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A large, stylized '5G' logo. The '5' is blue with white horizontal stripes, and the 'G' is red with white horizontal stripes, mimicking the US flag. Both letters have long, horizontal motion lines trailing to the right, suggesting speed. The background is a solid dark blue.

TECHNOLOGY

NOW

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SMART CAMPUS & 5TH GENERATION NETWORKS

Application of 5G in Smart Campus • Industry Talk 5: Smart Campus: The Journey Starts Here (CommScope Malaysia) • Industry Talk 6: 5G, Wifi6 and Emerging Network Technologies (HUAWEI)

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APPLICATION OF 5TH
GENERATION NETWORK IN

SMART CAMPUS

By LIM SHI KAI and MA ZE JUN

6 December 2021

With the popularization of the fifth-generation network, technology has improved people's way of life. Various technologies have been developed to help people carry out everyday activities. Although students have not given up their studies, the concept of smart campus has been implemented in higher education learning environments such as universities. The smart campus is similar to cloud computing and connects objects on campus through the Internet of things technology. The question is what this means for smart campuses. The smart campus uses advanced network infrastructure and Internet-connected devices to provide a supportive and participatory environment. Because the technology connects people, devices and applications, university administrators can make insight-driven decisions to improve security while maximizing resources.

Without the technological innovation of universities, the development of the intelligent campus is impossible. Several technologies supporting the transition from traditional to smart campuses have been identified in the literature, including cloud computing, the Internet of Things, augmented reality (AR), virtual reality (VR) and artificial intelligence (AI). One of those technologies is virtual reality, a simulated experience that can be similar to or completely different from the real world. In addition, VR provides a different way to teach students and gain experience. Virtual reality allows students, especially medical students, to take a realistic view of what they learn from books. They can see what the organs look like inside us. Students can gain experience through virtual surgeries before entering hospitals or medical centres for internships. In addition, VR enhances students' creativity and imagination, making things look more accurate than imagined through VR. Finally, VR creates an authentic learning environment that suits various learning styles. Every student has different learning patterns, so with the implementation of VR, lecturers can create many ways to help their students easily understand lectures and possibly help them do well in tests or exams.



Students may repeat the lesson several times for revision purposes. In addition, the participation of manufacturers makes the "smart campus" bundled with specific products. Such as smart schools, some universities in China, the school through the "wings", the student's student id card binding on parents and their cell phone, so that when students in and out of campus, will feedback to the parents and the school through the network, in addition to the intelligent entrance guard, through the phone to open the door, "my key, drawer keys, the classroom key... Every time I go out, I forget to take it with me, but since the Internet of Things technology comes to campus, I no longer have to worry about being "rejected" because I do not have my key. When the student comes back to the dormitory, he takes out his mobile phone from his pocket and gently shakes it in front of the card reader. With a sound of "di", the dormitory door opens. In addition to dormitories, classroom doors and office doors can be opened through the phone.

At the same time, the school also uses the access control subsystem to manage the cardholder's rights, which greatly improves the security of identity identification. These not only still have mobile phone library, attendance, etc., with the help of the Internet of things intelligent system comprehensive docking campus books management system, the user information bookbinding in the mobile phone card, use the business of mobile phone users can easily realize the books borrowing, return, also can be finished by text query, booking, due to remind, renew and other services. As for mobile phone attendance, teachers only need to provide the QR code of the course, and students can scan it and automatically record the attendance information of students.

Author's View

In the author's opinion, a smart campus has brought benefits to many people; students and university lecturers and staff can enjoy the advantages of an innovative campus. First of all, a smart campus improves students' experience because students can surf the Internet at home anywhere, including campus and dormitory. Therefore, campuses should provide convenient, safe and personalized modern experiences for students to support this. For example, the campus can provide virtual health services, where students can track their daily diet and make improvements according to the situation. In addition, the campus could support a real-time occupancy system for juniors and seniors, allowing them to access career information and move on after graduation. Then, the smart campus makes the campus safer than before. The safety of students and staff is of paramount importance to their families. With the innovation of intelligent campus, Internet security services for students and families provides peace of mind, which helps to reduce crime, raising awareness at the same time, such as intelligent IP camera, record visitors biometric information, such as face recognition, and then sent to the cloud computing system, when something happens, they can access it, and report to the police team for help. Finally, implementing a smart campus can bring many benefits to students, lecturers and the public, which can also improve the university's reputation.

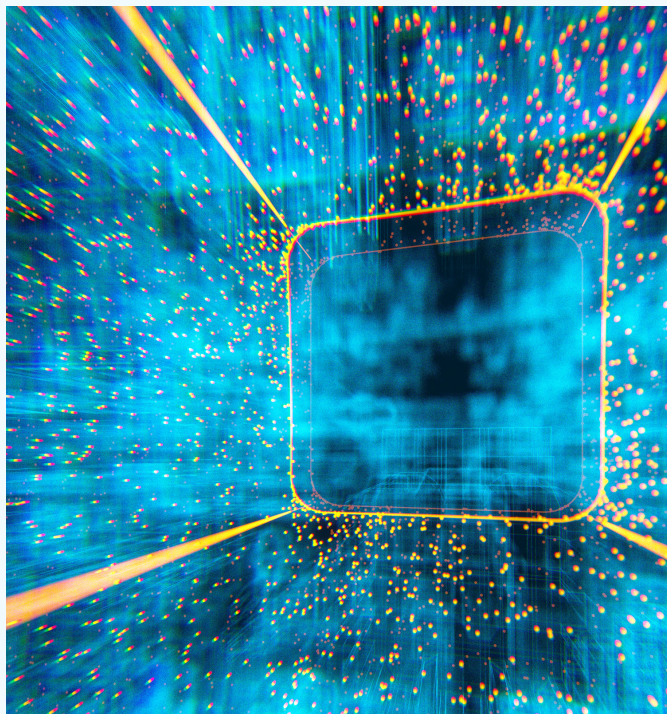
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•Devices used

Are you afraid that your old gadgets cannot access the new technology? Don't worry! Most of the technology is designed to be compatible with all the devices, although they are not the latest model. For example, most Wi-Fi products we have can work with Wi-Fi 6 networks, although almost none support this technology themselves. For instance, iPhone 11, Huawei P40 Pro, PlayStation 5 etc. In addition, users can still use the old version switch or ethernet cable like Cat 5e or above for the multigigabit technology to help users overcome the restricted speed at the switch port for faster internet speed. Meanwhile, a network controller was introduced to replace the WLAN controller and network management system used in the old days. Works are simplified when using network controller as it will summarize and allow users to monitor the network status on phones or laptops. Next, IoT technology has brought convenience to people in their daily routines. For example, IoT devices such as smart locks, smart refrigerators, and bulb help automate homes while intelligent fire alarms and intelligent security systems enhance people's safety. Lastly, we have cloud analytic technology that helps people analyze a significant amount of data. People can use the cloud analytics on Apps or platforms, such as Microsoft Excel, Azure Stream Analytics and AWS analytics.



•Domain

People create technology and optimize its use for remarkable improvement. For example, Wi-Fi technology enables humans to surf Online for information, entertainment, or interaction. Then, Wi-Fi 6 is created for faster Internet speed, better image resolution, and better data transmission. Hence, Wi-Fi 6 is used in high-density indoor areas such as homes, compartments, shopping malls, universities, and offices. Then, multigigabit technology is primarily applied in campuses, offices, and shopping malls to help users obtain more incredible Internet speed. Places like universities, schools, big companies, and offices often need faster data transmission and robust Internet connections to support the large size of devices connected. Hence, multiples of switches and access points are needed to enhance users experience. Then, the network controller will be the minor "manager" that helps manage the extensive network system. IoT technology is most commonly used in homes, condominiums, offices, shopping malls and campuses. Furthermore, this technology allows the deployment of smart campus, the combination of smart cities and smart homes that uses advanced network infrastructure and internet-connected devices to provide unique experiences to users, especially students, in terms of smart living, smart learning, and smart screening. For example, Smart ID cards, smart lighting, smart parking, and wayfinding. Smart learning enables flexible learning spaces and improves distance learning experiences by having virtual labs, lecture capture functions, and online library. Meanwhile, smart safety enhances the security and safety of the campus using smart CCTV, smart door locks, and sensors everywhere. Lastly, cloud analytic technology is generally used in areas that deal with massive data, such as factories, government, and big companies like Google, YouTube, and Microsoft.



Reflection

This talk gives me a quick view and tones of knowledge on the latest technologies available in the market. For example, Wi-Fi 6, multigigabit technology, network controller and others. The rise of these technology indicates a swift shift in wireless networking in the market, which allows more data transmission and exchanging of data in a short period to increase work efficiency. I hope that everyone can use these technologies wisely because they are created to ease human affairs and enhance work efficiency. Moreover, the deployment of smart campuses helps improve the education level in our country and give students a better experience while learning on the campus as students can get more information; it enhances the communication and interaction between lectures and students. Hence, we must not be fatuously content with existing conditions but must try our best and work hard to improve the technology for a better future.

5G, WIFI6 AND EMERGING NETWORK TECHNOLOGIES

By Chua Xin Lin

5G

5G is the next or the 5th generation of wireless technology systems that offer faster speed than any previous generation. It was introduced to the market at the end of 2018 and is driving global growth. 5G is more reliable and flexible compared to Wi-Fi because it is more stable and able to support a wide range of devices which enables a better experience for users and help to increase efficiency, especially in infrastructure. 5G technology provides ultra-low latency, massive network capacity, greater availability and has large area coverage, which allows huge size data to transmit faster and further. In other words, 5G is 10 to 100 times faster compared to 4G. For example, people take minutes or hours to download movies with 4K resolution, games or documents with 4G, but it can be done within seconds when using 5G. 5G technology is majorly used to enhance mobile broadband (eMBB), massive machine-type communication (mMTC) and ultra-reliable and low latency communication (uRLLC). For instance, 5G are widely used for Augmented Reality (AR), Virtual Reality (VR), entertainment and automation in vehicles, smart drones and others. It plays an essential role in VR technology as it improves and optimizes the Retina Experience by providing high resolution and full panoramic video mosaic, whereas ultra-low latency helps to avoid motion sickness by users and help them to enjoy VR technology. Besides that, 5G technology is highly deployed in industries to build better services like 5G smart transportation, 5G smart cities, 5G smart education, smart tourism and many more. This is likely because the industry needs the technology to improve efficiency, optimize usage of technology and transmit data in fast and simple way.

Wi-Fi 6

Wi-Fi 6, which is also known as 802.11ax, is a new standard in Wi-Fi technology that was designed to improve the reliability and speed of the wireless network. It is usually used in indoor ultra-high-density buildings such as home networks, malls, universities and stadiums. Wi-Fi 6 was introduced to the market in the form of chips in 2017 and entered the mature commercial use phase in 2019. Wi-Fi 6 has greater maximum data transfer rate, which is up to 9.6 Gbps, and 2T2R up to 2.4Gbps, which make a big difference compared to Wi-Fi 5. Besides, it also has benefits such as larger bandwidth, low latency, IoT-oriented Energy Saving, Anti-Interface, full-house coverage of 5 GHz signals, supports Gigabit Broadband Promotions, and provide services such as 1024-QAM that increase 25% of data rate, OFDMA that allows access points to serve multiple clients at the same time, UL/DL MU-MIMO that would enable various clients to connect to access point to send acknowledgement responses (ack) simultaneously, BSS Coloring that helps to identify the overlapping basic service sets so that data transmission can carry out simultaneously as different users have different colours, and TWT which is also named Target Wake Time that helps to save energy and cut down energy and terminal power consumption by 30%. In a simple way, this means that Wi-Fi 6 technology has a larger bandwidth up to 9.6 Gbit/s rates, high concurrency, low latency, low power consumption, 40% more coverage range, and better network efficiency than Wi-Fi 5.



Emerging Technology Of Huawei

Huawei is a telecommunications equipment company and a leading global provider of information and communications technology (ICT) infrastructure. Their mission is to bring digital to every person, home and organization for a fully connected, intelligent world. Huawei company works on devices, intelligent automotive components, connectivity, computing and the cloud. Besides that, they also provide digital power such as iTelecomPower, Data Center Energy, Solar energy and others. Huawei actually has created their own Wi-Fi 6 technology which is AirEngine Wi-Fi 6 and is powered by Huawei 5G technology and has intelligent continuous networking which can automatically optimize the radio resources according to the number of users. The AirEngine Wi-Fi 6 technology provides four core features: high performance up to 16x16 MU-MIMO, stable experience for the user, comprehensive IoT Apps, and is fully secured. To provide a stable experience for the user, Huawei has created a Smart Antenna that increases the coverage radius to 20% and SmartRadio that provide 10ms ultra-low latency and lossless roaming. This enables the users to get the information they want within a blink of an eye.

REFLECTION FROM THE TALK



From this talk, we know that 5G and Wi-Fi 6 are different in structure and usage. 5G is usually used for outdoor wide coverage places like cities, while Wi-Fi 6 is used in indoor ultra-high-density buildings like malls. Both 5G and Wi-Fi 6 are amazing technology as they give a great and better impact to the people compared to any previous generation of wireless technology in terms of latency, connection density, network energy efficiency, mobility, and area traffic capacity. This technology allows the data transmission to become faster and efficient, provides real-time interactivity for services using the cloud, low energy consumption and increase the potential and steps of 4th industrial revolution.

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