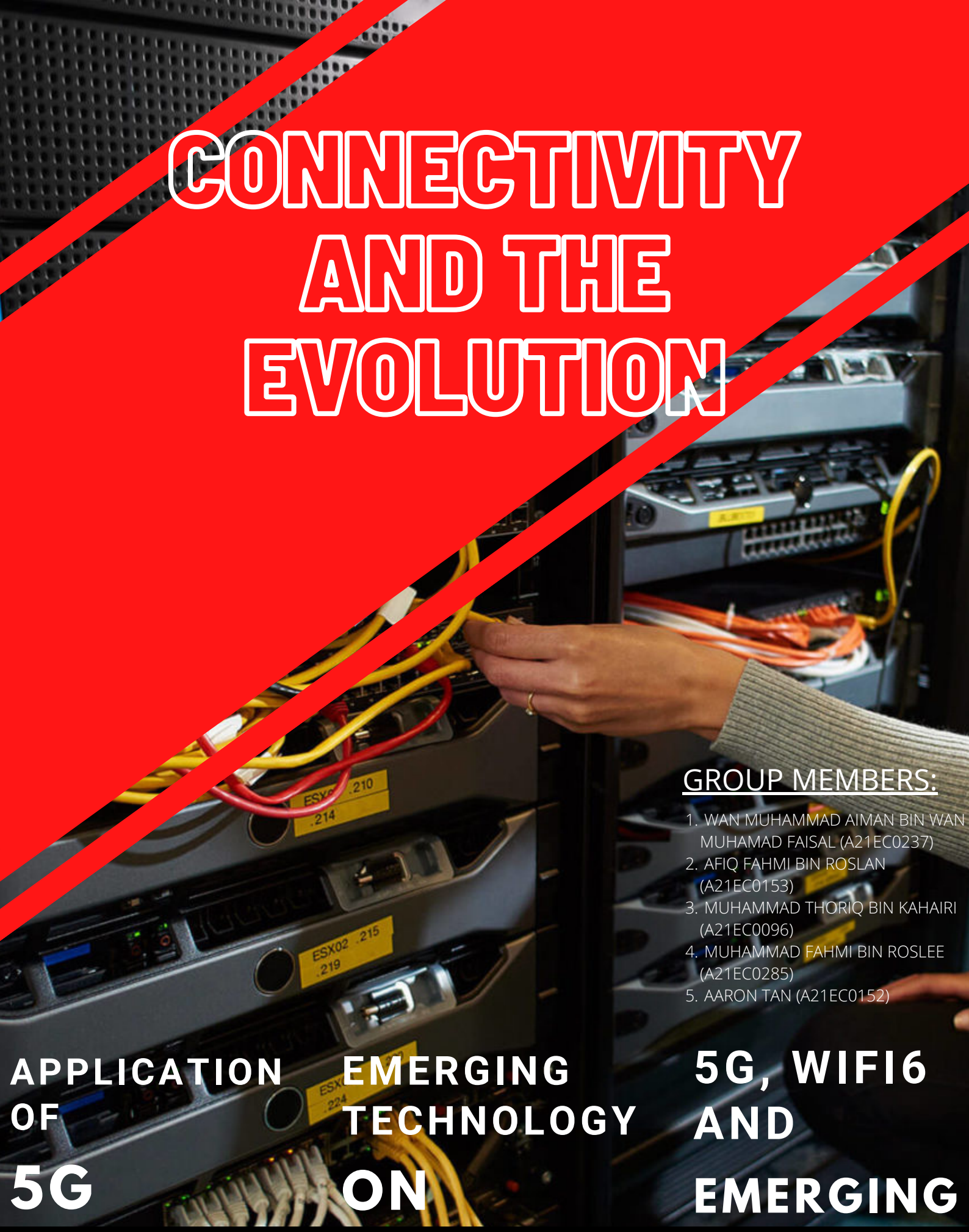
CONNECTIVITY AND THE EVOLUTION



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APPLICATION OF 5G IN SMART CAMPUS

EMERGING TECHNOLOGY ON NETWORK INFRASTRUCTURE

5G, WIFI6 AND EMERGING NETWORK TECHNOLOGIES

11 December 2021

APPLICATION OF 5G IN SMART CAMPUS

A smart campus provides helpful and engaging experiences by integrating advanced network infrastructure and internet-connected gadgets.

Smart campus makes use of cutting-edge technology to develop new experiences and services. These networks, AI-driven smart technologies can improve a variety of aspects of the student and faculty experience on campus, including enhancing student services, reducing compliance blunders, automating workflows, improving the financial assistance process, reducing waiting times, reducing human errors and conserving resources and energy. Without you knowing, this technology is already embedded in our life. We have interacted with this technology every day. The simplest example is using a smartphone which capable of many things instead of being so small. Old universities have difficulty in integrating this new technology. They need time and big funding to integrate it but once the university builds the foundation for wired and wireless services, the opportunities are endless.

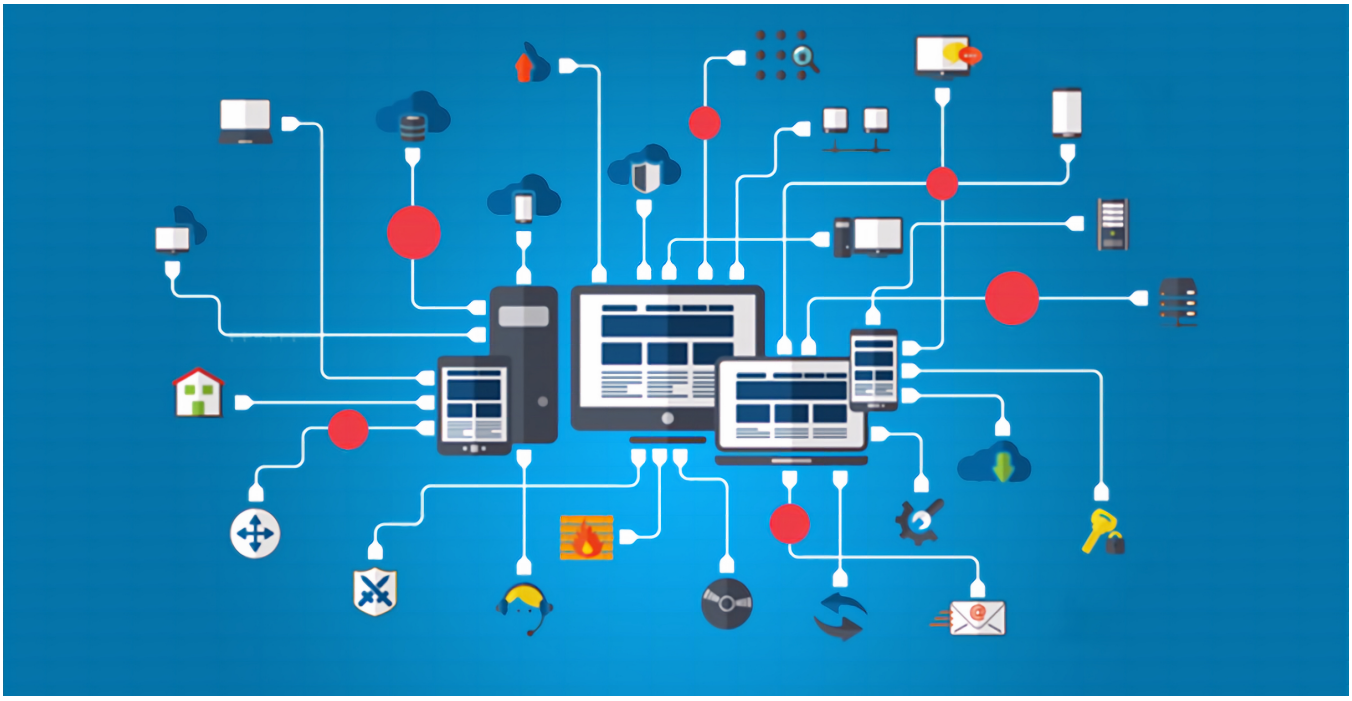
So, what are application of 5G in smart campus? With 5G, building automation can work seamlessly. Building automation can connect air conditioning, ventilation, heating and safety equipment with each other. With help of AI and 5g, power consumption can be reduced while enhancing the responsiveness of buildings to the people who live, work, and learn inside them. Connecting building control sensors to analytics and location-based services can be done to maximize fresh insights into how people use the room and make smarter investment and renovation decisions in future needs. Waste energy also can be minimized at the lowest rate possible so that the energy used can be reduced.

REFLECTION

What is the motivation/insights/information did you gain on the application of 5G in Smart Campus?

Smart Campus makes a difference in many ways. The possibilities are limitless. The most important part of a smart campus is it can make learning into another level that we never had. Students improve their experience during the study by using 5G technology. With Smart Campus, students can expect the internet connection is like home which is stable, reliable and can be accessed anywhere. Voice-activated assistance, smart laundry machines, virtual health services, smart library, autonomous foodservice and real-time tracking are attainable as all things are interconnected and working seamlessly. Security also can be enhanced. With real-time tracking, real-time crime also can be detected. The sensor will be triggered automatically when something suspicious happens. The crime will be reduced while increasing awareness. We hope that the 5G Smart Campus can be realised in the near future.

Emerging Technology On Network Infrastructure



What is Network Infrastructure?

So, what is network structure, exactly? Network structure can be referred as the resources of a network that enable network or internet connectivity, management, business operations, and communication. Hardware, software, systems, and devices make up network infrastructure, which enables computation and communication between users, services, applications, and processes. From servers to wireless routers, a system's network infrastructure is made up of everything involved in the network. Users, applications, services, devices, and other entities use network infrastructure to communicate and provide services. smartphone and laptop as well as Internet of things devices such as sensor and door locks through wireless protocols is an example of devices that make use of network structure.

How does it work?

All of them connect to an Access Point. The Access Points allows connection for devices within the area by creating a wireless signal from a wired signal. Meanwhile, the access points connected to a cable to the switches. The switches act as centralized nodes that controls and coordinate the flow of data via data packets. Multiple of these switches will be connected to the core switch, which is generally fast, in a bigger application where it is needed for a Wide Area Network (WAN).The core switches are usually located in the data base which is the area which permits the access of the internet. These databases also contain the servers and hardware.

How does it change the world?

There would be substantial increases in Wi-Fi speeds and usage of Cloud apps and video streaming at a workplace or campus, causing enormous stress and traffic on the core switches. As a result, modifications to the ports are required, as is the use of Multigigabit Ports. Devices that require more than 1 GB of data can use the Multigigabit ports. The present campus infrastructure, for example, only supports 10 or 40 Gigabit Ethernet (GbE) speed. However, by utilising the Multigigabit infrastructure, it is now possible to achieve 40 or 100 GbE throughput. This also addresses the issue of a bottleneck, which restricts data flow to devices. The bottleneck between the user and the access point has been switched to the access point and the switch. As a result, the maximum amount of data that may be linked to the devices is 100mb. In the case of multiple access points, the traditional approach to On-Premises LAN or WLAN network management is to use a LAN or WLAN controller. All the access points are managed and centralised by the controller. The network management system is then linked to the controller and switches. Currently, the controller and Network Management System have been replaced by the Network Controller, which performs both functions. The term for this is "unified network management."

Devices

The Access Point is one of the network infrastructure devices. There are outdoor access points such as the T and P series while R series is for indoor access points. According to COMMSCOPE's system engineer, Mr Goh Bih Der, the best indoor and outdoor access points on the market right now RUCKUS R840 and T750 respectively. All of these Wi-Fi 6 access points are offered by COMMSCOPE RUCKUS. Switches such as access, aggregation, and core switches are also available like the ICX 7150, ICX 7550, and ICX 7750

Domain

The domain here refers to the local subnetwork. Mr Goh Bih Der said the local subnetwork domain is the Local Area Network (LAN) where its domain contains a collection of servers within its subnetwork which are all under the management of a central database. This allows multiple access of services which in this case are the access points at once by just authenticating to the domain controller instead of individually accessing each of the access points. This is especially needed in universities like Universiti Teknologi Malaysia which have numerous amounts of access points.

REFLECTION

WE HAVE GAINED VALUABLE INSIGHTS ON THE IMPORTANCE OF THE NETWORK INFRASTRUCTURE ESPECIALLY POST COVID PANDEMIC. DUE TO THIS, THERE IS A HUGE PRESSURE AND DEMAND TO INCREASE OR IMPROVE THE PERFORMANCE OF HIGHSPEED BROADBAND CONNECTIVITY AND A SMOOTH SAILING NETWORK TRAFFIC. THROUGH THE UPGRADES SUCH AS FROM GIGABIT PORT TO MULTIGIGABIT PORT WHICH RESOLVES THE PROBLEM OF BOTTLE NECK AND THE EXISTENCE OF THE NETWORK CONTROLLER, IT IMPROVES THE ACCESSIBILITY OF USER TO THE INTERNET. WITH SUCH ACCESSIBILITY, IOT DEVICES LIKE SENSORS AND IOT DOOR LOCKS WILL RESPOND ACCURATELY AND WITHOUT DELAY. BESIDES THAT, THE USERS ARE ABLE TO ACCESS THE CLOUD APPLICATIONS AND VIDEO STREAMING WITH EASE. THIS IS ESPECIALLY TRUE FOR USERS WHO ARE IN A BUSINESS COMPANY AND STUDENTS FROM UNIVERSITY STAYING WITHIN THE CAMPUS.

5G, Wi-fi 6 and Emerging Network Technologies

What is 5G ?

5G networks will provide 50x more speed, 10x less latency, and 1,000x more capacity than 4G/LTE.1 This means 5G will be able to connect more devices and transmit more data than ever before, delivering fast connectivity and significantly enhanced user experiences. As with LTE, mobile carriers will offer subscriptions to their 5G network, which requires 5G-capable devices. Basically for indoor ultra-high density building and house .

Advantages

Higher Download Speed. The 5G network will have the capacity to increase download speeds by up to 20 times (from 200 Mbps (4G) to 10 Gbps (5G)) and decreasing latency (response time between devices). These speeds will maximize the browsing experience by facilitating processes that, although possible today, still present difficulties.

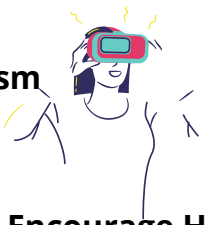
What is Wi-Fi 6 ?

Wi-Fi 6, based on the IEEE 802.11ax standard, will deliver 4x higher capacity and 75 percent lower latency, offering nearly triple the speed of its predecessor, Wi-Fi 5.2 Anyone can operate a Wi-Fi network—and most of us have one in our homes and offices, connected to broadband service. Wi-Fi 6 devices require a Wi-Fi 6–compliant access point to get the full speed, latency, and capacity improvements. For outdoor wide coverage industry and city.

Advantages

Benefit afforded by the WiFi 6 is the **increased battery life**. This improvement is beneficial to the average user and can be a critical factor in enabling low-power devices that comprise the Internet of Things (IoT) to make use of WiFi communication. Battery life is extended through a feature known as target wake time (TWT). TWT enables the WiFi access point to communicate with your device to tell it when exactly to turn its WiFi radio to wake up and go to sleep. This helps conserve power as your device will spend more time in sleep mode than with previous WiFi implementations.

Foster New Opportunities and Benefits



1.Next Generation Smart Tourism

Enhance visitors' experience via next generation AR and VR application

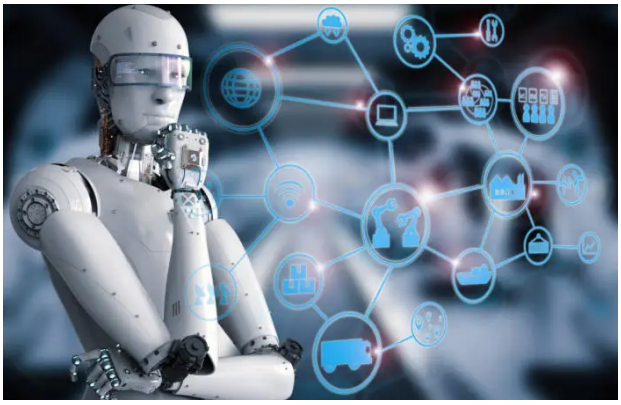
2.Advance 5G Industrial Park Encourage Hi Tech Industry Establishment

Able to attract Hi-Tech investors and create job opportunity to younger generation

The Devices used

Virtual Reality (VR) is a computer-generated environment with scenes and objects that appear to be real, making the user feel they are immersed in their surroundings. Why VR is need 5G and Wi-Fi 6 is because high throughput for retina experience VR and low latency to avoid motion sickness.

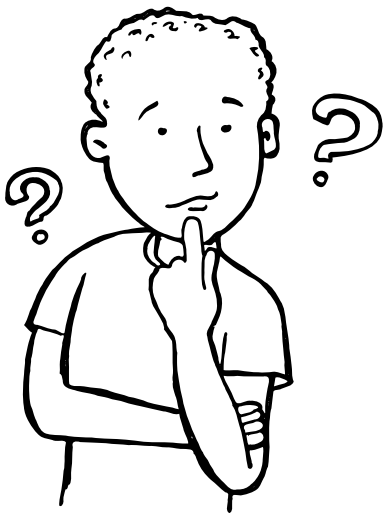
- 5037 x 5707 resolution for retina experience per eyes
- 6 angles for full-view panoramic video mosaics
- Motion to photon delay < 20ms



Artificial intelligence (AI) is a broad branch of computer science that involves building intelligent machines that can perform tasks that normally require human intelligence. Artificial intelligence (AI) applications are quickly entering daily life, whether it is traffic data from Waze maps, sensor data from autonomous vehicles, or Netflix entertainment recommendations. So 5G and Wi-Fi 6 are needed, because all these applications generate large amounts of data that must be collected and processed in real time.

Reflection

We've learned a lot about why network technologies are so important. As a result, there is a great deal of demand to improve or boost the speed of the data in the transmission and also low latency connection. It also may give improved support for remote workforces and strengthen overall network connectivity with speed, reliability, and flexibility through upgrades such as from 4G network, Wi-Fi 5 to 5G network, Wi-Fi 6 which tackles the problem of internet speed concerns. With this level of accessibility, IoT devices such as virtual reality (VR) and artificial intelligence (AI) can work in tandem to help the network evolve. Aside from that, users will depend less on the internal memory when intensifying the use of the cloud applications due to the latest evolution of the network technologies. This is very important for the users, especially university students who are having online classes during the covid-19 pandemic.



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