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Support of URLLC in NR Rel-15

Huawei, HiSilicon

TSG-RAN agreements on NR scope

- Overall Release-15 timeline unchanged, completion target June/2018

- Target content for Rel-15
  - Support for both Standalone and Non-Standalone operation included, work starting in conjunction and running together
    - Non-standalone NR in this context implies using LTE as control plane anchor
    - Standalone NR in this context implies full control plane capability for NR
    - Some potential architecture configuration options are shown in RP-161249 for information
  - eMBB, ***Low Latency, and High Reliability (to enable some URLLC use cases) in scope***
  - <6GHz and >6GHz in scope
  - Detailed target content subject to eventual SI conclusions and agreed WID scope

URLLC status in Rel-14 NR SI

- Sufficient agreements related to low latency part of URLLC
  - Larger subcarrier spacing, extended CP
  - Mini-slot
  - Grant-free transmission

- Sufficient agreements related to URLLC and eMBB multiplexing
  - From network perspective, multiplexing of transmissions with different latency and/or reliability requirements for eMBB/URLLC in DL is supported by same or different subcarrier spacings
  - Support dynamic resource sharing between different latency and/or reliability requirements for eMBB/URLLC in DL
  - DL dynamic resources sharing between eMBB and URLLC is supported without pre-emption by scheduling the eMBB and URLLC services on non-overlapping time/frequency resources.
  - For DL, support indication of time and/or frequency region of impacted eMBB resources to respective eMBB UE(s)

- Some but not sufficient study and evaluation on the reliability part of URLLC
  - To ensure the reliability requirement of NR-PDCCH for URLLC, at least the following aspects should be supported: 1) Defining a compact DCI format targeting low BLER operation; 2) The highest aggregation level should target a BLER of Y for this compact DCI format

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Rel-15 NR WI and URLLC SI (preferred scope)

- Rel-15 NR WI ensures full forward compatibility support for URLLC by Dec 2017 stage 3 freeze
  - Physical layer and higher layer design in the Rel-15 NR WI shall assume the support of eMBB and URLLC multiplexing in the same carrier, with aspects impacting eMBB included in the Rel-15 NR WI
  - Mini-slot and grant-free, as necessary functionalities for both eMBB and URLLC, are included in the Rel-15 NR WI
  - DL control channel design in the Rel-15 NR WI allows natural extension to support the necessary reliability required by URLLC, e.g. higher aggregation levels, compact DCI
  - Techniques to achieve low latency for user plane and control plane are included in the Rel-15 NR WI
  - INACTIVE state is included in the Rel-15 NR WI
- URLLC designs are studied in the Rel-15 URLLC SI, in parallel to the Rel-15 NR WI until Dec 2017
  - Techniques to achieve high reliability, e.g. spatial/ frequency/time/site diversity
  - Physical layer DL and UL control channel for URLLC
  - Physical layer DL and UL data channel for URLLC
  - Scheduling and HARQ mechanisms for URLLC
  - Channel coding for URLLC data channel and URLLC control channel
  - Techniques to achieve high reliability for user plane, e.g. multipath data delivery
  - Techniques to achieve high reliability for control plane, e.g. mechanisms to enhance RRC reliability
- Recommendation of URLLC designs from the Rel-15 URLLC SI shall be specified in Rel-15 by Jun 2018

THANK YOU

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