Breaking boundaries: Exploring the dual iconic features and enabling technologies of 6G

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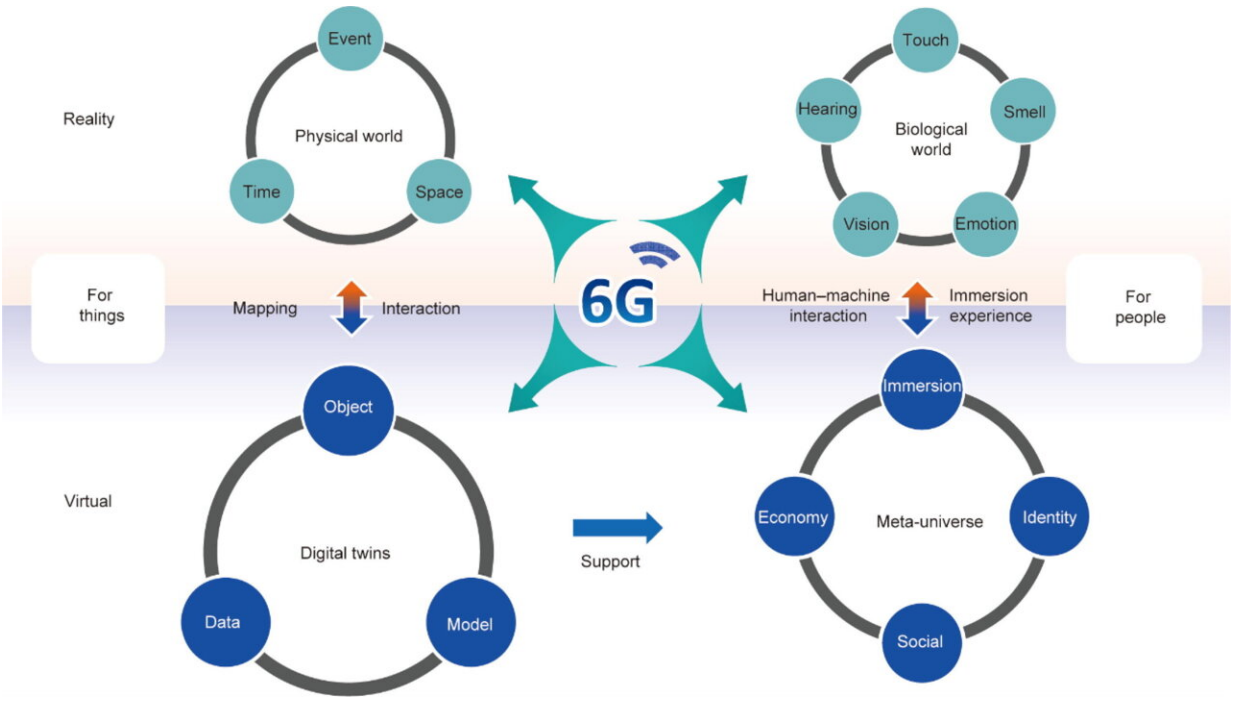

The 6G vision and two categories of applications: digital twins and the meta-universe. Credit: Shanzhi Chen, Shaoli Kang

The journal *Engineering* has released a study on the sixth generation (6G) of mobile networks. The study, titled "The Dual Iconic Features and Key Enabling Technologies of 6G," presents an in-depth analysis of the

future of mobile communications and highlights the key features and technologies that will define 6G.

Since the advent of the first generation (1G) of mobile networks in the 1980s, the industry has witnessed a generational upgrade every decade. Currently, the fifth generation (5G) is in the commercial stage, while the sixth generation (6G) is in the research stage. The standardization for 6G is expected to debut in 2025, with the first commercial version set to launch in 2030.

In order to provide a comprehensive understanding of 6G, the study proposes two iconic features and enabling technologies based on an analysis of the 6G vision. The first iconic feature of 6G is its ability to create a virtualized world with digital twins, enabling the perception of everything in the physical world. This feature will revolutionize the Internet of Things (IoT) and pave the way for advanced applications in various domains.

The second iconic feature of 6G is its capability to connect people's five senses with the tactile Internet and the meta-universe of immersive social networking and games. This breakthrough will redefine the way humans interact with technology and open up new possibilities for communication and entertainment.

However, the realization of these iconic features presents significant challenges. The first challenge is achieving connected wide-area and spatial coverage. Currently, terrestrial cellular communication (4G/5G) only covers economically developed and densely populated areas, accounting for a mere 20% of the land area or 6% of the earth's surface. To overcome this limitation, 6G will introduce integrated terrestrial-satellite communication (ITSC), enabling wide-area coverage even in remote and underserved regions.

The second challenge is ensuring local coverage for access points (AP) in the meta-universe. The APs in the meta-universe must provide high data rates, low latency, and massive system capacity to deliver a seamless user experience. To address this challenge, 6G will introduce a user-centric access network (UCAN), revolutionizing the concept of local coverage and ensuring reliable connectivity for users in any location.

To support the dual iconic features of 6G, several key enabling technologies have been identified. These technologies include a three-dimensional (3D) reconfigurable network architecture, hyper-dimensional antennas, advanced coding and modulation techniques, novel multiple access schemes, integrated communication and sensing capabilities, flexible spectrum sharing mechanisms, and native intelligence.

The research conducted by the CICT provides valuable insights into the future of mobile communications. The findings of this study will guide the development of 6G and lay the foundation for a new era of connectivity and innovation.

More information: Shanzhi Chen et al, The Dual Iconic Features and Key Enabling Technologies of 6G, *Engineering* (2023). DOI: 10.1016/j.eng.2023.03.014

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