5G Revolution: A Boost To Connectivity In IOT And Network Challenges

Surbhi Singh
Department of Computer Science & Engineering
Research Scholar, Deenbandhu Chhotu Ram University of Science & Technology, Sonipat

Abstract- *IoT-Main enabling factor of this promising paradigm is the integration of several technologies and communications solutions. Identification and tracking technologies, wired and wireless sensor and actuator networks, enhanced communication protocols (shared with the Next Generation Internet), and distributed intelligence for smart objects are just the most relevant. The main backbone of IoT is the network behind it which is handling all the traffic. This new era of 5G will bring together improved connectivity, cloud-based storage, and an array of connected devices and services. Extensive computing capability combined with virtual system architecture will open up a mobile internet of things (IoT). Advanced digital networks will bring together a system that connects billions of devices and sensors enabling advances in health care, education, resource management, transportation, agriculture, and many other areas.*

So in this paper we will address the advancement of the new 5G network along with the need of 5G in connecting the things with the internet.

Keywords- IoT, 5G, Intelligent Network, Security, Latency.

I. INTRODUCTION

Internet of Things (IoT) is an increasingly popular concept that has been widely adopted in a wide range of applications, partly due to decreasing costs of digital devices (e.g. mobile and portable devices such as sensors) and Internet services. In a typical IoT deployment, one could obtain information sent by sensors installed in rural and remote areas as long as there is Internet connection, for example via WiFi or a wireless sensor network (WSN), or 4G/5G network.

Though today's 4G networks incorporate the latest technologies and continue to offer faster data access, the road beyond LTE and LTE-A is far from clear. The rapid consumption of wireless data continues to outpace the industry's ability to meet demand. The mobile Internet has painted a picture of continued innovation and inspired researchers all over the world to think beyond faster data and greater capacity. These new networks, referred to as fifth generation or 5G, may transform our lives yet again and unleash enormous economic potential. This new era of 5G will bring together improved connectivity, cloud-based storage, and an array of connected devices and services. Extensive computing capability combined with virtual system architecture will open up a mobile internet of things (IoT).

II. OVERVIEW AND NEED OF 5G IN IoT

The Internet of Things is a network of devices that transmit, share, and use data from the physical environment to provide services to individuals, corporations, and society. The objects-things function either individually or in connection with other objects or individuals, and have unique IDs (identifiers). Also, the Internet of Things has different applications in health, transport, environment, energy or types of devices: sensors, devices worn/carried (wearable), e.g. watch, glasses, home automation (domotics). IoT is one of the international forefront research fields. With the continuous development of the IoT technologies, researchers began to combine IoT and control system in an effective way and gradually apply it to the automatic control fields like industrial manufacturing, rail transportation, aerospace, and so on.

In the next year, the internet will connect to about 1.5 billion new "things," and by 2020, more than 20 billion devices will be online. In theory, every one of them will be able to connect to every other. The internet was not created to handle this population explosion of data-generating devices. It won't collapse suddenly, but it does need to change. Here comes the need of the fast and intelligent network and which provides extremely low latency. All these requirements are filled by the invasion of the 5G network over 4G network.

5G is not simply an extension of 3G and 4G. Instead, it is a transformative ecosystem that includes a heterogeneous network that integrates 4G, Wi-Fi, millimeter wave, and other wireless access technologies. It combines cloud infrastructure, a virtualized network core, intelligent edge services, and a distributed computing model that derives insights from the data generated by billions of devices. The emerging network capitalizes on a variety of interfaces across licensed, licensed shared, and unlicensed spectrum in low-, mid-, and high-frequency bands. By design, it will not only increase capacity, it also will enable even the smallest devices to perform high-

level computations and connect quickly to processing power that is diffused throughout the system.

Consider these few examples of the necessity of 5G progress:

- Machine-to-machine communication if stalled by connectivity issues, can lead to revenue lost due to production line slowdowns
- A connected car traveling at 75 m/hr would travel over 10 feet further before applying the brakes if the system was experiencing a 100 millisecond delay
- Augmented and virtual reality both rely on speed and low latency as they demand immediate interactivity
- Connectivity predictions

In all these kind of cases the impact of 5G is quite positive. 5G will optimize the downlink transmissions to ensure deep coverage for these devices. For the uplink transmission, 5G can additionally support the use of non-orthogonal multiple access techniques, such as Resource Spread Multiple Access (RSMA), for target use cases such as sporadic uplink traffic from battery-powered IoT sensors. 5G devices will also support multi-hop communication, managed by the network. This will allow messages to be relayed until direct coverage is available, which allows these devices to use far lower power transmissions

III. KEY AREAS OF 5G IMPLEMENTATION

➢ **IoT Security Issue**:

"Internet of things"-based attacks, like the botnet that brought down Twitter and Netflix, are going to get more ambitious and more damaging. Attacks on infrastructure (power grids, traffic systems) or on IoT consumer devices themselves (appliances for example) are already being attempted.

➢ **Transferring Massive Data :**

Some IoT devices do have the potential to swamp existing networks. Cameras send a lot of real-time rich data. New jet engines are laden with sensors and generate 10 gigabits per second when running, terabits per flight. Cars also are now recording massive amounts of information. If there's one part of the global IoT network that needs rapid upgrades to serve business, it's the "edge," the border between IoT devices and the computers on the internet. The massive amounts of data being generated by IoT needs to be processed, reduced and analyzed before it hits the internet. It's a big opportunity.

➢ **Low-Power Wide Area Networks**

For years, cellular connectivity has been the primary transport for IoT due to its ubiquity, scalability and security. But as the number of services enabled by IoT devices continues to grow exponentially, many IoT applications have arisen that require long range and low-power capabilities. And this is where low-power wide area networks come in.

IV. ADVANTAGES OF 5G NETWORK

By 2020, industry analysts predict 50 billion devices will be connected to mobile networks worldwide, and these aren't just devices connected to a human hand. Below are the benefits which 5G network will provide with its advancement.

FASTER DATA RATE:- 5G targets peak data rates per user in the range of 10 Gb/s (over 1,000X 4G). To provide a frame of reference, a user can download an HD video in 40 minutes using the highest speed networks in good conditions. With 5G, a user can download this same video in a matter of seconds.

MILLIONS OF CONNECTED DEVICES:- The explosion of devices connected to the Internet has been dubbed the Internet of Things (IoT). These devices may incorporate sensors to measure pressure, temperature, or stress and perhaps include actuators to turn on and off devices or make adjustments in real time. Embedded devices sending bits of information to other devices, servers, or the cloud will account for a large percentage of the devices. The 5G systems needed to turn these possibilities into realities are composed of heterogeneous devices encompassing both low and high bandwidth.

IMPROVED SPECTRUM EFFICIENCY:- With fixed spectrum allocations below 3 GHz, researchers are investigating waveforms that make better use of the existing spectrum to essentially increase the number of bits through a given amount of spectrum. Current standards based on orthogonal frequency-division multiplexing require more frequency to separate transmit and receive data with sufficient efficiency. New 5G waveforms attempt to address spectrum efficiency using the existing network infrastructure to accommodate more users and devices and to squeeze out more bits per hertz.

V. CONCLUSION

With fixed spectrum allocations below 3 GHz, researchers are investigating waveforms that make better use of the existing spectrum to essentially increase the number of bits

through a given amount of spectrum. Current standards based on orthogonal frequency-division multiplexing require more frequency to separate transmit and receive data with sufficient efficiency. New 5G waveforms attempt to address spectrum efficiency using the existing network infrastructure to accommodate more users and devices and to squeeze out more bits per hertz.

REFERENCES

[1] Luigi Atzori et al, "The Internet of Things: A survey," Computer Networks, no. 54, p. 2787–2805, 28/10/2010.

[2] I.F. Akyildiz, W. Su, Y. Sankarasubramaniam, E. Cayirci, Wireless 1721 sensor networks: a survey, Computer Networks 38 (4) (2002) 393– 1722 422

[3] A. Gupta and R. K. Jha, "A Survey of 5G Network: Architecture and Emerging Technologies," IEEE Access, 2015.

[4] S. Mumtaz, S. Huq, K. Mohammed and J. Rodriguez, "Direct mobile-to-mobile communication: Paradigm for 5G," IEEE Wireless Communications, 2014.

[5] L. Atzori, A. Iera, G. Morabito, The internet of things: a survey, Comput. Netw. 54 (15) (2010) 2787–2805.

[6] D. Miorandi, S. Sicari, F. De Pellegrini, I. Chlamtac, Survey internet of things: vision, applications and research challenges, Ad Hoc Netw. 10 (7) (2012) 1497–1516.

[7] O. Hersent, D. Boswarthick, O. Elloumi, The Internet of Things: Key Applications and Protocols, second ed., Wiley Publishing, 2012.