URLLC key enablers for 5G and beyond systems

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URLLC is an inherent part of 5G and is the communication mode that imposes the greatest technical challenges for 5G and beyond systems.
Vision for 2030

Our society is data-driven, enabled by near-instant, unlimited wireless connectivity.

6G will emerge around 2030 to satisfy the expectations not met with 5G, as well as, the new ones fusing AI inspired applications in every field of society with ubiquitous wireless connectivity.
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Abstract

Even though some advancements have been made with 5G NR, we are still far from enabling that vision.

What are the **URLLC enablers for 5G and beyond systems** and their associated challenges?
MTC for 5GB

mMTC
- mMIMO
- Fast uplink grant
- Semi persistent scheduling
- Coded random access
- NB-IoT
- LTE-M

LLC (URC-S)
- NOMA
- Grant free RA

URC (URC-L)
- Latency < 1ms
- Very high coverage
- Reliability > 99.999%

High coverage
- $10^6$ devices/km²
- Low-cost devices
- Long lasting battery life

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MTC for 5G

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LLC (URC-S)
- Short TTI
- NOMA
- Grant free RA
- Fog
- C-RAN
- Machine learning

URC (URC-L)
- Network slicing
- Finite blocklength coding
- Network coding
- Multi-connectivity
- HARQ
- Packet duplication
- Diversity Techniques
- NOMA

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Diversity Techniques

Cooperative Diversity (HARQ)

Finite Blocklength Coding

- 32 bytes payload
- 99.999% reliability

Diversity Techniques
MIMO & FBC

Diversity Techniques
MIMO & FBC
Rate and Power Control

Robust QoS guarantees


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Challenges ahead

- Diversity (cooperative, spatial,...)
- Multi-connectivity
  - Meet 32 bytes & 99.999% reliability
- Deterministic QoS
- High reliability under strict latency
- High Coverage & availability
Kiitos!
Thanks!
Obrigado!

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