TECHS

VOL. 10 | DECEMBER 2020

APPLICATIONS OF 5G

Smart Campus and The Technologies

Amos Keagan Hosea
A21EC0161

INDUSTRIAL TALK 5

Emerging Technology on Network Insfrastructure

Norain binti Mohd Sulaiman
A21EC0106

INDUSTRIAL TALK 6

5G is The New Paradigm and WiFi 6 : The Next Generation

Nur Athira Nabila binti Lukman
A21EC0109

5G

HOW DOES 5G HELPS?

Since 5G connections have low latency and are able to carry immense amount of data, it will fulfill all the requirements for XR technologies mentioned. This is because with all the improved features, it will cause less buffering and it will be more responsive compared to 4G connection. Through this, we are able to experience all these XR technologies with better sound and graphics and perhaps might be as real as the world we are living in right now.

XR OR EXTENDED TECHNOLOGY, WITH THE HELP OF 5G WILL EASE EVERYTHING

Virtual Reality, Mixed Reality and Augmented Reality have made their way into the education scene which provides a more immersive learning environment and a more unforgettable experience for students. But, these technologies are still unable to be deployed due to the challenges which are:

- These technologies are resource intensive which means it requires lots of data in order for it to be responsive.
- The data stream for these are complex and requires strict processing.
- Current network speeds are unable to catch up with the high bandwith and low latency requirements.

REFLECTION

5G, THE FUTURE IS NOW!

From what we see around us right now, it is evident that 5G is becoming more dominant in terms of being the best network due to its ability to have a higher performance compared to past networks like 3G, 4G LTE and 2G. As a result, it accelerates the development of XR technologies as the quality of streaming nowadays are rapidly improving and has become much more advanced and more sophisticated..

And ever since 5G becomes more common and more affordable for the public, education sectors started to invent and test their own XR teaching methods which proves that education is no more about pen and paper but also in forms of silicone chips and complex computing made to make us discover the world with a deeper understanding and a new perspective on how to make education fun for everyone.

Who knows, maybe in the future all students are required to bring their own VR headsets to school instead of bringing a load of books and maybe the whiteboard of the future will only be a hologram display of the subject you are learning. Technology has endless capabilities but it's up to us to uncover those capabilities.

In 2021, Fisk University has launched it's very first VR interactive learning for medical students. The campus decided to make a some sort of virtual cadaver lab to replace a physical cadaver lab since it cost much less than the latter. Other than that, they're also going to offer some history lessons with VR imaging of famous historical sites.

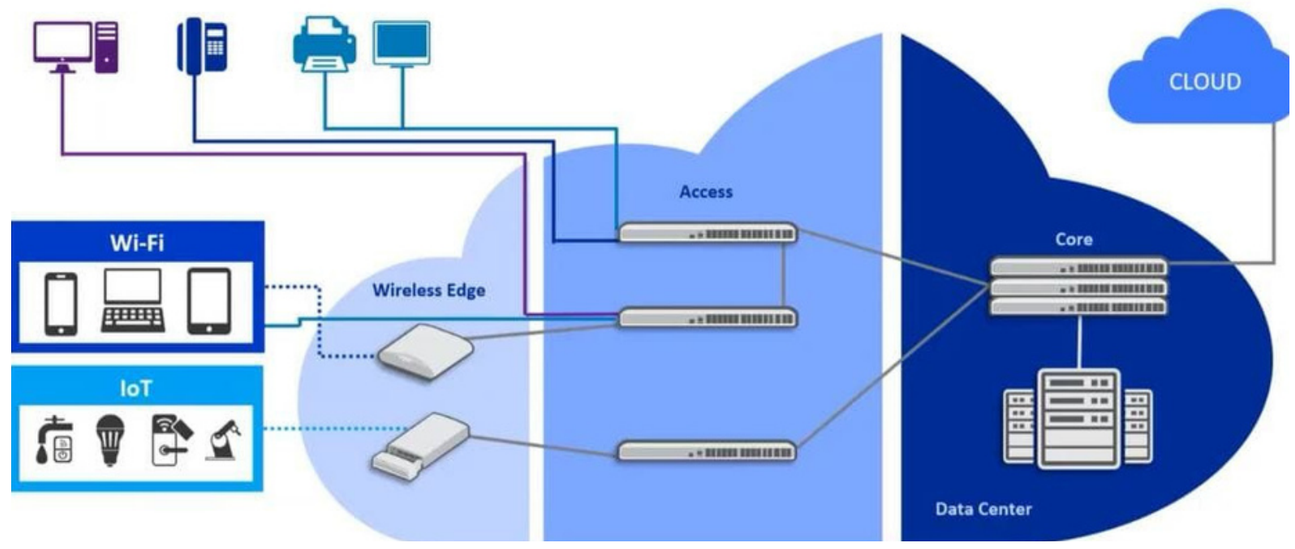
The students will be able to interact using the VR apparatus which is going to be using 5G connectivity. Due to 5G's low latency, this allows perfect synchronization between the VR apparatus to provide a more responsive experience and at the same time having a high bandwith enables fast transfer of data needed for the VR software to run without experiencing any sort of lagging during the lesson.

“Remote learning is broken and VR campuses enable professors and students to again come together to teach, learn and solve problems.” Steve Grubs,CEO of VictoryXR.

INDUSTRIAL TALK 5:
EMERGING TECHNOLOGY ON NETWORK INFRASTRUCTURE

Speaker

Mr Goh Bir Der
System Engineer at
COMMSCOPE Ruckus



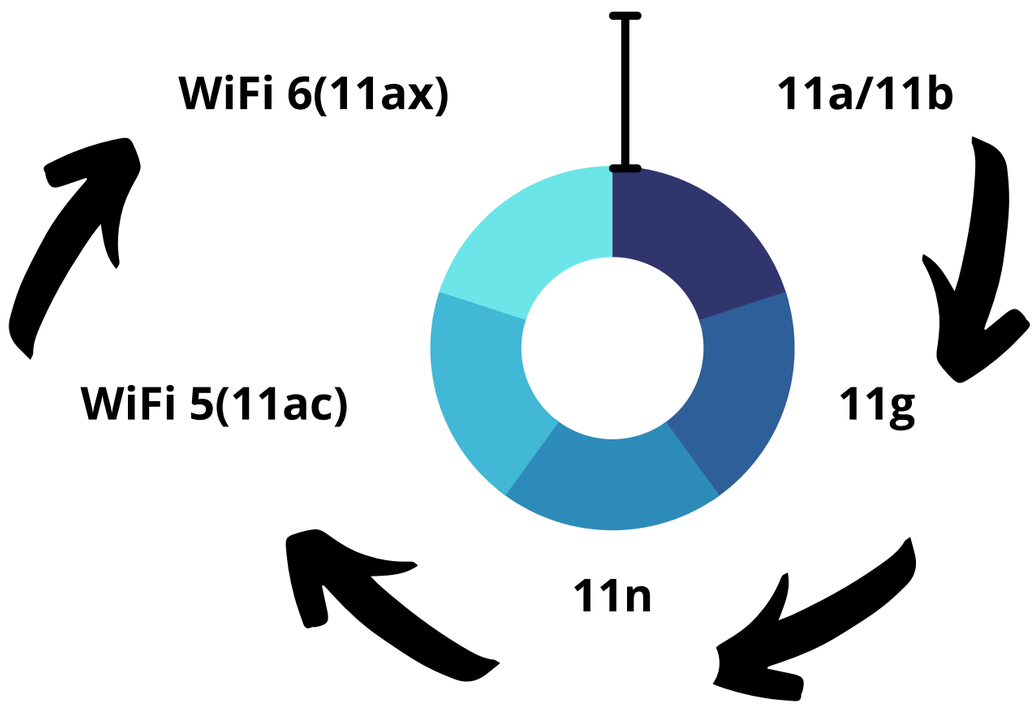
WHAT IS NETWORK INFRASTRUCTURE

The hardware and software that enable network connectivity and communication between users, devices, apps, the internet, and other things is referred to as network infrastructure. In our homes, for example, we have Unified networks with wireless routers that connect our devices to the internet. Universities' networks are similar, but more equipment is required. They require data centres, also known as cores, which hold billions of dollars in university data. The entire network infrastructure is interconnected and can be used for internal, external, or both communications. Network infrastructure devices are the components of a network that transport communications needed for data, applications, services, and multi-media.

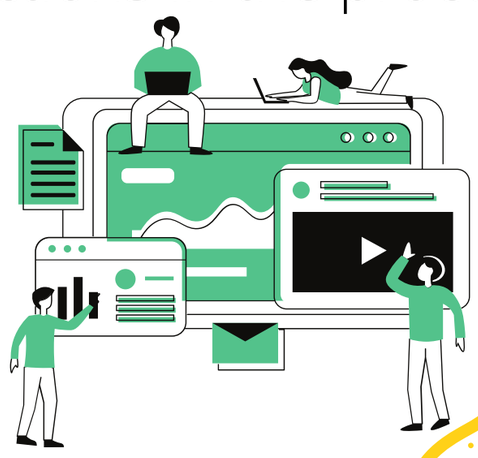
EXAMPLE OF NETWORK DEVICES

- **routers** - connect networks of your infrastructure, enabling systems to communicate.
- **firewalls** - sit between a router and application servers to provide access control, used to protect a trusted network (yours) from the untrusted network (the Internet).
- **switches** - switches connect systems within a network.
- **servers -** a computer program or device that provides a service to another computer program and its user, also known as the client.

WIRELESS PARADIGM SHIFT



Wi-Fi 6 is the next generation of Wi-Fi. It'll still do the same basic thing, connect you to the internet just with a bunch of additional technologies to make that happen more efficiently, speeding up connections in the process.



EXAMPLE OF WIFI 6 DEVICES

- iphone 11 and above
- samsung galaxy note 10
- playstation 5
- ipad pro
- HP spectre x360
- Dell XPS 13(2020)
- LG Gram 17

BY : NORAIN BINTI MOHD SULAIMAN

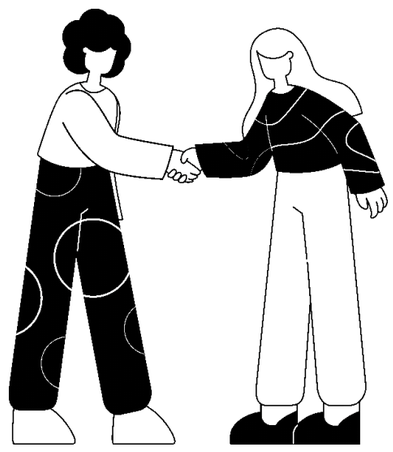
are you having a bad connections ?
it is time to upgrade to WiFi 6 !

WIFI6 SOLVES REAL PROBLEM

- **upgrade the MU-MIMO** - 'multi-user, multiple input, multiple output' allows a router to communicate with multiple devices at the same time . (up to eight devices)
- **OFDMA** - 'orthogonal frequency division multiple access' allows one transmission to deliver data to multiple devices at once.
- **power effieciency** - improve battery life
- **better security** - new security protocol, WPA3 makes it harder for hackers to hack by constantly guessing them, and it makes some data less useful even if hackers manage to obtain it.
- **long OFDM symbol** - guarantee outdoor realibility
- **BSS coloring** - enhanced wifi coexistence

'BOTTLENECK' HAS SHIFTED IN THE ACCESS LAYER

- Routers or switches running at capacity tend to induce escalating bottlenecks, which result in significantly longer times for clients to submit messages to servers on different networks.
- New bottleneck is not between the AP and the client but now between AP and switch .
- with wifi 5 , we will get 1Gbps connections from2.5GbE . but with wifi6 , we will get 5 Gbps connections out of GbE from the switch .
- it is time to consider upgrading beyond 1Gbps connections !



REFLECTION

At the first minutes of the talk, Mr Goh shared with us the situation of the world for the last 24-months with covid-19. Everyone living their daily lives virtually using their devices . Almost everything is held virtually using the internet including the meetings, bills payment and to keep in touch with the relatives . With the emerging technology in network infrastructure , we are able to achieve convenience in life . for instance in the campus , we have smart lighting , environment air monitoring , automated lock and much more . Those innovations are undeniable useful for the students to do the experiments and research .

All the technology expressing the phrase ‘Smart Campus’ and networking those tech is beyond important. Therefore , to make sure the networking is working well , we need a solid network infrastructure. Some employers might have their company lost out on business because of unforeseen problems with their network connectivity. To easily maintain the network ,we have to build the more automated, self-optimizing and healing network environments . this is because to obtain the optimised and secured network infrastructure,it is time consuming and it is not an easy task . we need to gain more knowledge and to master this field to improve the existing network infrastructure technologies for the next generation.

BY : NORAIN BINTI MOHD SULAIMAN

5G IS A NEW PARADIGM

The fifth generation of wireless technology systems is known as 5G. It offers quicker speeds than previous generations, comparable to those offered by fiber-optic lines. Earlier testing of this technology revealed real-world rates reaching from 700 to 3025 Mbps (3.025 Gbps), which users may encounter once 5G becomes commercially available. Movies that took minutes to download on 4G will take seconds to download on 5G.

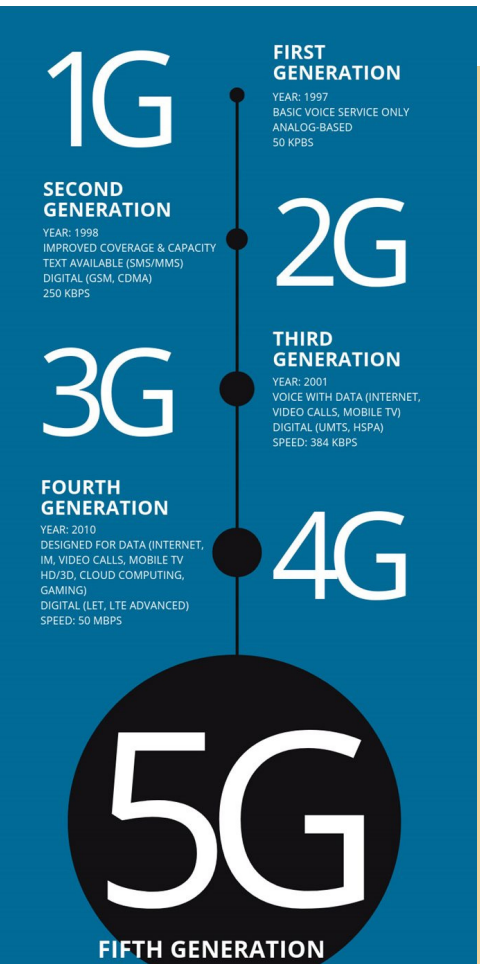
Once 5G is widely available, the impact on these industries could be transformative for three main reasons:

1. Because 5G devices have lower latency, they can transmit larger data streams more quickly.
2. 5G devices are more reliable, allowing for better data transfer in extreme conditions.
3. 5G is more adaptable than Wi-Fi and can accommodate a broader range of devices, sensors, and wearables.

Furthermore, 5G will contribute to the reduction of inequality by increasing access to and lowering the cost of important services such as healthcare and education. 5G will assist to minimise our carbon footprint and save natural resources by broadening the scope of wireless technologies and making devices more autonomous. Last but not least, economic expansion will increase both direct and indirect employment in all economies.

Market development insights 5G will start to realize its full transformational potential from 2022 onwards with the adoption of AR and VR.

A trial of 5G remote driving technology using an ordinary consumer car was held at the 2017 Mobile World Congress in Shanghai. Huawei provided 5G wireless solution connecting SAIC Motor's smart car (iGS), while China Mobile provided the 5G connectivity.



Broadly speaking, 5G is used across three main types of connected services, including enhanced mobile broadband, mission-critical communications, and the massive IoT. A defining capability of 5G is that it is designed for forward compatibility—the ability to flexibly support future services that are unknown today.

Enhanced mobile broadband
In addition to making our smartphones better, 5G mobile technology can usher in new immersive experiences such as VR and AR with faster, more uniform data rates, lower latency, and lower cost-per-bit.

Mission-critical communications
5G can enable new services that can transform industries with ultra-reliable, available, low-latency links like remote control of critical infrastructure, vehicles, and medical procedures.

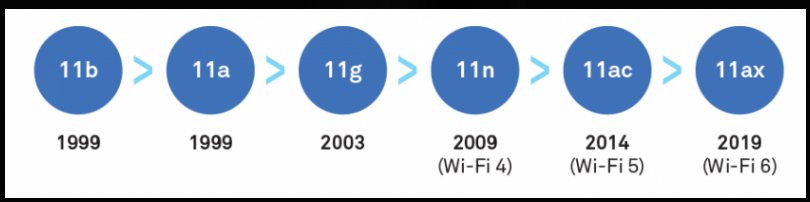
Massive IoT
5G is meant to seamlessly connect a massive number of embedded sensors in virtually everything through the ability to scale down in data rates, power, and mobility—providing extremely lean and low-cost connectivity solutions.

NUR ATHIRA NABILA BINTI LUKMAN A21EC0109

The term "Wi-Fi" was created by the nonprofit Wi-Fi Alliance and refers to a group of wireless networking protocols that are based on the IEEE 802.11 network standard. Wi-Fi has been around since the late '90s but has improved dramatically in the last decade. Wi-Fi 6 is a substantial upgrade over previous generations, though the differences may not seem immediately obvious to the average user. These changes might not dramatically change the way we use wireless routers or wireless networking but instead consist of many incremental improvements that stack up to be a substantial upgrade.

The first big change is that Wi-Fi 6 allows for potentially faster connection speeds. As usual, the latest Wi-Fi standard offers faster data transfer speeds. If you're using a Wi-Fi router with a single device, maximum potential speeds should be up to 40% higher with Wi-Fi 6 compared to Wi-Fi 5. Wi-Fi 6 accomplishes this through more efficient data encoding, resulting in higher throughput. Mainly, more data is packed into the same radio waves. The chips that encode and decode these signals keep getting more powerful and can handle the extra work. This new standard even increases speeds on 2.4GHz networks. While the industry has shifted to 5GHz Wi-Fi for less interference, 2.4GHz is still better at penetrating solid objects. And there shouldn't be as much interference for 2.4GHz as old cordless telephones and wireless baby monitors are retired.

Wi-Fi 6 is designed to improve speed, increase efficiency and reduce congestion in heavy bandwidth usage scenarios. Wi-Fi 6 was originally built in response to the growing number of devices in the world. If you own a VR device, multiple smart home devices, or simply have a large number of devices in your household, then a Wi-Fi 6 router might just be the best WiFi router for you.
Wi-Fi 6 expands the WiFi band from 80 MHz to 160 MHz, doubling the channel width and creating a faster connection from your router to the device. With Wi-Fi 6, you can enjoy 8K movies, large file downloads and uploads, and responsive smart home devices – all without buffering. Whether you're gaming, working, or just streaming video, upgrading to Wi-Fi 6 is worth considering.



Evolution of WiFi Technology

WIFI 6 VS 5G

Wi-Fi and 5G offer complementary functionalities. Where the user experience is concerned, 5G and Wi-Fi 6 can both achieve gigabit speeds and low latency. Because Wi-Fi has a lower cost to deploy, maintain, especially where access points need to serve more users—it will continue to be the predominant technology for home and business environments. This provides great support for dozens of data-hungry devices, like PCs, tablets, smartphones, streaming devices and printers, which must all connect to the network. It will also be used for connected cars, smart city deployments, and even for large manufacturing operations. The two technologies handle network management differently. Wi-Fi uses unlicensed spectrum, so you and your whole neighborhood can each have your own Wi-Fi network without getting a license to use it. However, this can mean your Wi-Fi performance is impacted by how many neighbors are using their network at the same time. When used in offices and other enterprise environments, Wi-Fi tends to be heavily managed to meet a desired performance goal. 5G and LTE networks typically are managed by operators and use a dedicated, licensed spectrum that requires subscription fees to access. As with LTE, 5G performance will depend on how many "bars" you have—in other words, how close you are to a base station and how many other people are using the network. Of course, there are exceptions to these generalizations. At the end of the day, whether to use 5G or Wi-Fi 6 depends on the specific use case.

REFLECTION

From the industrial talk 6, delivered by Mr. Nicholas Yong (Executive Industry Solution Manager from Huawei), we gained a lot of new information about the evolution of the network infrastructure like 5G and WiFi 6. 5G offers enormous prospects for the economy and all members of society, including consumers, residences, enterprises, and communities. Many services will be democratised as a result of the possible savings and increased efficiency of new technology. All populations will benefit from increased access to information and education as a result of connectivity. New business opportunities in a variety of industries will increase investment and employment. 5G will contribute to the long-term goal of decreasing our carbon footprint and conserving natural resources by broadening the scope of wireless technologies and making devices more autonomous. 5G communications technology will be more inclusive, progressive, proven, and powerful than any prior generation of communication technology. WiFi 6 offers the increase of battery life for devices accessing a WiFi 6 network. This improvement is beneficial to the average user and can be a critical factor in enabling low-power devices that comprise the Internet of Things (IoT) to make use of WiFi communication. Improvements in Multiple In/Multiple Out (MIMO) capabilities now allow a router with multiple antennas to both send and receive data transmissions from multiple devices at the same time. WiFi 5 could only send, but not receive multiple signals at once. This will lead to better performance in situations where many users are attempting to access the network. These are some of the ways that WiFi 6 alleviates the problems of accessing WiFi in congested settings such as sports arenas or entertainment venues. It promises to make connecting to wireless networks more efficient no matter where you are located.

NUR ATHIRA NABILA BINTI LUKMAN A21EC0109