INTERNET OF THINGS (IOT)

KENISHA CORERA|DFCS|DK|62|203| SIT 202

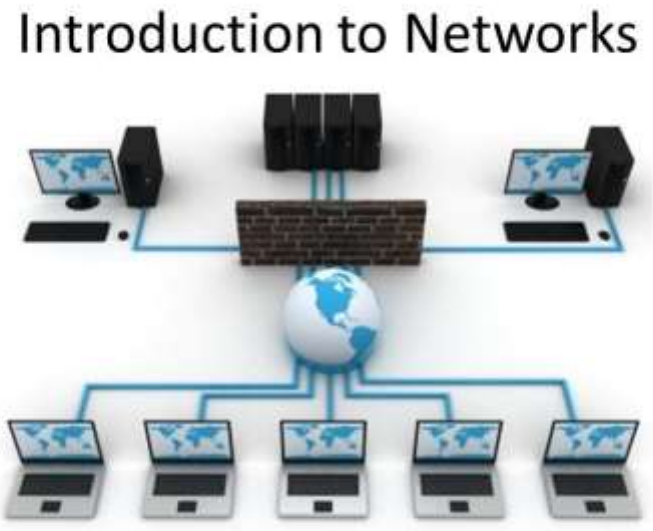
TABLE OF CONTENT

Introduction

- Computer networks are undergoing a fundamental change in their context. Three principal themes motivate this change from static, traditional network to an interconnected world: network security, internet of things (IoT)-imagine a future where smart cities are indeed like computer networks! Instead of being inflexible and unvarying, they are as variable in their responses to program changes as traffic lights reacting to current road traffic.

- The Internet of Things, or IoT, is like having all of the city's shops, cars, and homes networked and talking to each other! It's a massive network of devices that includes fitness trackers and smart appliances.

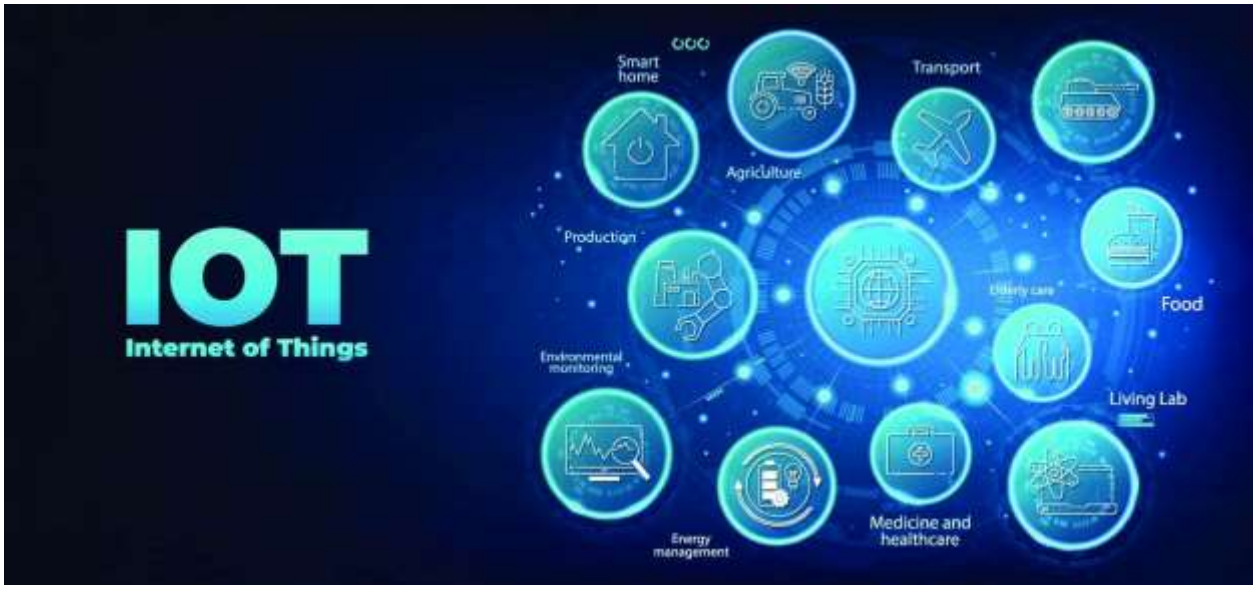
- This paper delves deeper into these themes, elucidating how they're transforming network architecture and management to make networks more adaptable and safe for the future.



Internet of Thing (IOT)

What is ITO?

- ✓ The Internet of Things (IoT) is a network of actual objects, or "things," that are outfitted with sensors, software, and connections to enable them to collect and exchange data over the internet [14].



How IoT differs from traditional networking?

- Traditional networking focused on connecting computers and servers, while the Internet of Things (IoT) broadens connectivity to ordinary objects, enabling data interchange and remote monitoring and control. [15]

Motivation behind IoT

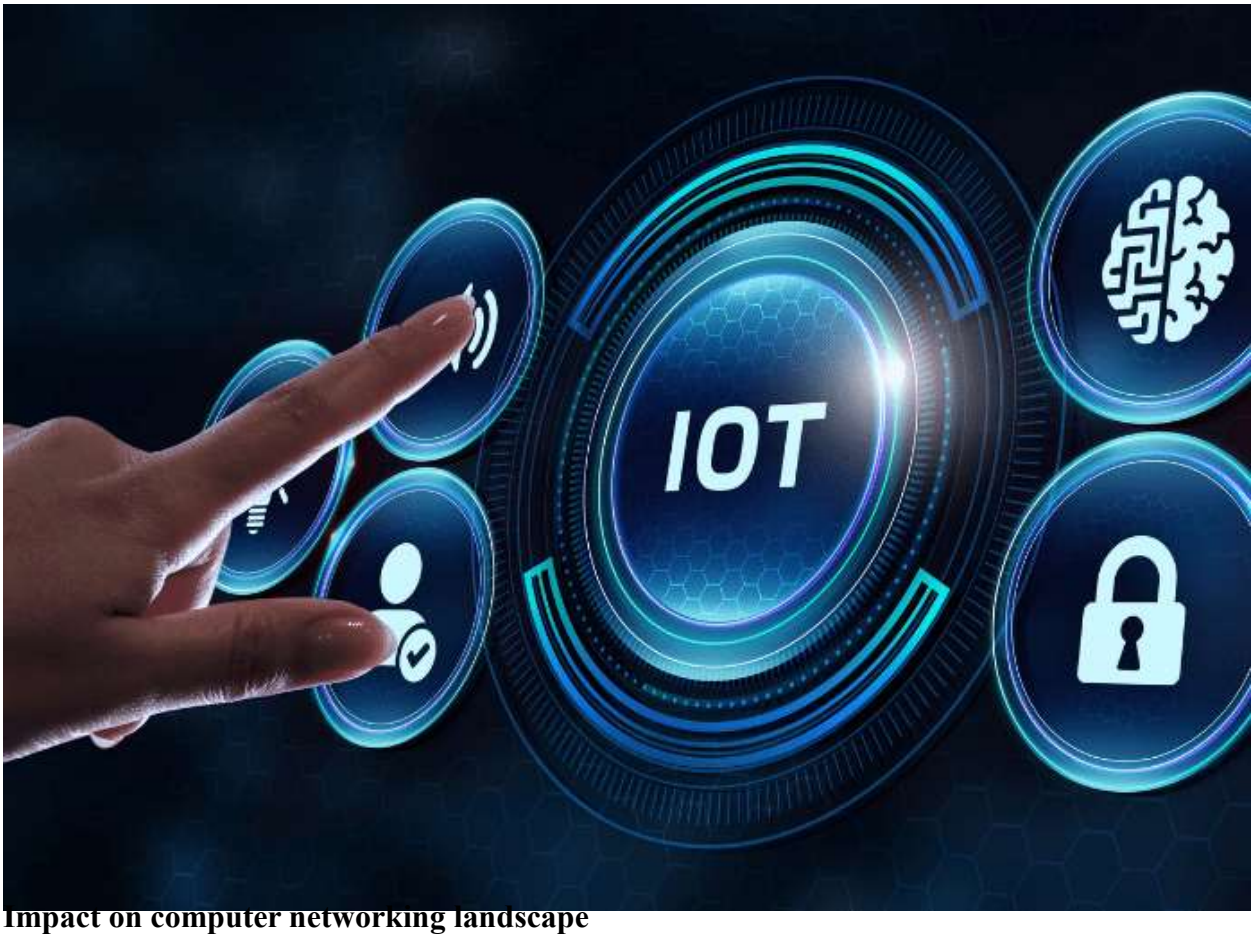
- IoT is mainly motivated by the desire to facilitate seamless communication and integration between various platforms and devices, which will increase output, automate procedures, and improve data-driven decision-making. [16]

Key technologies and concepts

- **Sensors and actuators**: Internet of Things devices employ sensors to collect data and actuators to perform actions.
- **Wireless communication methods:** Devices in the Internet of Things employ cellular networks, Bluetooth, Wi-Fi, ZigBee, and other wireless protocols to communicate.
- **Cloud computing and data analytics:** Cloud processing and analysis of IoT data is common for decision-making and insights. [17]

Applications of IoT

- The Internet of Things is used in a wide range of sectors and fields, including smart cities, smart homes, smart manufacturing, smart transportation, smart agriculture, and smart cities [18].



Impact on computer networking landscape

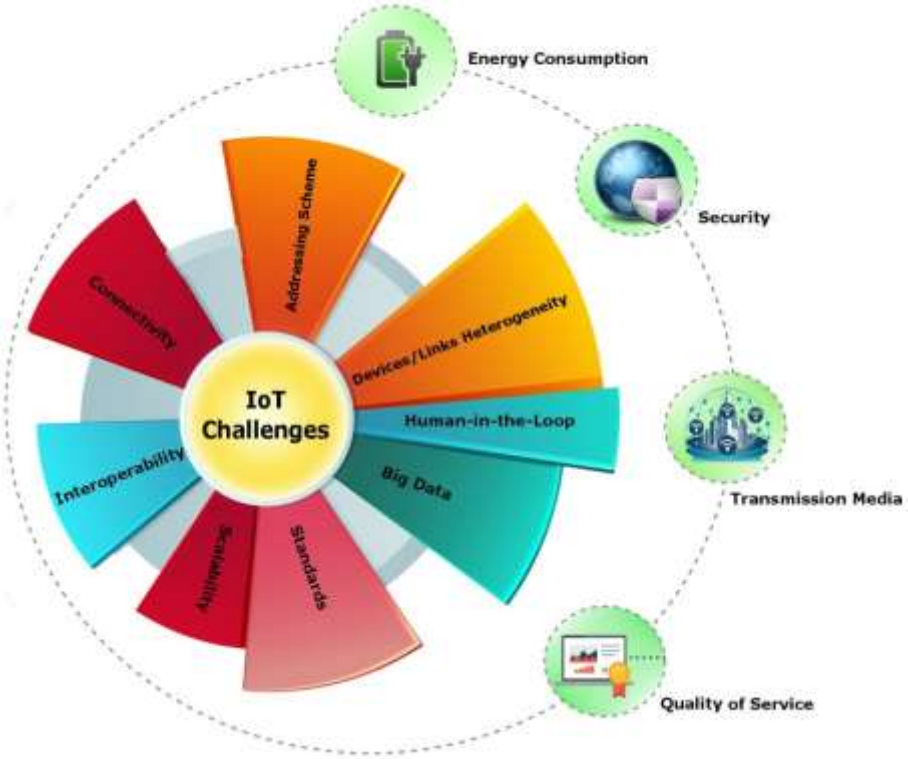
- The Internet of Things is driving the need for more dependable, scalable, and secure computer networks in order to manage the massive volume of data generated and the huge number of connected devices [19].

Changes required for current networking paradigm

- To allow IoT, computer networks must adapt to handle the increased traffic, provide better scalability and security, and implement enhanced security measures to thwart any attacks. [20]

What are the challenges in IoT?

- Because linked devices are vulnerable to hacking and data breaches, security and privacy pose the biggest problems in the Internet of Things. Another difficulty is interoperability because different devices frequently employ different communication standards and protocols. As the quantity of IoT devices increases and strains network infrastructure, scalability becomes a challenge. Another issue is power management, particularly with battery-powered gadgets. Massive data generation also increases the complexity of data management and storage. The utility of IoT devices might be limited by network dependability in some circumstances, such as distant places, and privacy standards require regulatory compliance.

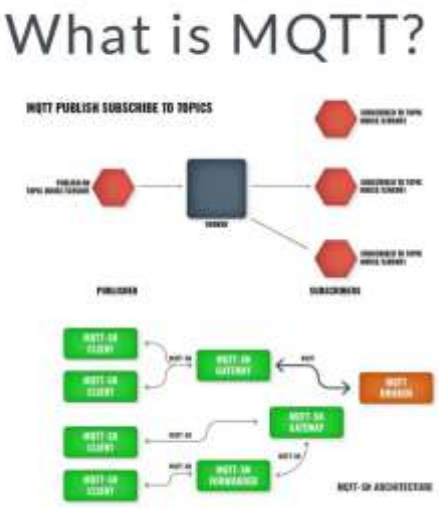


What are the different protocols used to support IoT use cases? Discuss different application protocols used.

- IoT uses a variety of protocols to accommodate various use cases. Web-based IoT devices frequently employ HTTP (HyperText Transfer Protocol), yet this protocol might not be appropriate for low-power or restricted situations. For devices with limited resources, the lightweight CoAP (Constrained Application Protocol) protocol is appropriate. Advanced Message Queuing Protocol, or AMQP, provides dependable communication in dispersed settings. MQTT (Message Queuing Telemetry Transport) is developed for low-bandwidth, high-latency networks. While Bluetooth and Wi-Fi provide device-to-device connection, Zigbee and Z-Wave are also utilised in smart home applications for low-power, short-range communication.

What is MQTT?

- MQTT (Message Queuing Telemetry Transport) is a lightweight messaging protocol that is perfect for Internet of Things applications because it is made for devices with limited bandwidth, high latency, or unstable networks. It makes use of a publish-subscribe paradigm in which clients, or devices, post messages to particular subjects, and subscribers, or other people, receive these messages. The protocol, which uses TCP/IP to function, is made to use the least amount of device resources and network traffic possible. Moreover, it provides Quality of Service (QoS) tiers to guarantee dependable message delivery. Because of its simplicity and effectiveness, MQTT is frequently utilised in Internet of Things systems for applications like home automation and remote monitoring.



How do I Implement a smart home that includes several smart appliances (an IoT use case) in Cisco packet tracer?

- Start by adding smart appliances from the IoT device library, such as security cameras, smart lights, and thermostats, to create a smart home with IoT devices in Cisco Packet Tracer. Make wired or wireless connections to a home gateway (router) from these devices. Make that the gateway is linked to the internet or a local network. To enable control, configure the appliances using the IoT Registration Server. By implementing an Internet of Things protocol such as MQTT, you can emulate device control from a laptop or smartphone. Lastly, use remote device control to test the configuration by checking camera feeds, changing temperature settings, and turning on or off lights.

How do I analyse MQTT protocol in Cisco packet tracer (tip: you can implement a MQTT broker in laptop, mobile connected to the LAN)? The following figure shows a sample smart home implementation in Cisco Packet Tracer. The analysis should include 1–2-minute video capture of the cisco packet tracer screen of your own implementation and MQTT in action (with your audio explanation).

https://drive.google.com/file/d/1sw4ZJ0d6BrEYcAM63zKaZF8O3aA1eto0/view?usp=drive_link

Conclusion

By incorporating commonplace items into networked ecosystems, the Internet of Things (IoT) is revolutionising established networking infrastructures and marking a major advancement in networking. The Internet of Things (IoT) facilitates the smooth exchange of data between devices by utilising essential technologies such as sensors, wireless communications, and cloud computing. This allows for real-time insights and automation. As we've seen, this transition brings with it both opportunities and difficulties, including the requirement for improved network interoperability, security, and scalability. Furthermore, protocols like AMQP, CoAP, and MQTT are essential for facilitating effective communication in Internet of Things contexts, particularly for devices with limited resources.

IoT has enormous promise; its uses span from smart cities and homes to healthcare and agriculture. To fully benefit from it, though, existing network concepts must change to meet the increasing traffic and security needs of billions of linked devices. IoT is positioned to transform daily life and industries as it develops further, pushing the limits of automation and connectivity.

Reference

- **Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M.** (2013). Internet of Things (IoT): A vision, architectural elements, and future directions. *Future Generation Computer Systems*, 29(7), 1645-1660.
- **Mouradian, C., Naboulsi, D., et al.** (2018). A comprehensive survey on fog computing: State-of-the-art and research challenges. *IEEE Communications Surveys & Tutorials*, 20(1), 416-464.
- **Höller, J., Tsiatsis, V., Mulligan, C., et al.** (2014). *From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*. Academic Press.