The x in xG

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The "x" in xG is an expression of the rapid and impactful growth of mobile wireless communications networks. These generational increments are more than simply increasing network speed and connecting more devices. Each network generation in cellular and wireless communications has its own uniqueness that deserves rigorous and focused studies. This need is so because xG heralds an era of far- and wide-ranging services, applications, and systems that promise to change business, society, and government. For example, the low latency of xG networks opens up opportunities for data-intense artificial intelligence (AI) applications to be deployed on Internet of Things devices with potential for new business models and increased customer satisfaction. The need to transmit high-speed data, provide data analytics across nodes, support visualizations on endpoints, and ensure cybersecurity and reliability are the accompanying challenges for these generational networks. This issue of *IT Professional* is focused on the discovery of challenges in these generational networks, their impact on technologies and businesses, and approaches to mitigating the problems that come with them.

There are numerous areas of xG that deserve further studies. For example, cloud architectures, network architectures, network convergence, data science and analytics, business process optimization, robotic process automation, reliability assurance, and user experience are topics that deserve research and discussions.

This special issue contributes to the body of knowledge in xG network research by throwing fresh light on expanding network coverage, reducing latency, and providing enhanced security.

xG MOBILE WIRELESS NETWORKS

Communications stability is the cornerstone of successful xG networks, and the higher the generations, the greater the need for availability and accessibility of communications. In our first article, researchers Premarathne and Rajasingham[A1] discuss their unique approach to redeployment of decentralized nodes through a priority-based algorithm. Their work divides the entire nodal set into core and sub- (decentralized) nodes. The proposed algorithm ensures a minimum availability requirement and maximum possible core node selection in spite of the restructuring of networks due to redeployment.

The availability and reliability of 5G networks has to be balanced with their security features. Business applications need a strong, underlying cybersecurity platform. In our second article, authors Rajabion and Unhelkar[A2] provide details of the cybersecurity landscape of the 5G networks. The cybersecurity challenges of these networks are highlighted, together with approaches to redressing some of them. AI is considered integral to a futuristic 6G setup in this discussion. AI-enabled automation of the process of detecting and handling cybsersecurity threats in the xG networks is discussed.

The third and equally important article in this special issue, written by AlQahtani[A3], deals with the effects of user equipment (UE) and integrated access backhaul (IAB) schedulers on the throughput of 5G millimeter-wave (mm-wave) networks. The delicate balancing act between the use of higher frequencies, and the corresponding path losses and obstructions as a result, is discussed. Starting with the premise that 5G needs higher rates of transmissions to achieve the desired quality of service, this article outlines the ensuing need for a higher density of base station deployments. The challenge of such deployments leads to the need for alternative approaches, one being IAB. Readers will find interesting the discussion of the study exploring the performances of schedulers on the UE throughput in 5G mm-wave scenarios using IAB.

The articles in this issue of *IT Professional* handle niche areas of xG, leaving many more areas to explore. Although 6G is still in the making, very soon, the applications and challenges associated with them will

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demand rigorous studies. The future directions of xG networks include use of contents in an increasingly imaginative way, intense collaboration and integration across the cloud and the edge, predictive and prescriptive cyberanalytics, and visualization beyond graphics. A number of industrial disciplines, such as defense, health care, and environment, stand to benefit by their sophistication in xG networks, with each requiring a dedicated study of their own.

APPENDIX: RELATED ARTICLES

A1. U. S. Premarathne and S. Rajasingham, "Priority-based redeployment algorithm for decentralized nodes in xG access networks," *IT Prof.*, vol. 25, no. 3, pp. 24–29, May/Jun. 2023, doi: 10.1109/MITP.2023.3253119.

A2. L. Rajabion and B. Unhelkar, "Impact of xG on cybersecurity," *IT Prof.*, vol. 25, no. 3, pp. 30–35, May/Jun. 2023, doi: 10.1109/MITP.2023.3274360.

A3. O. AlQahtani, "Effects of user equipment and integrated access and backhaul schedulers on the throughput of 5G millimeter-wave networks," *IT Prof.*, vol. 25, no. 3, pp. 19–23, May/Jun. 2023, doi: 10.1109/MITP.2023.3271300.

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