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Special Section: Call for Papers

Announcing a Special Section in **IEEE *Access***:

Advances on High Performance Wireless Networks for Automation and IIoT

Submission Deadline: 30 November, 2022

IEEE *Access* invites manuscript submissions in the area of **Advances on High Performance Wireless Networks for Automation and IIoT.**

High dependability and bounded transmission times are historically the main requirements of any communication networks conceived for automation. The recent pervasive introduction of wireless extensions to the wired backbones has opened new complex challenges, the most critical one being the ability to satisfy such requirements also over intrinsically unreliable communication supports like the radio spectrum.

Technologies for making devices communicate seamlessly over the air are expected to be adopted more and more in future digital ecosystems, including cyber-physical systems. The primary enabler is probably constituted by the Industrial Internet of Things (IIoT), which can be profitably applied to smart industry, smart environment, and smart agriculture, to cite a few. Thanks to IIoT, applications are hidden details about the underlying physical networks, as long as constraints on reliability and timeliness of end-to-end data transfers are overall met. Additional requirements have often to be considered, which impact on feasibility (technical, economical, and ecological), for example, power consumption may affect maintenance costs and battery waste, whereas communication range is a critical aspect in brownfield scenarios.

Because of the inherent complexity of wirelessly interconnected distributed systems, the relevant key performance indicators (KPI) to be used for design and optimization are application-driven, and usually the work of designers involves finding a compromise between a plurality of aspects, e.g., dependability, latency and jitter, power consumption, covered area, and node density.

It is worth stressing that, when dealing with IIoT, the term “high performance” does not refer simply to raw throughput, but rather to the ability of the network to satisfy in the best way and at the same time all the increasingly demanding requirements and constraints, both functional (mobility through wireless communication, ability to operate self-powered for very long times, support for safety and security, clock synchronization, etc.) and about performance (as expressed by above KPIs), dictated by modern distributed control applications for specific classes of (cyber-)physical systems. As an example, time, and consequently bounded latencies and synchronization, are essential for control applications: if the density of nodes is high, coordinated access to the channel is needed. If nodes are not fixed, low energy consumption and seamless mobility are other main requirements that need to be optimized to achieve high performance in this kind of network.

While a single winning wireless IIoT technology cannot be clearly identified, several competing solutions are currently available off-the-shelf. In the context of unlicensed bands, which are particularly appealing to users because they do not imply any fees, some of the most important ones are IEEE 802.11 (Wi-Fi), wireless sensor and actuator networks (WSN/WSAN) based on IEEE 802.15.4, including DSME and TSCH (Zigbee, WIA-PA, WirelessHART, ISA100.11a, 6TiSCH, etc.), Bluetooth Low Energy (IO-Link Wireless), and LoRaWAN. Concerning solutions operating in licensed bands, recent additions to 5G/6G, like URLLC and mMTC, are deemed particularly relevant in view of their use in the context of automation and sensing.

Current research on high-speed, highly dependable, and low-power wireless networks opens a promising door for the evolution of communications in automated systems, which will be heterogeneous in nature but, at the same time, capable of meeting very demanding constraints.

This Special Section aims to provide a forum for the academic and industrial communities to present the latest advances on wireless communication, with a specific focus on automation.

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The topics of interest include, but are not limited to:

- Dependable and timely wireless networking: protocols, algorithms, and architectures
- Ultra-Reliable, Low-Latency, and Quasi-Deterministic wireless networks
- Ultra-Low Power and Green wireless networks
- Mesh, Long-Range, and Ultra-Dense wireless networks
- Cross-Layer optimization of wireless protocol stacks
- Software-Defined Radios (SDR) and Networks (SDN for wireless) to enhance communication KPIs
- Coexistence and compatibility among wireless networks with performance optimization
- High performance Mobile Ad Hoc Networks and opportunistic networking
- Analysis, simulation, and modeling techniques in time-critical wireless systems
- Extension of TSN features to wireless including IEEE 802.11 and 5G/6G cellular networks
- Performance optimized integration and adaptation of 5G/6G systems with legacy industrial protocols
- Standardization efforts on next generation wireless networks and convergence toward TSN
- Precise time synchronization and localization over wireless networks
- Reliable roaming and fast handover in wireless networks
- Data compression techniques for high performance wireless networks
- Machine learning to improve the quality of wireless communication
- Wireless design for high performance applications in smart factories, smart agriculture, and smart environment
- Non-5G high performance wireless networks for rural areas
- PHY layer security mechanisms for URLLC wireless communication links
- Fault mitigation for reliable wireless networks
- Future demanding industrial applications that require high performance wireless networks

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