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6G TECHNOLOGY

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ABSTRACT:

The demand for wireless connectivity has grown exponentially over the past few decades. Fifth generation (5G) communications, with far more features than fourth generation, will soon be deployed globally. A new paradigm of wireless communications, the sixth generation (6G) system with full artificial intelligence support is expected to be implemented between 2027 and 2030. Beyond 5G, some fundamental issues need to be addressed: higher system capacity, higher data rate, lower latency, higher security and improved quality of service (QoS) compared to the 5G system.

The vision of future 6G wireless communication and its network architecture. Emerging technologies such as artificial intelligence, terahertz communications, optical wireless technology, free space optical network, blockchain, three-dimensional networking, quantum communications, unmanned aerial vehicles, cell-free communications, integration of wireless information and energy transmission, integrated sensing and communications, integrated access backhaul networks, dynamic network slicing, holographic beamforming, backscatter communication, intelligent reflective surface, proactive caching and big data analysis, which can help the development of 6G architecture in ensuring QoS.

Keywords-Money Pad, Digi-cash, Personal digital Assistance, Biometrics Technology, Finger print Reader, Float, Fiat Money, Specie-Backed, Legitimate

INTRODUCTION

We are moving towards a society of fully automated and remote-controlled management systems. The very rapid development of various new applications such as artificial intelligence (AI), virtual reality, three-dimensional (3D) media and the Internet of Everything (IoE) has generated a huge amount of traffic. Global mobile traffic volume was 7,462 EB/month in 2010, and by 2030 this traffic is forecast to reach 5,016 EB/month. This statistic clearly shows how important it is to improve communication systems. Autonomous systems are becoming increasingly popular in all sectors of society, such as industry, healthcare, roads, oceans and space. To provide intelligent life and automated systems, millions of sensors will be embedded in cities, vehicles, homes, industries, food, toys and other environments. Therefore, a high data rate with reliable connectivity is required to support these applications. Fifth generation (5G) wireless networks have already been deployed in certain parts of the world. By 2020, 5G is expected to be fully deployed around the world.

5G networks will not be able to provide a fully automated and intelligent network that offers everything as a service and a fully immersive experience. Although the 5G communication systems, which will be released very soon, will offer significant improvements over the existing systems, after 10years they will not be able to meet the needs of future emerging intelligent and automation systems.

The 5G network will offer new features and better quality of service (QoS) compared to fourth generation (4G) communications. 5G technology will include several new additional techniques such as: B. new frequency bands (e.g. the millimeter wave (mmWave) and the optical spectra), expanded spectrum use and management and the integration of licensed and unlicensed bands. Still, the rapid growth of data-centric and automated systems may outpace the capabilities of 5G wireless systems. Certain devices, such as B. Virtual Reality (VR) devices need to go beyond 5G (B5G) as they require a data rate of at least 10 Gbps. With 5G reaching its limits in 2030, the design goals for the next step are already being explored in the literature.

To overcome the limitations of 5G to support new challenges, a sixth generation (6G) wireless system with new attractive features needs to be developed.The main drivers of 6G will be the convergence of all previous features, such as network densification, high throughput, high reliability, low power consumption and massive connectivity. The 6G system would also continue the trends of the previous generations that included new services with the addition of new technologies. Emerging services include AI, smart wearables, implants, autonomous vehicles, computing reality devices, sensing, and 3D mapping. The key requirement for 6G wireless networks is the ability to handle massive amounts of data and very high data rate connectivity per deviceAs the development of electronic money continues to accelerate, protecting the rights of individuals must remain a priority. Since the past record of most governments in these early stages of electronic commerce has been viewed by many as confrontational and not protective of the rights of individuals, it is likely that upholding these rights is one of the reasons private currencies are likely to be used the internet and eventually will play an important role in global trade.

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Artificial Intelligence:

Intelligence is the fundamental feature of autonomous 6G networks. Therefore, the most important and newly introduced technology for 6G communication systems is AI. In 4G communication systems, there was no involvement of AI. The upcoming 5G communication systems will support partial or very limited AI. However, 6G is fully powered by AI for automation. AI-powered 6G will deliver the full potential of radio signals and enable the transformation from cognitive radio to intelligent radio. Advances in machine
learning are creating smarter networks for real-time communications in 6G. The introduction of AI in communication will simplify and improve the transport of real-time data. Using a variety of analytics, the AI can determine how to perform a complex target task. AI increases efficiency and reduces processing delays in communication steps. AI can be used to quickly perform time-consuming tasks like handover and network selection. AI will also play an important role in M2M, machine-to-human and human-to-machine communications.

Terahertz Communication:

Spectral efficiency can be increased by increasing the bandwidth. This can be achieved by expanding bandwidths and applying advanced massive multiple input multiple output (MIMO) technologies. 5G introduces mm-wave frequencies for higher data rates and enables new applications. However, 6G aims to push the boundaries of the frequency band to THz to meet even higher demand. The HF band is almost exhausted and is no longer sufficient to meet the high demands of 6G. The THz band will play an important role in 6G communications. The THz band is expected to be the next frontier in high data rate communications. THz waves, also called submillimeter radiation, usually refer to the frequency band between 0.1 THz and 10 THz with the corresponding wavelengths in the range of 0.03 mm–3 mm.

According to the recommendations of the ITUR (ITU Radiocommunication Sector), the 275 GHz-3 THz band range is the main part of the THz band for mobile communications. The capacity of 6G cellular communication is increased by adding THz band (275GHz-3THz) to mm-wave band (30-300GHz). The band in the 275 GHz-3 THz range has not yet been allocated for any purpose worldwide; therefore, this band has the potential to achieve the desired high data rates. When this THz band is added to the existing mm-wave band, the total band capacity increases by at least 11.11 times. Of the defined THz bands, 275 GHz-3 THz and 275 GHz-300 GHz are on the mm-wave and 300 GHz-3 THz on the far infrared (IR) frequency band. Although the 300 GHz 3 THz band is part of the optical band, it is at the border of the optical band and immediately after the HF band. Therefore, this 300 GHz 3 THz band shows quite similar characteristics as the HF. THz increases the potential and challenges of high-frequency communication.

Optical Wireless Technology:

OWC technologies are envisioned for 6G communications in addition to RF-based communications for all possible device-to-access networks; these networks also access networkto-backhaul/fronthaul network connectivity. OWC technologies have been used since 4G communication systems. However, it is intended to be used more widely to meet the demands of 6G communication systems. OWC technologies, such as light fidelity, visible light communication (VLC), optical camera communication, and FSO communication based on the optical band, are already well-known technologies. These communication technologies will be extensively used in several applications such as V2X communication, indoor mobile robot positioning, VR, and underwater OWC. Researchers have been working on enhancing the performance and overcoming the challenges of these technologies.

Communications based on wireless optical technologies can provide very high data rates, low latencies, and secure communications. LiDAR, which is also based on the optical band, is a promising technology for veryhigh-resolution 3D mapping in 6G communications. OWC confidently will enhance the support of uMUB, uHSLLC, mMTC, and uHDD services in 6G communication systems. Advances in light-emitting-diode (LED) technology and multiplexing techniques are the two critical drivers for the OWC in 6G. It is expected that both micro LED technologies and spatial multiplexing techniques will be mature and costeffective in 2026. White light based on different wavelengths will beneficial to accelerate the throughput performance via wavelength division multiplexing, leading to potentially 100+ Gbps for ultra-high-data-rate VLC access points. The addition of massive parallelization of micro LED arrays will enhance the further data rate to the target Tbps of 6G communication.

Massive MIMO and Intelligent Reflecting Surfaces:

Massive MIMO technology will be crucial in 6G system to support uHSLLC, mMTC and uHDD services. A fundamental way to improve spectral efficiency is to use MIMO technology. As MIMO technology is developed, spectral efficiency is also developed. Therefore, due to the need for better spectral and energy efficiency, higher data rates and higher frequencies, Massive MIMO is being integrated into both 5G and 6G systems. Compared to 5G, we expect a shift from traditional Massive MIMO to IRS in 6G wireless systems to offer large wireless communication surfaces and heterogeneous devices. IRS is a new hardware technology that has immense potential for energy-efficient green communication. Also known as the meta-surface, it consists of many reflective diode units capable of reflecting all incoming electromagnetic signals with an adjustable phase shift. Reconfigurable smart surfaces are envisaged as Massive MIMO 2.0 in 6G.

These materials can integrate index modulation to increase spectral efficiency in 6G networks. Gradient descent and fractional programming significantly optimize the smart surface phase shifts and transmit power, respectively. With this adjustable reflected phase-shifted signal and the transmitted signal, we can also improve the energy efficiency of the system. This technology is seen as a great solution to maximize data rate and minimize transmit power in upcoming 6G networks.

3D Networking:

The 6G system will integrate the ground and air networks to support communications for users in the vertical extension. The 3D BSs are provided by low-orbit satellites and UAVs. The addition of new dimensions in terms of height and the associated degrees of freedom makes 3D connectivity significantly different from traditional 2D networks. The heterogeneous 6G networks will offer 3D coverage. The 6G decentralized networks with the

integration of terrestrial networks, UAV networks and satellite systems truly realize the global coverage and stringent seamless access even for ocean and mountain areas.

Quantum Communication:

Unsupervised reinforcement learning in networks is promising in the context of 6G networks. Supervised learning approaches will not be practical for labelling large amounts
of data generated in 6G. Unsupervised learning does not need to be flagged. Therefore, this technique can be used to create the representations of complex networks autonomously. By combining reinforcement learning and unsupervised learning, it is possible to operate the network truly autonomously. Advanced quantum computing and quantum communication technologies are deployed to provide strong security against various cyber-attacks in 6G. The emerging paradigm of quantum computing, quantum machine learning and their synergies with communication networks is considered a key 6G enabler. The escalation of quantum computing and engineering is necessary to solve complex tasks. Quantum communication offers strong security through the application of a quantum key based on the quantum no-cloning theorem and the uncertainty principle. The information is encoded in the quantum state with photons or quantum particles and cannot be accessed or cloned without manipulation due to quantum principles. In addition, quantum communication improves throughput due to the superposition nature of qubits.

Cell-free Communication:

The tight integration of multiple frequencies and different communication technologies will be crucial in 6G systems. As a result, the user will move seamlessly from one network to another network without the need for making any manual configurations in the device. In 6G, the concept of conventional cellular and orthogonal communications will be shifted to cell-free and non-orthogonal communications, respectively. The best network is automatically selected from the available communication technology. This will break the limits of the concept of cells in wireless communications. Currently, the user's movement from one cell to another cell causes too many handovers in dense networks. Also, it causes handover failures, handover delays, data losses, and the ping-pong effect. The 6G cell-free communications will overcome all these and provide better QoS. Cell-free communication will be achieved through multi-connectivity and multi-tier hybrid techniques and by different and heterogeneous radios in the devices.

Trends in Mobile Communication:

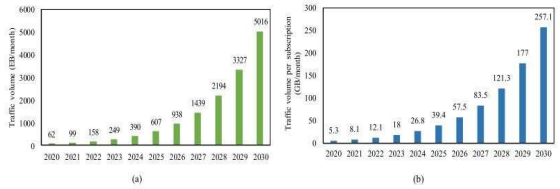

Fig:The predicted growth of global mobile connectivity during 2020-2030.[1]
(a) Total global traffic volume, (b) Traffic volume per subscription.

Since the beginning of the first analog communication system in the 1980s, a new generation of communication systems has been introduced almost every ten years. The transfer from one generation to another improves the QoS metrics, includes new services, and provides new features.
Moreover, the use of M2M connectivity will also increase exponentially. The traffic volume for each of the mobile devices will also increase. The traffic volume of a mobile device in 2010 was 5.3 GB per month. However, this volume
will grow 50 times in 2030. The number of M2M subscriptions will increase 33 times in 2020 and 455 times in 2030, as compared with 2010.
Recently, research interests have shifted to data-driven adaptive and intelligent methods. The 5G wireless networks will build a foundation of intelligent networks that provide AI operations. It is estimated that by 2030, the capacity of 5G will reach its limit. Then, fully intelligent network adaptation and management for providing advanced services will only be realized using 6G networks.

ADVANTAGES

1. Supports Higher Number of Mobile Connection
2. Supports Higher Data Rates
3. Revolutionize the Healthcare Sector
4. Independent Frequencies
5. Large Coverage

CONCLUSION

Each generation of communication systems brings with it new and exciting features. The 5G communication system, which will be officially launched worldwide in 2020, has exciting features. However, 5G will not be able to fully support the growing demand for wireless communication in 2030. Therefore, 6G must be introduced. Research on 6G is still in its infancy and study phase. This paper presents the prospects and ways to achieve the goal of 6G communications. In this paper we presented the possible applications and the technologies to be used for 6G communication. We have also

outlined the potential challenges and research directions to achieve the goals for 6G. Besides clarifying the vision and goal of 6G communications, we have indicated the different technologies that could be used for 6G communications.

Future Enhancements

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