TECHNOLOGY INFORMATION SYSTEM

EMERGING NETWORK TECHNOLOGIES

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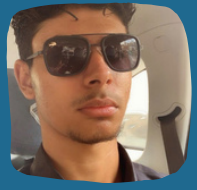
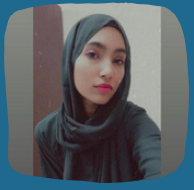


YOUSSEF MOUSTAFA
A21MJ0145



AZKA AFTAB
A21MJ0145

IFFASHAFIQAH
A21MJ5030

HASAN QURESHI
A21MJ0139

Application of 5G in smart Campus

The proposed Smart Campus Framework is based on high technology. The technology platform consists of data collection devices, peripheral computers, data management servers, data refinement algorithms, terminals, applications, and user interfaces connected to wireless and fixed networks.

The high capacity, high speed, and low latency of 5G technology enable a multitude of new services on different campuses, including smart airports, smart gates or smart stadiums and college campuses. Private 5G network or 5G network slicing and edge computing enable specific applications and experiences at their peak performance.

https://www.cio.com/article/3447896/middle-east-braces-for-5g-opportunities-and-challenges.html

For example, at smart airports, the implementation of 5G could range from a positive experience for passengers to better air traffic management and more efficient airport operations. 5G-enabled high-density video collaboration capabilities help airlines and various airport users manage urgent tasks and one-off challenges. It also supports the massive deployment of IoT applications that provide better passenger comfort and increase efficiency through proactive monitoring of key airport services. AR / VR applications for use in aircraft maintenance and dramatically improve crew efficiency.

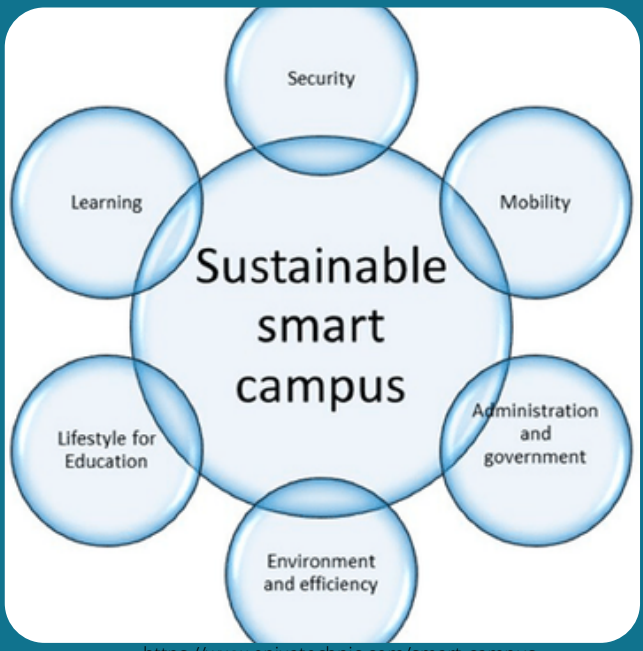
Areas that can reap huge benefits include autonomous driving, baggage handling, flight rotation optimization, and passenger flow management. This will help to significantly reduce the costs of fuel and other resources such as labor.

Although 5G technology is not equipped to reliably cover alarm signals, 5G will ultimately benefit many alarm participants since it can significantly reduce the latency, or the time it takes for devices to communicate with each other. This should allow for faster communication of signals, potentially reducing the time it takes to notify the appropriate parties of an alarm or fault condition and can therefore be used for fire alarms at smart airports.

Network management can be improved by monitoring network faults or Detection of malfunctions in network units (Fixing the malfunctions remotely), Adjusting network parameters for optimal performance, Analysis of network data, and control of network services.

REFLECTION

5G technology is very useful in many fields and therefore a complete movement to 5G will eventually be inevitable, but not until the wireless carriers have completely implemented their networks. Till then, 4G / LTE will remain the best technology for alarm communication. Though for other things like facial recognition, security, communication, and networking 5G seems to be the best option.



https://www.epixatechnic.com/smart-campus

Enterprise Network Infrastructure and emerging technologies

WIFI & ACCESS POINT

With the rapidly increasing technology, the wireless technology is rapidly advancing as well, the latest in the market is WIFI 6. Although most places are running with WIFI 5 Access but soon the overly advantageous WIFI 6 is inevitable for a takeover.

https://aliga.sk/en/what-the-heck-is-a-smart-city/

How WIFI6 is advantageous?

·Increased Network capacity
·WIFI 6 technology (MU-MIMO) allows the access point to communicate with multiple devices
·Better device batteries (they are interconnected)
·Transfer more data through access hence faster and efficient
·Outdoor reliability
·Enhances Wi-fi coexistence so lesser interference

Wireless communication is transforming; in enterprise AP design instead of the reference design, the device can support multipurpose such as Bluetooth technology, etc.

Multigigabit technology

There's a high load on the core network because enterprise traffic is increasing which is due to various factors including a rapid increase in Wi-fi speeds and an increase in IoT device production and usage. Therefore, multigigabit infrastructure is used to upgrade the core network in connection with access.

Consider data from the client device to access point, there is a bottleneck in-between which allows less than 1 Gbps transfer data rate whereas, with multigigabit switch connected in line with an access point, a new bottleneck between access and aforementioned switch allows more than 1 Gbps transfer data rate which is being considered to upgrade to as high as up to 5 Gbps.

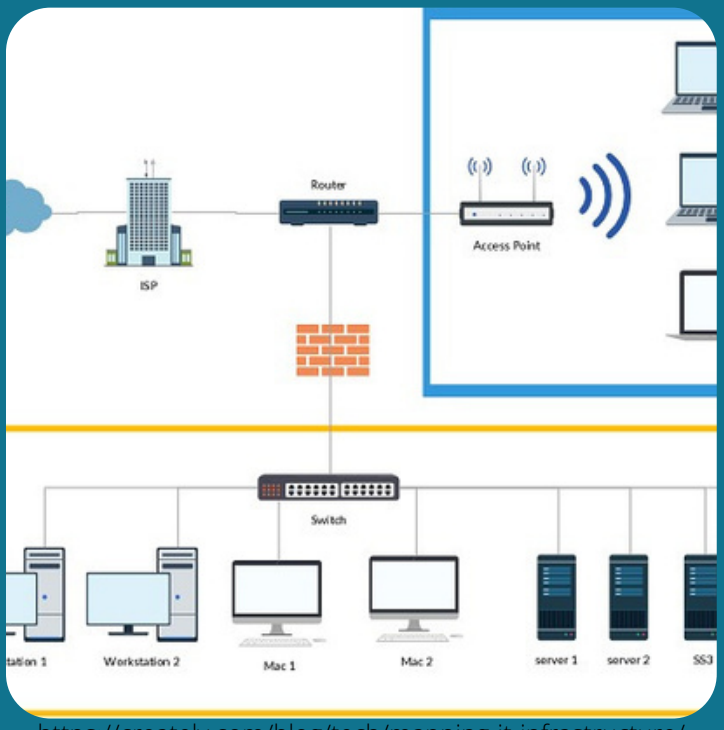
Unified network management

The Traditional Network management structure had all the Access points connected to the WLAN controller. In turn, WLAN controller and Switches would be connected to the Network management system to centralize all the networking but in unified network management, the only network controller is connected to each access point and switch hence providing an efficient, all-in one, central management system.

Internet of things (IOT)

IoT is radically changing the structure. 'Smart' is a name associated with it as it is slowly making everything in your life automated, easy to control through commands. Smart schools are being made which provides efficient security, management system as well as smart lighting. Network connectivity of IoT is dependent on various protocols, to communicate to networks, such as wi-fi, Bluetooth, and ZigBee technologies. Although connectivity, security (prone to hacking attack), and compatibility pose challenges, the outweighing advantages listed below are revolutionizing the city's structure:

·Cost reduction
·High Efficiency and productivity
·Increased economic opportunities
·Enhanced customer experience and satisfaction



https://creately.com/blog/tech/mapping-it-infrastructure/

Cloud analytics

The IT resources are too many and too complex for individuals to work at, hence it requires automation to achieve efficiency, enterprise to run smoothly operationally which would be achieved by setting up

cloud analytics applies AI and machine learning to find and troubleshoot networking issues.

REFLECTION

The application of these emerging technologies will result in smart campuses being made, which would be able to attract and provide bright experiences to students with

·Smart living

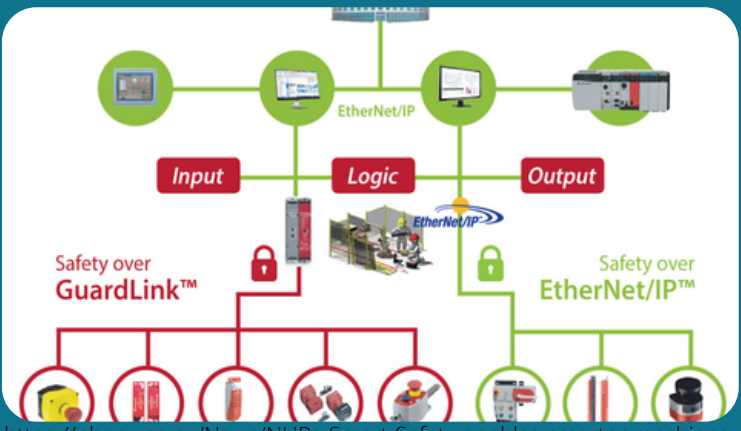
Smart ID card, smart parking and lightings, and security

·Smart learning

Virtual labs, distance learning, recorded lectures, and all sorts of materials; data-driven curriculum

·Smart safety and security

Smart locks and sensor intruder alarms



https://nhpnz.co.nz/News/NHPs-Smart-Safety-enables-smarter-machines-and-equipment

All this is just not centralized and heavily increases the operational efficiency and productivity of the Network but also allows the reduced cost of education. The smart campus would use a similar network infrastructure with cloud analytics involved to help manage resources. This can be a steppingstone to a smart city that would greatly benefit the living conditions, businesses, and client experience.

5G, Wifi6 and Emerging Network Technologies (HUAWEI)

THE DEVICES USED

5G, The next fifth generation of wireless technology system. It provides speeds and is also faster than the previous generation compare to those delivered via fiber-optic cables. It shows real-world speeds of 700-3025 Mbps (3.025 Gbps), which consumers will experience once the 5G released. The benefits of 5G for people are 5G using lover latency and enabling faster transmission of large data streams.

5G is also more reliable, enabling better transmission of data in extreme conditions. It is more flexible than Wi-Fi and can support a wider range of devices, sensors, and wearables.

5G also supports an application for VR such as Chipset, VR Terminal, Content Producer, and Broadcast Platform. VR is a huge benefit of 5G because it uses High Throughput for Retina Experience VR and Low Latency to avoid motion sickness.

https://www.bbva.ch/en/news/advantages-and-disadvantages-of-5g-technology/

Use case example:

1) Augmented Reality
2) Virtual Reality
3) Driver Information
4) Entertainment in the Vehicle
5) Automation in the vehicle
6) Smart Grid
7) Delivery Drone

5G Top Potential Industry Application

-5G Smart Mine-Open-pit Mining
-5G Cement

https://www.5gtechnologyworld.com/gsma-launches-cloud-ar-vr-initiative

https://www.procurious.com/procurement-news/future-drone-delivery-worldwide

Foster New Opportunities and Benefits

1) Next-Generation Smart Tourism Requires New Technology Application
2) Advance 5G Industrial Park Encourage Hitech Industry Establishment, Create Local Job Opportunities.
3) 5G enable AR/VR-based Virtual Education which helps the student with excellent resource all over the country/world.
4) Requirement will Support More applications

Wi-Fi 6, The new version of WiFi called Wi-Fi 6 has been verified for more than 3 years. Huawei started using Wi-Fi 6 in September 2017using enterprise AP, 7060DN. Intel company releases Wi-Fi 6 chips for Home Gateways and Terminals in June 2018. Also, other companies such as Asus, Broadcom, Samsung, Charter, Apple and etc using WiFi6.

The evolutions Path of Wi-fi Technology based on October 2018, the Wi-Fi Alliance specified a new name for different Wi-Fi standards, 802.11ax was named Wi-Fi 6 which is a revolutionary new technology. New Wi-Fi 6 (802.11ax) Standard, Empowering Enterprises' Digital Transformation had Large Bandwidth Low Latency. IoT-oriented Energy Saving and Anti-interference.

How Wi-Fi 6 Improves Bandwidth:

-Improved Coverage: Full-house Coverage of 5 GHz Signals.
-New Video Service: Multi-screen IPTV, Online Education, VR, eSports.
-Support better Multi-user Experience: More than 100 Terminals are connected and the power consumptions of Terminals Reduced by 30%.

Core Technologies of Wi-Fi 6 vs Wi-Fi 5

Wi-Fi 6 contains large Bandwidth of 1024-QAM up to 9.6 Gbit/s rates which is 4 times the bandwidth. It also had High Concurrency, the number of terminals on a single AP:1024 which 4 times the number of concurrent users. Although Wi-Fi had Low Latency which service latency was reduced to 20ms average latency: 50%. And Low Power Consumption TWT mechanism and terminal power consumption: 30%.

REFLECTION

5G is the new revolution of mobile technology. Thus the features and its usability are much beyond the expectation. With its speed, it is potential enough to change the meaning of a cell phone usability. It also new Technology that can increase more efficient way for Industrial and other Technology such as VR and etc. For us to stay connected and experience the ultra-high speed of network, we will be using The next generation of the Wi-Fi standard is Wi-Fi 6, also known as 802.11ax, the latest step in a journey of nonstop innovation. The standard builds on the strengths of 802.11ac while adding efficiency, flexibility, and scalability that allows new and existing networks increased speed and capacity with next-generation applications.

https://www.scienceabc.com/innovation/what-is-wifi-6-ieee-802-11ax.html

https://www.nexthardware.com/focus/wi-fi-6-aka-80211ax-203/

SOURCES

- https://www.cio.com/article/3447896/middle-east-braces-for-5g-opportunities-and challenges.html
- https://medium.com/@thinkwik/superfast-5g-network-why-you-must-have-it-9d603f6d6e31
- https://new.siemens.com/global/en/markets/smart-campus.html
- https://www.epixatechnic.com/smart-campus
- https://aliga.sk/en/what-the-heck-is-a-smart-city/
- https://creately.com/blog/tech/mapping-it-infrastructure/
- https://www.bbva.ch/en/news/advantages-and-disadvantages-of-5g-technology/
-https://www.nexthardware.com/focus/wi-fi-6-aka-80211ax-203/
- https://www.scienceabc.com/innovation/what-is-wifi-6-ieee-802-11ax.html