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# A Survey on Impact of 5G on Cloud Technology

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**ABSTRACT:** 5G is a 5<sup>th</sup> generation digital technology that converts bytes (unit of data) wirelessly. The millimetre wave spectrum is used in this new interface. It allows you to use different devices in the same geographic region. As 5G technology rolls out and cloud computing resources are pushed to the network's edge, cloud infrastructure and communications networks are becoming more connected and fused, a trend that is expected to continue as 5G deployments expand. 5G implies more data which in turn would fuel cloud applications. Likewise, service and cloud providers seek to expand their infrastructure and services to collect, transmit, and manage this data. This paper presents an in-depth examination of 5G technology in Cloud Computing, including its benefits, applications, and future prospects.

**KEYWORDS:** 5G, Cloud Computing, Impact, Benefits, Applications

## I. INTRODUCTION

The superlative invention of the web has generated innovative developments in the computer world, some such innovations are 5G & Cloud Computing. The cloud computing sector will benefit greatly from the new 5G technology. This is because most technological breakthroughs will be more efficient when cloud-based technology will be used. 5G, with its low to zero latency, increases that integration, resulting in better connections. To deploy 5G technology, corporations, telecommunications firms, and cloud service providers would need to make considerable changes to network standards and infrastructure, as 3GPP release 15 standards classified 5G devices as non-standalone devices, i.e., they cannot act independently [1]. The advent of 5G technology brings up new opportunities for enterprises. For example, IBM and Vodafone recently signed a B2B (Business-to-Business) agreement geared at cloud hosting [2]. 5G is a beneficial factor for cloud-dependent companies and cloud industries themselves. The cloud is a valuable area for non-device storage in everything from healthcare applications to autonomous vehicles, and even wearables and mobile apps. Using the cloud with 5G connectivity will improve the performance of these technologies. Cloud-based goods services are likely to improve in terms of dependability, speed, and efficiency. These advancements will, in turn, hasten cloud business investments [3]. As a result, cloud service providers are focusing attention on maximizing the utilization of 5G technology. This paper is motivated by this, and it explores the benefits, uses, and future of the two revolutionary technologies when they are combined. Furthermore, 5G-Cloud integrated applications are discussed in order to study the technology in a more realistic and efficient manner.

## II. LITERATURE SURVEY

Wubben, et al [4] describes the benefits of 5G mobile network in respect to cloud computing and investigates challenges which can be faced by signal processing algorithms. The paper identified challenges in RANaaS concept by [5], i.e., the timing constraint caused by 3GPP LTE Protocol Stack and also addressed its benefit of flexible functional split between Radio Access Points and centralized cloud platform. The paper also discussed the technologies which could help overcome the challenges.

Cayamcela, et al [6] describes how artificial intelligence can be used to improve 5G network and vice versa. The paper describes how a reliable 5G network should have low latency so that data can be saved even in remote location can be accessed in matter of milliseconds. To make 5G network reliable, the paper suggests that 5G technology should be optimized with the help of Artificial Intelligence. The paper further explores how AI and 5G



are linked for Edge Caching (the use of caching servers to store data closer to consumers) so that content may be made available to end users more quickly.

Wang, et al [7] explains the emerging trends and challenges in mobile cloud computing. The paper anticipates that Mobile Cloud Computing will significantly alter people's work patterns and lifestyles in a future networked society. The paper throws light on growing demand for resource management, data storage, and mobile sensing has prompted the development of Mobile Cloud Computing designs in 5G that focus on mobility/network management, resource offloading, and sensing services in various Mobile Cloud Computing environments. The study also discussed issues including architecture, resource management, security and privacy, networking protocol development, and Mobile Cloud Computing service provisioning.

Shafique, et al [8] provided an in-depth examination of the 5G wireless technologies that have emerged as critical enablers for the widespread adoption of IoT technology. The study provided an overview of the history of cellular wireless technologies, demonstrating how 5G wireless technology improved on preceding technologies, allowing for the widespread adoption of IoT. The paper also discusses how high data transfer rates with minimal latency from 5G-IoT nodes are critical for cloud-based application layer programs that run cutting-edge artificial intelligence, machine learning, and deep learning algorithms for effective real-time data processing and prediction. Such contemporary day applications operating on top of 5G-IoT, such as smart transportation, smart healthcare, and so on, are also explored by the paper.

Shorgin, et al [9] examined the critical advancements provided by next-generation wireless communications technology in order to allow Mobile cloud Computing applications and services. The paper suggests that despite great development in this area, further steps are needed to improve heterogeneous connectivity before it can efficiently meet the MCC criteria. The study feels more development is required to enable higher-bandwidth MCC architectures, service quality and availability must also be enhanced by providing more sufficient methods for dealing with heterogeneity in mobile devices, clouds, and wireless networks. On the cloud front, significant problems remain in improving data access efficiency, developing efficient context-aware mobile cloud services, providing more complex architectures for mobile computation offloading, and improving security, privacy, and trust.

### III. BENEFITS OF 5G TECHNOLOGY IN CLOUD COMPUTING

5G technology, as is generally known, will bring faster speeds, reduced latency, more synchronization across all devices, and a better internet surfing experience. It is unsurprising that 5G technology will have an influence on every industry, both positively and negatively. Similarly, the influence of 5G technology on the cloud is quite favorable and welcome. The following are some advantages of the advent of 5G technology on the cloud: -

- 5G Technology will allow for quicker data transmission and analytics [10].  
5G networks are well-suited to allowing real-time streaming from one facility to another. Businesses that rely on time and large data, such as metrological and space agencies, would gain greatly from this. Storage and broadcasting will take place when they happen. Cloud providers' performance would soar to new heights.
- 5G will improve the efficiency of internet based industrial activities.  
Any industry that relies on the cloud to run its operations would profit greatly from the 5G network's simplified operation. The network's high speeds and dependability will be extremely beneficial to the cloud computing security firm that uses vast volumes of sensitive data in real-time. As the business's activities can be quantifiably planned, the burden is going to become more manageable. Order tracking, inventory control, and delivery tracking, among other things, will be easily accessible from a single system.
- Because of improved connection, 5G technology will enable work activities to be done from any location.  
Cloud computing technologies connected to a 5G network will improve the experience of working from anywhere. This is due to the fact that the linked distant devices that employ sensors will use this high-speed, low-latency network to obtain the required information in the matter of seconds. This technology will allow businesses and individuals to track their cargo or automobiles as they travel. It will also make it easier to develop better home and workplace security automation systems [11]. Every industry will save a considerable amount of money and effort.
- 5G will vastly boost the capabilities of artificial intelligence systems [12].



AI technology is still in its early childhood. The advancements achieved since its discovery have been astounding, yet they have yet to reach their pinnacle. Given that the capacity of a computer to impersonate a human is the main motivator of an AI system, its processing speed must be critical. Having said that, an example of robotics utilized in both industrial and healthcare would gain greatly from the 5G network. A surgeon may now use a robot to operate on a patient at another place. And, with a 5G network, the procedure will be much more efficient.

- 5G will spur the development of improved security measures  
In the ever-changing webspace, offenders and hackers are the drawbacks that come with improvements. Such parties jeopardize several collaborations by penetrating firewalls and gaining access to crucial and sensitive information held by businesses and even governments. Administrators, on the other hand, would be able to detect and avert such cyber-attacks with 5G connection. Hybrid cloud computing is certain to be safer, with the added benefit of smoother cloud transfers [13].

#### IV. 5G CLOUD INTEGRATED APPLICATIONS

The fifth generation of wireless technology, known as 5G, signifies a shift in the face of communication. 5G, which is designed for maximum speed and capacity, has the potential to greatly increase how data is transmitted and will enable a plethora of new applications and use cases that extend far beyond the smartphone. Many of tomorrow's most exciting technical developments will rely on 5G Cloud integration, from the expansion of IoT to significant advances in how AI is employed in the real world. Some of the applications are as follows: -

- Use of IoT to its full potential  
Some IoT limitations, such as the challenge of storing, processing, and accessing massive volumes of data, have been addressed by the collaborative use of Internet of Things and cloud technology. With the help of cloud technology, it is feasible to apply advanced processing of sensory data streams in conjunction with new monitoring systems [14]. Now, after the onset of 5G technology, IoT will touch new heights as the promise of low latency and great network capacity in 5G promises to eliminate the most significant constraints to IoT proliferation. 5G and IoT are a logical coupling that will touch practically every business and consumer by giving devices near-real-time capacity to perceive and respond.
- High Speed Mobile Service  
Improved mobile service is one of the most visible immediate effects of the 5G network rollout. Mobile Cloud Computing will thrive with significantly enhanced mobile service. Mobile cloud services will then be employed in every industry, including healthcare, banking, OTT platforms, streaming services, and so on [7].
- Edge Computing Connectivity  
With the transition to cloud-native 5G networks, businesses may benefit from strategically distributed computational capacity, allowing more data to be processed and stored in the most appropriate location based on the demands of the application. Intelligent edge computing is enabled by the confluence of ultra-low latency 5G, IoT, and AI technologies. Devices and applications may use edge cloud computing resources without having to travel thousands of kilometers to a centralized data center [14].
- Extensive usage of artificial intelligence  
The application of AI to massive amounts of data at scale will be expedited by rapid, efficient connection. For example, smart city AI may automatically correlate traffic signal data and apply new patterns if a neighboring apartment building opens. With automated detection of possible security breaches or unwanted visits, smart security and machine vision can keep protected facilities safe.  
While 5G will aid in edge AI inference, it will also play a role in sending data from devices to the central cloud to train or refine AI models. Real-time data on road conditions obtained by connected automobiles, for example, can improve cloud-based mapping systems [14].
- Augmented World and Interactive Gaming  
5G promises a more immersive future for games. 5G speeds will significantly improve high-definition live streaming, and owing to ultra-low latency, 5G gaming will not be limited to devices with high CPU power. The game itself is shown and controlled by a mobile device, while processing, storage, and retrieval can be done in the cloud.



Low-latency 5G will spur significant innovation in virtual reality (VR) applications, which rely on quick feedback and reaction times to give a realistic experience. As 5G networks and devices become the standard, the quantity and sophistication of these applications is anticipated to skyrocket [15].

#### V. FUTURE PROSPECTS OF 5G AND CLOUD INTEGRATION

At its foundation, 5G infrastructure is based on digital and virtualized design, with cloud-friendly characteristics. These include highly reliable low latency communication and cloud virtualization, which provide enhanced and more flexible bandwidth, latency, and cloud-based administration. Unlike 4G, 5G is based on cloud-native design concepts and virtualization. This makes it simple to interface with a variety of cloud services while also providing a platform for the introduction of methods such as network slicing [16].

5G technology will eliminate network connection flaws that have plagued the cloud business. 5G's ultra-low latency has the potential to improve mobile experience and will benefit enterprises that use a client-server architecture, such as cloud computing. 5G speeds up real-time streaming from facility to facility, allowing cloud providers to offer services more efficiently, quickly, and seamlessly than ever before.

When 5G becomes available, more money will be poured into the cloud industry. With increased investment, cloud-based application innovation and development will reach new heights.

#### VI. CONCLUSION

In this paper, we examined how 5G would affect the Cloud Computing business. 5G, being a breakthrough technology in and of itself, will transform several sectors, including cloud computing. The use of the cloud in all sectors will be propelled to new heights largely owing to extremely dependable low latency technology. The technology is opening up new avenues for innovation in the cloud business, notably in mobile cloud computing. These technologies will attract significant investment, and additional advancements will be observed.

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