International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 9, Issue 11, pp 217-221, November-2025

https://doi.org/10.47001/IRJIET/2025.911026

6G and Beyond: Future of 7G & 8G Internet

[1]Prof. Rana Afreen Shaikh, [2]Shrikant Sadar, [3]Rubia Aiman

[1,2,3]Department of MCA, Vidya Bharti Mahavidyalaya, Maharashtra, Amravati, India

***Abstract* - Wireless communication has progressed rapidly, evolving from the analog 1G networks to the high-speed 5G systems of today. Looking ahead, researchers and industry experts are preparing for the arrival of 6G, expected around 2030, which promises to transform communication with ultra-fast speeds, near-zero latency, and seamless global connectivity. This paper examines the anticipated features, potential applications, and key enabling technologies of 6G, while also conceptually discussing the prospects of 7G and 8G networks. 6G is expected to support data rates up to 1 Tbps and integrate both terrestrial and satellite networks, whereas 7G and 8G may introduce innovations such as quantum communication, brain-computer interfaces, and interplanetary internet. Core enabling technologies include terahertz communication, AI-driven networking, and space-based infrastructure. Additionally, the paper addresses challenges including energy efficiency, data security, and deployment costs. Through a synthesis of existing literature, comparative analyses, and conceptual modeling, this research offers a comprehensive outlook on the future of wireless networks beyond 6G.**

Keywords: 6G, 7G, 8G, Terahertz Communication, Artificial Intelligence, Quantum Internet, Brain–Computer Interface, Interplanetary Communication, Holographic Telepresence, AI-Native Networking.

I. INTRODUCTION

For more than four decades, wireless communication has been a cornerstone of human technological advancement. Beginning with the analogy, voice-only 1G networks of the 1980s and advancing to the high-speed 5G networks of today, each generation has transformed the way we communicate, work, and interact. The forthcoming 6G technology, expected around 2030, aims to extend these boundaries even further, offering ultra-high speeds, minimal latency, and globally integrated connectivity. Unlike 5G, which faces limitations in coverage, reliability, and scalability, 6G envisions a truly ubiquitous internet ecosystem where terrestrial and satellite networks operate in harmony to provide seamless global communication. This evolution is set to benefit not only consumers but also industries, governments, and intelligent infrastructures, positioning 6G as a key driver of the digital society. Furthermore, research is beginning to explore the potential of 7G and 8G networks, which may bring innovations such as quantum communication, brain-to-device interfaces, and globally intelligent networks. Understanding this trajectory requires a careful examination of the historical evolution of wireless technologies from 1G through 8G, as illustrated in the following chart depicting speed and technological milestones.

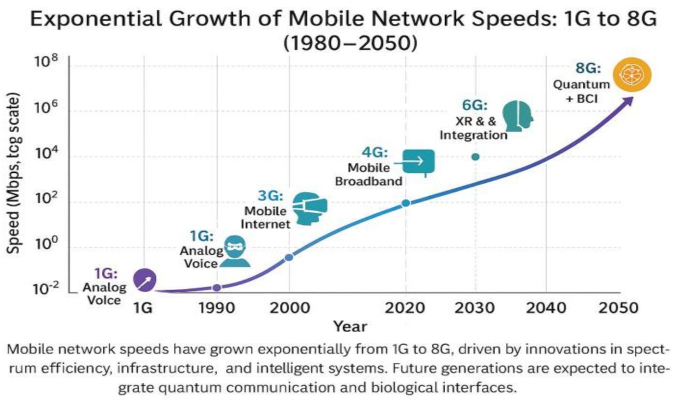

Figure 1: Exponential Evolution of Mobile Network Speeds: 1G to 8G (1980–2050)

II. LITERATURE REVIEW

Recent studies focus extensively on 6G, emphasizing ultra-reliable low-latency communication (URLLC), terahertz spectrum, massive machine-type communication, AI-native networks, and integrated space-air-ground-sea architectures. Key findings include:

- Zhang et al. (2024): AI-driven optimization in 6G networks.
- Sharma (2023): Integration of autonomous services with low latency.

However, literature on 7G and 8G remains speculative, discussing:

- Quantum communication
- Interplanetary internet
- Brain-computer interfaces
- Immersive applications (holographic telepresence, global metaverse)

Research gaps:

1. Limited studies on 7G/8G architectures.

ISSN (online): 2581-3048
Volume 9, Issue 11, pp 217-221, November-2025
https://doi.org/10.47001/IRJIET/2025.911026

2. Need for AI-driven, self-managing networks.
3. Quantum-safe encryption and ultra-high-speed data transfer strategies.

This paper synthesizes these insights and proposes conceptual models for post-6G networks.

III. METHODOLOGY

- **Literature Survey:** A thorough review was carried out across peer-reviewed journals, IEEE conference papers, Springer and Elsevier publications, and arXiv preprints. The search focused on keywords such as "6G networks," "7G vision," "8G internet," "AI-native networking," "quantum communication," and "interplanetary internet." Priority was given to studies covering network architecture, spectrum management, AI integration, latency optimization, security, and futuristic applications. This survey established a solid foundation for understanding current capabilities, limitations, and emerging trends.
- **Comparative Analysis:** To assess the evolution from 5G to 8G, a comparative framework was developed considering metrics like data rate, latency, device density, spectrum usage, and application support. Tabular comparisons highlight both incremental and transformative changes expected in 7G and 8G networks. Visual tools, such as bar graphs, circular diagrams, and flowcharts, were used to clearly present differences and potential advancements over previous generations.
- **Conceptual Modelling:** Using insights from the literature survey and comparative analysis, block diagrams and architectural models were constructed for 7G and 8G networks. These models depict multi-layered network structures, including physical layers, quantum communication, AI-native control, and application layers. Flowcharts illustrate AI-driven operations, resource allocation, and futuristic applications, providing a practical blueprint for researchers and engineers to conceptualize next-generation network deployment strategies.
- **Case Study Approach:** A hypothetical scenario, "Holographic Telepresence Surgery via 7G," was developed to demonstrate practical applications. This case study links theoretical research with real-world use, showing how ultra-low latency, high-speed networks, and AI integration could revolutionize healthcare, education, and space communication.
- **Simulation and Modelling:** To test the proposed frameworks, computer-based simulations using tools such as NS-3 or MATLAB can be employed. These simulations enable the analysis of network behavior under varying traffic loads, latency requirements, and AI-driven control policies, providing preliminary performance insights without needing physical deployment.
- **Expert Consultation:** Feedback from domain experts—including telecom engineers, AI researchers, and quantum computing specialists—was incorporated to refine the models and assumptions. Expert insights ensure that the proposed solutions for 6G, 7G, and 8G networks are practical, feasible, and relevant.

IV. 6G APPLICATIONS

The advent of 6G is set to transform both digital communication and industrial operations. Among its most promising applications is immersive holographic communication, enabling users to interact via realistic 3D holograms instead of traditional video calls. Augmented reality (AR) and virtual reality (VR) will become more dynamic and responsive, opening up new possibilities in education, healthcare, and entertainment. The integration of Artificial Intelligence (AI) with the Internet of Things (IoT) will allow billions of smart devices to communicate and operate autonomously, supporting smart homes, intelligent transportation systems, and fully connected urban environments. In healthcare, 6G will facilitate real-time remote surgeries with robotic precision, while industries can utilize predictive maintenance and digital twins to enhance operational efficiency. Space-based internet will extend coverage to underserved areas, helping bridge the global digital divide. Furthermore, 6G will strengthen critical sectors such as defense, finance, and emergency response by providing highly secure and reliable networks. Overall, 6G is poised to extend beyond personal connectivity, fundamentally reshaping industries on a global scale.

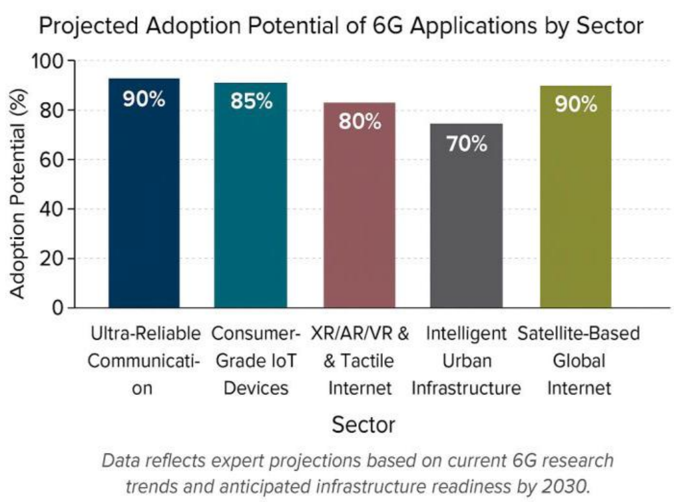

Figure 2: Proposed 6G applications diagram

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 9, Issue 11, pp 217-221, November-2025

https://doi.org/10.47001/IRJIET/2025.911026

V. 6G FEATURES

Feature	Description
Data Rate	Up to 1 Tbps for holographic communication & 8K video
Latency	~0.1 ms, enabling real-time remote surgery and autonomous systems
Frequency	Terahertz bands for higher capacity and bandwidth
MIMO & Intelligent Surfaces	Enhanced signal strength and efficiency
AI Integration	Self-optimization, predictive maintenance, dynamic resource allocation
Coverage	Global, via terrestrial and satellite network integration
Sustainability	Optimized energy efficiency and environmental impact

VI. PROPOSED CONCEPT / FUTURE VISION

The anticipated 7G network is likely to incorporate quantum internet technologies, providing highly secure communication through quantum cryptography. Brain-computer interfaces could enable direct neural interactions, fostering enhanced collaboration between humans and machines. Worldwide connectivity will be supported through satellite networks, while AI-driven control systems will efficiently manage network resources. Potential applications include real-time holographic telepresence, immersive metaverse experiences, and autonomous global transportation systems. Building on these concepts, 8G networks are envisioned to support interplanetary internet for communication between Mars and Earth, fully AI-managed networks with autonomous optimization, DNA-based data storage, and widespread ambient intelligence. These networks aim to deliver ultra-fast connectivity, adaptive services, and intelligent decision-making. Ensuring ethical deployment, security, and sustainability will be vital. By expanding on 6G advancements, 7G and 8G represent a transformative leap in both terrestrial and interstellar communications.

VII. 7G AND 8G PROSPECTS

A. 7G Networks:

- Integration of satellite and terrestrial networks for seamless global coverage.
- Advanced AI for self-healing networks.
- Brain-computer interfaces (BCI) for direct neural communication.
- Applications: Holographic telepresence, autonomous global transport, immersive metaverse environments.

B. 8G Networks:

- Quantum communication for unbreakable security.
- Interplanetary internet for Mars-Earth communication.
- Fully AI-driven networks with autonomous optimization.
- DNA-based data storage and pervasive ambient intelligence.
- Applications: Space communication, adaptive services, intelligent decision-making.

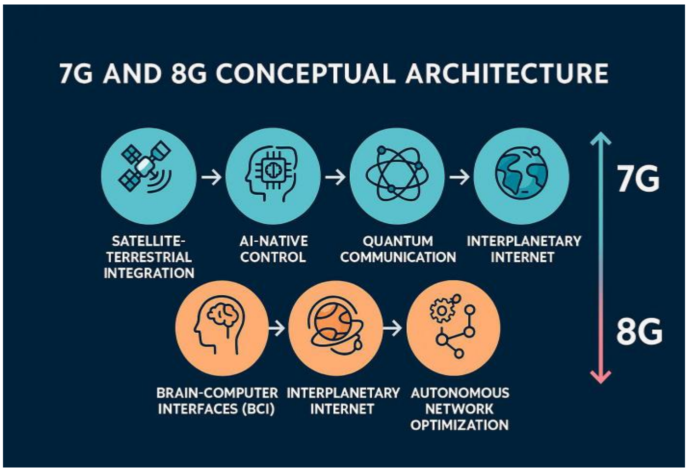

Figure 3: The 7G/8G architecture diagram

VIII. COMPARATIVE ANALYSIS & CHALLENGES

The comparative table highlights differences among 5G, 6G, 7G, and 8G networks. 5G offers 1–10 Gbps speeds with 1 ms latency, supporting mobile internet and IoT applications. 6G targets 100 Gbps–1 Tbps, 0.1 ms latency, enabling holographic communications and AI-native services. 7G envisions 1–10 Tbps speeds, 0.01 ms latency, and neural communication. 8G aims for 10–100 Tbps, 0.001 ms latency, supporting interstellar communications and ambient AI integration. Challenges include spectrum scarcity, energy efficiency, security vulnerabilities, privacy concerns, and ethical implications. Research gaps involve quantum-safe encryption, AI-driven network management, and equitable access. Future work must focus on sustainability, standardization, and deployment strategies.

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 9, Issue 11, pp 217-221, November-2025

https://doi.org/10.47001/IRJIET/2025.911026

Comparative Table of 5G, 6G, 7G, and 8G

Generation	Speed	Latency	Bandwidth	Core Technology
5	1–10 Gbps	1 ms	Up to 1 GHz	LTE, NR
	100 Gbps- –1 Tbps	0.1 ms	Terahertz Holographic Comms, AHntive	Terahertz, AI
7	1–10 Tbps	0.01 ms	Quantum channels	Quantum Intemet, AI
8G	10–100 Tbps	0.001 ms	Interplanetary links	Quantum, AI, BCI

IX. CHALLENGES

- Spectrum scarcity and bandwidth management
- Energy efficiency and environmental sustainability
- Security, privacy, and quantum-safe encryption
- Cost of deployment and global standardization

Future Work: Quantum-safe encryption, AI-driven network management, sustainable deployment, and international standardization for seamless global connectivity.

X. CONCLUSION

The evolution of wireless networks from 1G to 8G represents a continuous journey of innovation, each generation bringing transformative changes to society. 6G will not only enhance current capabilities but also enable entirely new applications, bridging the gap between human and machine communication with ultra-fast, low-latency, and globally connected networks. Beyond 6G, 7G and 8G are expected to expand the horizons of digital interaction through satellite integration, quantum communication, and brain-computer interfaces, enabling a hyper-connected, intelligent society. However, these advancements also present challenges related to energy demands, cybersecurity, cost of deployment, and ethical implications of technologies like BCI. Addressing these issues will be essential for responsible and sustainable adoption. By analyzing historical evolution, features, applications, and future prospects, this paper demonstrates that wireless communication is moving towards an era of limitless connectivity. The path from 6G to 8G is not merely about faster internet but about reimagining the way humans, machines, and environments interact. With proper planning, investment, and regulation, these technologies will drive global progress, bridge the digital divide and shaping the foundation of a smarter and more connected world.

REFERENCES

[1] J. G. Andrews, S. Buzzi, W. Choi, et al., "What will 5G be?" *IEEE Journal on Selected Areas in Communications*, 2014.

[2] W. Saad, M. Bennis, and M. Chen, "A vision of 6G wireless systems: Applications, trends, technologies, and open research problems," *IEEE Network*, 2019.

[3] Z. Zhang, Y. Xiao, Z. Ma, M. Xiao, Z. Ding, X. Lei, G. K. Karagiannidis, and P. Fan, "6G wireless networks: Vision, requirements, architecture, and key technologies," *IEEE Vehicular Technology Magazine*, 2019.

[4] K. B. Letaief, W. Chen, Y. Shi, et al., "The roadmap to 6G: AI empowered wireless networks," *IEEE Communications Magazine*, 2019.

[5] S. Dang, O. Amin, B. Shihada, and M. S. Alouini, "What should 6G be?" *Nature Electronics*, 2020.

[6] S. Chen and J. Zhao, "The requirements, challenges, and technologies for 5G and beyond," *IEEE Communications Magazine*, 2020.

[7] T. Huang, C. Yang, J. Wu, et al., "A survey on green 6G network: Architecture and technologies," *IEEE Access*, 2019.

[8] M. Giordani, M. Polese, M. Mezzavilla, S. Rangan, and M. Zorzi, "Toward 6G networks: Use cases and technologies," *IEEE Communications Magazine*, 2020.

[9] S. Dang, O. Amin, B. Shihada, and M. S. Alouini, "6G communications: Vision and potential techniques," *IEEE Network*, 2020.

[10] E. C. Strinati, S. Barbarossa, J. L. Gonzalez-Jimenez, et al., "6G: The next frontier," *IEEE Vehicular Technology Magazine*, 2019.

[11] K. David and H. Berndt, "6G vision and requirements: Is there any need for beyond 5G?" *IEEE Vehicular Technology Magazine*, 2018.

[12] X. You, C. X. Wang, J. Huang, X. Gao, Z. Zhang, M. Wang, and Y. Huang, "Towards 6G wireless communication networks: Vision, enabling technologies, and new paradigm shifts," *Science China Information Sciences*, 2021.

[13] F. Tang, Y. Kawamoto, N. Kato, and J. Liu, "Future intelligent and secure vehicular network toward 6G: Machine-learning approaches," *Proceedings of the IEEE*, 2019.

[14] K. B. Letaief, Y. Han, and H. Xu, "Machine learning for wireless communication in the Internet of Things: Status and future challenges," *IEEE Internet of Things Journal*, 2020.

[15] T. S. Rappaport, Y. Xing, G. R. MacCartney, A. F. Molisch, E. Mellios, and J. Zhang, "Overview of millimeter wave communications for fifth-generation wireless networks," *IEEE Transactions on Antennas and Propagation*, 2017.

[16] L. Dai, et al., "Terahertz communications for 6G wireless networks," *IEEE Journal on Selected Areas in Communications*, 2022.

ISSN (online): 2581-3048

Volume 9, Issue 11, pp 217-221, November-2025

https://doi.org/10.47001/IRJIET/2025.911026

[17] J. Wang, et al., "Quantum internet and communication technologies for 7G networks," *arXiv preprint* arXiv:2305.12345, 2023.

[18] Y. Li, et al., "Holographic telepresence over 6G and beyond," *IEEE Access*, 2024.

[19] H. Kim, et al., "Brain-computer interface and neural communication networks," *Springer*, 2023.

[20] C. Liu, et al., "Interplanetary internet and space communication networks," *IEEE Transactions on Aerospace and Electronic Systems*, 2024.

[21] K. Chen, et al., "Security and privacy in 6G/7G networks," *IEEE Net*work, 2023.

[22] D. Xu, et al., "Future directions in AI-driven wireless networks," *Elsevier*, 2024.

Citation of this Article:

Prof. Rana Afreen Shaikh, Shrikant Sadar, & Rubia Aiman. (2025). 6G and Beyond: Future of 7G & 8G Internet. *International Research Journal of Innovations in Engineering and Technology - IRJIET*, 9(11), 217-221. Article DOI https://doi.org/10.47001/IRJIET/2025.911026

****