

A.S.A TECH

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NETWORK TECHNOLOGY

APPLICATION OF 5G
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Application of 5G in smart campus

One application of 5G in smart campuses is a smart environmental monitoring system. The smart environmental monitoring system is the process that describes activities in a surrounding area as well as control and monitors the quality of the environment. The smart environmental monitoring system is important to collect data in the natural environment to analyze, monitor and maintain the environment of campus to ensure the comfort and safety of all the academic staff and students. Smart environmental monitoring systems usually use smart sensors to monitor the quality of the environment for example Air temperature sensors, air humidity sensors, Passive Sampler, Visibility Sensor and so on.



Types of environmental monitoring

1. Air monitoring
2. Soil monitoring
3. Water monitoring
4. Temperature monitoring
5. Humidity monitoring
6. Environmental gases monitoring
7. Noise monitoring
8. Air pressure monitoring



Benefits of smart environmental monitoring system

- Utilize the data provided by smart environmental monitoring system to analysis the environment around us to improve the well-being of students and staffs
- Provide real time data of things such as temperature, weather conditions, humidity, air quality and water quality of campus
- Reduce pollution and other impacts on the environment of campus, by analyzing the real time data from smart environmental monitoring system to know the effects and reduce it



Boston University has conducted on their Smart-city Cloud-based Open Platform and Ecosystem Scope for five years. The objective is to test sensor networking throughout innovative environments.



Arizona State University invested 300 million dollar to build football stadium which contains smart sensors and cameras to elevate operational efficiency. For instance, the sensors will send data about water usage, noise levels and so on



University of Wisconsin-Madison are planning to build an autonomous vehicle testing zone which will include sensors on traffic lights throughout the 32-acre site



The University of Texas has the biggest microgrid in the United States. The microgrid monitors and supplies all the heat, cooling as well as electricity on the campus.

Reflection

Smart environmental monitoring system is imperative in managing and monitoring the environment of the campus in order to provide an excellent and comfortable side for students and staffs to elevate their efficiency in conducting their tasks and works. Besides that, it is also good in protecting our environment and solving pollution issues.

Emerging Technology on Network Infrastructure

The pandemic throughout the world, its impacts how things usually work and one of those are IT World. This created a new normal in IT like cloud & Mobile Computing, acceleration of Digital transformation, and high-speed broadband connectivity. With the rapid revolution and high demand in this field, comes the pressure to improve the performance such as higher asset utilization, lower energy/utility costs, improved guest services, and better security. Billions of IoT devices are being deployed every month to help with these issues.

Technology Highlights

Based on Telecom Advisory Services, the global value of Wi-Fi in 2021 is \$3.3 trillion USD and will escalate to \$4.9 trillion USD in 2025. The wireless paradigm in our society also shifts from Today's Network (Theoretical peak speed) to Tomorrow's Network (Overall network capacity). Wi-Fi 6 is the next-generation wireless standard that's faster than 802.11ac. More than speed, it will provide better performance in congested areas, from stadiums to your own device-packed home. Wi-Fi 6 officially arrived in late 2019, and Wi-Fi 6-enabled hardware was released throughout 2020.



Wi-Fi 6 Solves Real Problems

OFDMA Frequency (Network capacity)
MU-MIMO (Network capacity)
Power efficiencies (Device battery life)
1024-QAM (Peak throughput increase)
Long OFDM symbol (Outdoor reliability) (Peak throughput increase)
BSS colouring (Network capacity) (Enhanced Wi-Fi coexistence)

Multigigabit Technology

The Campus Core Is Under Stress

- Rapid increases in Wi-Fi speeds
- IoT devices / Smart Buildings
- 10x Increase in wired edge speeds (Multigigabit/802.3bz)
- Cloud applications and video streaming

'After considering every way to solve this problem, The 'Bottleneck' has shifted in the access layer. The new bottleneck is now removed from between the access point and the client to between the access point and the switch.'



Internet of Things (IoT)



IoT Forecast

- 50 billion new devices are expected to be connected by the year 2025
- The smart building market will grow to \$108b by the year 2025
- Home automation market growing by \$25b/year
- Smart Hospitality market growing to \$12b by the year 2025

Challenges when deploy IoT solutions:

- Connectivity
- Security
- Compatibility



Benefits of implementing IoT solutions:

- Cost reduction
- Enhance customer experiences
- Increase efficiency & productivity
- Increase business opportunities



IoT in Education / School

1. Environment Air Monitoring
2. Vape Detection
3. Window Sensors
4. Asset Tracking
5. Occupancy Management
6. Smart Thermostats
7. Smart Lighting
8. Automated Locks

Smart City

A Smart City places physical infrastructure on its network infrastructure to create situational awareness for new services, lower costs & public safety, and use IoT to connect buildings, vehicles, people, and things. In 2020, smart sensors and emerging technologies throughout different districts in 2020.

Some of the top Smart Cities in the world :

1. Singapore.
2. Amsterdam.
3. Dubai.
4. London.



Smart Cities consist of 3 things :

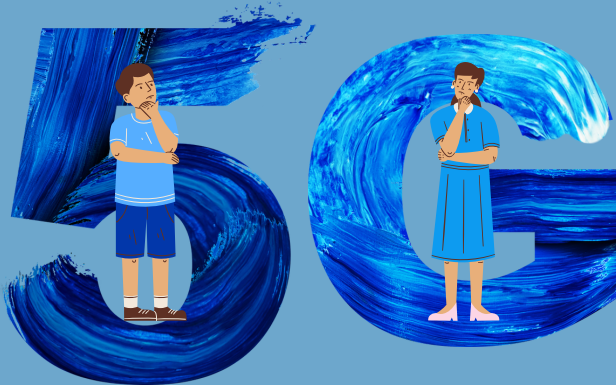
1. Smart Living

Some examples are Smart ID cards, In-building LTE, Smart parking/transit, Wayfinding, Personal networks, and IPTV Smart lighting.

2. Smart Learning

Some instances are Flexible Learning, Spaces Digital Portals, Virtual Labs Distance Learning Lecture Capture, and Library of The Future.

3. Smart Security



What is 5G?

5G Features

5G is the fifth-generation technology of wireless technology systems. It is the latest global wireless standard after 1G, 2G, 3G and 4G networks. 5G offers higher speed and lower latency than previous generations. Besides that, 5G enables a new type of network to connect and transmit data virtually to everything and everyone together comprising with devices, machines and so on.

1. Ultra-low latency with less than 1ms
2. High download speeds with 20Gbps
3. Up to 800MHz frequency channel
4. 10 Mbps/m² data processing per area
5. 500 km/h allowable maximum mobility speed

5g & Wi-Fi 6

What is Wi-Fi 6?

Wi-Fi 6 is the next generation standard in WIFI technology. Wi-Fi-6 also can be known as AX WIFI or 802.11ax WIFI. The purpose of building Wi-Fi 6 is to deal with the continuous increasing number of devices globally such as smart electrical appliances in our households, multiple smart home devices, virtual and augmented reality devices and so on. Wi-Fi 6 is explosively fast, high efficiency and excellent in transmitting data.

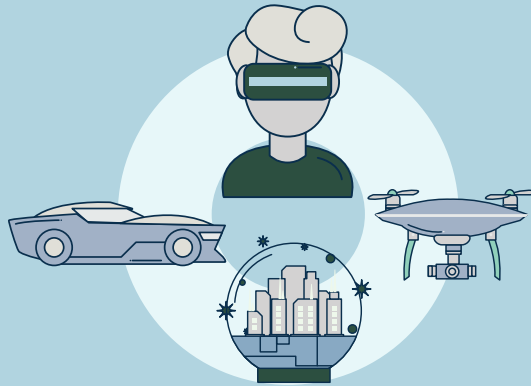


Wi-Fi 6 Features



- High Wi-Fi band from 80MHz to 160MHz
- Extended battery life by reducing 30% power consumption
- High coverage range with less than 50m indoors and up to 300m outdoors
- High network capacity increase by 4 times compared to Wi-Fi 5
- Low latency with average of 20ms

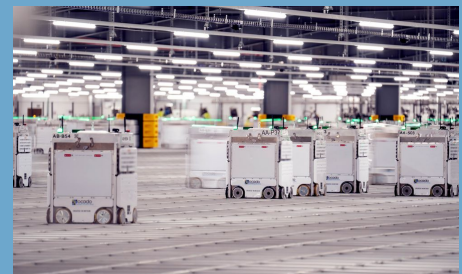
Devices that utilize 5G and Wi-Fi 6



1. Autonomous cars
2. Smart home devices
3. Smartphones
4. Virtual Reality
5. Augmented reality
6. Delivery Drone
7. Smart Grid

A domain that utilizes 5G and Wi-Fi 6

The domain that can utilize 5G and Wi-Fi 6 technologies is manufacturing. 5G and Wi-Fi 6 provide the network for all the devices and machines to connect, exchange and transmit data and instructions with ultra-low latency and high speed to elevate the safety, efficiency and productivity with low cost of the manufacturing. For example, Ocado is the biggest online delivery company in the United Kingdom. The warehouses of the company are heavily automated by utilizing 5G and Wi-Fi 6 technologies to connect robot arms to pick, produce, pack and shift products faster than humans can.



"Reflection on the 6th industrial talk"



Via the 6th industrial talk, it has successfully widened my views and improved my understanding about the features, importance, benefits and uses of 5G and Wi-Fi 6 technologies. I strongly believe that these technologies will elevate the standard of living and bring lots of advantages to human beings. To illustrate, 5G and Wi-Fi 6 technologies can improve the profit of retailers by using VR and AR to enhance customers' experience.