

5G and its Cyber security issues (Editorial article)

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Abstract: The technological developments in the area of electronics and communication engineering is phenomenal in recent years and gives rise to wireless communication systems. One such wireless system which started ruling the world is 5G. This paper looks in to the history of wireless communication from 1G to 5G, discusses the characteristic features, advantages and disadvantages, comparison of 5G and finally the cyber security issues related to 5G is discussed in detail and concluded with future of 5G.

I INTRODUCTION

In recent years, we can see many changes in the field of engineering and technology that, introducing of new branches in engineering, merging various technologies and regularly few technologies became obsolete which are few years back considered as great technologies is happening, the prominent new technologies are IOT, Cloud computing, Block chain technologies, mobile communication ,etc.. created parallel opportunities in communication engineering and cyber security areas. The development of technologies especially in the areas of communication by introducing internet, computer networks, satellite communication & mobile communication is reached great heights in recent years and rationalized the demand for high speed communication, high quality of information, good uploading and downloading features ,advanced security features etc...

If we trace the history of developments in communication engineering, especially in wireless technologies, it goes back to Guglielmo Giovanni Maria Marconi, an Italian inventor and electrical engineer, during 1895, he made an invention of a practical radio wave-based wireless telegraph system through which he ensured the transmission of Morse code signals using radio waves without wire for a distance of 3.2 KM . Then during 1970`s an engineer at Motorola, Martin Cooper worked on a handheld device which was capable of two way communication wirelessly, and based on this, he invented the first generation mobile phone which was initially developed to be used in car segments, this invention is considered as a turning point in wireless communication and later which led to many technologies and standards. One such technological area became more prominent and popular is mobile communication and mobile network technologies. Later the era of modern internet protocol (IP)-based networks is started wherein from 1G (first generation) to the fifth generation (5G) networks and it is still continuing to change the scenarios in the field of not only mobile communication but in all types of communication systems. Martin Cooper, an engineer at Motorola during 1970s working on a handheld device capable of two way communication wirelessly, invented the first generation mobile phone. It was initially developed to use in car segment, this invention is a turning point in wireless communication which led to an evolution of many technologies and standards in

future. One such technological area became more prominent and popular is mobile communication and mobile network technologies.

As said earlier, in the wireless communication systems from 1G to 5G, here the letter G means GENERATION and each generation of wireless broadband is a set of telephone network standards which describes the technological implementation of the related system and each generation of wireless communication systems is intended to provide high quality reliable communication. As on date we have witnessed the decades of purely analog systems with no data capabilities - 1G, through digital circuit-switched systems using full-duplex communication and superb voice telephony -2G, later dominated by the broadband and multimedia systems -3G, and challenging all-IP network revolution as -4G, and finally the era of unified IP with massive and seamless end-to-end connectivity and mobility environment as -5G.

II ABOUT 5G

5G technology is a fifth generation wireless network architecture which is developed to ensure the superior data communication rate in wireless networks. The technology is designed in such a way that it offers great speed and responsiveness of wireless networks along with good network management features. Implementing the 5G technology, network operators can deliver 5G fixed wireless broadband services and 5G cellular services as the 5G networks operate on rarely used radio millimeter band range (30 GHz to 300 GHz range). The Testing of 5G in this band range results approximately 500 meters range from the tower.

High speed and Low latency is one of 5G's biggest and most important features, Theoretically the peak speed clocked for 5G is 10 GBPS with an average

speed of 400 MBPS. Whereas the peak speed clocked is 1GBPS and average speed is 50 MBPS for 4G systems and proved that 5G is 10 times faster than 4G.

The 5G offers EMBB (Enhanced Mobile Broadband) which contributes in improving mobile data rates, latency, indoor and outdoor coverage to support broadcasting & streaming, mobility and user density. Also offers MMTC (Massive Machine Type Communication) which supports smart cities, remote monitoring, fleet management, logistics, tracking, smart agriculture and smart metering, etc...

To support the industrial communication requirement 5G offers URLLC (Ultra-reliable low-latency communications) which offers high reliability, very low latency for critical communication systems like Industrial automation, remote manufacturing, remote surgery, smart grid, traffic safety, emergency services, broadband radios, and Space based networks. The International Telecommunication Union (ITU) has put forth some requirements for 5G that focus on fulfilling three key performance indicators, namely More than 10 GBPS peak data rates for the EMBB (enhanced mobile broadband), More than 1M/km² connections for MMTC (massive machine-type communications) & Less than 1ms latency for URLLC.

5G features includes the NRMMW (New Radio Millimeter wave: 1 to 6 GHz is very crowded, 30 to 300 GHz. Then NGC (Next Generation Core), Small cells/Het Net, Beam forming, Full Duplex, Network slicing, Mobile edge computing, Software defined Radio, etc....

As on date, Global average internet speed is 96.1Mbps and Median Internet speed global average is 58.1 Mbps. India stands at 81st ranking

the world with 77.64Mbps, median average is 58.1 Mbps and ranked at 80 and Globally the Enterprise 5G networks are powering the digital transformation of industrial applications in various fields and by 2034, it is expected to be a \$2.2 trillion digital economy.

III 5G SECURITY ISSUES

Any technologies which exists today cannot overcome the issues of security, and 5G is also one such area which suffers immensely with cyber security issues, such prominent ones which contributes as security issues for 5G are

- a) As 5G is inherited its properties and characteristics from it's predecessor technologies from 1G -4G, all their vulnerabilities will continue to haunt 5G related to cyber security issues.
- b) As 5G supports AI (artificial Intelligence) and IOT (Internet of Things) the crimes and cyber security issues related to AI and IOT will be raised phenomenally.
- c) As 5G networks is more vulnerable to cyber security attack as it is built on easy accessible and got open internet protocols .
- d) As 5G offers the processing done at decentralized inter-communicating nodes got issues of data theft and hence edge computing issues.
- e) As 5G is new technology and will be established to every possible places in every countries, that level of knowledge and expertise is not with work force to handle and maintain the 5G and its subsidiary systems which makes the 5G network and systems is more succceptable to cyber attacks.

- f) As 5G User-security parameters are not updated during roaming between operator networks leads to Roaming security issues.
- g) As 5G offers more bandwidth in turn made possible high data transfer rate which leads to short download time, it indirectly offers more pathways for cyber attacks.
- h) As 5G network is IDOR (Insecure Direct Object Reference) offers unsecured routes of radio interface encryption.
- i) As 5G waves are having small wavelength in the range of 60GHz - 28GHz. the reflection of the signal might be diffused and resulting negatively on its signal quality and path loss.
- j) As 4G suffers with injection attacks into ML algorithms to extract information, is very useful by launching MiTM attacks in the 4G network. This is directly achievable in a 5G network also after a downgrade attack.
- k) As 5G is new and advanced technology than 4G and its predecessors, to install and implement the 5G , requires restructuring & replacing of old equipment's and systems to match with 5G and in many places both 5G and 4G systems are overlapped which causes the whole communication system vulnerable to cyber attacks.
- l) As 5G offers various remote control options and functions, but it is a weapon for criminals and they misuse this facility to control drones and robots related activities.

All these issues limits the 5G usability in all the public domains with serious concerns of security issues, these are also supported by few challenges faced by 5G which includes vulnerability of

software, DDOS (Distributed Denial of Service) attacks, Built in security weakness, etc.

All the above 5G security issues made 5G a non trust worthy technology, it can be made more secure, trustworthy by considering various implementations like;

- Developing robust built in security measures in 5G.
- Periodic risk assessments.
- Threat detection at Real Time.
- Improvements in IOT security services
- Implementation of suitable AI (Artificial Intelligence) and MI (Machine Learning) at all levels in IOT and other technologies.
- -Provision of suitable updating and upgrading the 5G systems against its identified vulnerabilities.
- Option of detailed vulnerability management especially related to data transfer.
- Implementation of zero trust framework for 5G environment.
- Implementing default usage of MFA(Multi factor Authentication).
- Implementation of suitable and versatile access control mechanism for 5G systems.

IV CONCLUSION

Even though 5G is so much powerful than its predecessors in mobile communication area ,and in the words of Prof.C.Murali in his book Lecture notes on Wireless Mobile Communication, the wireless communication systems offers service “anytime,

anything, anyone, anywhere” but, 5G has got its own limitations and issues especially related to Cyber security issues, the concern is how the 5G industry came out with solutions for all its vulnerability and at the same time it still unclear how 5G will sustain against 6G and 7G which are already showing their prominence and declaring rationalizing not only mobile communication but beyond.

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