

## **Role of 5G Network in Improving Performance of IoT Devices**

### **Problem Statement:**

The Internet of Things (IoT) has transformed almost every industry from healthcare to transportation, and every aspect of life at individual and business level. However, despite the rapid growth of IoT applications, the currently used network infrastructures like 4G LTE present certain limitations with respect to speed, efficiency, latency and connectivity, which do not allow IoT devices to perform optimally. As a solution to this problem, Pons et al. (2023) suggested that by converging 5G technology with IoT, the performance of IoT devices will enhance, leading to a more comfortable user experience. Furthermore, Modesta et al. (2019) pointed out that 5G network is capable of supporting up to 1 million gadgets each square kilometer which is 10 times higher than the capacity of 4G network. It can also lead to an increased battery life by making the device 100 times more efficient as compared to a 4G network. Likewise, Khanh et al. (2022) articulated that 5G network has got the power to connect billions of gadgets with extremely high throughput along with extremely low latency. This network has the potential to realize a digital society in a true sense where all things can be connected through the internet, familiar as the Internet of Things (IoT). In near future, there will be deployment of IoT applications in almost every domain of humanity such as smart agriculture, smart homes, smart transportation, smart cities, etc. Similarly, Shafique et al. (2020) proposed that concepts centered on IoT such as e-health care, augmented reality, streaming of high resolution media, and so on, have a universal presence these days. For all these applications to work appropriately, higher data rates, increased capacity, large bandwidth, high throughput and low latency is required. In order to resolve all these issues, 5G enabled IoT devices are needed.

### **Research Objectives:**

#### **1. To conduct an in-depth assessment of the role of 5G network in improving the performance of IoT devices:**

- To analyze the role of 5G network in increasing throughput and decreasing latency for a seamless user-experience.

- To understand the 5G network architecture that how it helps in boosting the performance of IoT devices.
- 2. To suggest a comprehensive framework regarding the convergence of 5G network and IoT devices:**
- To propose a framework which addresses the identified issues like high latency and low throughput and suggest ways of their resolution through 5G enabled IoT devices.
  - To prove that 5G enabled IoT devices will provide a seamless user experience.
- 3. To provide with validation of the suggested framework with respect to multiple IoT applications:**
- To validate that convergence of 5G network and IoT devices will result in an improved user experience in e-healthcare.
  - To validate that 5G enabled IoT devices work smoothly during the streaming and downloading of high resolution videos.

### **Literature Review:**

IoT has emerged as a transformative technology and has greatly impacted almost all the aspects of human life in this digital era. However, for an optimal performance of IoT devices, network plays a crucial role. The 5G network is the most advanced one and if converged with IoT, the result will be improved performance of smart devices. This literature is aimed at conducting a thorough analysis of the existing studies relevant to this research and to validate the role of 5G network in improving the performance of IoT devices.

**Vision of IoT and Significance of 5G Network:** In the study conducted by Khanh et al. (2022), a vision of the IoT is provided which will serve as the major driving force behind the sweeping digital revolution of the future. It provides a detailed overview of communication technologies in the IoT system along with challenges associated with existing technologies and directions of future research for IoT. Based on the assessment of the vital components for IoT in 5G technologies, a short survey was conducted focusing on low power technologies for communication for IoT in 5G. It is evident from the research of this survey that IoT will become the future of humanity in which everything like people, systems and software would be connected via the internet. Moreover, a study by Modesta et al. (2019) is based on literature

review on how IoT and 5G technology can integrate effectively in order to achieve immediate transformation on the way people do things. The 5G technology has the potential to transform the IoT into a realistic reality from a mere cerebral concept. Through this technology, devices can be connected directly amid an external central hub, enabling them to share digital resources in an administered manner. This will lead to a more powerful communication for which less battery power, self-contained as well as partitioned functions are required.

**Deployment of 5G and Functionality of IoT Applications:** The paper by Ahad et al. (2020) is aimed at highlighting the role of 5G networks in tackling the diverse communication requirements of applications related to healthcare in IoT. It has presented a detailed review of smart solutions of health care in IoT assisted by 5G technology. It has concluded that 5G network has a vital role in improving the functionality of IoT devices. In this regard, four diverse scenarios are taken into account considering different conditions for 5G network. Lastly, it discussed the open challenges along with directions for future research with respect to smart health care related to 5G networks. Likewise, another study proposes the deployment of 5G technologies in the applications of Internet of Things (IoT) along with network optimization challenges and current limitations through inferences. It has presented 5G as well as IoT technologies by providing an explanation of their common architectures, usual implementation of IoT and recurring challenges. This literature review based paper has also provided an in-depth analysis of inference with respect to wireless applications in general, inference with respect to IoT and 5G in particular, along with a discussion regarding possible techniques of optimization for overcoming these challenges. The research is aimed at highlighting the significance to address interference as well as optimizing the performance of network in 5G networks to assure an efficient and reliable connectivity for IoT based devices, which is crucial for adequate functioning of business process. As per the findings of this paper, the convergence of IoT and 5G technology is a necessary step towards the achievement of more opportunities for business and boosting global connectivity (Pons et al., 2023).

**Proposed Frameworks to Improve Performance of IoT Devices:** Shafique et al. (2020) has presented IoT technology from a bird's eye view by covering its architectural trends, cases of usage, along with challenges as well as prospects in future. This study has also provided an extensive and detailed synopsis of the emerging scenario of 5G-IoT considering a thorough

review of the existing literature. It has also made a detailed discussion regarding challenges associated with QoS requirement in today's 5G-IoT. The detailed review presented in this research will support both academia and industry for making coordinated efforts in bringing about advancements in 5G-IoT technologies. A similar paper focuses on the advantages of 5G technologies, which are applied in health care as well as wearable IoT based devices like continuous monitoring of a patient's health or chronic diseases using 5G, management of prevention of infections using 5G, etc. Precisely, the 5G technology has the potential to directly affect clinical decision making by improving the performance of IoT devices in healthcare. It has concluded that through the widespread embracement of 5G technology by systems of healthcare, sick people becomes capable of accessing specialist health care providers in need and get convenient health care services in a convenient way.

## References

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