

Internet of Things (IoT) – 1 Page Notes

◆ **Definition**

The Internet of Things (IoT) refers to a network of interconnected physical devices that communicate and exchange data using the Internet without human intervention.

◆ **Key Components**

1. **Sensors/Devices** – Collect data from the environment (e.g., temperature, motion, light).
 2. **Connectivity** – Enables communication via Wi-Fi, Bluetooth, Zigbee, 4G/5G, LoRa, etc.
 3. **Data Processing** – Cloud or edge computing systems analyze and process the collected data.
 4. **User Interface** – Allows users to monitor and control devices (via apps or dashboards).
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◆ **Working Process**

1. **Sense** → Devices collect data through sensors.
 2. **Transmit** → Data is sent to a cloud or local server through communication networks.
 3. **Process** → Data is analyzed for insights or actions.
 4. **Act** → System triggers a response (e.g., adjust thermostat, send alert).
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◆ **IoT Architecture**

1. **Perception Layer** – Sensors and actuators (data collection).
 2. **Network Layer** – Communication between devices and servers.
 3. **Application Layer** – End-user applications and services.
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◆ **Communication Protocols**

- **MQTT (Message Queuing Telemetry Transport)**

- CoAP (Constrained Application Protocol)
 - HTTP/HTTPS
 - Bluetooth Low Energy (BLE)
 - Zigbee, LoRaWAN
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◆ Applications

-  Smart Homes – Smart lights, thermostats, and security systems.
 -  Smart Transportation – Vehicle tracking, traffic management.
 -  Industrial IoT (IIoT) – Predictive maintenance, automation.
 -  Healthcare – Wearables, remote patient monitoring.
 -  Agriculture – Smart irrigation, soil monitoring.
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◆ Advantages

-  Improved efficiency and automation
 -  Real-time monitoring and decision-making
 -  Resource optimization
 -  Enhanced safety and comfort
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◆ Challenges

-  Security and privacy risks
 -  High implementation cost
 -  Network reliability issues
 -  Data management complexity
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◆ Emerging Trends

- Edge Computing
- 5G-Enabled IoT
- AI + IoT = AIoT (Artificial Intelligence of Things)
- Digital Twins

 Example

A smart thermostat measures room temperature and automatically adjusts cooling/heating using IoT connectivity and cloud intelligence.