Information Technology System Magazine

Application of 5G in Smart Campus

"Emerging Technology on Network Infrastructure"

5G, Wifi6 and Emerging Network Technologies

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Application of 5G in Smart Campus

For several years, most business areas have been subjected to digitalization efforts, The data traffic load of mobile client users on the smart campus network platform has increased due to the growth of mobile Internet technology and the adoption of intelligent mobile terminals has made many student having problem with their studies. However, with the implementation of a 5G network, this problem will be resolved with ease. Aside from that, a 5G network has been implemented in some campuses, leading to the development of smart campuses.

Person/vehicle management is a typical 5G service application provided by smart campuses. This has resulted in a safer and more organized campus for students. As we can see, some staff or student may forgot to clock in their attendance which will cause him to be absent. So, with the facial recognition provide by the smart campus. It will reduce the waiting time for clock-in and cases of forget to clock in. Moving on to the following point, certain Malaysian campuses experience significant traffic in the morning due to a large number of cars. They may be late as a result of this. So, for the vehicle fast passing solution it need to integrated with the guess management system in order to recognize vehicle plate numbers and accept online self-service payments. This will streamline the procedure while also improving vehicle traffic efficiency and user satisfaction. Not to mention that a lot of problem have been solved with ease with the implementation of 5G

Smart campus is a campus that provides supportive and engaging experiences by utilizing advanced network infrastructure and internet-connected devices. It connects people, devices, and applications, empowering universities to make data-driven decisions to improve security and maximize resources.

Reflection

Therefore, the implementation of 5G have make it easier for many students and employees. The Application of 5G in Smart Campus not only make the traffic more efficiency but also prevent unwanted guest such as criminal to get into the campus to cause havoc or a crime. Not only that, having the facial recognition make people their being watch all the time therefore this might will led to lower percentages of crime to happen in the campus. Overall, having 5G in the campus make the life easier for the student, staff and also the lecturer

INDUSTRIAL TALK 5

"EMERGING TECHNOLOGY ON NETWORK INFRASTRUCTURE"

Infrastructure

Description of the infrastructure discussed in the talk

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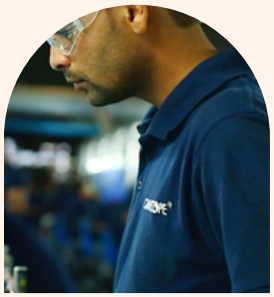
Devices

IoT devices used

page 04



Examples

Examples of Wi-Fi 6 devices

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INFRASTRUCTURE DISCUSSED IN THE TALK

Industrial Talk 5 was about emerging technology on network infrastructure and delivered by Mr. Goh Bih Der, a system engineer from CommScope Malaysia(an American global network infrastructure provider company based in Hickory, North Carolina).

Commscope RUCKUS is a company that provides software & SaaS, control & management, switches and access point. They are also one of the first companies that provide Wi-Fi 6 and already certified by the government. Nowadays, there are a lot of IoT devices in the market and most of it needs installation apps by the IoT vendor brands but for Commscope, people can use their AP to communicate with other brands' equipment, no need the installation by the vendor.

Next, CommScope also provides RUCKUS analytics which can help in incident analytics, service validation, config change analysis, network health monitoring, client troubleshooting, reporting, dashboard and data explorer. Enough about the company; let's get to the main point of the day. Employees or students used to work and study physically before covid, but because of covid, we now need to learn about hybrid work and study or remote working. Something has changed in IT work over the last 24 months. Many businesses are moving to a remote working environment, and some digital transformations, such as online shopping, are also taking place. Aside from that, during this time period, people are always curious about their internet usage, which is why the analysis is taking place. Analyses are also performed as a result of remote working, which is enabled by IT infrastructure, which also allows for some remote management. If a student needs to access something in the university resource center, they can always use VPN.

We have a Unifi network at home, which has a wireless connection, but there is some additional equipment required for enterprise, university, or large network connections. In the diagram, we can see that any device that requires an internet connection, such as a mobile phone or a laptop, will connect to the wireless edge, and at the same time, there are IoT devices that connect with IoT protocol and will connect to different switches, and there is a cable that connects them to the core switch, which is similar to a data center that also has a firewall, and so on.

Wi-Fi 6 is the most recent wireless paradigm shift. As IT professionals, we no longer speak of "theoretical peak speed," but rather of "overall network capacity. If you use a new access point but an old version of wireless devices, you will not get that speed, and vice versa. That is why we speak of network capacity as a whole. We can improve wireless access points by upgrading them to Wi-Fi 6 because it can solve real-world problems such as network capacity (OFDMA/ MU-MIMO), peak throughput (1024-QAM), outdoor reliability, and many more. There are already a plethora of devices on the market that can connect to Wi-Fi 6 via iOS or Android. Phones nowadays have been upgraded to become converged communication devices that can be used for more than just calls and messages. Similarly, Wi-Fi access points have been upgraded to converged access points that have built-in wireless protocols such as the Zigbee protocol, allowing us to use them for other purposes as well.

IOT DEVICES USED

GOOGLE HOME VOICE CONTROLLER

AMAZON ECHO PLUS VOICE CONTROLLER

AUGUST SMART LOCK

EXAMPLES OF WI-FI 6 DEVICES

REFLECTION FROM THE TALK

The reflection that we can gain from the talk is that CommScope and many more companies are working really hard in assisting our daily lifestyle to make it easier. Many IoT devices are being created and installed as we;; as new technologies to improve society in many aspects. Businesses and companies are moving towards better usage of technologies and electronic devices. We as consumers need to have high adaptability and also move forward as the technologies keep getting better. We should upgrade our old devices so we can have better network configuration and the latest updates.

5G -THE 5TH GENERATION MOBILE NETWORK-

Definition of 5G

They are designed to provide advanced data speeds, achieve lower latency, be more flexible than Wifi, and are able to support a broad range of tools. 5G is the fifth generation technology standard for broadband cellular networks, which cellular phone operators began building globally in 2019, and is the expected successor to the 4G networks that connect most existing cellphones. According to the GSM Association, 5G networks would have more than 1.7 billion members worldwide by 2025.

5G REQUIREMENTS

KEYWORD "1.10.1M"

The latency rate is 1ms, which is the period between transmitting and receiving data, is very low at 1ms.

The highest data speed is 10 Gbps, which is 10 to 100 times faster than 4G.

1 million connection per 1 km^2 used to ensure the effective transmission of a message of a specified size in a certain amount of time.

5G networks, like their predecessors, are cellular networks with service areas divided into small geographic areas called cells. Radio waves connect all 5G wireless devices in a cell to the Internet and telephone network via a local antenna in the cell. The main benefit of the new networks will be increased capacity, allowing for faster download speeds of up to 10 gigabits per second (Gbit/s). In addition to being faster than current networks, 5G can connect more devices, and even when people are in crowded places, the servers will be more unified, enhancing Internet service quality. Due to the increased of bandwidth, the networks are expected to be increasingly used as general internet service providers (ISPs) for laptops and desktop computers, competing with existing ISPs like cable internet, and enabling new applications in the internet-of-things (IoT) and machine-to-machine areas. The new networks, which require 5G-enabled wireless devices, will not operate with 4G telephones. 5G has an impact on our lives. It develops technology that will enable remote control of critical services. It will advance self-driving cars, the Internet of Things, personal communications, and the way our businesses access, store, share, and protect data. It will have an impact on artificial intelligence and augmented reality.

APPLICATION OF 5G

1 eMBB
(Enhanced Mobile Broadband)

minimize data transfer rate, achieve greater bandwith & reduce latency

2 uRLLC
(Ultra-reliable and Low-latency Communications)

coordinate systems & manage traffic in drone-based deliveries, self-driving automobiles, and power control

TESLA

3 mMTC
(Massive Machine Type Communication)

manage a high number of internet devices connected at the same time

5G TOP POTENTIAL INDUSTRIAL APPLICATION

- 5G SMART PORT
- 5G CEMENT
- 5G SMART MEDICAL
- 5G PRIVATE LINE
- 5G SMART EDUCATION
- 5G SMART POWER GRID

OPPORTUNITIES & BENEFITS

Smart tourism is one of the benefits and opportunities that come with 5G. A smart tourism initiative must be physically and digitally accessible to everyone, regardless of age, gender, religion, race, sexuality, or disability. This also includes language-specific information on tourism products. Tourists can look for live activities ahead of time.

Fifth-generation (5G) wireless communication networks are expected to play a critical role in vertical industry transformation. Logistics tasks in industrial parks can be performed more efficiently using vehicle-to-everything (V2X) communications, one of many exciting applications enabled by 5G. We can also see that most industrial parks are outfitted with high-tech specifications, implying that more people are required to participate, resulting in more job opportunities.

VR, powered by 5G, brings the curriculum to life by allowing students to virtually explore different parts of the human body or animal cells with their hands, all while being remotely guided by a teacher. Because of its immersive properties, students learn through experience, which aids in their understanding and retention of the topic.

WI-FI6 -THE NEXT GENERATION WI-FI-

Wi-Fi 6 Has Been Verified For More Than 3 Years

2017

Broadcom & Qualcomm released Wi-Fi 6 series chips

Huawei Wi-Fi 6 Enterprise AP

ASUS 1st home Wi-Fi 6 router

intel Wi-Fi 6 chips for Home Gateways and Terminal

2018

The WiFI Alliance Initiates WiFi 6 Certifications

Intel release WiFi 6 network adapter with access by flagship computer

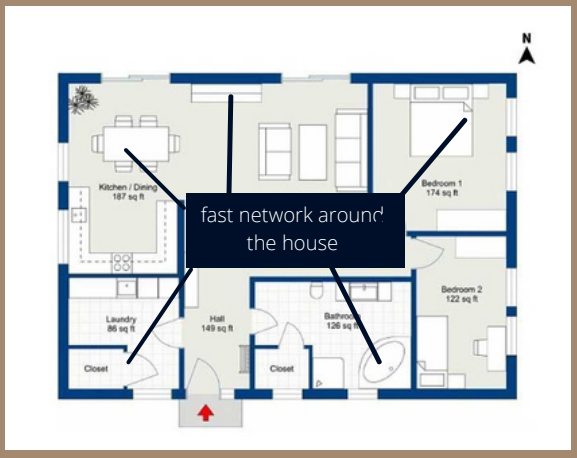
WiFi 6 router is launched and sold everywhere

2019

THE EVOLUTION PATH OF WI-FI TECHNOLOGY

	Wi-Fi 4	Wi-Fi 5	Wi-Fi 6
Protocol	802.11n	802.11ac	802.11ax
Max Rate	600Mb/s	1.73Gb/s	9.6Gb/s
2T2R	300Mb/s	866Mb/s	2.4Gb/s
Spectrum	2.4Ghz & 5Ghz	2Ghz	2.4Ghz & 5Ghz

IMPROVE COVERAGE



SUPPORT GIGABIT BROADBAND PROMOTION

download with high speed to 1Gb/s

cloud backup with speed 1Gb/s

1K QAM / 160M/frame length / subcarrier optimization

↓

improve bandwith by 2.8 times

866 Mb/s actual(600 Mb/s) → 2.4 Gb/s actual(1.6 Gb/s)

AC → AX

3.2 us/time → 12.8 us/time

5.2%

4.3%

234 subcarriers

↓

980 subcarriers

HUAWEI AIRENGINE WI-FI 6 TECHNOLOGIES

- Highest performance
- Most Comprehensive IoT Apps
- Most Secure
- Most Stable Experience

WIFI 6 VS WIFI 5

If you're experiencing buffering, make sure it's not because of your router! Take advantage of the fastest WiFi 6 technology to get on the super-fast highway. WiFi 6 is the latest generation of WiFi technology, designed to increase network capacity and improve the performance of your home network. It will provide you with faster WiFi speeds and more reliable connections than WiFi 5. Firstly, WiFi 6 delivers the best performance in multi-device households with multiple devices. WiFi 6 is the latest WiFi standard, and it improves on the already excellent WiFi 5 (802.11ac) technology. While WiFi 5 brought gigabit speeds to our WiFi connections, it falls short of providing the best WiFi experience as the smart home becomes smarter as more devices connect to the network. WiFi 6 employs orthogonal frequency division multiple access (OFDMA), a key feature that boosts overall network efficiency by allowing multiple devices with varying bandwidth requirements to connect to your WiFi. Next, WiFi 6 has faster real-world speeds and a greater range. Each frequency band (2.4 GHz or 5 GHz) in WiFi technology is made up of component streams. Our WiFi data travels through these streams. WiFi 5 and WiFi 6 carry the most streams, allowing for gigabit WiFi speeds. WiFi 6 boosts the number of streams to a new high of 12 across the 2.4 and 5 GHz bands, whereas WiFi 5 has a dual band limit of 8. With more streams, your connection speed increases, and your client devices have more paths to communicate with your WiFi router. In fact, WiFi 6 enabled client devices have a 40% speed increase over WiFi 5 counterparts. Finally, WiFi 6 has lower latency and power consumption than WiFi 5. WiFi 6 employs the TWT mechanism, which reduces terminal power consumption by 30%. Aside from that, the latency of Wifi 6 has been reduced to 20ms, making the connection faster and allowing the user to use it without stuttering, buffering, or other annoying hiccups that are common with older WiFi technology.

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Trend Report - 2022

"You never know ahead of time what something's really going to be like." "Every broken heart has one time or another asked, "What is important to me now?" "Wise is the one who flavors the future with some salt from the past.