*3GPP TSG RAN Rel-18 workshop*
*Electronic Meeting, June 28 - July 2, 2021*

*RWS-210238*

# LG's View on Rel-18 5G-Advanced: non-eMBB related

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# Rel-18 non-eMBB overview

## eMBB evolution

- TCP boosting (RWS-210226)

- Enhancement for MIMO (RWS-210240)
- Enhancement for mobility (RWS-210227)
- Enhancement for SON
- Enhancement for NR QoE

## Non-MBB evolution

Supporting diverse vertical applications

- Factory IAB (RWS-210228)
- Inter-UE duplication avoidance (RWS-210229)

- Enhancement for sidelink operation (RWS-210244)
- Enhancement for RAN slicing (RWS-210230)
- Enhancement for SDT (RWS-210231)
- Enhancement for NTN (RWS-210232)
- Enhancement for RedCap

## Cross Functionalities

Both for eMBB & non-eMBB

- Full duplex operation (RWS-210241, RWS-210242)
- Physical layer aspects for AI/ML operation (RWS-210243)
- ML-aided predictive mobility (RWS-210233)
- AI/ML enabled NG-RAN

- Enhancement for positioning (RWS-210245)
- Enhancement for device requirement (RWS-210249)
- Enhancement for XR operation

* Separate Tdocs submitted for items in red color



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# non-eMBB related [1/3]

- **Factory IAB (RWS-210228)**
  - Support factory IAB including topology adaptation with zero-interruption mobility, duplication/express routing for much higher reliability.
  - Support dynamic interference coordination to overcome interference by full mobility.

- **Inter-UE duplication avoidance (RWS-210229)**
  - In order to reduce resource waste when multiple UEs are given to a same mission in an automated system, RAN2 studies and develops enhancements for transmission of high quality image/video with the help of inter-UE duplication avoidance.


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# non-eMBB related [2/3]

- **Enhancement for sidelink operations (RWS-210244)**
  - Sidelink carrier aggregation
  - Co-channel coexistence of LTE and NR sidelinks
  - Sidelink beam management or multi-panel management
  - Enhancements for sidelink operation in FR2
- **Enhancement for RAN slicing (RWS-210230)**
  - RAN solutions to support new (Rel-18) slice restrictions and requirements identified by SA1
  - Slice aware mobility when usage of network slices is restricted
  - Power saving mechanisms based on slice priority or disjoint network slices information
- **Enhancement for SDT (RWS-210231)**
  - Support DL data transmission in RRC_INACTIVE
  - Paging enhancement, co-existence with UL SDT
- **Enhancement for NTN (RWS-210232)**
  - Support CA and DC in NTN networks, including scenarios:
    - CA with LEO PCell + SCell
    - DC with GEO (MN)+LEO (SN)
    - DC with LEO(MN)+LEO (SN)
    - DC with TN (MN) + NTN (SN)
  - Support inter-satellite link(ISL) using regenerative payload.


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# non-eMBB related [3/3]

- **Enhancement for RedCap**
  - Enhancements for low end use cases (e.g. narrower band operation, DRX/SDT enhancements)
  - Application of power saving and NTN features for RedCap UEs


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# Annex

More detailed proposals for some selected topics

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# Factory IAB[1]

[1] RWS-210228

- **Motivation**
  - New market demands for a private network, e.g. factory, is growing and this requires more stringent latency/reliability requirement.
  - A backhaul link blockage causes severe performance degradation. Factory IAB would encounter dynamic blockages by mobility of IAB nodes and moving objects. Zero-interruption would be an important factor to increase system performance.
  - Mobility of IAB nodes decreases overall network stability as well as packet routing performance. However, topological redundancy in IAB Rel-16/17 has limitation to satisfy stringent reliability/latency requirement of factory IAB. More proactive topological redundancy scheme, e.g., duplication and express routing, should be considered. In addition, interference situation changes dynamically due to mobility. Dynamic interference coordination among IAB nodes is needed to sustain low interference level.

- **Objective**
  - Support dynamic topology adaptation with zero-interruption mobility.
  - Support dynamic topological redundancy with controlled duplication and express routing.
  - Support dynamic interference coordination for intra- or inter-IAB networks.


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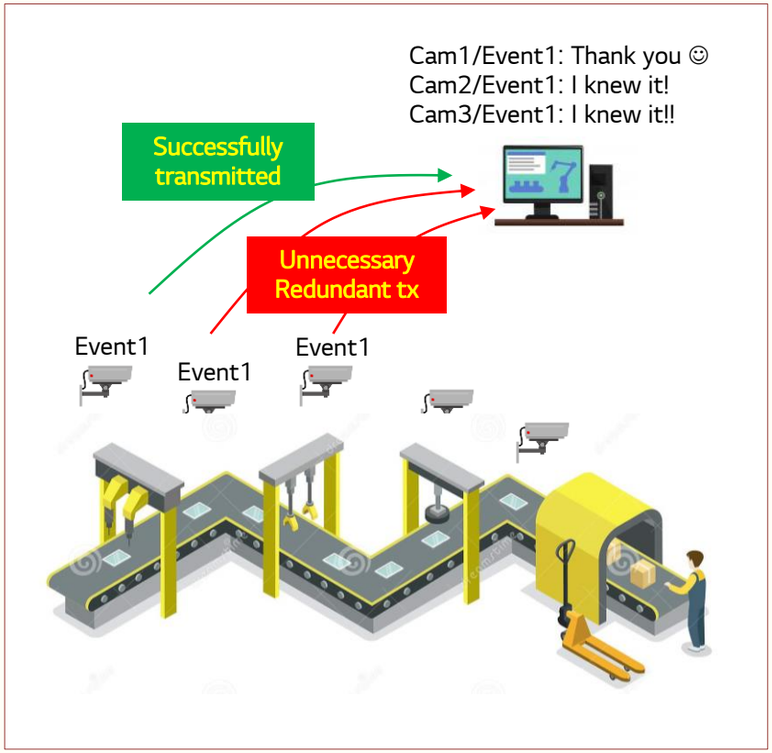
# Inter-UE duplication avoidance[2]

[2] RWS-210229

- **Motivation**
  - In an automated system, e.g., smart factory/city, transport/logistic system, multiple UEs in different locations transmit the same message/information for the same event which occurs at the same time in order to achieve higher reliability. It would cause huge waste of radio resource in URLLC transmission.
  - A mechanism should be considered improve resource efficiency by reducing redundant transmission of the same message/information from multiple UEs for a same event.

- **Objective**
  - Enhancements for resource-efficient transmission of high quality image/video in a small/large group working on the same mission with the help of inter-UE duplication avoidance.
    - To provide a feedback of the received message/information to multiple UEs in the same group
    - To avoid redundant transmission of the same message/information based on the feedback





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# Enhancements on sidelink operation[3]

[3] RWS-210244

- **Sidelink carrier aggregation**
  - For bandwidth expansion when configuring a single large sidelink bandwidth is not possible
    - For example, ITS band consisting of 10 or 20 MHz channels or simultaneous sidelink operation over multiple frequency bands (one in an ITS band and another in a licensed band)
- **Co-channel coexistence of LTE and NR sidelinks**
  - For migration from LTE to NR in an ITS band
  - For better utilization of the spectrum allocated to LTE sidelink
- **Sidelink beam management or multi-panel management**
  - Only omni-directional transmission is supported in sidelink while multi-panel vehicles were included in the V2X evaluation methodology
    - "Option 2: Two panels are placed in the vehicle as follows and the antenna pattern for each location is given by …" [TR 37.885]
  - Selection of the sidelink transmission beam or panel with the best channel quality to the target receiver
    - This is to improve the link quality and avoid unnecessary interference.
- **Enhancements for sidelink operation in FR2**
  - For high data rate in V2X or commercial services which grows up to 1~10 Gbps [TS 22.186, TS 22.261]


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# Enhancement for RAN slicing[4]

[4] RWS-210230

- **Motivation**
  - In Rel-17, RAN slicing solutions are being discussed for the scenarios where all cells within a tracking area support the same slice availability.
  - SA1 identified new use cases and new requirements in Rel-18.
  - In Rel-18, RAN should work on enhancements for RAN slicing to support new use cases and new requirements according to SA1, including:
    - Multiple and different slices are supported on different frequencies or geographical area (regardless of tracking area).
    - Restriction on simultaneously supported network slices at UE.
    - Different users or services have different priority for the available network slices.
  - A mechanism to efficiently minimize power consumption (e.g., cell search, cell measurement) should be discussed considering different types of slice restrictions and priority.

- **Objective**
  - Support slice aware mobility when usage of network slices is restricted.
    - Restriction is based on frequency, geographical area, timely-manner, simultaneous usage of network slices.
    - Consider both idle mode and connected mode mobility.
  - Support power saving mechanisms based on slice priority and/or disjoint network slices information
    - RRM relaxation and DRX optimization in consideration of slices.


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# Enhancement for SDT[5]

[5] RWS-210231

- **Motivation**
  - In Rel-17, SDT is introduced to support UL data transmission in RRC_INACTIVE. However, data transfer is not limited to UL but should cover DL.
  - To avoid unnecessary signaling overhead due to transition of RRC state, a mechanism needs to be introduced to support for DL data transmission in RRC_INACTIVE.
    - To trigger RRC_INACTIVE UE to receive DL data, paging mechanism needs to be enhanced.
    - Resource-efficient and power-efficient scheme should be considered.
    - Co-existence with UL SDT should be considered.

- **Objective**
  - Paging enhancement for DL SDT
  - DL SPS utilization for DL SDT
  - DRX enhancement for DL SDT
  - Co-existence with UL SDT


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# Enhancement for NTN[6]

[6] RWS-210232

- **Motivation**
  - Since there are numerous NTN UEs in a single NTN cell, average per-UE throughput is quite restricted. To meet the NR service requirements (e.g. 15Mbit/s DL for Airplanes connectivity), CA/DC should be supported to increase the per-UE throughput from NTN cell.
  - Upon radio link failure due to feeder-link switch, disappearance of LEO satellite, or bad weather, re-establishment in a NTN cell is the fastest recovery mechanism, but the service interruption time is very long due to long propagation delay. If CA/DC is supported, UE can recover the link failure faster via alternative node.
  - In Rel-17, only transparent payload is considered which results long signaling delay between two satellites because the satellites should communicate through gNBs on the ground. If regenerative payload using inter-satellite link(ISL) is supported, the satellites can communicate directly each other so the signaling delay is reduced when a satellite coordinates with neighbor satellites for DC configuration.

- **Objective**
  - Support CA and DC in NTN networks, including:
    - CA with LEO PCell + SCell: Increase data throughput
    - DC with GEO (MN)+LEO (SN): MN manages UE mobility and MN takes role of data transmission
    - DC with LEO(MN)+LEO (SN): Increase data throughput
    - DC with TN (MN) + NTN (SN): SN complements weak signal area of MN
  - Support inter-satellite link(ISL) using regenerative payload to reduce signaling latency between satellites for faster DC configuration.


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