

33. NEXT GENERATION NETWORKS: 5G TECHNOLOGY AND ITS IMPACT ON COMMUNICATIONS DEVELOPMENT

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This work outlines the rapid evolution of digital communication, highlighting the significant impact of 5G technology. It details 5G's advantages over previous generation, such as higher speeds, lower latency, and the capacity to support a multitude of devices and services. The piece explains the technical underpinnings of 5G, like Orthogonal Frequency Division Multiplexing (OFDM) and the use of smaller transmitters, which enhance network efficiency and flexibility. Additionally, it touches on the real-world applications of 5G across various industries.

The way we connect, communicate, and traverse the digital landscape is evolving at an incredible pace. In the last few years, as the technology space has continued to evolve, our options for communication have grown increasingly impressive. While various innovations have facilitated this transformation, one of the most impactful is the introduction of Next-generation networks.

5G is the fifth generation of wireless cellular technology that delivers faster upload and download speeds, more stable connections, and increased capacity compared to previous generations of networks. Next-generation network technology has a theoretical peak speed of 20 Gbps, while the peak speed of 4G is only 1 Gbps [1]. 5G also promises lower latency, which can improve the performance of business applications as well as other digital experiences (such as online gaming, videoconferencing, and self-driving cars). But what engineering ideas made this possible? Next-generation network technology works in a similar manner to previous cellular networks, using cellular sites to transmit data via radio waves. These sites connect wirelessly to networks, with advancements in data encoding allowing operators to employ a greater number of radio waves in 5G technology. An essential aspect of Next-generation networks is Orthogonal Frequency Division Multiplexing (OFDM), a modulation format that facilitates high-frequency waves offering reduced latency and enhanced flexibility compared to LTE networks [2]. Furthermore, 5G implements smaller transmitters on buildings and infrastructure instead of conventional free-standing mobile towers utilized in older network technologies. The transition to smaller sites enables better support for numerous devices at faster speeds. Moreover, mobile operators can establish multiple independent virtual networks on the same infrastructure using 5G technology, customizing each network segment for specific services and commercial applications. This segmentation of services brings advantages such as heightened reliability and device efficiency for users.

5G connectivity has been rolled out in select regions across some countries. These initial iterations of 5G, known as 5G non-standalone (5G NSA), utilize existing 4G LTE network infrastructure to deliver enhanced speeds. However, the primary focus of the industry lies in the next level of 5G technology, termed 5G standalone (5G SA), which promises even higher speeds and lower latency.

Mobile technology has long had a fundamental impact on the way we live and work. The development of new smartphones, faster internet connections and stronger processors have allowed us to explore the online world without being tied down to a desktop device. The real-world impact of 5G technology includes enhanced network performance and speed, as well as new connected experiences for users. In healthcare, 5G connectivity will allow for continuous monitoring of patients through connected devices that provide data on vital health indicators. In the automotive industry, 5G and machine learning algorithms will offer real-time information on traffic and accidents, enabling vehicles to communicate with each other and infrastructure. The 5G Wireless Module Market Research Report for 2024 highlights trends, growth prospects, and potential scenarios up to the year 2032 [3].

From 2024 to 2032, the 5G Wireless Module market displays a consistent and positive growth direction, indicating a favorable outlook for the industry. This growth is propelled by several key factors, including increasing consumer demand, advancements in technology, and shifting consumer preferences.

The advancements in speed, efficiency and connectivity enabled by 5G are revolutionizing the way we interact with technology. From significantly faster download and upload speeds, to the ability to deploy IoT devices at scale and the foundation for real-time applications, 5G is at the forefront of a new wave of digital transformation.

References:

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