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IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS

Ultra-Reliable Low-Latency Communications in Wireless Networks

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IEEE JSAC Special Issue on Ultra-Reliable Low-Latency Communications in Wireless Networks

Ultra-high reliability and low latency have not been provided by most wireless networks, due to the focus on human-centric communications, delay-tolerant content and reliability levels in the order of 95-99%. New uses of wireless communication are envisioned in areas such as augmented and virtual reality, industrial control, automated driving or flying, robotics, and tactile Internet. In response, new releases of mobile cellular networks are envisaged to support ultra-reliable low-latency communications (URLLC) scenarios with strict requirements in terms of latency (ranging from one to a few milliseconds end-to-end latency) and reliability (higher than 99.9999%). This will require a departure from throughput-oriented system design.

URLLC introduces new research challenges in air interface design, signal processing, resource allocation, network deployment, control/user plane design, protocol stack design, core network and integration in existing wired infrastructures. URLLC rekindles the interest in the long-standing challenge of completely characterizing the non-asymptotic fundamental tradeoffs between delay, throughput and error probability in wireless networks, including both coding and queuing delays. In addition, the highly variable and delay-sensitive nature of network traffic together with the associated control information (metadata) should be incorporated in the conventional communication theoretic framework. Recent advances in combining queuing theory with communication theory promise significant performance gains in terms of latency, reliability and throughput of wireless networks. It still remains unclear how the application of such theoretical concepts to the design of wireless systems can satisfy and guarantee the stringent URLLC requirements.

This special issue aims to bring together contributions from researchers and practitioners focusing on the above mentioned challenges. These topics, together with fundamental advances in the underlying theory as well as real-world deployments of delay-constrained systems form the core of this special issue. We solicit original research work in various areas of importance to URLLC. Topics of interest include, but are not limited to, the following:

- Fundamental limits, performance analysis, network theoretic approaches (e.g. stochastic network calculus, timely throughput)
- New waveforms, coding, MIMO techniques, numerology and multiple access schemes
- Interference, radio resource and mobility management
- Network architecture and protocol design for high reliability-latency guarantees
- Network infrastructure, backhaul & core network issues
- Integration of URLLC links in wired infrastructures
- Co-design of control information and data
- Mission-critical applications, e.g., smart grid, industry automation and control, robotics, tactile Internet, and vehicular communications
- Network slicing and network function virtualization
- Results from real-world deployments, experiments, prototypes, and testbeds

Submission Guidelines

Authors should follow the IEEE JSAC guidelines regarding the manuscript and its format. For details, please refer to Author Information at <http://www.comsoc.org/jsac/author-information>. All papers should be submitted through EDAS (<http://www.edas.info>) according to the following schedule:

- **Initial Paper Submission:** June 15, 2018
- **Acceptance Notification:** October 15, 2018
- **Final Manuscript Due:** December 1, 2018
- **Publication Date:** First Quarter 2019

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