

It's Not Too Early to Prepare for 6G

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With 5G still in phased stages of development and deployment, it may seem premature to plan for the next generation of wireless communication technology. But with ambitious goals that build upon the current generation, it's not too early to begin addressing the technological, regulatory, geographical, and educational challenges that will be required to make ubiquitous 6G a reality.

This next generation of wireless technology is expected to bring even faster speeds, lower latency, and more bandwidth to instantly deliver massive amounts of data to and from more devices across decentralized, intelligent networks.

Historically, technology research begins 10-15 years prior to the development of new industrial standards. Like 5G, some of 6G will be an evolution but some will be revolutionary, and taken as a whole, we can expect a step-function increase in technical capability.

6G will accelerate the digitalization of economies and society, moving the world significantly closer to becoming a truly global and digital community. It envisages a society that by year 2030 is data-driven, enabled by near-instant, unlimited wireless connectivity. 6G will build on, and greatly expand, the capability that 5G is expected to deliver for vertical industries that



rely on connectivity in healthcare, manufacturing, energy, transportation, and public safety – no longer as a novelty or a special set of use cases, but as an integral part of our daily lives.

Use cases range from holographic communications that include information beyond sight and sound, to making digital twins far more sophisticated and thorough, to changing the way that we leverage data through machine learning (ML) and other forms of artificial intelligence. 6G will form the basis for sophisticated emergency and disaster management, and from a consumer perspective, it will make mobile communications an even more fundamental part of our daily lives – from driving to work, to educating our children, to cooking dinner, to healthcare, shopping, and banking.

The possibilities are endless, but we have a long way to go before 6G is a reality. In order to deliver on the promise of 6G, businesses, governments, and innovators must first concentrate on these key breakthroughs:

1. Rethinking seamless networks through technical innovation

Even though 5G is a global standard, seamless integration of all wireless networks (from Bluetooth to 5G), wireline networks (from LAN to WAN), and even non-terrestrial networks, remains elusive. 6G requires next-generation radio technologies that enable seamless use of these systems and flexibility depending on location and demand. And while AI is already being used in a wide range of industrial applications today, we need to make AI an integral part of 6G network architecture to dynamically optimize the performance, efficiency, and flexibility of complex 6G networks. Finally, continued innovations in IoT, enhanced mobile broadband, and ultra-reliable communications are critical to building the foundation for 6G.

2. Creating global industry standards

A single global standard that applies to all industries and geographies will ensure consistency and economies of scale in the 6G rollout. It's too soon for specifics, but the framing for both the evolution and revolution of 6G must be set.

We must come together to evaluate and evolve 5G standards through joint projects, trials, and demonstrations to anticipate the needs of 6G. Innovative initiatives like The 6G Flagship Program, a global research and co-creation ecosystem for 5G adoption and 6G innovation, is already bringing together a community of industry stakeholders to develop the fundamental technologies needed for 6G. These international collaborations will help minimize geopolitical tensions that lead to competing standards and technologies, ensuring that 6G will be accessible to everyone.

3. Taking a proactive approach to cybersecurity

Each new mobile wireless generation has to address a two-fold cybersecurity challenge: 1) address vulnerabilities inherent in the previous generation; and 2) address new vulnerabilities created by the new generation's expanded threat surface. 5G has better encryption and security architecture than 4G but also will be used in a much wider array of applications, with more connected devices. The vision for 6G is an even more elaborate set of use models and is thus a bigger target for dynamic, software-based cyber threats. And as IoT applications grow, each of the billions of connected devices across networks represents a potential entry point for attackers.

All 6G participants — from mobile operators to suppliers and their customers to over-the-top (OTT) application developers — need to implement and adopt new security, testing, and training standards. Then, design cybersecurity into the software architecture and development lifecycle, with built-in protections that identify vulnerabilities and help networks quickly recover in the event of a breach in order to de-risk 6G development and operation across the ecosystem.

4. Enabling innovation, accessibility, and safety through policy

Policymakers have the opportunity to build the regulatory foundation for 6G starting today. In partnership with industry leaders, they need to create policies that enable industry and protect people and their data across mission-critical applications such as autonomous vehicles, healthcare, the military, smart cities, and more.

We're seeing rising economic, educational, and social inequalities between those who have Internet access and those who do not. Early visions for 6G set by Europe's Hexa-X project aim to close that digital divide but making 6G accessible to rural or low-income areas requires public-private collaboration.

5. Empowering the next generation of engineers

To make 6G a reality, we need to train the next generation of researchers, scientists, physicists, and engineers. Electrical engineering, from digital to radio to semiconductor, along with many facets of computer science, will continue to be vital in this field. In addition, tomorrow's connectivity problem-solvers will need a holistic, multidisciplinary education to dive into a career that covers a multitude of technologies. Corporations and educational institutions should partner to close the skills gap by increasing interest and skills in STEM subjects, as well as highlighting the unique and rewarding opportunity to build the future of wireless technology.

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While 6G is just in the research phase today, overcoming each of these hurdles will take time. With the 5G rollout already underway, it is not too soon to start planning for 6G. Leaders across the private and public sector must come together to develop infrastructure, new technologies, and standards that support the countless innovations enabled by 6G. Now more than ever, we must act to sustain the momentum of 5G and pave the way for 6G.

About the Author

Ron Nersesian is chairman, president, and chief executive officer of Keysight Technologies. Prior to Keysight's separation from Agilent Technologies in 2014, Ron served as Agilent's president and chief operating officer. Ron has spent most of his career working for the Hewlett-Packard Company, Agilent's predecessor, Agilent, and Keysight with much focus on electronic test and measurement. Ron holds a bachelor's degree in electrical engineering from Lehigh University and an MBA from New York University, Stern School of Business. He also serves as a member of Georgia Tech's Advisory Board.

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