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6G Wireless Communication: Security Technology and Research Challenges

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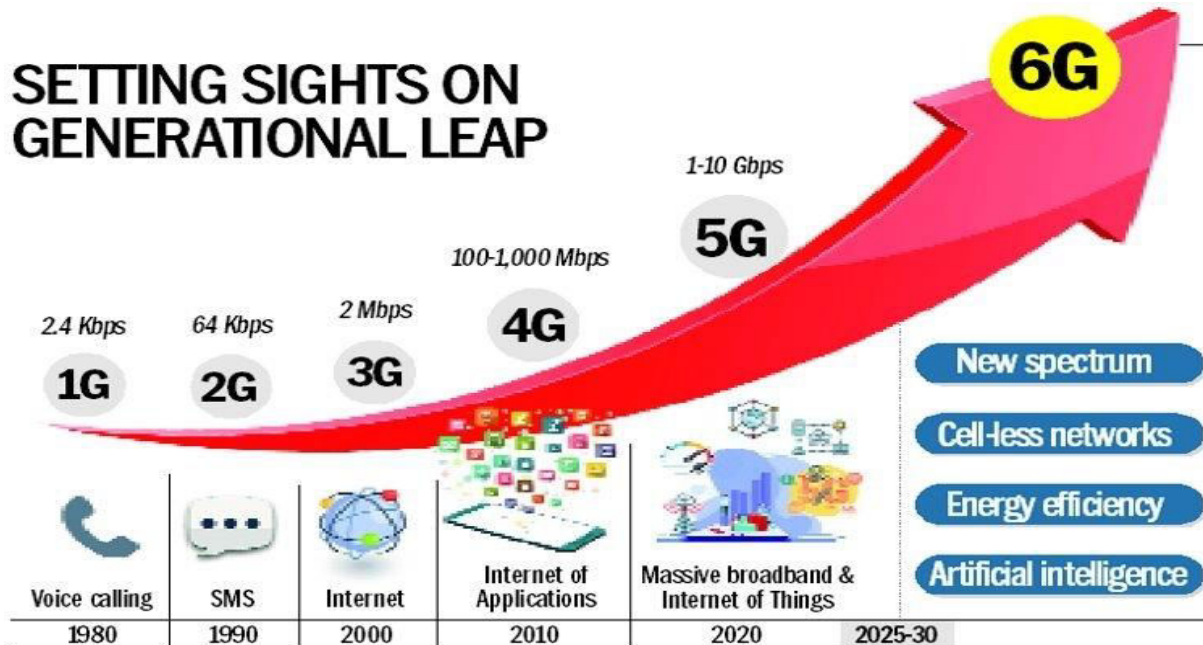
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ABSTRACT: By analyzing the expectations and requirements of the intelligent information society in 2030, it becomes clear that what technologies would be demanded in 6G wireless network, especially for security. As promising security technologies, Artificial Intelligence, Quantum Computing and Communications, and Blockchain are deliberately provided and discussed, and these technologies certainly have the ability to enhance the security for 6G. In addition, two research challenges are presented, and the problems and corresponding research directions of them are provided.



I. INTRODUCTION



The network characteristics of 4G ,5G and 6G

Characteristic	4G	5G	6G
Peak Data Rate	100MB/s	20GB/s	$\geq 1\text{TB/s}$
Latency	10ms	1ms	10100 μs
Mobility	350km/h	500km/s	$\geq 1000\text{km/s}$
Experienced Data Rate	10MB/s	0.1GB/s	1GB/s
Connectivity Density	10^5 Devices/km ²	10^6 Devices/km ²	10^7 Devices/km ²

- 6G is proposed to integrate 5G with satellite network for global coverage
- It is the technology with complete wireless network with no limitation
- 6G technology is considered to be cheap and the fast internet technology and it having the transmission speed in Terabit range

II. SPECIFICATIONS AND REQUIREMENTS

□Service Requirements

The 6G wireless system will have the following key factors.

- Enhanced mobile broadband (eMBB)
- Ultra-reliable low latency communications (URLLC)

- Massive machine-type communication (MMTC)
- AI integrated communication • Tactile internet
- High throughput
- High network capacity • High energy efficiency • Enhanced data security

□New Network Characteristics

1. Satellites integrated network
2. Connected intelligence
3. Seamless integration of wireless information and energy transfer

□Few General Requirements in Network Characteristics

1. Small cell networks
2. Ultradense heterogeneous networks
3. Highcapacity backhaul
4. Radar technology integrated with mobile technologies
5. Softwarization and virtualization:

III. SECURITY TECHNOLOGY

- Artificial Intelligence
- Terahertz communications
- Massive multiple input, multiple output technique
- FSO backhaul network • Blockchain
- Quantum Communications
- Unmanned aerial vehicle • Cellfree communications
- Integration of wireless information and energy transfer
- Integration of sensing and communication
- Integration of accessbackhaul networks
- Dynamic network slicing • Big data analytics

IV. RESEARCH CHALLENGES

- Integrated Security Architecture of Space air ground underwater Network
- Blockchain based Identity Authorization System

V. CONCLUSION

- Based on the analysis and discussions presented above, the conclusions are obtained as below:
- The advantages of 6G compared with 4G and 5g are described, especially in the key performance indicators and technologies. And it is evident that 6G wireless network would provide more broad coverage and much better quality of user experience.
- The security technologies including AI, quantum technologies and blockchain can be used for 6G to ensure network security, therefore, the functions and application methods of these technologies have been discussed.
- The research challenges including integrated security architecture of spaceair groundunderwater network and blockchain based identity authorization system are briefly analyzed, and the problems and research directions of the two topics are provided

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