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FUNDAMENTAL ANALYSIS BETWEEN FIFTH GENERATION AND FOURTH GENERATION OF TELECOMMUNICATIONS TECHNOLOGY

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ABSTRACT
In the field of mobile communications, a "generation" generally refers to a change in the fundamental nature of the service, non-backwards-compatible transmission technology, higher peak bit rates, new frequency bands, wider channel frequency bandwidth in Hertz, and higher capacity for many simultaneous data transfers (higher system spectral efficiency in bit/second/Hertz/site). Each generation of cellular technology differs in its data transmission speed and encoding methods, which require end users to upgrade their hardware. 4G can support up to 2 Gbps and is slowly continuing to improve in speeds. 4G featured speeds up to 500 times faster than 3G. 5G can be up to 100 times faster than 4G.One of the main differences between 4G and 5G is the level of latency, of which 5G will have much less. The objective of this paper is to compare 4G and 5G mobile technology using descriptive analysis and previous study.

Keyword: *LTE, ITU-R, ISPs, 4G and 5G.*

Introduction
4G is the fourth generation of broadband cellular network technology, succeeding 3G. A 4G system must provide capabilities defined by ITU in IMT Advanced. Potential and current applications include amended mobile web access, IP telephony, gaming services, high-definition mobile TV, video conferencing, and 3D television.

5G networks are the new generation of mobile internet connectivity, offering faster speeds and more reliable connections on smartphones and other devices than ever before. Combining cutting-edge network

technology and the latest high-spec'd devices, 5G offer connections that are multitudes faster than previous mobile technology.
Where 4G fails at providing all the data needs to a growing number of mobile devices, 5G opens the airwaves for more internet-enabled tech like smart traffic lights, wireless sensors, mobile wearable, and car-to-car communication.

Fifth Generation (5G)

In telecommunications, 5G is the fifth generation technology standard for broadband cellular networks, which cellular phone companies began deploying worldwide in 2019, and is the planned successor to the 4G networks which provide connectivity to most current cellphones. Like its predecessors, 5G networks are cellular networks, in which the service area is divided into small geographical areas called cells. All 5G wireless devices in a cell are connected to the Internet and telephone network by radio waves through a local antenna in the cell. The main advantage of the new networks is that they will have greater bandwidth, giving higher download speeds, eventually up to 10 gigabits per second (Gbit/s). Due to the increased bandwidth, it is expected the networks do not exclusively serve cellphones like existing cellular networks, but also be used as general internet service providers for laptops and desktop computers, competing with existing ISPs such as cable internet, and also will make possible new applications in internet of things (IoT) and machine to machine areas. 4G cellphones are not able to use the new networks, which require 5G enabled wireless devices.

Fourth Generation (4G).

The term 4G stands for 'fourth generation' and refers to mobile network technology that enables 4G compatible phones to connect to the internet faster than ever before. The simplest explanation is that the "G" in 4G stands for "generation," because 4G is the fourth generation of mobile data technology, as defined by the radio sector of the International Telecommunication Union (ITU-R). LTE stands for "Long-term Evolution" and applies more generally to the idea of improving wireless broadband speeds to meet increasing demand.The ITU-R set standards for 4G

connectivity in March 2008, requiring all services described as 4G to adhere to a set of speed and connection standards. For mobile use, including smartphones and tablets, connection speeds need to have a peak of at least 100 megabits per second, and for more stationary uses such as mobile hot spots, at least 1 gigabit per second. When these standards were announced, these speeds were unheard of in the practical world, because they were intended as a target for technology developers, a point in the future that marked a significant jump over the current technology. Over time, the systems that power these networks have caught up, not just in the sense that new broadcasting methods have found their way into products, but the previously established 3G networks have been improved to the point that they can be classified as 4G.

Summary of the Comparison Between 5G And 4G

Table 4.1 Comparison Between 5G And 4G

Specifications	Fifth Generation (5G)	Fourth Generation (4G).
data transmission Speed	20 gigabits per second	300Mbps
Required resources	Packet switched,802.11ad or P802.11ay standardized by the IEEE	Packet switched,802.16m standardized by the IEEE
Home Broadband	Operate both wired and wireless	Operates through air waves that is wireless only
radio frequencies	24.25GHz and above	Maximum of 8GHz
Applications	Urllc, Mmtc and eMBB	Smart transportation, Road wireless and video surveillance etc.
Peak download	10gbit/s	1000Mbits/s
Bandwidth	100MHz	5-20MHZ optionally up to 40MHZ
encoding methods	Polar codes and LDPC	Turbo codes

level of latency	21-26ms	45 milliseconds
channels	between 100 and 800 MHz	20 MHz to 160 MHz
capacity	Million device per square kilometer	100,000 device per square kilometer
Access	SCMA OR NOMA	Multi-carrier-CDMA or OFDM(TDMA)

Conclusion

After years of hype, 5G is finally beginning to make some serious progress as it vies to take over from 4G, but for some, the progress made by 5G is still underwhelming. A growing number of manufacturers have released 5G-capable smartphones, while carriers like Verizon and T-Mobile are gradually building out their 5G networks. That said, there's still a lot of work to be done in making 5G connections available to a majority of mobile users. Even if you own a 5G smartphone right now, chances are you probably can't use it to its full potential, due to the relatively small amount of 5G network coverage. At the same time, LTE is also still advancing, and the gap between 5G and LTE may not be as big as you think. The reality is that 4G and 5G will coexist, which should help the integration of 5G and make the transition a little smoother. Judging by what has happened with 4G, it could be several years before 5G is widely available, but that day is still relatively fast-approaching. You can keep an eye on our guide to 5G to stay abreast of the latest developments. And who knows? Maybe in a few years, 5G will be so widespread that it's hard to imagine life without it.

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