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Wireless System 5G in Future Network

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Abstract—

The fifth generation of cellular technology is known as 5G. This is the latest advancement in cellular technology. 5G wireless technology will bring Gbps peak data rate, ultra-low latency, improved reliability, massive network capacity, improved availability, and more user experience to more users. Not only can 5G support millions of devices at lightning speed, but his has the potential to transform the lives of people around the world. Future 5G wireless networks will create new competition and increased demand for network capacity to support large numbers of devices running applications that require high data rates and always-on connectivity. is huge and will support new business models in the wireless networking market that demand more open networks. New challenges lead to new solutions, with changed plans for network positioning, management and operations of future 5G wireless networks to accommodate current wireless networks. One of the main objectives of future 5G wireless networks is to create service-specific networks for different services using a unified cloud reserve and wireless/wired network properties that can be offered by multiple infrastructure providers and operators. It's about provisioning your network compliantly.

INTRODUCTION

The fifth generation mobile network is known as 5G. It is the new global wireless standard after 1G, 2G, 3G and 4G networks. 5G will enable the creation of a new kind of network that connects almost everyone: machines, objects, gadgets. 5G wireless technology is expected to provide more users with fast peak data speeds of several Gbps, ultra-low latency, improved reliability, massive network capacity, increased availability and a more consistent user experience. I'm here. Higher performance and improved efficiency enable new user experiences and connect new industries. [When were 5G networks introduced?

In 2017, network operators began testing fixed 5G wireless services as an alternative to wired broadband at home. 5G Home Internet Closed His trial lasted until his 2018 and was commercialized later that same year. His first 5G mobile network was deployed in early 2019

HISTORY OF WIRELESS TECHNOLOGY

1G:-The first generation cellular network was introduced in Japan in 1979 by the Nippon Telegraph and Telephone Company (NTT) of Tokyo. In the early 1980s, it became popular in the US, Finland, UK and Europe. This system used analog signals and had many drawbacks due to technical limitations.

2G:- The second generation of mobile communication systems introduced a new digital technology for wireless transmission, also known as Global System for Mobile Communications (GSM). GSM technology later became the base standard for further development of wireless standards. This standard could support data rates from 14.4 to 64 kbps (maximum), which is sufficient for SMS and email services. The Code Division Multiple Access (CDMA) system developed by Qualcomm was also introduced and implemented in his mid-1990s. CDMA has more capabilities than GSM in terms of spectral efficiency, number of users, and data rates.

3G:- The third generation of mobile communications began with the introduction of UMTS (Universal Mobile Terrestrial/Telecommunication Systems). UMTS has a data rate of 384 kbps and supports video calling on mobile devices for the first time.

After the introduction of 3G mobile communication system, smartphones spread all over the world. Special applications have been developed for smartphones to handle multimedia chats, emails, video calls, games, social media and healthcare.

4G:- The 4G system is an upgraded version of the 3G network developed by the IEEE, offering higher data rates and capable of handling more advanced multimedia services. LTE and advanced LTE wireless technology used in 4th generation systems. Additionally, compatibility with previous versions facilitates deployment and upgrades to LTE and enhanced LTE networks.

The LTE system, which allows simultaneous transmission of voice and data, significantly increases data rates. All services, including voice services, can be sent via IP packets. Complex modulation schemes and carrier aggregation are used to increase uplink/downlink capacity.

5G:- 5G networks use advanced technology to deliver ultra-fast Internet and multimedia experiences to customers. Existing LTE-Advanced networks will be transformed into supercharged 5G networks in the future.

In pre- deployments, 5G networks operate in non-standalone and standalone modes. In non-standalone mode, both LTE spectrum and 5G NR spectrum are used together. Control signaling is connected to the LTE core network in non-standalone mode.

USES OF 5G

A: 5G will bring a variety of life-changing experiences, including faster download speeds, lower latency, and increased capacity and connectivity for billions of devices, especially in the areas of virtual reality (VR), IoT, and artificial intelligence. designed to do that. (AI).

5G use cases range from enterprise and enterprise use to occasional consumer use. Here are some examples of 5G use cases:

- High quality video streaming.
- Communication between devices in an Internet of Things (IoT) environment.
- More accurate location tracking.
- fixed wireless service.
- low latency communication.
- The superior real-time analytics capabilities.

How does 5G work?

A wireless network consists of sectorized cell sites that transmit data over the airwaves. Fourth Generation (4G) Long Term Evolution (LTE) wireless technology forms the foundation of 5G. Unlike 4G, which requires large and powerful cell towers to broadcast the signal over long distances, 5G radio signals travel through a large number of small cell towers placed in locations such as light towers and building rooftops. It will be sent. The use of multiple small cells is necessary because the millimeter wave (mmWave) spectrum (the 30 to 300 gigahertz (GHz) spectrum that 5G relies on to generate high speeds) can only carry over short distances and is subject to weather and weather conditions. This is because they are susceptible to interference. Physical obstacles such as buildings and trees.

Which 5G smartphones are available?

Phones or other hardware cannot get software updates and enable 5G on 4G phones. 5G requires special hardware. To use 5G, a user must have his 5G-supporting device, a carrier that supports 5G, and be in an area with 5G nodes within range.

Examples of 5G-enabled phones are:

- Samsung Galaxy S10 5G
- Samsung Galaxy Note10+ 5G
- Samsung Galaxy A90 5G
- OnePlus 7 Pro 5G
- Moto z3
- Xiaomi Mi MIX 3 5G
- Huawei Mate X
- Huawei Mate 30 Pro 5G

What are the benefits of 5G?

The disadvantages of 5G, which are obvious given how easily mmWave is blocked, or less obvious given the high radio frequency (RF) exposure limits, are that 5G has: It has many beneficial advantages.

- high bandwidth.
- Enhanced Mobile Broadband.
- 5 ms low latency.

Is 5G available now?

A: Yes, 5G is here today and the global operator started rolling out his new 5G network in early 2019. Also, all major phone makers are selling his 5G phones. And soon more people will have access to his 5G.

5G has been deployed in over 60 countries and the number continues to grow. We are seeing much faster adoption and adoption compared to 4G. Consumers are very excited about high speeds and low latency. But 5G goes beyond these benefits and also delivers capabilities for mission-critical services, enhanced mobile broadband, and large-scale IoT. It is difficult to predict when he will have access to 5G for everyone, but in his first year he saw great momentum in 5G rollouts and in 2020 and beyond he We expect to expand our network to more countries.

How fast is 5G?

A: 5G is designed to deliver peak data rates of up to 20 Gbps based on IMT-2020 requirements. Qualcomm Technologies' flagship 5G solution, the Qualcomm® Snapdragon™ X65, is designed to achieve peak downlink data rates of up to 10 Gbps.

But 5G is more than just faster. In addition to higher peak data rates, 5G is expected to offer much more network capacity by expanding into new spectrum such as mmWave. The

5G is also able to keep data rates consistently high as users move around, while also delivering much lower latency for faster responses and an overall more consistent user experience. And the new 5G NR cellular network will be supported by a Gigabit LTE coverage base that can provide ubiquitous Gigabit-class connectivity.

5G Network:-

5G technology can “split” a physical network into multiple virtual networks. Operators can better manage their networks by provisioning the appropriate network slices based on usage. This means that operators can choose different disk capacities according to the importance of their tasks. A simple device can be decoupled from more complex and demanding applications such as unmanned vehicle management, while her one user streaming video uses another part of the organization.

Fig.1 Network

What Is a 5G Network Transport ?

5G transport network connects 5G RAN and core network.

In order to provide the ultra-high bandwidth, ultra-low latency, flexible and intelligent connection services required by 5G application scenarios, the 5G transport network will use new network architecture and key technologies.

Fig. Network Transport

What is the structure of the 5G transport network?

The figure below shows the target structure of the 5G transport network.

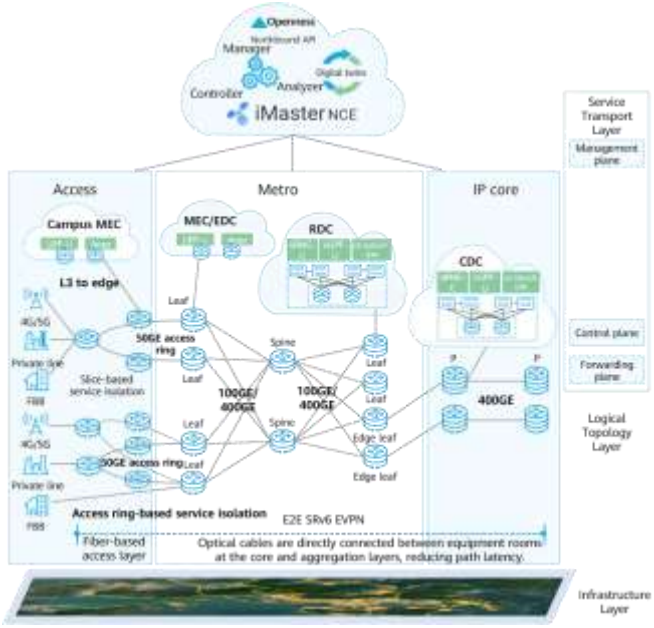

Fig. Target structure of a 5G transport network

5G and smart factories:

5G will revolutionize the production process on the factory floor, according to a white paper published by HMS Labs. The technology is expected to lead to safer, more efficient and more flexible manufacturing systems.

This new smart factory model enables greater automation, reduces costs, and improves product quality by eliminating the possibility of human error. These smart factories can also provide flexibility for personalized products, so demand can be met quickly, efficiently and cost-effectively. All of this is made possible by the stability, scalability and performance of 5G, according to the white paper. With wireless technology and machine-to-machine connectivity, 5G can automate logistics, material handling and factory automation. Thanks to this connectivity and the improved automation brought about by 5G, everything from material supply to production, warehousing and final product delivery could be controlled and monitored remotely. According to the HMS white paper, “The only industrial manufacturing unsuitable for 5G is motion control, which requires a cycle time of less than 1 millisecond,” and “The only industrial manufacturing unsuitable for 5G is We need motion control with sub-millisecond cycle times.” 5G Smart Factory

Fig. 5G and smart factories

5G Architecture:-

5G includes wireless broadband access, multimedia messaging services (MMS), video chat,mobile TV, HDTV content, digital video broadcasting (DVB), voice and data and other services that use bandwidth. The definition of 5G is to provide adequate RF coverage, increase bits/Hz and interconnect all wireless heterogeneous networks to provide users with a seamless and consistent telecom experience.

Basic Architecture:-

5G will create a dynamic, consistent and flexible framework of advanced technologies to support a wide range of applications. 5G uses smarter architectures, and radio access networks (RANs) are no longer constrained by base station proximity or complex infrastructure. 5G ushers in a fragmented and flexible virtual RAN with new interfaces to create additional data access points.

Compare 1G to 5G:-

5G technology offers higher data rates, lower latency, more energy efficiency, higher system capacity and more connected devices than previous generations. The method offers new, different technologies and improved versions of existing ones, as well as new features.

Generation	Speed	Technology	Key Features
1G (1970 –1980s)	14.4 Kbps	AMPS,NMT, TACS	Voice only services
2G (1990 to 2000)	9.6/ 14.4 Kbps	TDMA,CDMA	Voice and Data services
2.5G to 2.75G (2001-2004)	171.2 Kbps 20-40 Kbps	GPRS	Voice, Data and web mobile internet, low speed streaming services and email services.
3G (2004-2005)	3.1 Mbps 500- 700 Kbps	CDMA2000 (1xRTT, EVDO) UMTS and EDGE	Voice, Data, Multimedia, support for smart phone applications, faster web browsing, video calling and TV streaming.
3.5G (2006-2010)	14.4 Mbps 1-3 Mbps	HSPA	All the services from 3G network with enhanced speed and more mobility.
4G (2010 onwards)	100-300 Mbps. 3-5 Mbps 100 Mbps (Wi-Fi)	WiMax, LTE and Wi-Fi	High speed, high quality voice over IP, HD multimedia streaming, 3D gamming, HD video conferencing and worldwide roaming.
5G (Expecting at the end of 2019)	1 to 10 Gbps	LTE advanced schemes, OMA and NOMA	Super fast mobile internet, low latency network for mission critical applications, Internet of Things, security and surveillance, HD multimedia streaming, autonomous driving, smart healthcare applications.

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Fig. Compare 1G to 5G

1. Since the spectrum of radio waves is 10,000 times smaller than that of visible light [5], the capacity of radio waves is less than that of visible light.
2. Availability - sensitive locations such as hospitals, airplanes, etc.

CONCLUSION

5G represents the next major step in mobile communication standards following the upcoming 4G standard. 5G technology will change the way most high-bandwidth users access their phones. 5G transmitted through VOIP-enabled devices will allow people to experience unprecedented levels of call volume and data transfer.

By 2025, we will use 13 times more data than we do today, according to regulator Ofcom. There are already 7 billion internet-connected devices on the planet, and by 2025 he is estimated to have 21 billion. Many of these new devices power and monitor our homes, urban infrastructure, transportation, and other areas. This network is known as the Internet of Things. It has been hailed as one of the next great digital reevaluations, and as it is critical to stay connected to key devices regulating security, improving network response time or latency becomes essential.

REFERENCES

[1] H Haas、L Yin、Y Wang、C Chen、「LiFi とは?」Journal of Lightwave Technology、vol. 34号6、S. 1533-1544、2016.

[2] M. Vasuja、A. Mishra, US Chauhan, D. Chandola und S. Kapoor

[3] S. Dimitrov und H. Haas, Principles of LED Light Communications: Towards Networked Li-Fi, Cambridge: Cambridge University Press, 2015.

[4] D. Tsonev, H. Chun, S. Rajbhandari, J. J. D. McKendry, S. Videv、E. Gu、M. Haji, S. Watson, A E. Kelly, G. Faulkner, M. D. Dawson, H. Haas and D. O'Brien, "3 Gb/s OFDM-Based Wireless VLC Link with Single LED Using Gallium Nitride μLED," IEEE Photonics Technology Letters, vol. 26, No. 7, pp. 637– 640, 2014.

[5] H. Haas, "Wireless data from every lightbulb," TEDGlobal Talk, Edinburgh, 2011.

[6] S. Ghnimi, J. Ben Romdhan Hajri, F. Harrathi and A. Gharsallah, "Statistical Study of the Effects of Mobile Phone Technology Use on Human Health," 17th International Conference on the Science and Technology of Automated Control and Computing (STA), Sousse, 2016, pp. 675-678, 2016.

[7] R. Shanmughasundaram, p. P. Vadanan und V. Dharmarajan, “Li-Fi-based Automated Traffic Signal Control for Emergency Vehicles,” 2nd International Conference on Advances in Electronics, Computers and Communications (ICAECC), Bangalore, 2018,

[8] R. Mahendran, "Integriertes LiFi (Light Fidelity) für Intelligente Kommunikation durch Beleuchtung", International Conference on Advanced Communication Control and Computing Technologies (ICACCCT), Ramanathapuram, S. 53-56, 2016.

[9] I. Demirkol, D. Camps-Mur, J. Paradells, M Combalia、W. Popoola und H. Haas、「Powering the Internet of Things through Light Communication」、IEEE Communications Magazine、vol. 57、Nr。 6、S. 107-113, Juni 2019.

[10] L. U. Khan, "Visible Light Communications: Applications, Architectures, Standardization and Research Issues", Digital Communications and Networks, vol. 3, Nein. 2, S. 78-88, May 2017.

[11] „semaphore-world-first-telegraph.html“, [online]. Verfügbar: https://www.amusingplanet.com. [accessed May 20, 2020].

[12] G.J. Holtzmann, "Early History of Data Networks," Los Alamitos, CA, IEEE Computer Society Press, 1995, p. 251-252.[[13] S. Schulz et al., "Latency-critical IoT applications in 5G: Perspectives on the design of air interfaces and network architectures", IEEE Communications Magazine, 55(2): 70-78, 2017..

[14] D. Zhang, A. Festag, G. Fettweis, "Generalized Frequency Division Multiplexing-Based Physical Layer Performance in Vehicle Communications," IEEE Transactions on Vehicle Technology, 2017.

[15] A. Gonzalez, S. Kühlmorgen, A. Festag, G. Fettweis, "Resource Allocation for Block-Based Multi-Carrier Systems Considering QoS Requirements," Proceedings of the 2017 IEEE Global Communications Conference. “5G: Personal Mobile Internet Beyond What Cellular Brings to Telephony,” Communications Magazine, IEEE 52.

[16] D. DINEV, V. ALEKSIEVA and H. VALCHANOV, “Comparative analysis of prototypes based on Li-Fi technology”, 16th Conference on Electromechanical, Drives and Power Systems (ELMA), Varna, Bulgaria, S. 1- April 4, 2019.

[17] M. Mekala, P. Viswanathan, N. Srinivasu und G. Varma, “Accurate decision-making system for mining environments using Li-Fi 5G technology on IoT framework,” Modern Computing and Information. International Conference on Science (IC3I), Singapore, S. 74-79, 2019.

[18] J. D. Bokefode, S. A. Ubale und R. M. Gaikwad、「Retrifying Real Time Data Through IOT Devices and Storage Securely on Cloud Using Li-Fi」、3rd International Conference for Convergence in Technology (I2CT)、Pune、S. 1-5、2018.

[19] X . Qi, L. Du, S. Wang and J. Liu, "Design of indoor positioning glasses for blind people based on LiFi technology," IEEE 4th International Conference on Computer and Communications (ICCC), Chengdu, China, S. 744 -747, 2018.

[20] E. Pikasis und W. O. Popoola, “Understanding LiFi Effects on LED Light Quality,” 2018 IEEE Photonics Conference (IPC), Reston, VA, USA, S. 1-2, 2018

[21] F. Aftab, "Potentials and Challenges of Fidelity-Based Indoor Communication Systems", International Journal of New Computer Architectures and Their Applications (IJNCAA), vol. 6, No. 3, pp. 92-102, 2016.

[22] P. Kuppusamy, S. Muthuraj, S. Gopinath, Investigations and challenges of Li-Fi compared to Wi-Fi, International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), Chennai, p. 896-899, March 2016.

[23] S. Chatterjee, S. Agarwal, A. Nath, “Scope and Challenges of Light Fidelity (LiFi) Technologies in Wireless Data Communications,” International Journal of Innovative Research in Advanced Engineering (IJIRAE), vol. 2, no.