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5G and WIFI6

FEATURES

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APPLICATION OF 5G IN SMART CAMPUS

Before we talk about application of 5G in Smart Campus, let's learn what Smart Campus shall we?

SMART CAMPUS

A smart campus provides helpful and engaging experiences by utilising advanced network infrastructure and internet-connected technologies. It connects people, devices, and apps, allowing universities to make informed decisions about security and resource management. Smart campuses is identified as one of the top 10 strategic technologies impacting higher education.

TABLET

CCTV

EXAMPLES

TOUCH BOARDS

CUSTOMIZED APPS

SENSOR

BENEFITS

1.IMPROVES STUDENT EXPERIENCES

- Students should be able to freely move throughout campus and rely on services that are intuitive, convenient, and simple to use.
  - Examples are Voice-activated assistance, Mobile and contactless payment options

2.ENHANCES COLLEGE CAMPUS SAFETY

- Location intelligence supports students walking alone.
- Wireless sensors monitor asset location
- Smart IP video cameras send data and alerts so administrators can secure locations.

3.REDUCES OPERATIONAL COSTS

- Automation tools free up administration time.
- Automate temperature, lighting, and utility use by adding sensors to HVAC systems and more

5G

5G is the fifth-generation technology that uses a wireless network to function. Experts developed successive generations with better features and capabilities.

5G is an upgrade of 4G LTE with high data speeds, reliability, and zero downtimes. You can connect numerous devices, and it still performs effectively. One 5G tower cell can support over one million devices with slight delays. The 5G has a higher bandwidth, so it can handle annoying traffic.

Teachers usually face buffering issues due to low Internet speeds, which affects learning. Technology is shifting to e-learning, and both teachers and students need a wireless network to enhance efficiency. That is why 5G is now the new technology causing shockwaves in the Industry.

5G is more advanced than 4G, recording extremely high Internet speeds. Educators can now enjoy collaborative learning with students, regardless of location. High-quality images, fast downloads, and virtual reality learning is now the new normal.

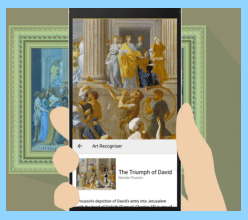
APPLICATION OF 5G IN SMART CAMPUS

5G will support Augmented Reality and Virtual Reality

VR classrooms, unlike the video conferencing calls we utilise in online learning right now, may allow for more dynamic engagement by moving away from static, 2D video and toward 3D digital representations of participants. Microsoft, for example, has demonstrated its 'Mesh' platform for creating augmented reality (AR) and virtual reality (VR) apps. Participants in one of Microsoft's demos interacted in a virtual world where they could communicate, gesture, and transfer digital items back and forth. **Higher speed, bandwidth, and latency of 5G** will be key in making these sorts of live, digital interactions seamless.

MIROSOFT MESH

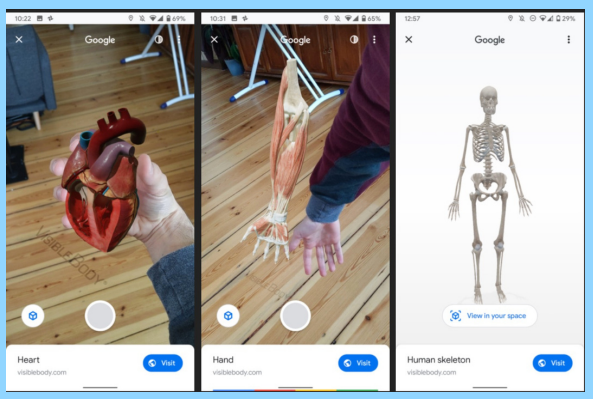
Another wonderful method that 5G might improve educational experiences is through AR exploration. Students can use augmented reality to examine objects in ways they wouldn't be able to in real life. There are currently a few instances of AR instructional tools available on Google. Not only that, but 5G enables lower-cost devices to take part in more complicated experiences like virtual schools. A Chromebook, for example, is unlikely to be powerful enough to handle a whole virtual classroom on its own.



Lets you take virtual tours of famous museums and cultural sites

Google Arts & Culture

Google AR & VR



REFLECTION

From what I learn about application of 5G in smart campus is that the 5G technology is that one key leap that will assist us to achieve that engaging and collaborative education in our campus. From allowing students across larger geographic regions to collaborate and learn together online to creating exciting new opportunities for virtual education, 5G could be a game-changer if leveraged effectively.

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EMERGING TECHNOLOGY ON NETWORK INFRASTRUCTURE

COMMSCOPE® RUCKUS®

When you think about Network Infrastructure, you may envision a cluster of wires running above ceiling tiles. While that is a small component of an infrastructure system, Network infrastructure is a larger collection of everything that is required to run all of the technology. These include software, composite hardware, network services, and resources. The infrastructure system allows team members to deliver services and solutions to customers and partners.

WIFI AND ACCESS POINT

WiFi and access point are important as it is the key factor for the connectivity of internet user. Commscope Ruckus provide access point that is integrated with the latest technology called **Wi-Fi 6.** The WiFi 6 has many advantage to the user compare to predecessor like Wifi 5, 11n etc. it increasing in speed and effeciency, can connect to many client in a single access point without decreasing in bandwith connectivity and can enhance Wi-Fi coexistence.

MULTIGIGABIT TECHNOLOGY

Multigigabit Technology is a technology that is integrated in latest Ruckus Switch technology. With the enormous growth of 802.11ac and new wireless applications, wireless devices are driving the demand for more network bandwidth. This creates a need for a technology that supports speeds higher than 1 Gbps on all cabling infrastructure. Ruckus multigigabit technology enable user to achieve bandwidth between speeds of 1 and 10 Gbps over traditional Cat 5e cabling or above. In addition, Multigigabit Infrastructure enabled user to use the network controller switch to manage access point and distribution in a single platform instead of the existing infrastructure such as Network Management that separates the management of access point (Wlan Controller) and swtich.

UNIFIED NETWORK MANAGEMENT

Commscope Ruckus has provided a unified network management devices that could replace the tradition approach of network management in order to centralized and manage equipment in a single platform. These platform can be used in **Ruckus SmartZone 6.0 Dashboard**.

INTERNET OF THINGS

Commscope has a Software as Service that could integrated all the internet of things to be used in a single platform. For instance. each IOT devices has its own providers. Instead of using different providers to use these IOT devices, **Ruckus IoT suite** to synchronice all the IoT devices into single platform.

CLOUD ANALYTICS

Cloud analytics is the process of storing and analyzing data in the cloud and using it to extract actionable business insights. Similar to on-premises data analytics, cloud analytics algorithms are applied to large data collections to identify patterns, predict future outcomes and produce other information useful to business decision makers. **Ruckus Analytics** provides many solution towards problem in networking. For instance, it priorities which incident required to solve first, it help automatically validate the service without needing to check onsite, has the ability to monitor the changes in networking, network health monitoring client troubleshooting and lastly, monitor the user's activities on the network from the data gathered through reporting

The Device Used

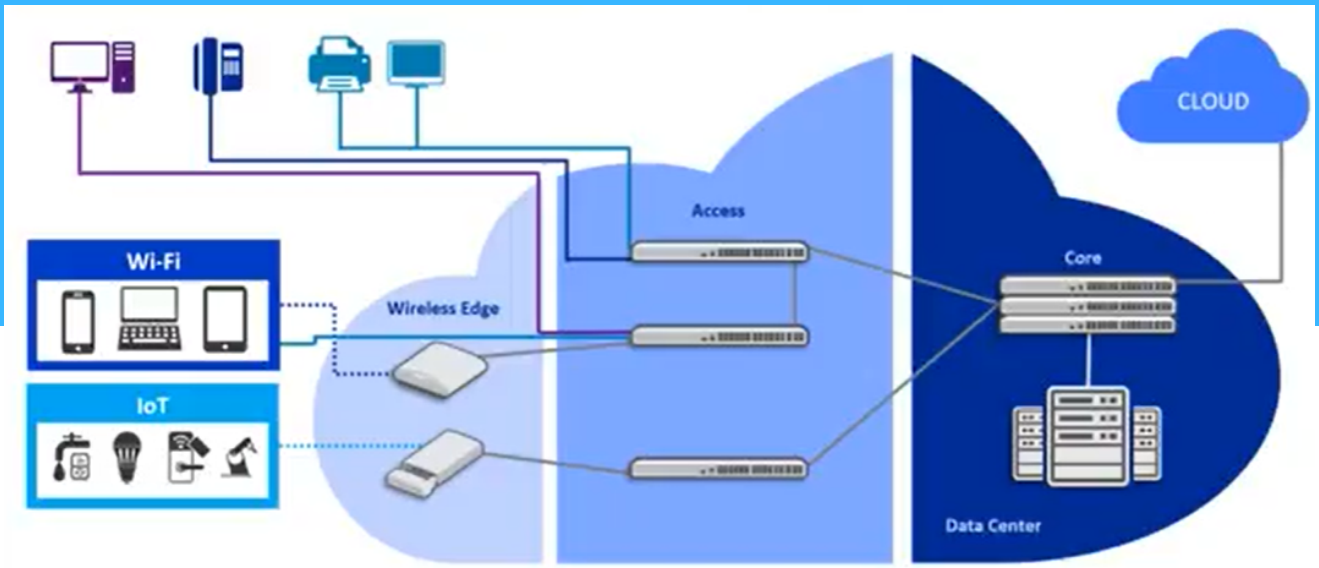
SOFTWARE & SAAS
Security - Cloudpath
Reporting - SmartCell Insight
RUCKUS Analytics
Location analytics - SPoT

CONTROL& MANAGEMENT
Virtual - SmartZone
Physical- ZoneDirector
Ruckus Unleashed
RUSCKUS IoT Controller
RUCKUS Cloud

SWITCHES
Access
Aggregation
Core

ACCESS POINT
Outdoor T,P Series
Indoor - R Series
Speciality - H Series

THE EXAMPLE OF DOMAIN



WIRELESS EDGE - REMOTE ACCESS DOMAIN

The end user could connect their device (such as laptop phone etc.) and IOT devices to the internet through wireless edge called the ***access point***. The access point could be the router or some devices that has IOT protocol.

ACCESS - LAN DOMAIN, LAN-TO-WAN DOMAIN

From the access point, it will be connected to the ***distribution switch*** where the switch will connect all the devices and IOT devices from the access point to the internet. If there is devices that need to be connected to the internet through cable (intranet), this section is where all the devices will be connected to.

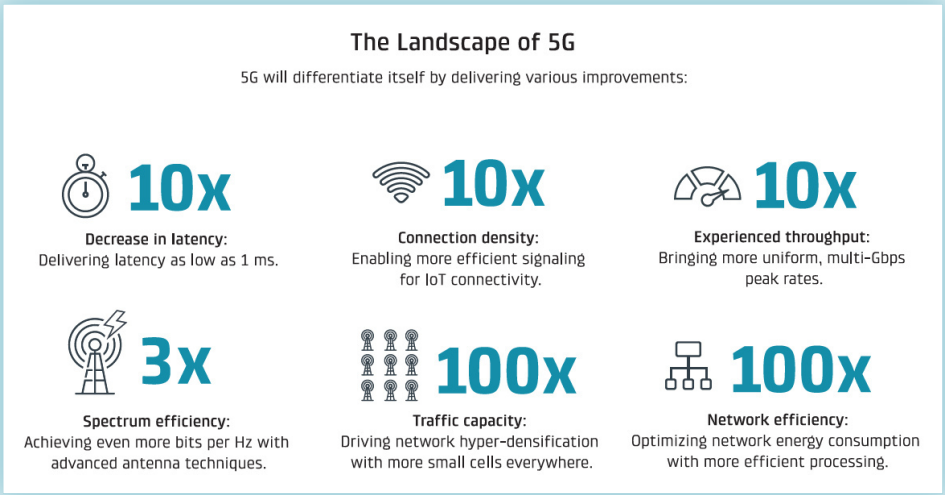
CORE - SYSTEM/APPLICATION DOMAIN

Lastly, all the distribution switch need to be connected to the ***core switch*** so that the administrator could manage the distribution of the network easily in single platform. For instance, there is variety of faculty in a University where each of the faculty will have their own distribution switch. The distribution switch will be connected to the core switch which some may called "Data Centre" through a dedicated called uplink. The core switch is usually connected to the place where internet is located or terminated (cloud), In addition to that, the core section is also a place where all the main component of network management located such as main server, main switch, cloud storage and firewall of the organization.

REFLECTION

Covid-19 has cause many new innovation to be created in order to help human life in term of surviving the pandemic. It also cause acceleration in digital transformation where society now familiar with hybrid or remote working and studies. The acceleration also produce more benefits for human in every aspect of life. For instance, in networking, the usage of devices in high speed broadband connectivity created a system called smart city where society are now enabled to increase the efficiency of daily life with easiness. For example, student can benefit more from smart campus feature through smart living, smart studies and smart security. The infrastructure that is used and explained through the talk enable us to live in the smart city due to the increasing in performance and also due to the IOT deployed to solve complex challenge

5G and Wi-Fi6



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What is 5G?

5g is often known as the **fifth generation** of wireless technology. The term 5G has formally been defined as "IMT-2020" by the International Telecommunication Union (IMU) as a subsequent of IMT-2000 (3G) and IMT-Advanced (4G). High latency and low bandwidth are the two essential elements of 5g that modify and improve the forms of communication, use case applications, and business processes. With a peak data throughput of 10 gigabits per second and 1 million connections between 1 kilometer, 5g will be able to serve more application and supply significantly faster and rapid speed. 5g also has a 100x higher network efficiency, a dense area capacity, and a 1ms lower latency.

The implementation of 5g has a significant influence on industries, since the low latency provided by 5g facilitates data transfers by opening up a wide variety of new data transmission applications. Aside from that, 5g devices are more reliable since they allow for greater transmission, allowing for the capacity to send more data. In addition, 5g devices are more flexible than Wi-Fi since they have a greater range and can connect up to a million devices at once. Using 5g, people will be able to stream any videos in 4k or 8k.

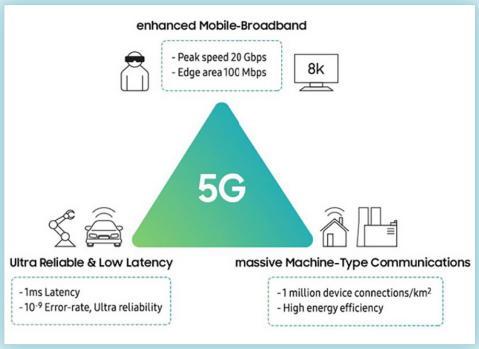
The following are the primary domains of 5g applications.

Enhanced mobile broadband - eMBB
- **3D Videos, Cloud computing, Augmented Reality**

Machine automation (massive machine type communication) - mMTC
- **Smart home, Smart Building, Smart City, Vehicle to Infrastructure**

Ultra-reliable and Low-latency communication - uRLLC
- **Self automated car, Vehicle to Vehicle, Industry automation, Remote Surgery**

Application of 5G



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Example of technology that uses 5g

- **Virtual Reality**

For a retina experience of 5037x5707 resolution for one eye and 6 angles for full panoramic video, virtual reality demands high throughput. Low latency is also required in virtual reality to prevent motion sickness. Therefore, VR requires 5g as 5g is capable of meeting and exceeding these standards.

Potential Industrial Application of 5g

- 5G Smart Port
- 5G Smart Medical
- 5G Live Broadcast
- 5G Smart Education
- 5G Smart Manufacturing
- 5G Smart Mine
- 5G Smart Petrol
- 5G Smart Transportation

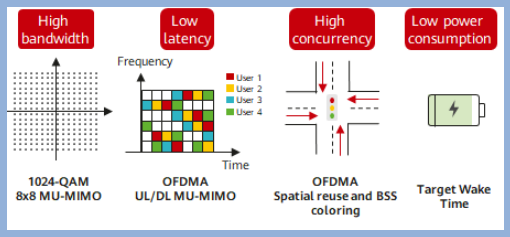
Benefits of 5g

- **Tourism**
  1. **Tourists will be able to broadcast their adventures live at any moment.**
  2. **Virtual reality and augmented reality can be used to enhance the experience.**

- **Industry**
  1. **Create chances for employment**
  2. **Equip industrial business with high-tech technology**

- **Education**
  1. **Online class learning**
  2. **Enables VR/AR Education**

Wi-Fi6's key domain



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- **4x bandwidth**
- **4x the number of concurrent users**
- **Reduced service latency to 20ms**
- **Terminal power consumption of 30%**

Examples of technologies that uses Wi-Fi6

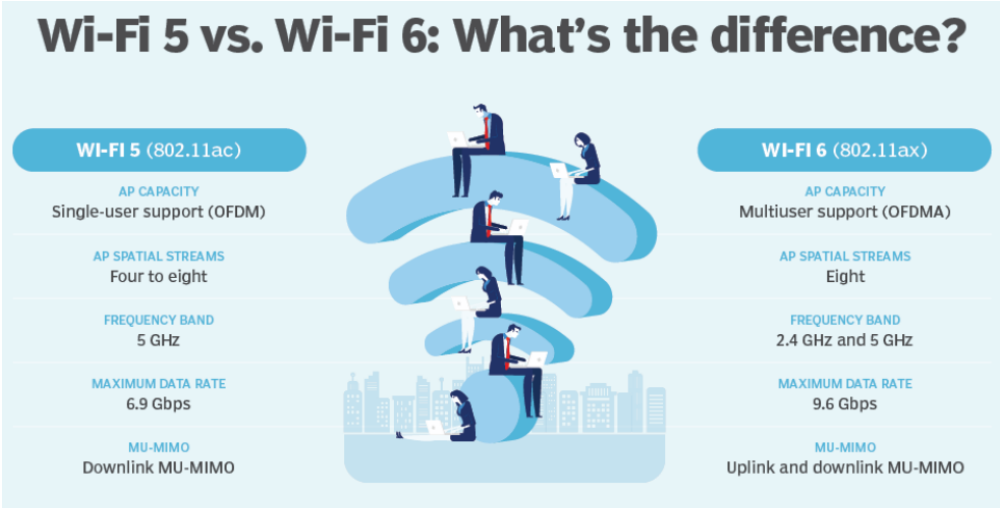
- **Huawei Air Engine**

Huawei air engine demands the best performance, the most consistent experience, the most extensive IoT apps, and the most secure technology. As a result, Wi-Fi6 are able to meet all of the aforementioned requirements. The smart antenna, which employs 5g technologies as well as Wi-Fi6, ensures a steady experience by expanding 20% of the coverage radius.

Huawei air engine is the world's first technology to employ 10gps Wi-Fi, which is supported by Wi-Fi6, with the fastest Wi-Fi6 AP ever, 2x real-time speed, and real-world testing.

Reflection

The industrial talk 6 on 5G and Wi-Fi6 provided the students with a wealth of life-learning information and opportunities for adapting to new technologies. It introduces new information about the evolution of technology advancement which is 5G and Wi-Fi6 technology. The integration of 5g into daily life will tremendously assist humans in their daily activities. 5G and Wi-Fi6 technology will be able to allow remote control of activity services, making it easier for people to perform any task and perhaps reducing the amount of human power required. For example, the use of 5G in self-driving cars will benefit people by allowing them to rest and not do anything throughout the entire drive while the technology takes charge. 5G and Wi-Fi6 enhance internet connectivity and make data transfer faster and more seamless. As a result, more applications or devices will be able to utilize the technology, resulting in improved user experience. For instance, virtual reality demands are completely supported by 5G and Wi-Fi6, ensuring the best possible user experience. The implementation of 5G and wifi6 into our daily lives will significantly improve our quality of life.



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WHAT IS WIFI6?

Wi-Fi6 is the next version of Wi-Fi, much as 5g is the next generation of wireless technology. In 2017, the first Wi-Fi6 chipset was launched. Then, in September 2019, the Wi-Fi alliance certifies WiFi6, indicating that it has entered the mature commercial usage phase. Wi-Fi6 is also known as **IEEE802.11ax**, which is the standard evolution process of Wi-Fi6. The technology of wifi6 has been developed and increased over that of wifi5, which is 802.11ac, and wifi4, which is 802.11n.

Wi-Fi6 is known for having a greater maximum rate of 9.6 gigabits per second, higher two transmitters, and two receivers (2T2R) aspect of 2.4 gigabits per second, as well as increased speed and capabilities, including the ability to send, transport, and carry more data, together with enhance coverage. The implementation of Wi-Fi6 will increase the rate at which high-quality graphics may be streamed. The bandwidth of Wi-Fi6 has increased by 2.8 times, with a 25% increase in peak performance over Wi-Fi5. The Wi-Fi rate is affected by four factors: spatial stream, subcarrier amount, symbol duration, and coding method. Wi-Fi6 increases bandwidth by having 2x the number of spatial streams as compared to Wi-Fi5, a higher sub-carrier with an effective rate of 95.7 percent, 1024-QAM coding, and a greater transmission duration of 12.8 seconds per terminal.

Benefits of Wi-Fi6

- **Improve coverage**

The chipset improvement of Wi-Fi6 increases data transfer power. It has narrowband transmission, can penetrate one additional wall, has better direction coverage, with 5ghz coverage available for a 120 m² household.

- **Enhanced video service**

Wi-Fi6 employs OFDMA, multi-user sequential scheduling, BSS coloration, anti-interference, and decreased latency. Wi-Fi6 also enhances the advancement of home value-added services, such as multi-screen IPTV, Cloud VR interactivity, Virtual education, and Online sports acceleration.

- **Promotes more enjoyable multi-user experience**

Wi-Fi6 reduces terminal power consumption by 30% while also strengthening the gateway's role as the smart home's control centre.