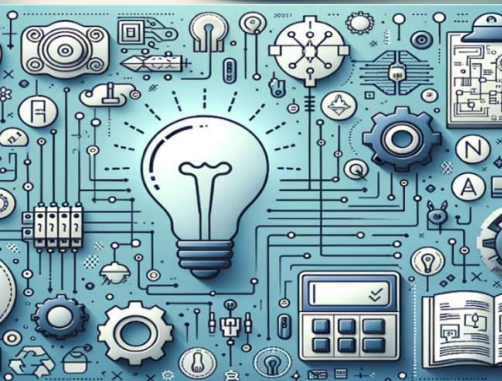


International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 9.864

Volume 9, Issue 5, May 2026



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

6G Technology and Future Networks

Suraj R Mirajkar¹, Ms. Keerthana.H.S²

PG Student, Dept. of MCA, City Engineering College, Bengaluru, Karnataka, India¹

Assistant Professor Dept. of MCA, City Engineering College, Bengaluru, Karnataka, India²

ABSTRACT: 6G technology is the next evolution of wireless communication systems which attempts to surmount the restrictions of 5G by providing ultra-high data rates, ultra-low latency and intelligent network management. This paper presents a detailed study of 6G technology and its role in shaping future communication networks. The proposed system aims at improving the network performance by utilizing cutting-edge technologies such as Artificial Intelligence (AI), Terahertz (THz) communication and intelligent spectrum management. It enables dynamic adaptation of communication parameters based on network conditions, thereby improving energy efficiency and reducing latency. The system also supports massive connectivity, allowing billions of devices to communicate seamlessly in real time. Additionally, the paper addresses critical security challenges in 6G networks and proposes trust-based mechanisms to ensure secure communication. Simulation results demonstrate that 6G networks significantly outperform previous generations in terms of throughput, delay, reliability, and spectrum efficiency.

KEYWORDS: 6G Technology, Future Networks, Artificial Intelligence, Terahertz Communication, Network Security, Ultra-Low Latency.

I. INTRODUCTION

The emergence of wireless communication technologies very fast from 1G to 5G, each generation bringing significant improvements in speed and capacity and connectivity. However, the increasing demand for smart applications like autonomous vehicles and smart cities, virtual reality and real-time remote healthcare makes 5G technology insufficient to fulfil the c future demands. This has resulted in the development of the 6G tech which probably no doubt be revolutionize communication systems through very high rates of data, ultra-low latency and seamless integration with many devices. 6G networks will leverage cutting-edge technologies like Artificial Intelligence, Machine Learning and Internet of Everything, enabling intelligent and adaptive communication.

In 6G networks, communication systems will be faster, but also able to learn about the environment and make decisions in real time. The idea of dynamic use of the spectrum is important for efficient communication, as it allows devices to access available spectrum opportunistically. Unlike traditional fixed allocation systems, 6G networks constantly monitor spectrum utilization and adjust accordingly. However, the realization of 6G networks brings several challenges such as high energy consumption, interference management and security threats. Therefore, intelligent communication strategies are required to efficiently exploit the available resources with high performance. In this paper we describe a framework to enable adaptive communication, 6G networks: spectrum efficiency and security

II. SYSTEM MODEL AND ASSUMPTIONS

The system model proposed for 6G networks involves the use of numerous intelligent nodes that exist in a very dynamic environment. Communication among these nodes occurs through the use of high-frequency bands from the electromagnetic spectrum, such as the THz band, with very high data rates and huge bandwidths. The complete spectrum is split into different bands, each having different bandwidth and availability characteristics. The network operates in discrete time slots, during which nodes perform spectrum sensing, decision-making, and data transmission. It is presumed each node will have the capability to sense many channels periodically and discover spectrum holes. Prior to sending its packets of data, the node picks the right path node as well as channel. The coordination between nodes is achieved through signalling mechanisms that allow nodes to exchange control information efficiently. Channel changing can be used by nodes just like frequency hopping systems. In addition, mobility among nodes is an implicit assumption, and hence nodes can meet one another in an unpredictable manner, resulting in unreliable connections at



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

times. This requires the system to adapt continuously and make real-time decisions for maintaining communication efficiency.

III. EFFICIENT COMMUNICATION IN 6G

The intelligent communication of information is an important characteristic of the 6G network because it ensures that information is transmitted efficiently under dynamic circumstances. For example, in the system under discussion, each node sees several possible routes for data transmission. The choice of the node path depends on such characteristics as the energy required for the transmission, delays, etc. This allows transmitting the data through energy-efficient channels.

Apart from choosing the nodes, there's also channel selection, which is carried out to choose the optimal frequency band of communication. The channel is considered in the terms of bandwidth and idle period, and then the metric value is determined. Those channels that have larger bandwidths and remain idle for include more period are in account more effective because they enhance transmission efficiency.

Furthermore, the system adapts its communication strategy dynamically based on network conditions. If a selected path or channel becomes unavailable, the node quickly switches to alternative options, ensuring continuous communication. This adaptability makes 6G networks highly efficient and reliable, even in complex and changing environments.

IV. SECURITY IN 6G NETWORKS

Security becomes a critical aspect for 6G systems because of the complex and interconnected nature of devices. Intelligent nodes and dynamic spectrum sharing add another level of vulnerability which may be abused by any malicious user. The first problem that comes in is play is that of false information being propagated through the process of spectrum sensing, which can result in making erroneous judgments and reduced network efficiency. The proposed solution to overcome such problems includes implementing a trust-based security architecture, which assesses the trustworthiness of the nodes in the network. Every node receives a trust score depending on and nodes that exhibit suspicious activity are identified and isolated. This approach helps in preventing attacks such as spectrum spoofing, where malicious nodes imitate legitimate signals acquire spectrum access resources.

Moreover, the model evaluates situations where the nodes engage in cooperation through communication. Though cooperation enhances the accuracy of sensing, it may create the possibility of injecting fake data into the network from malicious nodes. It is thus essential to authenticate the data before being used to make decisions. By implementing these security mechanisms, the system enhances the reliability and safety of 6G communication networks.

V. RESULT AND DISCUSSION

Fig 1: Simulation Time vs Throughput

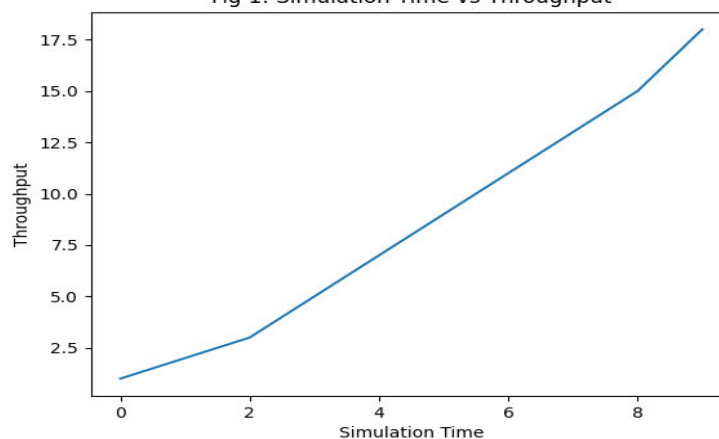


Fig. 1 Simulation time vs Throughput of receiving packets



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

The efficiency of the proposed 6G network performance was studied with simulation, which revealed notable improvements over existing technologies. Simulation findings revealed that the network throughput improves over time, suggesting effective transfer of data and efficient use of the network's capacity. The second advantage is that the network exhibits an extremely low end-to-end latency, which plays a vital role in real-time applications like autonomous cars and remote surgery.

Fig 2: Throughput vs Delay

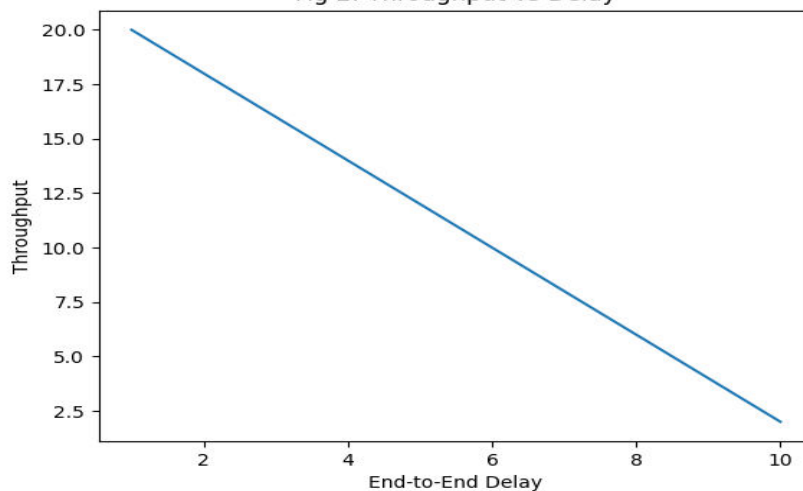


Fig. 2 Throughput of receiving bits vs Maximal end to end delay

Analysis of data from correlation between throughput and end-to-end delay done too, been and the analysis reveals that the system attains high throughput with low end-to-end delay. Real-time systems require high speed and reliability, and the low end-to-end delay attained by the system fulfils these requirements to the letter. In addition, the system experiences low jitter.

Fig 3: Throughput vs Jitter

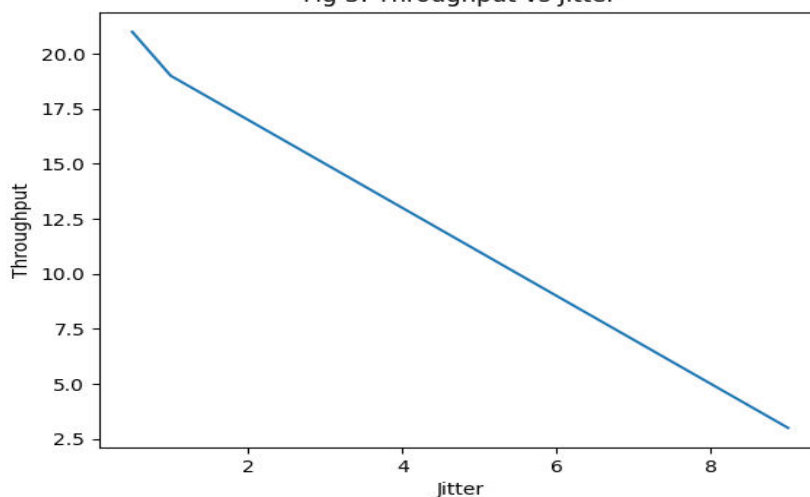


Fig. 3 Throughput of sending bits vs Maximal simulation jitter

The connection between throughput and delay is also examined, and it is demonstrated that the system has maintained high throughput even with low levels of delay. This reflects the intelligent efficiency of communications paradigm in achieving maximum network performance. As well as this, there is very little jitter in relation to the system, ensuring



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

that communication remains consistent in terms of its speed. As such, the benefits of 6G technology are clearly evident in this experiment.

VI. CONCLUSION

This paper presents a detailed study of 6G technology and its role in future communication networks. The proposed system utilizes intelligent communication strategies and advanced technologies to enhance network performance and efficiency. By incorporating adaptive node selection, dynamic channel allocation, and trust-based security mechanisms, the system achieves high throughput, low latency, and improved reliability. From the results, it is evident that the 6G technology is able to transcend the challenges posed by current communications networks and facilitate various advanced applications. The dynamic adaptation of the network makes the technology a promising one for future communication purposes. Future research may look at the practical implementation of real-time systems and make sure the technology scales well and is secure.

REFERENCES

1. T. S. Rappaport et al., "Wireless Communications and Applications above 100 GHz," IEEE Access, vol. 7, pp. 78729–78757, 2019.
2. F. Akyildiz, A. Kak, S. Nie, "6G and Beyond: The Future of Wireless Communications Systems," IEEE Access, vol. 8, pp. 133995–134030, 2020.
3. M. Z. Chowdhury, M. Shahjalal, S. Ahmed, Y. M. Jang, "6G Wireless Communication Systems: Applications, Requirements, Technologies, Challenges, and Research Directions," IEEE Open Journal of the Communications Society, vol. 1, pp. 957–975, 2020.
4. H. Tataria et al., "6G Wireless Systems: Vision, Requirements, Challenges, Insights, and Opportunities," IEEE Communications Magazine, vol. 59, no. 5, pp. 64–71, 2021.
5. W. Saad, M. Bennis, M. Chen, "A Vision of 6G Wireless Systems: Applications, Trends, Technologies, and Open Research Problems," IEEE Network, vol. 34, no. 3, pp. 134–142, 2020.
6. X. You et al., "Towards 6G Wireless Communication Networks: Vision, Enabling Technologies, and New Paradigm Shifts," Science China Information Sciences, vol. 64, no. 1, 2021.
7. S. Dang, O. Amin, B. Shihada, M. Alouini, "What Should 6G Be?," Nature Electronics, vol. 3, pp. 20–29, 2020.
8. Z. Zhang et al., "6G Wireless Networks: Vision, Requirements, Architecture, and Key Technologies," IEEE Vehicular Technology Magazine, vol. 14, no. 3, pp. 28–41, 2019.
9. F. Tariq et al., "A Speculative Study on 6G," IEEE Wireless Communications, vol. 27, no. 4, pp. 118–125, 2020.
10. K. David, H. Berndt, "6G Vision and Requirements: Is There Any Need for Beyond 5G?," IEEE Vehicular Technology Magazine, vol. 13, no. 3, pp. 72–80, 2018.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com