

Rel-18 Broadband URLLC

3GPP TSG RAN Rel-18 workshop
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Source: Sony

Initial URLLC Requirements

- In the Rel-15 NR requirements study (TR38.913), the initial requirements for URLLC were for a transmission of a 32 byte packet at 99.999% reliability with a user plane latency of 1 ms.
- The Rel-16 study (TR38.824) on URLLC considered the following use cases:
 - Electrical power distribution
 - Differential protection: *250 byte packets, 6 ms latency, 99.999% reliability*
 - Power Distribution Grid Fault and Outage Management: *100 byte packets, 3 ms latency, 99.9999% reliability*
 - Transport industry
 - Remote driving: *2.5 Mbps UL with 5220 byte packets, 1 Mbps DL with 2083 byte packets, 3 ms latency, 99.999% reliability*
 - Intelligent Transport System: *1.1 Mbps with 1370 byte packets, 7 ms latency, 99.999% reliability*
 - Factory Automation: *32 byte packets, 1 ms latency, 99.9999% reliability*
 - Rel-15 use cases:
 - Case 1: *32 byte packets, 1 ms latency, 99.999% reliability*
 - Case 2: *200 byte packets, 1 ms latency, 99.999% reliability*
 - Indoor (AR/VR): *4096 byte packets, 7 ms latency, 99.9% reliability*
- Rel-17 focused on IIoT, typically small packets.
- **Observation: Rel-15, Rel-16 & Rel-17 URLLC assumed services with low to mid data rates.**

Broadband URLLC

- For Audio & Visual (AV) rich & real time applications, e.g. XR (26.928) & VIAPA (22.263), the expected example requirements are:
 - High throughput, for example:
 - VR with 8K video per eye using HEVC codec requires $2 \times 90 \text{ Mbps} = 160 \text{ Mbps}$
 - Medical images, ultrasound, CT/MR scans requires 500 Mbps to 4 Gbps
 - Low latency, for example:
 - Immersive Online Gaming, requires network RTT latency of 5 ms
 - UHD medical video & telesurgery requiring latency 1 ms to 20 ms
 - High reliability, for example:
 - Police Critical Mission with AR
 - Medical image scans requiring 99.9999% to 99.99999%
- Some AV with video-intensive applications are uplink heavy:
 - For example: AV Production transmitting uncompressed UHD requires UL 12 Gbps vs DL 20 Mbps
- Future 5G (or 5G Advance) needs to support broadband URLLC, i.e. high throughput, low latency and high reliability services.
 - Rel-15, Rel-16 and Rel-17 features assumed small to mid-sized packet targeting low-mid throughput, low latency & high reliability services.

Rel-18 Considerations

- A common element of most of the use cases where broadband URLLC is required, is the controlled environment (e.g. factory, stadium, hospital).
- In addition to large resources & bandwidth, in controlled environments the UE can benefit from high SNIR coverage, e.g. in a conference hall or a street with high density pico cells.
- **Proposal for Rel-18:**
 - Consider designs for broadband URLLC under a controlled environment where the UE has high SNIR coverage.
 - Consider UL heavy URLLC scenarios and methods to support them.

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