sidelink for Industrial-IoT

- Augmentation of local Uu forwarding (DL+UL) by direct sidelink transmissions
- Augmentation of Uu (DL or UL) transmission by local PC5 forwarding
- Sub-slot sidelink transmissions with channel access / resource selection enhancements
- Sidelink support in unlicensed spectrum
- Intra-UE service prioritization (resource selection for multiple TBs, etc.)



Augmentation of local Uu forwarding (DL+UL) by sidelink transmission

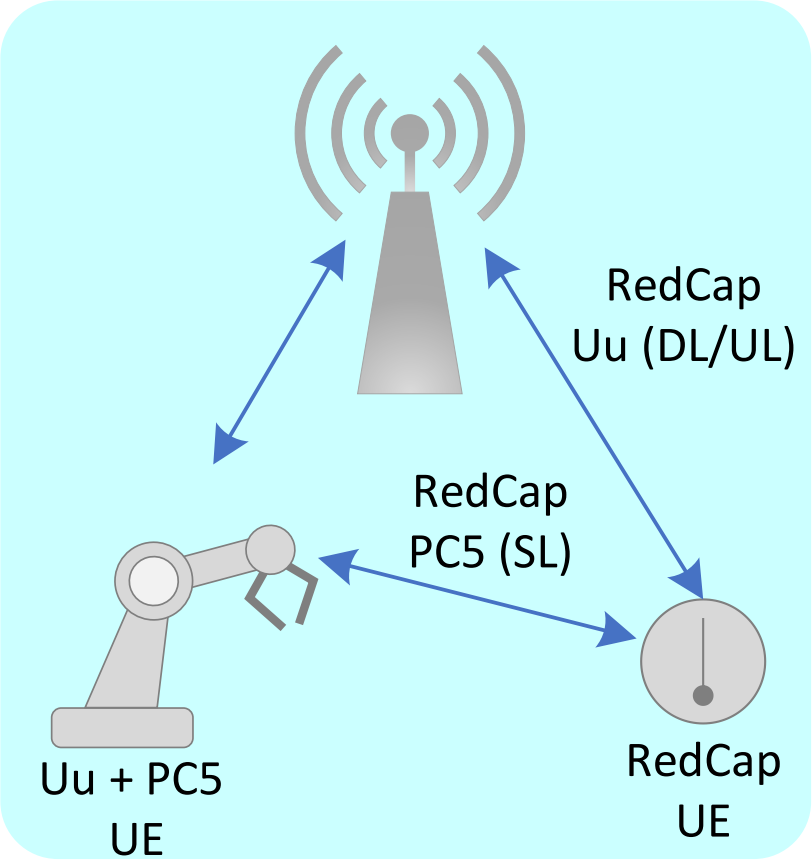
Augmentation of Uu (DL or UL) transmission by local PC5 forwarding



RedCap Sidelink

RedCap DL/UL + Sidelink

- Sidelink Power Saving Enhancements
  - Reduced sidelink BW support / processing capabilities
  - SL BWP adaptation / sub-pooling
  - Sidelink wake up signal support
- Framework is useful for sidelink-aided industrial-IoT, consumer, IoT use cases



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