

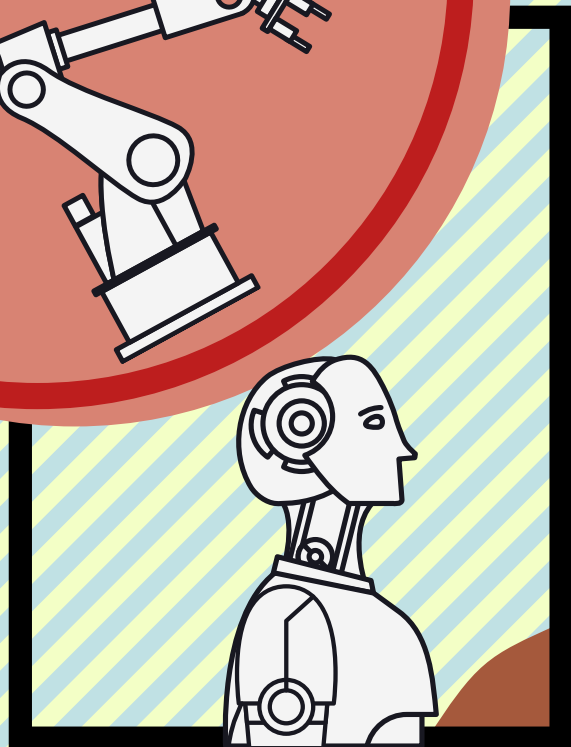
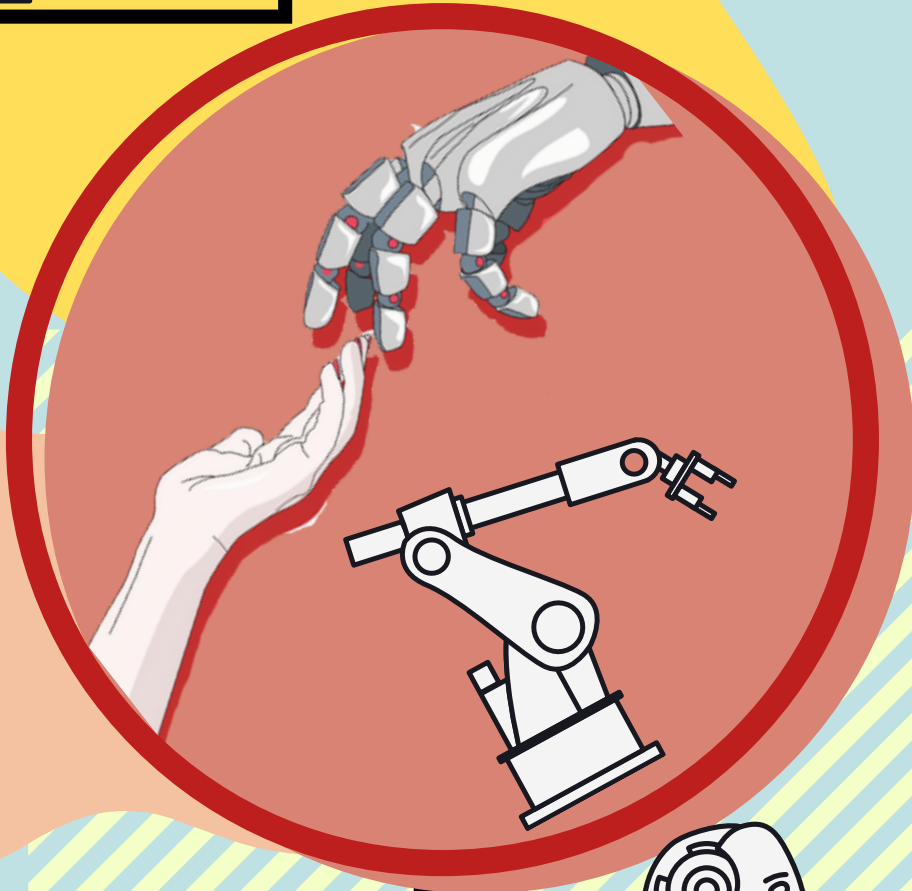
# INDUSTRIAL

13.12.2021

APPLICATION OF 5G IN  
SMART CAMPUS

EMERGING TECHNOLOGY ON  
NETWORK INFRASTRUCTURE

5G, WiFi 6 AND EMERGING  
NETWORK TECHNOLOGIES  
(HUAWEI)



REVOLUTION

MAYDAY  
MAYDAY  
MAYDAY



AIN BATRISYIA BINTI NORAZLAN  
(A21EC0009)



LEE RONG XIAN (A21EC0043)



MUHAMAD AKMAL BIN SHAMSUL HAMIDI  
(A21EC0057)



NOOR HANNANI SYAMIMI BINTI MOHD SUFFIAN  
(A21EC0104)



SITI NURKAMILAH BINTI SAIFUL BAHARI  
(A21EC0131)



## IN SMART CAMPUS

A SMART CAMPUS is a basic unit of a smart city and an essential path to an intelligent society.

## WHAT IS 5G?

5G is the 5th generation mobile network. It is a new global wireless standard after 1G, 2G, 3G, and 4G networks. 5G enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects, and devices.



5G

## FACIAL RECOGNITION AND VIDEO RETRIEVAL

- Distribution of the blocked person
- Restriction on entering the zone
- video analysis

## FIRE EXTINGUISHING LINKAGE

- Intelligent pre-incident warning
- System linkage and one-click handling during the incident
- Intelligent post-incident analysis

## PERIMETER LINKAGE

- Video to assist on case handling
- System linking handling (a system links two or more material devices with a network of communication)

## REFLECTION

Based on the information, the application of 5G in smart campuses has broadly increased the convenience and efficiency of human beings. We observe that implementing 5G in comprehensive security protection and safety systems located in the smart campus provides a safer environment to society because the security has dramatically improved. Besides, an effective way of attendance management has been ensured through automatic attendance based on a face recognition system using 5G. After seeing the conveniences brought by the application of 5G, we long for the application of 5G could be widely implemented in Malaysia to ensure a better quality of living.

# EMERGING TECHNOLOGY ON NETWORK INFRASTRUCTURE

Five technologies have been highlighted.

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## WI-FI & ACCESS POINT

The latest wireless technology is Wi-Fi 6. Wi-Fi 6 can solve lots of problems. Firstly, it increased the efficiency of how the Wi-Fi transmits the data. On top of that, with MU-MIMO technology, the access point can communicate with multiple devices at one time. It also improved the battery life, especially for IoT devices. Also, BSS

colouring will increase Wi-Fi performance due to less interference happening in the networks. Lastly, it has 1024-QAM, which can carry 10 bits rather than 8 bits.

There are two network elements: the WLAN controller and Network Management System. Why do we need a controller when too many access points and switches in the networks? Because network controller is a system that has the function to centralise and manage all the access point together.

## UNIFIED NETWORK MANAGEMENT

## MULTIGIGABIT TECHNOLOGY

When talking about multigigabit technology, we need to look at the campus core networks. Rapid increases in Wi-Fi speeds, IoT devices/smart buildings and wired edge speeds has caused a dramatic increase in core traffic.

## INTERNET OF THINGS (IoT)

The evolution of the network is like this: Wired Devices à Wireless Devices à IoT devices give a lot of benefits: cost reduction, enhanced customer experiences, increased efficiency & productivity, and increased business opportunities. Despite all the benefits, it also has challenges when deploying IoT solutions involving connectivity and security. For additional information, some IoT equipment in the market makes IoT deployment risky. Some are smart locks, sensors, thermostats, CCTV and many more.

Too much IoT equipment will make it too complex for the average human to manage it. According to the research, 42% of network professionals spend too much time troubleshooting, while 38% cannot proactively identify network performance issues.

Let's take a look at the ESG Network Predictions for 2020;

"Moving forward, organisations won't be able to rely on acts of individual heroism, but rather will need to evolve to more automated, self-optimizing, and healing network environments."

CLOUD ANALYTICS

**SMART CITY** places a physical infrastructure on the network infrastructure using IoT devices to connect buildings, vehicles, people, and things. Examples of smart cities are Wi-Fi providers, smart landing systems across the street and sensors.

The smart home has Amazon Alexa technology or IoT equipment such as intelligent lighting systems in the home environment. **SMART HOME**

What is a domain? According to a resource, apart, in the context of networking, it refers to any group of users, workstations, devices, printers, computers and database servers that share different types of data via network resources.

google.com and wikipedia.org can be examples for the domain. Using a domain name makes it much easier to identify a location on the Internet than using a numeric IP address.

**DOMAIN**

## REFLECTION

From the industrial talk, we are beneficated from knowing about developments contributed by the Wi-Fi 6 technology and multigigabit infrastructure. Numerous problems have been addressed by Wi-Fi 6 technology, such as network capacity, device battery life, and just to name a few. Besides, the implementation of IoT solutions improves customer experiences, increases productivity and increases business opportunity. To exemplify, a few IoT devices that can be implemented in school are environmental air monitoring, smart lighting and automated locks. By referring to the contributions of these technologies, we firmly believe that our life quality has greatly improved in many aspects of our life, namely the ease of information access and the ease of living. It is hoped that the Wi-Fi 6 technology will be greatly implemented in Malaysia soon.

## SMART CAMPUS

The innovative campus is a combination of smart city and smart home where they can provide “3S”, which are smart living, smart learning, and smart security. Here are the examples for 3S:

- Smart living – smart id cards, in-building LTE, smart lighting
- Smart education – flexible learning spaces, digital portals, virtual labs
- Smart security – connected entry, tracking assets, CCTV&VMS

**EMERGING TECHNOLOGY**

**ON NETWORK**

**13.12.2021 INFRASTRUCTURE**

# Wi-Fi 6

Is the next level of Wi-Fi. It will still carry out the same essential activity as the generations before it connects users to the internet. In this version, there will be a lot of different technologies to make that result effectively, increase the connections in operation and give a better experience to the user and the community.



Huawei H6ws8000-10WiFi6 + Smart Home Router

## ADVANTAGES

Wi-Fi 6 gives many advantages to its user. First, the coverage range increased up to 40% from the previous generation. Wi-Fi 6 enables the user to have a strong internet connection at every house's edge—next, larger bandwidth. Wi-Fi 6 has improved up to 2.8 times compared to before. Lastly, Wi-Fi 6 improves battery life. Wi-Fi 6 will let devices plan out communications with a router by reducing the time to make the antennas stay powered on to transmit and search for signals. So, batteries will less drain or improve battery life.

## HUAWEI AIRENGINE WIFI 6 TECHNOLOGIES

Huawei AirEngine is one of the technologies that use the Wi-Fi 6 feature. These technologies provide a higher performance because of the 16X16 MU-MIMO functions. Next, Huawei AirEngine Technologies has the most stable experience through the intelligent antenna, dynamic turbo, and joining scheduling MU-MIMO and OFDMA.

Wi-Fi 6 provides four times more excellent wireless performance in crowded areas than Wi-Fi. As the Internet of Things becomes more established in homes and businesses, everyone will benefit from it. The increased wireless interference is led by the number of gadgets requiring Wi-Fi connection, particularly in the city.

**WI-FI 6  
INCREASE THE  
PERFORMANCE  
IN A  
COMMUNITY**

Wi-Fi guarantees connectivity with a broad scope of gadgets and serves legacy tools. Wi-Fi 6 can split up the bandwidth into narrower sub-channels with a greater spectrum available, providing a better method for clients and access points to interact along and support different linked devices on any network. Wi-Fi 5 is slightly struggling to tackle these emerging problems. So, when the Wi-Fi is improved, the business also improves.





## 5G DEVICE

Many devices use the 5G features. One of the popular devices is Virtual Reality (VR). 5G is required for this device as it provides high throughput for retina experience VR. Next, low latency of the 5G features is vital to avoid motion sicknesses like dizziness or fainting. So, users will have greater realism in VR and more immersive entertainment.



Huawei Virtual Reality Headset

## A FEW UNIQUE FEATURES OF 5G

Firstly, 5G devices are built, in lower latency, enabling more significant data streams to be transmitted faster. Other than that, 5G also has higher and larger bandwidth that can deliver more information than a low bandwidth network given the same amount of time. Because this can make the web feel faster. 5g is applied in developing smart cities, smart homes, and industrial automation.

## EXAMPLE OF 5G IN EDUCATION DOMAIN

Virtual Reality (VR) provides a different experience in teaching and learning systems. With advanced technology, teaching and learning system become unique and exciting. In the classroom, the interaction is by using gestures. Virtual Reality has helped students in numerous ways. Firstly, students can learn well through significant experience. VR has provided students with a chance to learn through experience and not traditional reading and writing methods. Students might get bored with the classic teaching style. The modern technology of VR will attract students' interest as it is more exciting for students through its visual experience.

## REFLECTION

Throughout the industrial talk, we are able to visualize and imagine how mightiness of the great invention of 5G and Wi-Fi 6 technology. The latest generation of wireless technology system, 5G, enables the speedy transmission of larger data streams, supports more applications with index 1 as well as fosters new opportunities and benefits. Moreover, we also get to know that the low latency of 5G is very prominent in enabling the use cases such as Augmented Reality (AR), Virtual Reality (VR), and Automation and Entertainment. Besides, Wi-Fi 6 not only improves wide network coverage but also provides new video services as well as supports better experiences for the end-users. We are amazed by the devices which are designed using both Wi-Fi 6 or 5G technology, namely Huawei Air Engine Wi-Fi 6, Smart Antenna and Speed DEMO. With these technologies, we are able to ensure a safer and more sustainable future.

**13.12.2021**

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