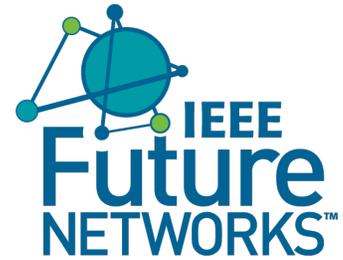


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ABSTRACT

The Institute of Electrical and Electronic Engineers (IEEE) Future Networks International Network Generations Roadmap (INGR) Applications and Services Working Group developed a Transdisciplinary Framework that extends across end-to-end ecosystems, and caters to different stages of priorities, resources, and technologies. The Transdisciplinary Framework is sustainable, structured, flexible, adaptable, and scalable. It may be used by academic stakeholders for new research topics of interest, industry stakeholders to develop solutions for roadmap identified opportunities while minimizing negative risks, and government stakeholders for governance and policy development.

The 2023 edition provides additional details on the Applications and Services Transdisciplinary Framework from Smart Cities, developed in the 1st edition, and was extended towards Smart Communities that include both urban and non-urban areas in the 2021 and 2022 editions. This edition of the IEEE INGR Application and Services roadmap chapter includes:

- **Transdisciplinary Framework:** a dynamic sustainable framework for applications and services that extends across end-to-end ecosystems, and caters to the priorities, resources, and technologies for local urban and non-urban areas.
 - **Ecosystem of Ecosystems:** intra-ecosystem and inter-ecosystem alignments for agriculture, education, electrical power, health care, media and entertainment, public safety, transportation, and water distribution and wastewater treatment ecosystems.
 - **Network of Networks:** Future networks components (access, service delivery, operations and service management, and network extensions), use case categories and network operations enhancements.
 - **Governance Function of Functions:** strategic and governance related functions to support local area objectives that include economic development, quality of life, stakeholder attraction and retention, and policy development.
- **Transdisciplinary Framework Scenarios and Use Cases:** climate change, smart cities, smart communities, pandemic response planning, and media and entertainment scenarios and use cases.

The Applications and Services Working Group will extend the reach and depth of this framework to add new ecosystems and enhance existing ecosystems already addressed for future INGR editions.

Key words:

Transdisciplinary Framework, The fifth generation (5G), beyond 5G (B5G), smart cities, smart areas, pandemic, coronavirus disease of 2019 (COVID-19), future networks, roadmap, strategy, ecosystems, framework, governance, enhanced mobile broadband (eMBB), critical communications, ultra-reliable low latency communications (URLLC), massive machine-type communication (mMTC), agriculture, education, media and entertainment, public safety, transportation, health care, telehealth, electrical power, water distribution, wastewater treatment

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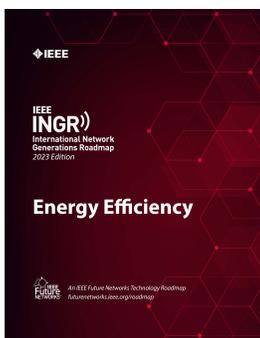
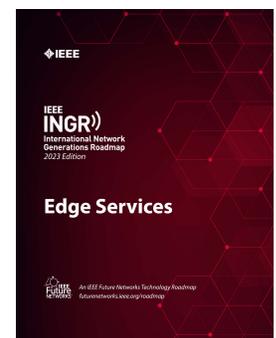
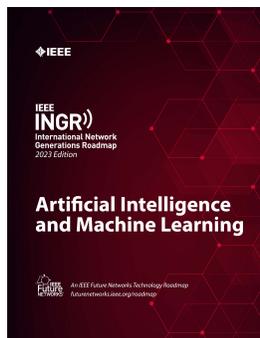
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