PRACTICAL-3

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Page : 15

AIM : Study the various IoT Protocol libraries (e.g., WiFi, Bluetooth, ZigBee, LoRa).

I). WiFi : (Wireless Fidelity)

→ Definition : WiFi is a widely-used wireless networking protocol that allows devices to connect to the internet or communicate with each other using radio waves over short to medium distance (up to 100 m).
Based on the IEEE 802.11 family of standards.

→ key features : i). High-speed data transfer
ii). Widely availability
iii). Security.

→ Real-life Applications : i) Smart Homes
ii). Healthcare
iii). Industrial IoT (IIoT)

→ Advantages : i) High data throughput.
ii). Widely adopted.
iii). Relatively easy to set up.

→ Disadvantages : i). Range limitations.
ii). Power consumption.
iii). Congestion in crowded areas.

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II) Bluetooth

→ Definition: It's a short-range wireless communication protocol used to exchange data between devices over a low-power, secure and low-latency connection. It is standardized under the IEEE 802.15.1.

→ Key features: i). Low energy consumption.
ii). Short-range communication.
iii). Mesh networking

→ Real-life Application: i). Healthcare
ii). Wearables
iii). Smart home
iv). Automotive.

→ Advantages: i). Low power consumption.
ii). Widely supported.
iii). Low cost.

→ Disadvantages: i). limited range
ii). lower data transfer rate.
iii). Interference.

III) ZigBee

→ Definition : ZigBee is specification for a set of high-level communication protocols designed for low-power, low-data-rate wireless communication. It is based on the IEEE 802.15.4 and often used in automation, control and sensor networks.

→ Key features : i). Low power consumption.
ii). Mesh networking
iii). Low data rates
iv). Security. (AES-128 encryption)

→ Real-world Application : i). Home automation.
ii). Industrial control
iii). Smart agriculture.
iv). Healthcare.

→ Advantages : i). Low power
ii). Mesh networking.
iii). Robust and secure.

→ Disadvantages : i). Low data rates
ii). Limited range
iii). Complexity.

IV) LoRa (Long Range)

→ Definition : LoRa is a long-range, low-power wireless communication protocol designed for wide-area IoT networks.
It uses sub-GHz radio frequencies and is optimized for low-bandwidth, long-range communication.

→ Key features : i) Long-range communication (up to 15-30 km)
ii) Low power
iii) Low data rates
iv) Scalable

→ Real-world Application : i) Agriculture
ii) Smart cities
iii) Logistics
iv) Energy management.

→ Advantages : i) Long-range
ii) low power consumption
iii) Scalable.

→ Disadvantages : i) Low data rate
ii) Limited to specific frequencies.

Conclusion : By performing the following practical we got in-depth information about Wifi, BT, ZigBee & LoRa.

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