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IEEE Future NETWORKS

An IEEE 5G and Beyond Technology Roadmap
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ABSTRACT

The fifth generation (5G) Wireless Communication systems development has brought out a paradigm shift using advanced technologies e.g., softwarization, virtualization, Massive MIMO, ultra-densification and introduction of new frequency bands. However, as the societal needs grow, and to satisfy UN's Sustainable Development Goals (SDGs), 6G and beyond systems are envisioned. Non-Terrestrial Networks including satellite systems, Unmanned Aerial Vehicles (UAVs) and High-Altitude Platforms (HAPs) provide the best solutions to connect the unconnected, unserved and underserved in remote and rural areas in particular.

Over the past few decades, Geo Synchronous Orbits (GSO) satellite systems have been deployed to support broadband services, backhauling, Disaster Recovery and Continuity of Operations (DR-COOP) and emergency services. Recently, there is a considerable renewed interest in planning and developing non-GSO satellite systems. Within the next few years several thousands of Low Earth Orbit (LEO) satellites and mega LEO constellations will be ready to provide global Internet services.

This report is the 2022 Edition of the INGR Satellite Working Group Report, subsequent to the previous two editions [1] [2]. The topics considered in this INGR Satellite WG 2022 Edition of the roadmap are the following taking 6G systems into account: applications and services, reference architectures (both backhaul and direct access), satellite IoT, mmWave use for satellite networks, machine learning and artificial intelligence, edge computing, QoS/QoE, security, network management and standardization. The work on the roadmap will continue towards the next edition of the roadmap addressing new challenges and potential solutions for future networks.

Key words
Satellite Communications, Satellite Networks, Waveforms, MIMO, mmWave, OFDM, QoS, QoE, Security, Network Architecture, LEO, MEO, GEO, HAP, UAV, MEC, AI/ML, IoT

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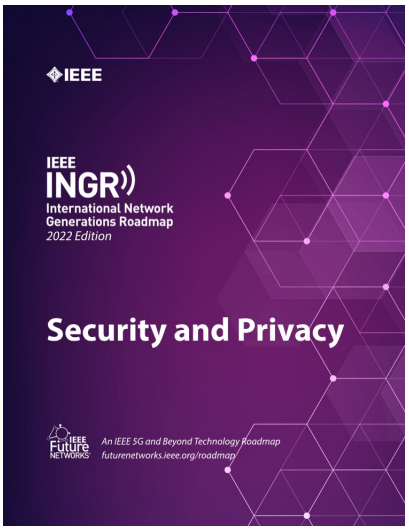

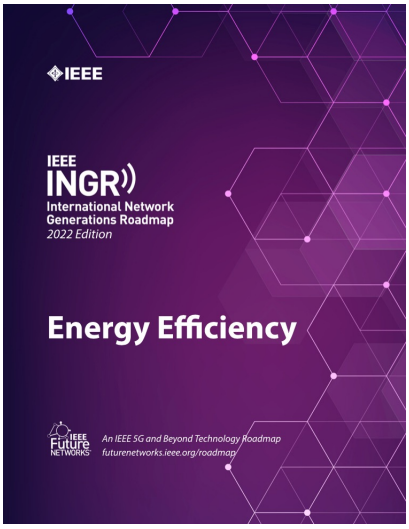

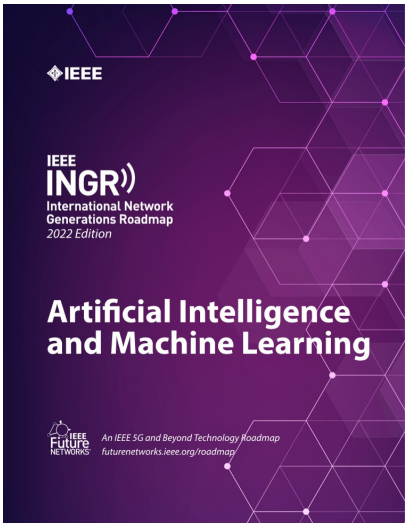

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