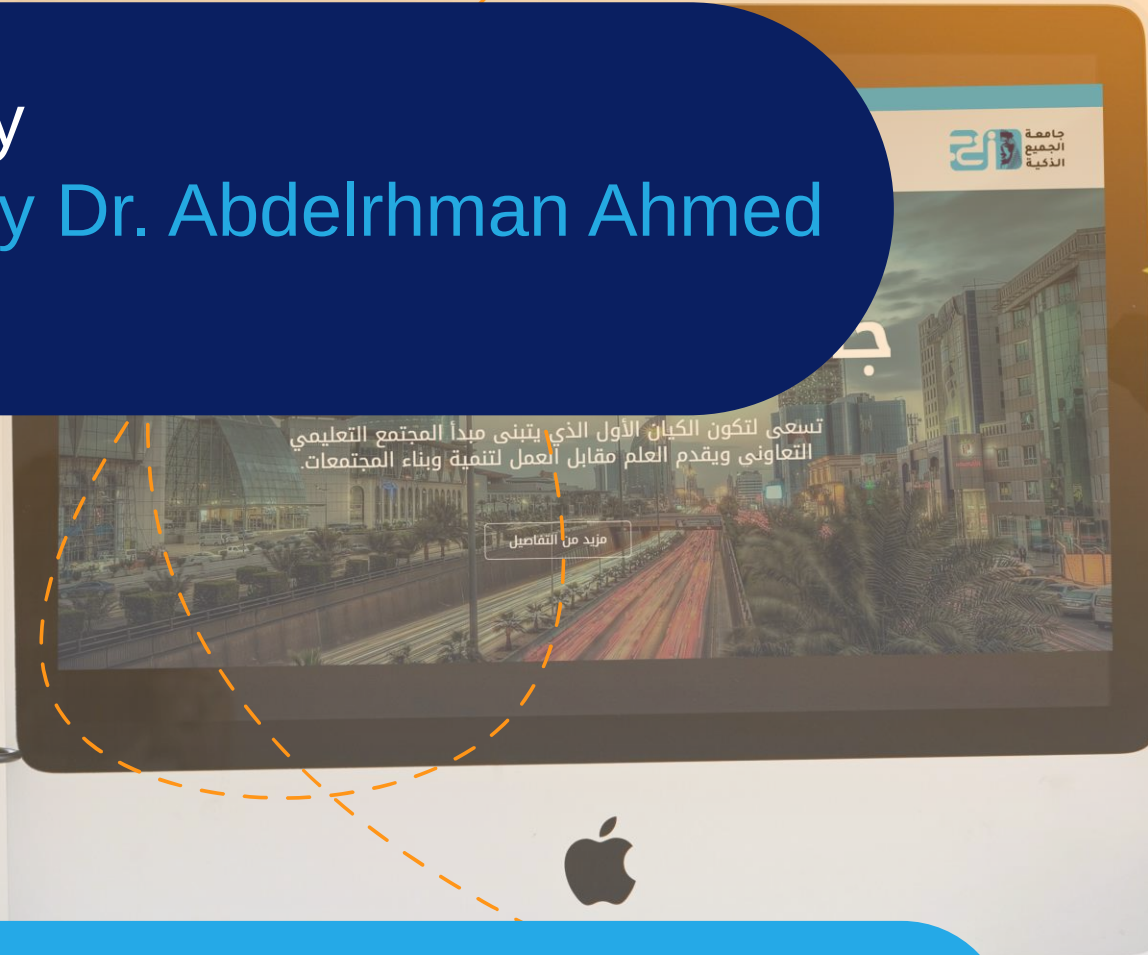


IoT Security

Prepared by Dr. Abdelrhman Ahmed

Lecture 3



جامعة الجميع الذكية
EVERYONE'S SMART UNIVERSITY

Industrial IoT Gateways

- Amidst global competition, the net profit of industrial manufacturing continues to decline, while traditional business models are forced to transform. Emerging from this is a wide unknown market space – industrial interconnection. With opportunity for growth and profit, industrial interconnect scenarios involve harsher environments, require more diversified interfaces to adapt, face more network security challenges, and are more difficult to maintain than in enterprises or the family home.
- To keep up, Huawei has designed and launched a series of high-end, mid-range, and low-end IoT gateways. These feature-rich gateways stand out for their unmatched edge computing, IoT platform support, and extensive adaption to industrial interconnection scenarios.

□ **Upon completion of this course, you will be able to:**

- Understand basic concepts and features of industrial IoT gateways.
- Master key technologies of industrial IoT gateways.
- Understand Huawei industrial IoT gateway products and features.
- Understand application scenarios of Huawei industrial IoT gateways.



Intelligent meter reading

Ubiquitous power IoT promotes the development of smart meters.

Smart transportation

Traffic video surveillance
Information collection and release

Intelligent power distribution

Power distribution automation and information collection
Large-scale construction in developed countries/regions

Intelligent energy efficiency management

Intelligent building management, enhancing energy efficiency



Gap between enterprise IP products and the stringent industrial-grade requirements of IoT fields

Industrial-grade requirements

Temperature: -40°C to $+70^{\circ}\text{C}$

Dustproof and waterproof

Strong anti-electromagnetic interference

vs.

Enterprise routers

Temperature: 0°C to 40°C

Non-compliant

Non-compliant

Diverse industrial interfaces and protocols

BPL, PLC, ZigBee, RF/Sub-GHz, RS485, RS422, RS232, Modbus, IEC 62056, IEC 60870-5-101, IEC 104...

Can you differentiate their application scenarios? Do multiple networks need to be maintained? Does a protocol converter need to be purchased?

Security risks on open networks

Industrial production network/
Remote site

Office network

Internet

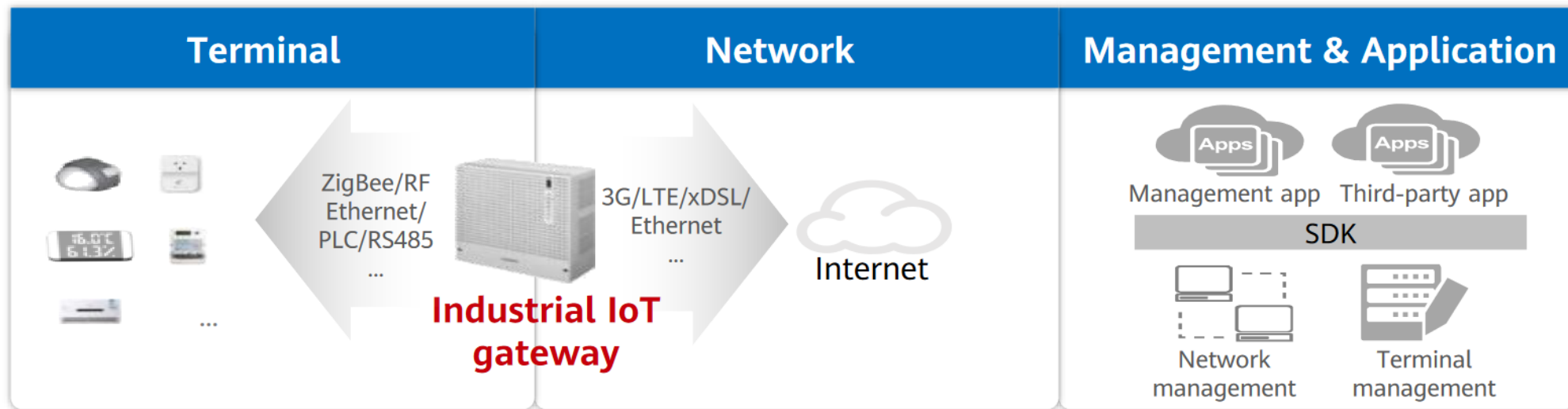


Complex IoT network O&M



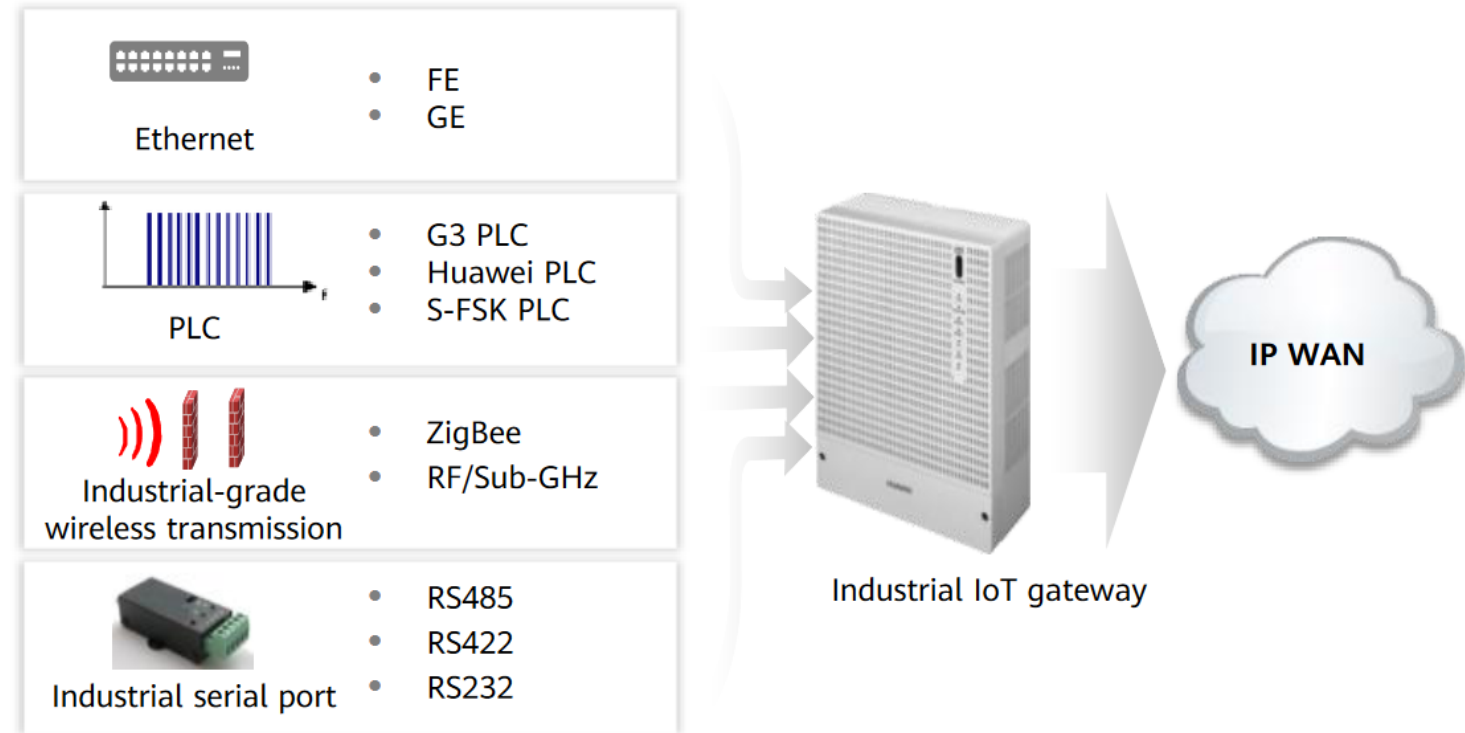
Dispersed sites, heavy deployment workload, and difficult management
High requirements on engineers' skills and expertise

- An industrial IoT gateway functioning as the aggregation device on the local network provides:
 - Uplink transmission channels
 - Edge computing capabilities, ensuring a real-time local response
- A converged gateway designed for industrial IoT applications supports:
 - Adaptation to harsh industrial environments
 - Industrial field interfaces/IP-based protocols



- Huawei industrial IoT gateways are designed for industrial IoT applications. They integrate routing, switching, wireless, and security functions.

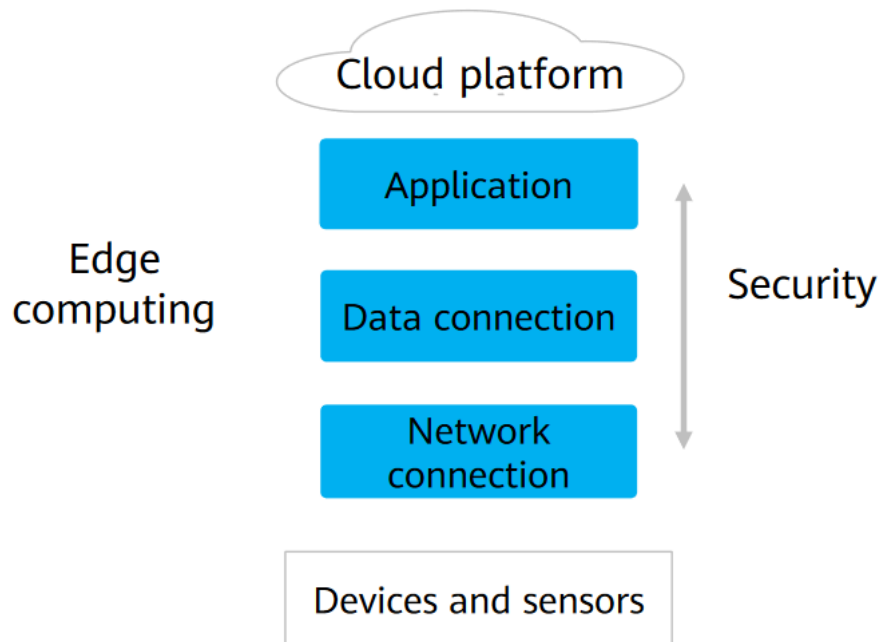
- Industrial-grade standard design
- Extensive interfaces and protocols
- Edge computing
- Security encryption
- Centralized management
- ...



- In addition to open and standard Ethernet interfaces, Huawei industrial IoT gateways also support diverse industry interface and bus standards, **meeting the requirements for interconnection and communication between old and new devices. These gateways help enterprises maximize their investments and achieve smooth transition to IP-based networks.**

- What Is Edge Computing?
 - Edge computing provides connection, computing, storage, control, and application functions on network edge nodes close to terminals to meet users' requirements for real-time services, intelligence, security, and data aggregation. Leveraging mature communication technologies, edge computing distributes computing, storage, and security capabilities on edge nodes. The computing, storage, and communication loads of the central node are distributed to edge nodes with weak computing capabilities. This minimizes the latency and cost and improves reliability of services, while protecting user privacy at the edge. Edge computing enables the transformation of networks from a cost center to a business value center.
- Core Benefits of Edge Computing
 - **Real-time services:** Dynamic path adjustment, real-time data analysis, and event response in milliseconds are supported.
 - **Intelligent analysis and processing at the edge:** Services can be deployed at the edge and flexibly adjusted. Automatic O&M can be implemented for networks.
 - **Data aggregation:** Data fragmentation is eliminated, invalid noise is shielded, and data is uploaded on demand.
 - **Private security domains:** data, node, and network security domains

- An open platform that integrates core capabilities such as connection, computing, storage, control, and application is deployed at edge nodes close to terminals or data sources to meet users' requirements for real-time services, intelligence, data aggregation, and security.



Traditionally, data must be sent to a server for processing, resulting in a long latency, which cannot meet requirements of IoT services.

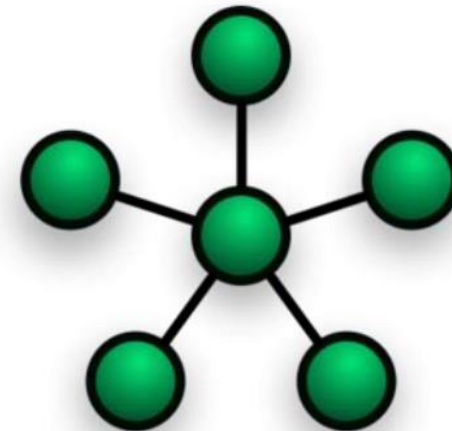


Currently, the local gateway provides containers to process data locally, minimizing the latency and improving reliability.

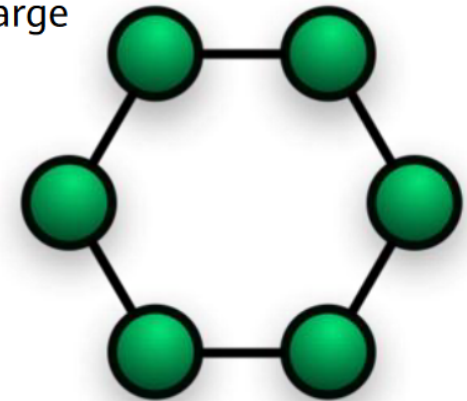
Communication Networking Technologies

- A network topology refers to the layout of computers and devices on a communication network, representing the physical or logical arrangement of network elements (NEs). If two networks have the same connection model, their network topologies are of the same type, though the physical connections inside the two networks and the distances between nodes may be different.

- The star topology is a topology in which all nodes are connected through a central network device such as a hub or a switch.
- It has the following advantages:
 - ✓ Simple structure, facilitating management
 - ✓ Easy control, facilitating network construction
 - ✓ Short network latency, ensuring efficient transmission
- It also has some disadvantages:
 - ✓ High cost
 - ✓ Low reliability
 - ✓ Poor resource sharing capability

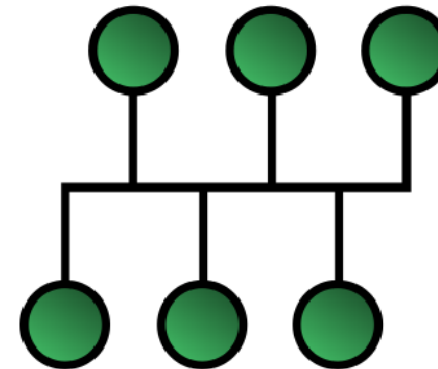


- The ring topology is widely used on LANs. On a ring network, packets of data travel from one device to the next until they reach the destination. This structure eliminates the dependency on the central node for communication between end users.
- The ring topology has the following characteristics:
 - ✓ Information flows towards a fixed direction on a network, and there is only one path between two nodes, simplifying path selection.
 - ✓ The control software is simple.
 - ✓ Information is transmitted over nodes on the ring network in sequence. If there are a large number of intermediate nodes, the information transmission rate will be lowered, increasing the network response time.
 - ✓ The ring network is closed, causing difficulties in expansion.
 - ✓ If a node is faulty, the entire network will break down, resulting in low reliability.
 - ✓ It is difficult to locate faults on branch nodes.

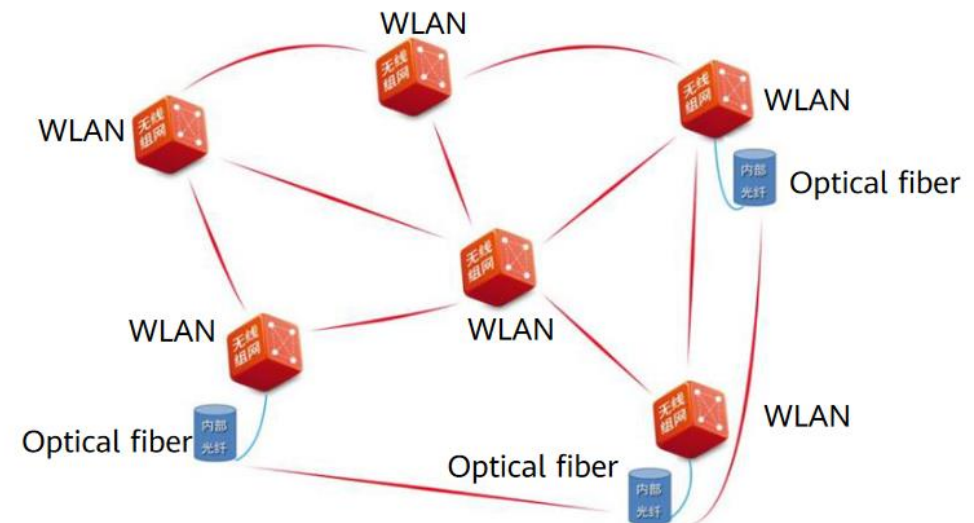


- Bus topology (or bus network) is commonly referred to as a "linear bus" because all the nodes are physically connected in a straight line.
- The bus topology has the following characteristics:

The structure is simple, facilitating expansion. When a node needs to be added, only one branch interface needs to be added on the bus to connect to the branch node. When the maximum bus load is reached, other buses can be expanded. A small number of cables are needed, facilitating installation. Simple and reliable devices are used. It is difficult to locate faults on branch nodes.



- A wireless mesh network is also called a multi-hop network. It is a new wireless network technology that is totally different from a traditional wireless network. It does not rely on the preset infrastructure, and allows for temporary networking, rapid deployment, and is resilient to damage even without a control center.
- A wireless mesh network uses the mesh topology, which is a multipoint-to-multipoint network topology. In this mesh topology, network nodes are connected in a wireless multi-hop manner through adjacent network nodes.



Chapter 03

Huawei Industrial IoT Gateway Portfolio

AR550-H



- 4GE combo
- 8FE+24FE

L3 switching, power distribution and industrial control

AR550C



- Smaller size
- Built-in PoE

L2 switching, power distribution and video surveillance

AR2504E-H



- Dual power supplies
- 2 x WSIC slots

Transformer station monitoring and TDM network reconstruction

AR532/531



- PLC
- ZigBee
- RF

Power IoT and intelligent meter reading

AR502S



- LTE+2GE
- RF/RS485

Outdoor IoT gateway model

AR169



- 1GE COMBO+4GE
- ZigBee, RS232
- Android

Smart retail, education, energy efficiency, and business O2O

AR515C



- 4 x PoE FE, LTE, and Wi-Fi
- Computing + storage

Vehicle-mounted video surveillance

AR501S



- Noise, temperature, humidity, gas, and PM2.5 sensor

Sensor access gateway

AR502EGR



- LTE + 2 x GE + RS232/RS485/DIDO/RF (6LoWPAN)

Power monitoring, environment monitoring, and lighting

AR509CG-Lc
AR509CG-Lt
AR509CG-Lt-N



- LTE + 4 x GE
- LAN + RS232

ATMs, billboards, power distribution networks, and backhaul networks

AR503E train model

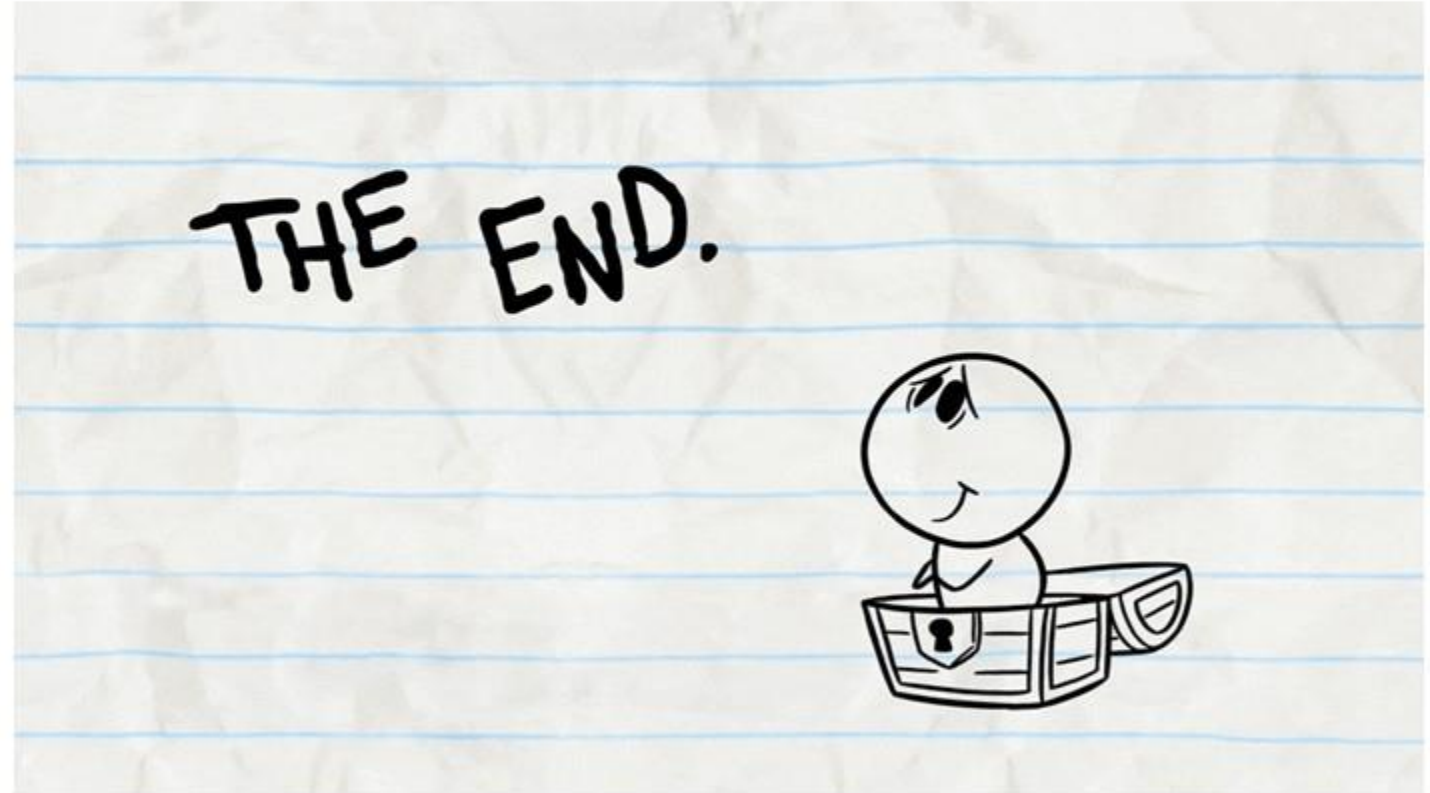


- 110 V voltage, complying with EN 5015
- 4 x PoE FE, LTE, and Wi-Fi
- Computing + storage

Wi-Fi for railway trains

The End

Please feel free to contact me anytime if you have any questions



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