

Lecture 1-Network Configuration in IoT



- ☐ Network configuration
- ☐ Network Topologies
- ☐ IoT Network
- ☐ Used case
- ☐ Summary

What is network configuration?

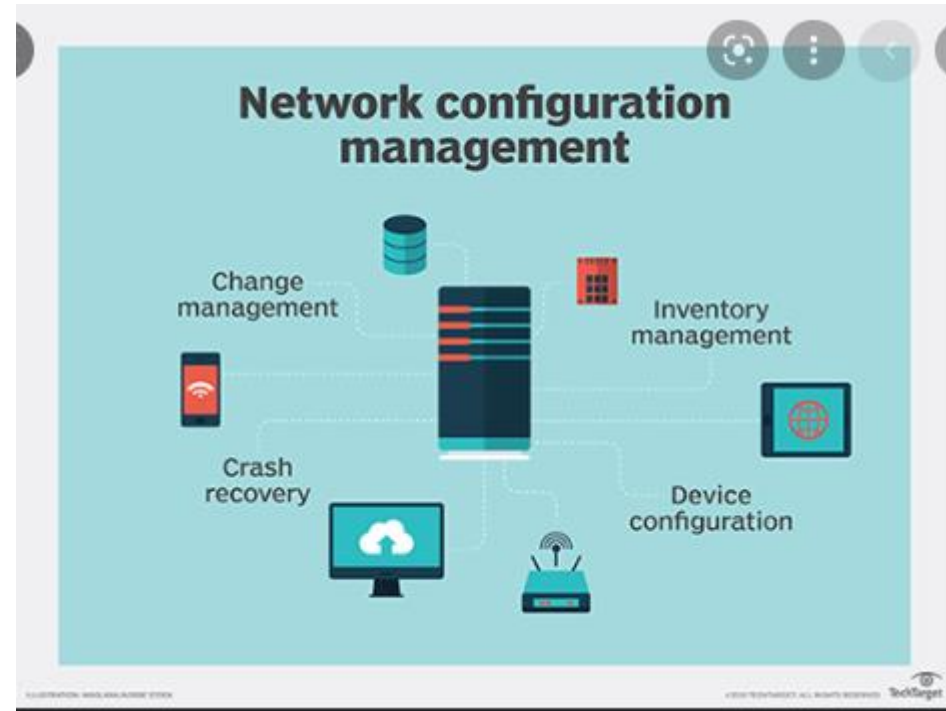
Network configuration is **the process of assigning network settings, policies, flows, and controls**. In a virtual network, it's easier to make network configuration changes because physical network devices appliances are replaced by software, removing the need for extensive manual configuration.

How do you configure a network?

- **A step-by-step guide to setting up a home network**
- Connect your router. The router is the gateway between the Internet and your home network. ...
- Access the router's interface and lock it down. ...
- Configure security and IP addressing. ...
- Set up sharing and control. ...
- Set up user accounts.

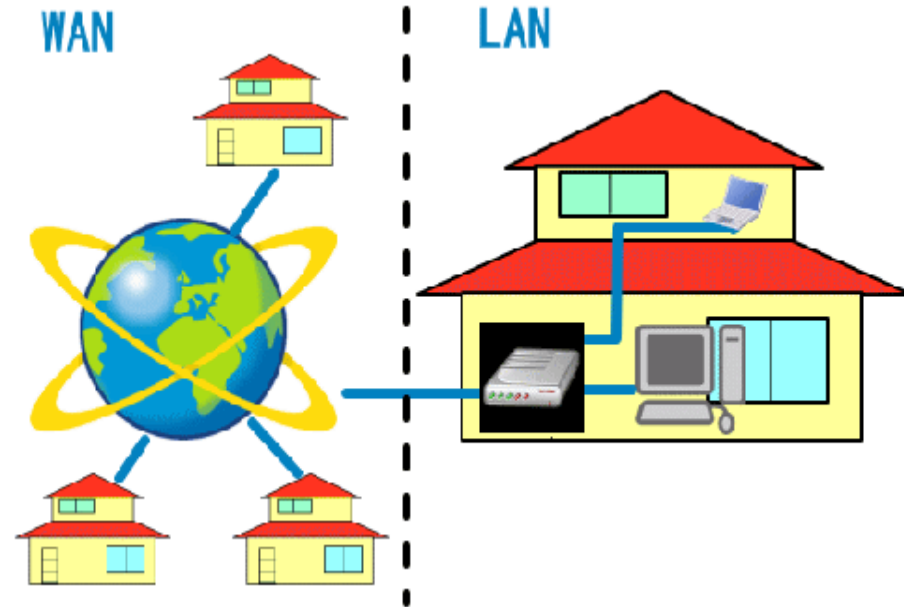
What are the benefits of network configurations

- **Advantages of network configuration**
- Streamline the processes of maintenance, repair, expansion and upgrading.
- Minimize configuration errors as part of change management.
- Optimize network security.
- Ensure that changes made to a device or system do not adversely affect other devices or systems.



What are the types of network configuration?

- Personal Area Network (PAN) ...
- Local Area Network (LAN) ...
- Wireless Local Area Network (WLAN) ...
- Campus Area Network (CAN) ...
- Metropolitan Area Network (MAN) ...
- Wide Area Network (WAN) ...
- Storage-Area Network (SAN) ...
- System-Area Network (also known as SAN)



What are network topologies?

- Different types of network configuration in computer networks are commonly referred to as *network topologies*.
- A network topology describes how the nodes or devices (physical or virtual) in a network are arranged and how they communicate with each other.
- Network topology can be physical (referring to where physical devices are placed in relation to each other) or logical (referring to how data is transmitted through the network, including any virtual or cloud resources).
- When choosing a network topology, an organization must consider the size of its network, its performance requirements and the flow of its traffic.















Common Network Topologies

- **Bus:** Every node in the network is connected along a linear path. This simple topology is used most often for small networks.
- **Ring:** Nodes are connected in a loop, and traffic may flow in one direction or in both directions. Ring networks tend to be cost-effective, but not as scalable or stable as other network topologies.
- **Star:** A central node connects to all other nodes in the network. This is a common and stable topology that's often used for local area networks (LANs).
- **Mesh:** Nodes are linked in such a way that multiple paths between nodes are possible. This type of network topology increases the resiliency of the network, but also increases cost. A network may be fully meshed (all nodes connecting to all other nodes) or partially meshed (only some nodes having multiple connections to other nodes).
- **Spine-Leaf (Tree):** Multiple star topologies are connected together in a larger star configuration.
- **Hybrid:** A combination of other topologies are used together within one network.

What is an IoT network?

IoT network is the network with physical interconnected objects embedded with sensors, smart devices that connect and exchange data with other devices and systems without human intervention.

4 Types Of IoT Networks

	Cellular	Local Area Network (LAN/PAN)	Low Power Wide Area Networks (LPWAN)	Mesh Protocols
	LTE-M, NB-IoT, 3G, 4G, LTE-M	Bluetooth (BLE), WiFi	LoRaWAN, Sigfox	Zigbee, RFID
DATA RATE	~100 kbps - 100 mbps	~100 kbps - 100 mbps	~10 kbps	~250 kbps
RANGE	Long	Short	Long	Short
BATTERY LIFE	Medium	Medium	Long	Long
USE CASES	Traditional M2M  Traditional communication  Smart agriculture  Asset management	Building & In-home  Wearables  WiFi  Smart home  Bluetooth	Wide-area IoT projects  Location  Smart City  Asset tracking  Metering	Wide-area IoT projects  Lighting management  Metering  HVAC control

Types Of IOT Networks

- **Cellular.** Cellular networks use the same mobile networks as smartphones to allow IoT devices to communicate. ...
- Local and Personal Area Networks (LAN/PAN) ...
- Low Power Wide Area Networks (LPWAN) ...
- Mesh Networks.

- LTE-M and NB-IoT both belong to **low-power wide-area networks (LPWAN)** and both can operate in a 4G band. These open standards were both introduced by 3GPP (3rd Generation Partnership Project), and are designed for reliable, secure, low power operations but they differ in frequency, range, security, cost, and power consumption. Nevertheless, they are considered to be one of the most popular solutions for IoT since they can cover large areas.
- Being a solid solution in the mobile consumer market, they have been evolving, providing reliable and high bandwidth IoT connectivity. By 2026, NB-IoT and LTE-M will cover over 60% of the 3.6 billion LPWA network connections.

- **Local area networks and personal area networks (LAN/PAN)** are cost-effective, however, data transmission is limited due to the local environment. WiFi and Bluetooth belong to this category and are commonly used for IoT connectivity solutions.

- **Low Power Wide Area Networks (LPWANs)** are a new set of wireless protocols that can literally connect all types of IoT sensors and facilitate numerous applications built specifically to support wide-ranging IoT projects. These networks can be used by devices to communicate over large areas with the help of small inexpensive batteries with low power consumption. In comparison with cellular networks, LPWANs are a cost-effective and long-term solution.
- It seems that LPWANs is among the best networks; however, as each network has its pros and cons, the downside of LPWAN lies in the small data quantities it can send in a single instance so that it can be a good fit for use cases without high bandwidth.
- Considering different purposes, there are licensed (NB-IoT, LTE-M) and unlicensed (LoRa, Sigfox) types of LPWANs. The main challenge for licensed LPWAN is power consumption; Quality-of-Service and scalability belong to the main issues when implementing unlicensed technologies.

- Due to short-range capacity, Mesh protocols are great solutions for mid-range IoT projects with the data transfers in close proximity. In Mesh networks, the communication between sensor nodes is conducted in a distributed way to reach the gateway which is the contrast approach of the data transfer to the central hub.
- Mesh protocols are robust and popular solutions for in-building and street use like smart building automation (smart lighting, HVAC operations, security, and energy control, etc.), street lighting.

How to select the most suitable IoT network?

- **The important criteria which should be considered are-**
- **Power Consumption.** If you're looking for longevity and a solution without the need to supply a device with power, Bluetooth and LPWAN are the networks suitable for this case. Technologies with a high-power consumption like Wi-Fi is not recommended.
- **Coverage Area.** The size of the area that needs to be covered defines the type of protocol to be applied for your IoT project. Whereas LoRA is limited to national boundaries, the Sigfox network is available in 60 countries.
- **Data amount.** If you need to transmit small data quantities, there are solutions like BLE over a short distance or LPWAN for long-range data transfers. For big data amounts, we recommend Wi-Fi and GSM networks.
- **Devices' density.** The selection of proper IoT protocol depends here on the need for geographical proximity whether on the need to be spread out. If the objects need to be connected closely to each other, WiFi will be a good option; in the case of proximity, LPWAN and GSM networks are recommended.

The licensed network built for IoT

- The IotaComm Network is the backbone and enabler of all of the company's IoT solutions from [Smart Buildings](#) to Smart Energy.
- IotaComm Network is the first IoT network employing FCC licensed spectrum.
- The sensors and devices operate within the portion of the radio spectrum reserved for organizations that have been granted FCC licenses.
- With exclusive rights, communications operate without interference or spectrum crowding. The FCC provides legal protection and enforcement to prevent other operators from transmitting over the same frequency in the same geographic area.

- Our proprietary network gives us the ability to ensure that every system and part of your building will be connected with no interruption or problems. And almost equally important, it operates independent of your conventional IT infrastructure, so no interoperability headaches.
- Superior Building Penetration
- Secure Network & Data
- Dedicated IoT Band
- Cellular/Wi-Fi/Blue-Tooth Capability
- Independent from Facility IT Network



Thank You !!