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2023 Edition

System Optimization



An IEEE Future Networks Technology Roadmap
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ABSTRACT

Fifth generation (5G) networks are now in the early deployment stages in networks around the world. Use cases driving this transition for 5G networks focus on the need to support heterogeneous traffic such as enhanced Mobile Broadband (eMBB), massive Machine-Type Communications (mMTC), and Ultra-Reliable Low-Latency Communications (URLLC). On the software and control side, 5G and beyond networks are enabled through Software-Defined Networking (SDN) and Network Function Virtualization (NFV) technologies and leverage the merging of communication and computing.

Although not yet in the standardization stage, early thinking on 6G networks focuses on the convergence of physical, human, and digital worlds, including support for:

- digital twinning (tight synchronization between the physical world and the twin),
- immersive communication (support of pervasive haptics),
- cognition (awareness of human intentions, desires, and mood), and
- connected intelligence (trusted AI everywhere with interaction between virtual representations).

All this also needs to be realized in sustainable fashion^[1].

With the deployment of novel applications and the expected increase in their usage and demand, the scope of innovation within future networks will be governed by: (a) limitations and boundaries of available resources; (b) limitations of the adaptability of legacy solutions (scalability and flexibility); (c) limitations of available decision making entities (network slice orchestrators and SDN controllers will not be enough); and (d) lack of intelligent management and control solutions for multi-variate optimization. Technologies are available for efficient use and self-adaptive optimization of resources using enablers such as AI-powered autonomic control loops. With ever-increasing complexity expected for beyond-5G networks, there is a necessity for novel design, planning and operations paradigms. There is a need for assessment of legacy tools versus new Artificial Intelligence solutions for applicability to systems optimization, and a need for introduction of novel methods to model and study the behavior of highly complex systems developed for the realization of 5G and beyond networks. The goal of this working group (WG) is to assess complexity challenges for the 5G era and beyond, explore novel design, planning and operations techniques for networks and services, and to create the Systems Optimization roadmap of the IEEE Future Networks Initiative (FNI) Systems Optimization WG.

Key words:

Systems Optimization, Traffic Variance, Control Variance, Service Variance, Confluence, Dependency, Complex Systems, Self-Organizing Networks, Self-X, Autonomics, Autonomic Management and Control (AMC), Emergence.

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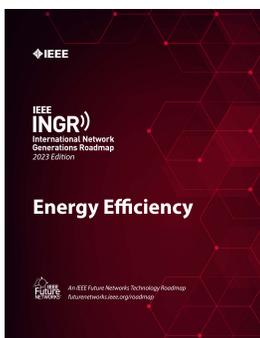
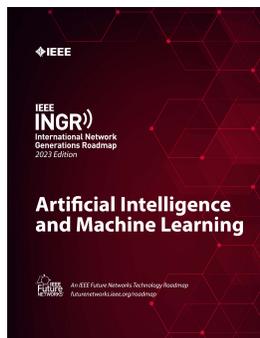
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