

BYTEBUZZER

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5G IN SMART CAMPUS

WHAT IS A SMART CAMPUS,
5 EXAMPLES OF IOT
IMPLEMENTATION AND
BENEFITS

5G, WIFI6 AND EMERGING NETWORK TECHNOLOGIES (HUAWEI)

A TALK WITH LEADING
PROVIDER OF ICT
INFRASTRUCTURE AND SMART
DEVICES

"EMERGING TECHNOLOGY ON NETWORK INFRASTRUCTURE" (COMMSCOPE MALAYSIA)

AN EXCLUSIVE TALK WITH
COMMSCOPE MALAYSIA ABOUT
NETWORK INFRASTRUCTURE
WIFI 6 AND BENEFITS

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5G IN SMART CAMPUS

WHAT IS A SMART CAMPUS?

A SMART CAMPUS PROVIDES HELPFUL AND ENGAGING EXPERIENCES BY UTILISING MODERN NETWORK INFRASTRUCTURE AND INTERNET-CONNECTED GADGETS. IT CONNECTS PEOPLE, DEVICES, AND APPS, ALLOWING INSTITUTIONS TO MAKE DATA-DRIVEN CHOICES TO ENHANCE SECURITY AND RESOURCE ALLOCATION

Examples of IoT implementation in smart campus

● Smart Street Light system

IR sensor is connected to street light to sense a presence or movement so that it can control the brightness of the street light. This brings power saving because the street light is turned off whenever there is no presence or movement in the nearby area.

● Smart Parking system

Consist of IR sensors and cameras. IR sensors will sense the empty lot in the parking lot and LED display will show arrow marks to direct the vehicle to the particular parking lot.

● Smart Automation

Smart automation is about controlling the power for light and fans to turn ON/OFF. Using motion detection to sense motion or movement which contribute to power saving.

● Smart Library

Combined with an Android application that is created and installed in all student phones. Inform all students about the books or other resources available in the library. Also inform the students about the books they borrowed.

● Smart Office

A database consists of information about students, faculty and others related to the campus. All students and members in the campus can access the information easily through android application. The information consists of details about students such as full name, matric number, attendance, etc.

● Smart Security

Smart security consists of smart cameras, biometric locks, motion sensors, gunshot sensor, facial recognition etc.

WHAT IS 5G ?

FIFTH-GENERATION WIRELESS (5G) IS THE MOST RECENT VERSION OF CELLULAR TECHNOLOGY, DESIGNED TO DRAMATICALLY IMPROVE WIRELESS NETWORK SPEED AND RESPONSIVENESS.

Five benefits of IoT in smart campus

1. ENHANCE STUDENT EXPERIENCE.

Students demand home-like internet connection in school and in their dorms. Colleges must deliver modern campus experiences that are convenient, secure, and personalised in order to accommodate tech-savvy, always-connected students. In addition, accessibility is essential. Students should be able to travel freely around campus and rely on services that are intuitive, convenient, and simple to use. As the year 2020 has demonstrated, on-campus experiences must adapt swiftly to accommodate the requirements of off-campus students. Universities must provide similar experiences regardless of whether the class is held in person, online, or via satellite sites to accomplish this.

2. ENHANCE COLLEGE CAMPUS SAFETY.

Good visibility and regular patrols are no longer sufficient to provide the protection that kids (and their parents) desire and require. Students and their families can have peace of mind thanks to internet-connected security services. Smart campus solutions assist in the reduction of crime while also raising awareness. Universities can implement intelligent technology to secure assets and people using reliable connected systems.

3. MINIMISE OPERATIONAL COST.

Administrators can save money by connecting buildings and utilities to smart technologies. Automation tools, for example, free up administrative time and enable higher education administrators to reallocate resources. Sensors in HVAC systems and other devices can be used to automate temperature, lighting, and utility usage. You can recognise maintenance needs and quickly dispatch people to undertake routine maintenance, such as replacing light bulbs before they burn out, in a connected environment.

4. ASSIST DATA-BASED DECISIONS.

Education requires data-driven and flexible decision-making. Smart campus design gathers real-time data that can be used throughout our corporation.

5. ESCALATE UNIVERSITY REPUTATION.

Every aspect of a smart college campus improves its reputation. Your university has a competitive advantage thanks to enhanced security measures, proactive student support services, and modern educational methods.



5G, Wi-Fi 6 and Emerging Network Technologies

(HUAWEI)

| 5G

5G is the fifth-generation of wireless technology, engineered to be high in speed and high responsiveness to outdo the hindrances and challenges that we faced today with 4G. 5G provides speeds faster than you could ever imagine than any previous generation, comparable to those delivered via fiber-optic cables that can be used on-the-go. 4K videos or films that took hours or minutes to download with 4G, will take seconds with 5G.

Once 5G becomes widely used globally, the effect on these industries could be transformative for three (3) main reasons:

- 5G devices are lower latency, enabling faster transmission of larger data streams
- 5g devices are more reliable, enabling better transmission of data in extreme conditions
- 5G is more flexible than Wi-Fi and can support a wider range of devices, sensors and wearables.

New opportunities and benefits are on our way as 5G will be a game changer in our lives. Holidays would not feel the same with the 5G network that can stream our experiences live, without any challenges. Industries able to equip Hi-Tech Parks with fully connected and intelligent machines to attract Hi-Tech investors. In the meantime, creating new job opportunities for younger generations. Education will feel alive and help students excel in their studies with AR/VR based Virtual Education.

| Wi-Fi 6

Wi-Fi 6 (802.11ax) is faster than the previous versions. Faster internet is constantly in demand, especially as we consume more bandwidth-demanding apps, games, and videos with our laptops and phones. Wi-Fi 6 is the new generation of Wi-Fi and it has been verified for more than three years. Everyone is surrounded by screens; laptops, telephones, tablets. Each usage of devices uses the Wi-Fi to connect to the internet resulting in slower internet speeds due to the overburdened connections. With Wi-Fi 6, it has been designed to increase speed, efficiency and reduce congestion in high-bandwidth situations. This Wi-Fi connection is empowering enterprises' digital transformation with larger bandwidth, lower latency, IoT-oriented energy saving and most importantly, anti-interference.

Wi-Fi 6 improves in speed because it supports gigabit broadband promotion — 1 Gbit/s to mobile phones, personal computers, fast download, and cloud backup experience. The maximum speed the Wi-Fi 6 can reach is up to **40%** faster than Wi-Fi 5 by using a router on one device. The network speed is four times better than the previous version. If you download a game that requires seven-minute at 30 Mbit/s speed, Wi-Fi 6 can do the process in 20 seconds at 1000 Mbit/s. The advancement in Wi-Fi 6 technology has allowed new video services; multi-screen IPTV, online education, VR, and E-Sports. Orthogonal Frequency-Division Multiple Access (OFDMA) is a feature of Wi-Fi 6 that allows access points to serve multiple clients simultaneously in a sequential scheduling.

Another feature is Basic Service Set (BSS) colouring, a method that enables data to transmit over the same channel at the same time because various colours correspond to different users. These features support a better multi-user experience with more than 100 terminals connected, and the power consumption of terminals is reduced by **30%**. The capability of "Target Wakeup Time" (TWT) allows the device to change the time and the way it receives and transmits data. With all these features and advantages, the inclusion of Wi-Fi 6 is likely to become even more common year by year.

DEVICES USED

5G

- HUAWEI Smart Antenna
- HUAWEI Mate 30E Pro
- HUAWEI Enjoy Z

Wi-Fi 6

- HUAWEI AirEngine
- HUAWEI WiFi AX3 (Quad-core)
- iPhone 12 series

5G and Wi-Fi 6 are two similar technologies but with different implementations in different scenarios. Wi-Fi 6 provides an indoor network with ultra-high density buildings or houses such as home network, supermarket, universities, classroom and stadium while 5G technology provides an extensive outdoor coverage for industries, and cities such as urban areas,



"These two technologies will bring digital to every person, home, and organization for a fully connected, intelligent world just like HUAWEI's vision."

Stronger and powerful technology have been invented in the modern world. With the passage of time, much more will be invented as the day comes. As a result, life becomes easier, such as the ability to communicate with individuals in faraway places in a short amount of time. With the existence of 5G and Wi-Fi 6 technology as our internet facility, many things can be achieved greatly. This digital transformation can be seen in the midst of COVID-19 pandemic where everything becomes virtual. From meetings, classrooms, hanging out, everything has become on-screen experiences. Malaysia has transformed drastically to adapt with the digitalized world. Nowadays, we need network connection to stay connected with our lives throughout the day for us to do our jobs, tasks and communicate. Therefore, the advancement in technology (5G and Wi-Fi 6) has increased the efficiency and productivity of people's life as well as impacted the intellectual capabilities of learners to move forward.

“Emerging Technology on Network Infrastructure”

Network infrastructure refers to all the resources in the network that made internet connectivity, management, communication, and also business management become possible. Hardware and software resources, devices, and systems make up the network infrastructure which enables communication path for the end-user, application, services, devices and so forth.

WHAT YOU NEED TO KNOW ABOUT WIFI 6

The wifi 6 comes with handy features and benefits. Wifi 6 is the new generation of wifi which is equipped with a bunch of new technologies that will offer a significant boost in internet connectivity and efficiency. OFDMA is one of the new technologies that help to improve connectivity speed. This technology will enable the access point or router to transmit data to multiple devices, therefore, increase the efficiency of how the data is transmitted to other devices. WIFI 6 also provided an upgraded version of MU-MIMO which allows the access point or router to communicate with multiple devices at one time. There are other technologies that come in with WIFI 6 such as Target Wake Time(TWT) and BSS Coloring.



TWT will enable devices to schedule their wake-up time to send and receive data resulting in improved battery life. Meanwhile, BSS Coloring deals with network interference, therefore, increasing wifi performance.

Devices Used

Access point

- Access point is a wireless network device that operates as a portal that connects multiple wireless devices to a local area network. The access point is then connected to a wired router or switches via ethernet cable to enable the devices access to the internet.

Switch

- switches are equipment that connects multiple devices through the computer network and transmits the data to the core switches that are located in the data centre via ethernet cables. In enterprise networks, these switches are known as distribution switches and are used to connect all the devices and access points in a building to a core switch.

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of the example for wifi 6

The smart campus which is a combination of a smart city and a smart home. A smart campus offers a useful and interactive experience to the students and staff by implementing modern network infrastructure and Internet of Things(IoT) solutions to the campus. It brings people, devices, and apps together digitally, therefore enabling universities to make data-driven decisions to improve security and resource management. The smart campus will arguably improve students' learning experience, enhance security, optimization of resources, and also attract new students to the campus.



REFLECTION

Through industrial talk 5, we are able to learn and understand the working of the network infrastructure of home networks and enterprise networks such as how access points, switches, and core switches work together to provide an internet connection to the end-users and also smart devices. This talk also gave us a lot of input on what WIFI 6 is and the multiple solutions that can be achieved through the technologies from WIFI 6. In addition, we also believe that the idea of implementing smart campuses is very intriguing and also very practical to enhance the teaching and learning experience for both students and staff.