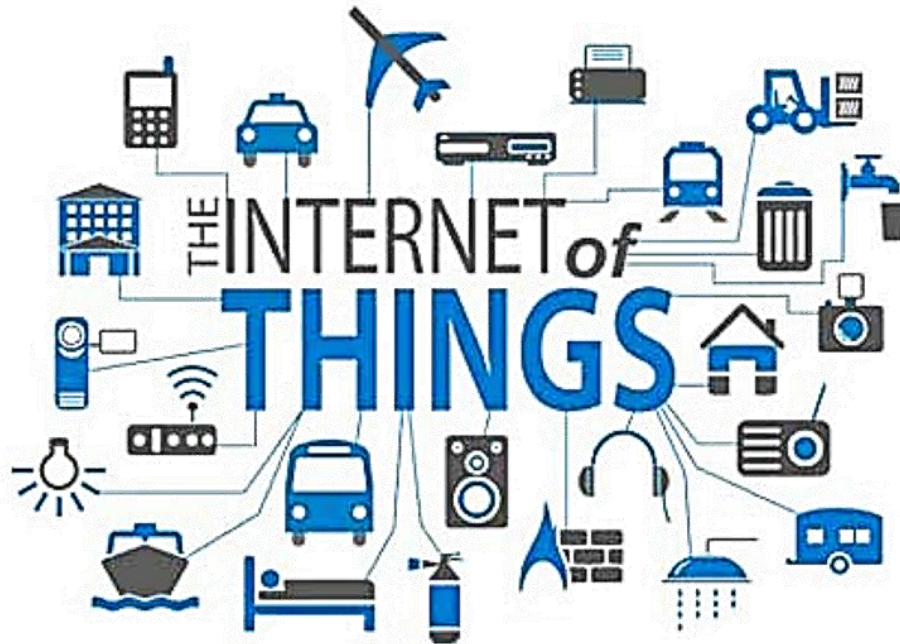


Introduction to IOT



How IOT Works

IoT devices collect data about their surroundings



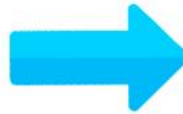
Devices connect to the internet via Bluetooth or Wi-Fi



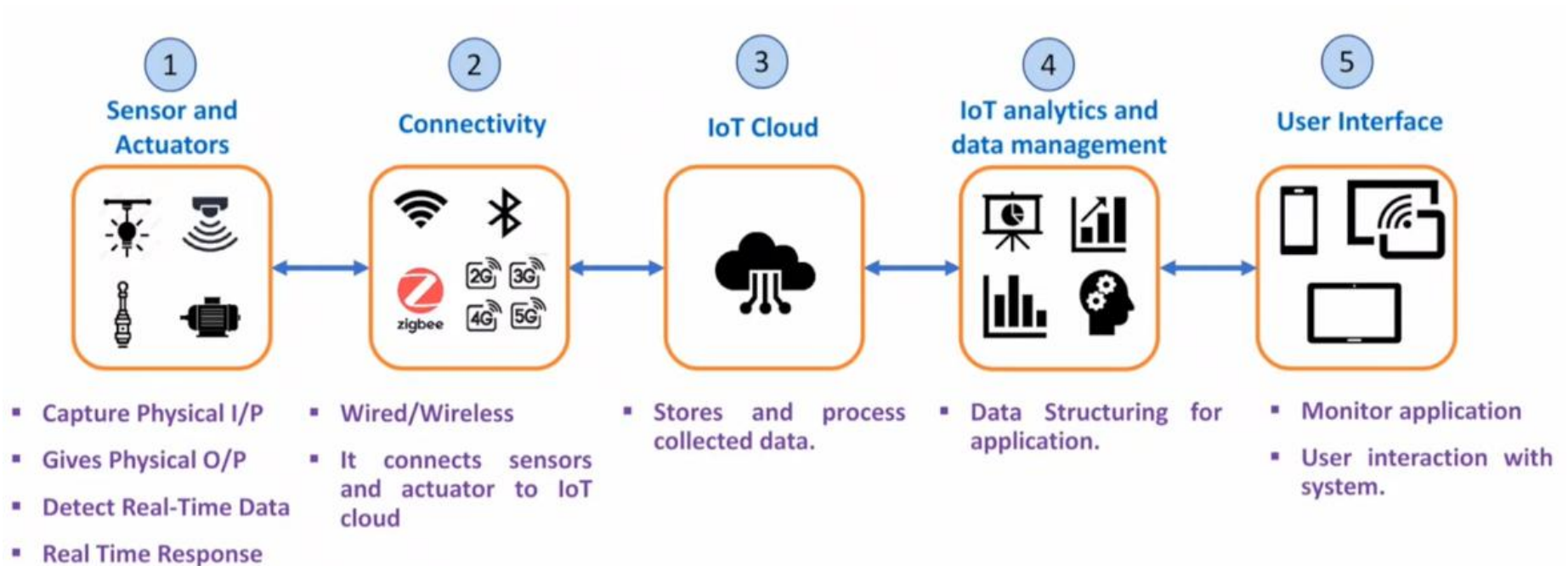
Data becomes accesible for authorized users



Data is sent to the cloud



How IOT Works (continued)



1.a) Sensors



Touch



Temperature



Flow



Position



Load



Gas



Speed



Sound

- Definition – It measures physical input from the surroundings and converts it into electrical signal (Analog or Digital).
- Integration with microprocessor/microcontroller embedded system.
- E.G Smartphones - (GPS, Fingerprint, Tilt, camera, etc)
- The size of sensors is very compact due to advancements in technology.
- The choice of sensors is based on accuracy, precision, Level of intelligence, and the needs of the application.

1.a) Actuators



Motor



Valve



Pump



Led



Speaker

- While sensors, sense; actuators act
- Cause an action, to control the situation.
- To make something happen based on the trigger, actuators are used.
- Control signal could be analog or digital.
- To turn something on or off Actuators are used.

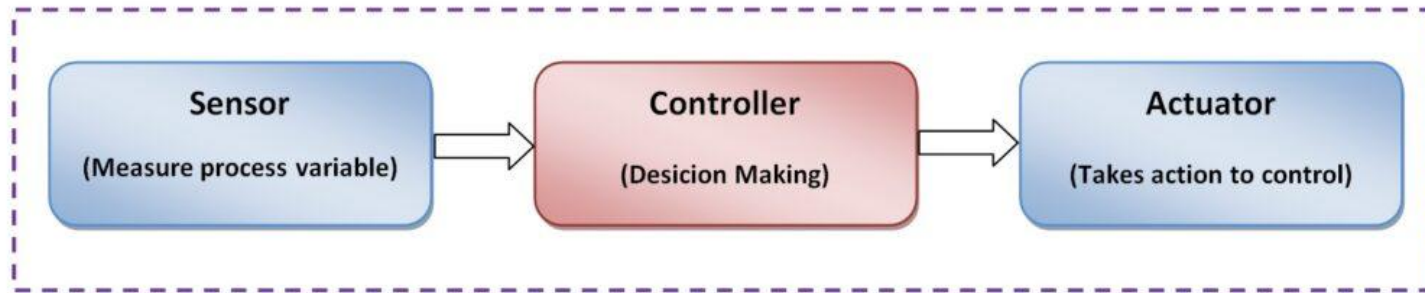
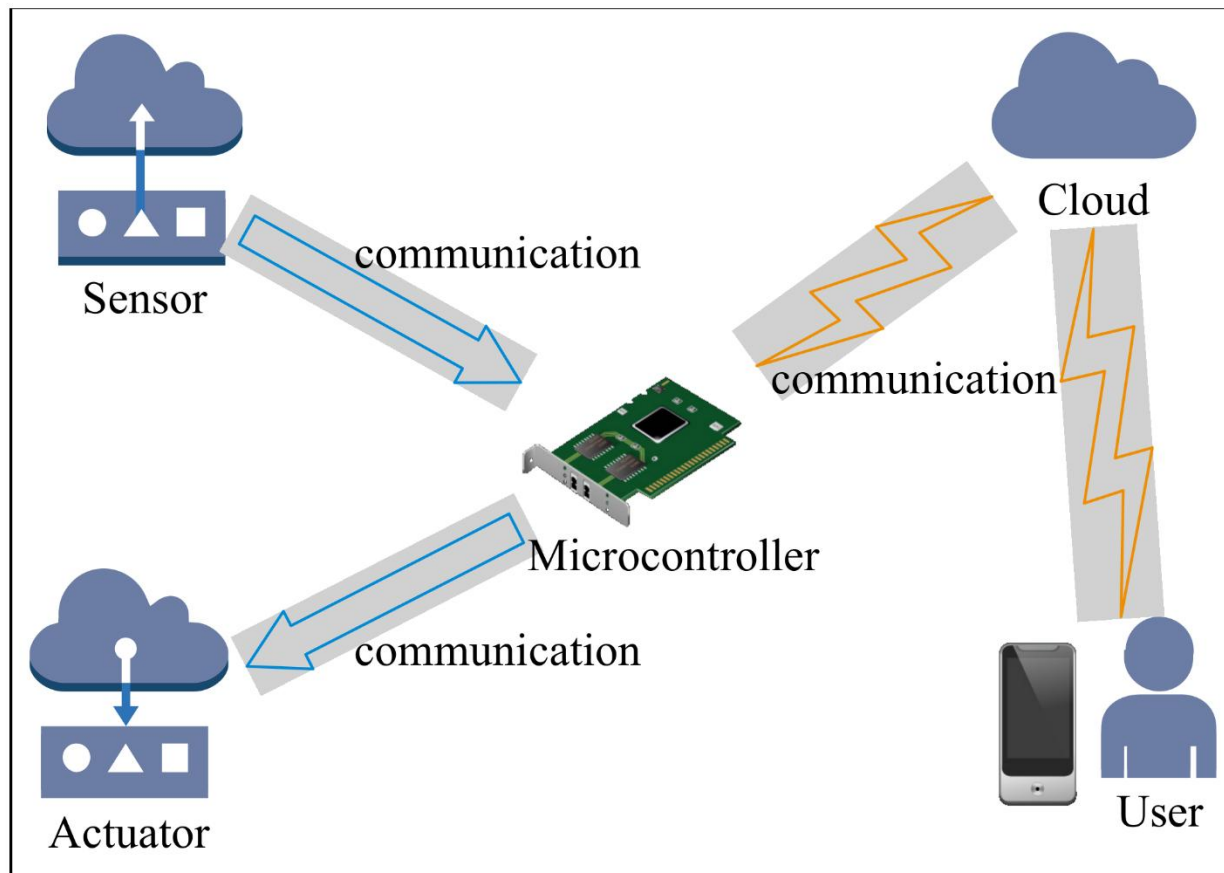


Figure- Sensor and actuator in a system



Sensor and Actuators

Sensor

Control Center

Actuator



Temperature sensor detects heat.

Sends this detect signal to the control center.

Control center sends command to sprinkler.

Sprinkler turns on and puts out flame.

Sensor to **Actuator** Flow

Sensor Vs Actuators

| SENSOR | ACTUATOR |
|---|---|
| A device that detects events or changes in the environment and sends that information to other electronic devices | A component of a machine that is responsible for moving and controlling mechanism |
| Connected to the input ports of the system | Connected to the output ports of the system |
| Help to monitor the changes in the environment | Helps to control the environment or physical changes |
| Output is an electrical signal | Output is a movement |
| Ex: biosensors, image sensors, motion sensors, chemical sensors | Ex: electric motors, stepper motors, comb drives, and hydraulic cylinders |
| | Visit www.PEDIAA.com |

Top sensor types in IoT



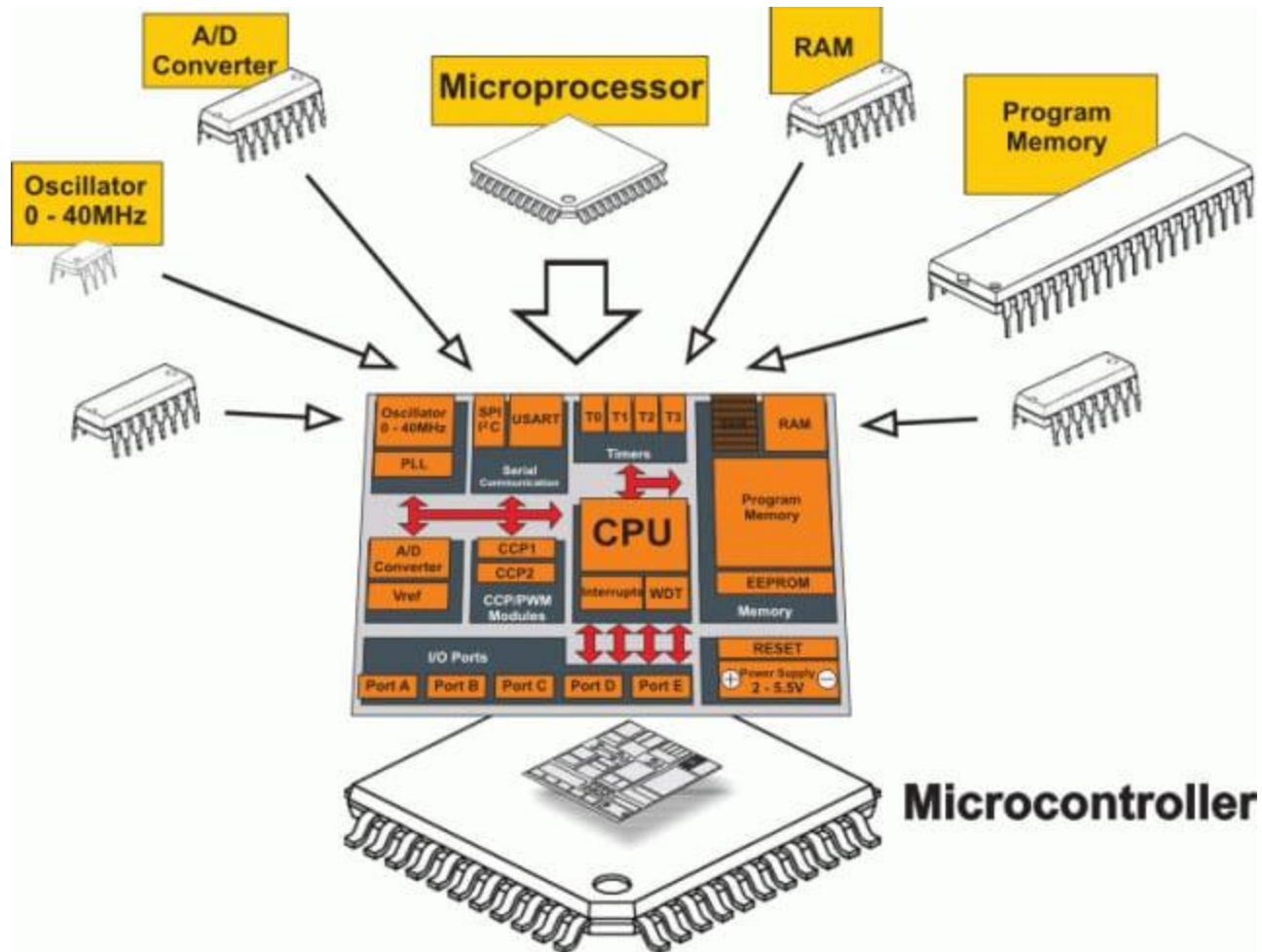
Types of Sensor

| Type of Sensor | Context Sensed | Sensor Examples |
|------------------------|--|---|
| Temperature Sensor | Temperature | Thermometer, Thermocouple, Thermistor |
| Heat Sensor | Heat | Bolometer, Calorimeter |
| Magnetism Sensor | Orientation | Magnetic Compass, Flux-gate, Compass |
| Pressure Sensor | Altitude, Atmospheric Pressure, Speed | Altimeter, Barometer |
| Gas/Liquid Flow Sensor | Velocity of the Wind, Rate of Fluid Flow | Anemometer, Mass Flow Sensor |
| Mechanical Sensor | Acceleration, Position, Angle, Deformation | Acceleration Sensor, Position Sensor, Selsyn |
| Chemical Sensor | Proportion of Gas | Carbon Monoxide Detector, Ion-Selective Electrode |
| Light Sensor | Light | Phototubes, Photodiode |
| Sound Sensor | Audio | Microphone, Hydrophone, Seismometer |
| Motion Sensor | Speed, Acceleration | Radar Gun, Speedometer, Odometer |
| Orientation Sensor | Orientation | Gyroscope, Artificial Horizon |

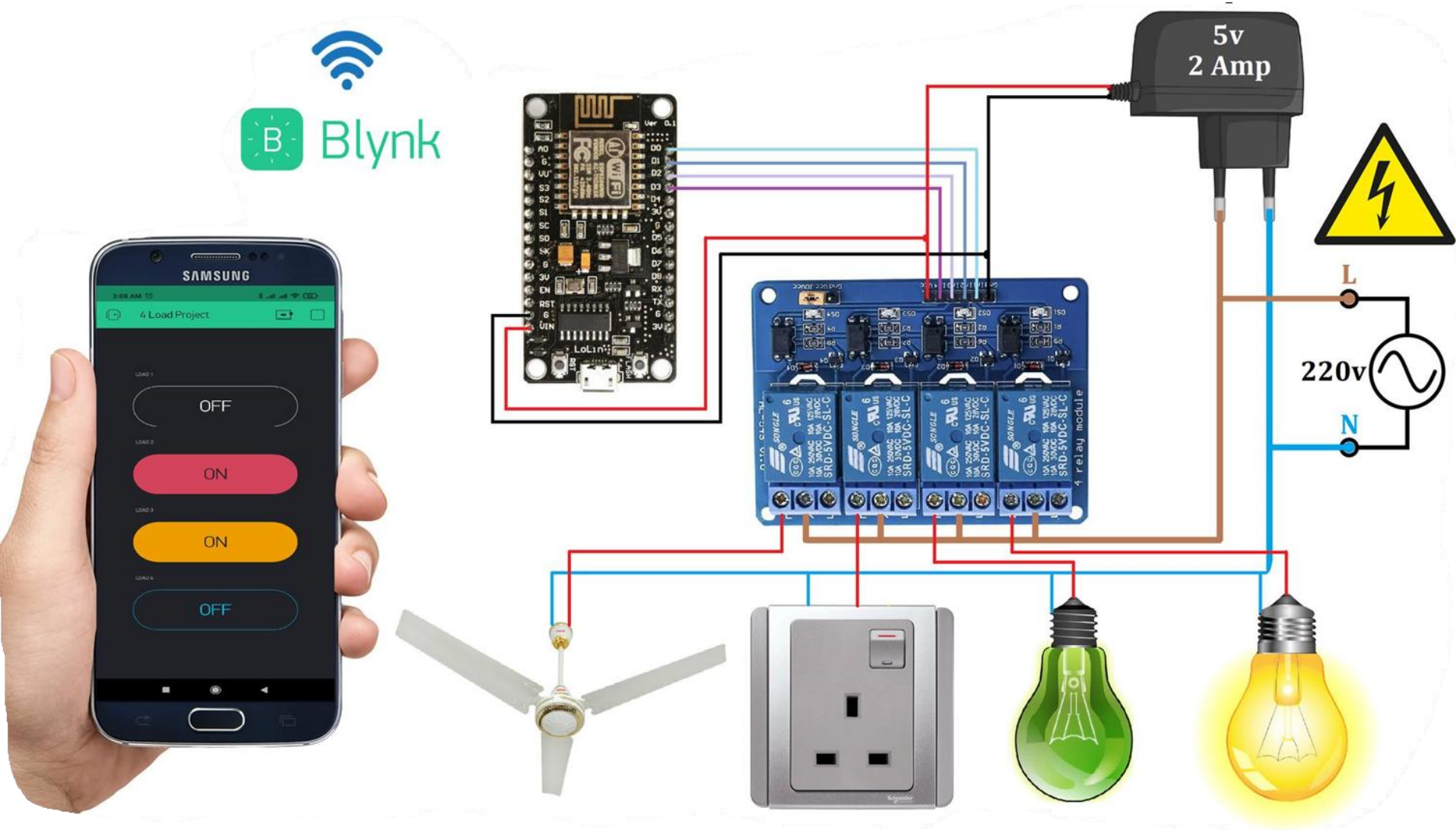
Characteristics of Sensor

| Characteristic | Description |
|--------------------|---|
| Accuracy/Precision | The correctness of the measured absolute value or event |
| Drift | The degree to which the measured value shifts away from the correct value over time |
| Dynamic range | The allowed lower and upper limits of the instruments' input or output given the required level of accuracy |
| Reliability | The ability to consistently return correct measures |
| Resolution | The finest measurable change in input value |
| Repeatability | The ability to consistently return the same measure for the same input conditions |
| Update rate | The rate at which a new signal value is collected |

Microcontroller



IoT Application

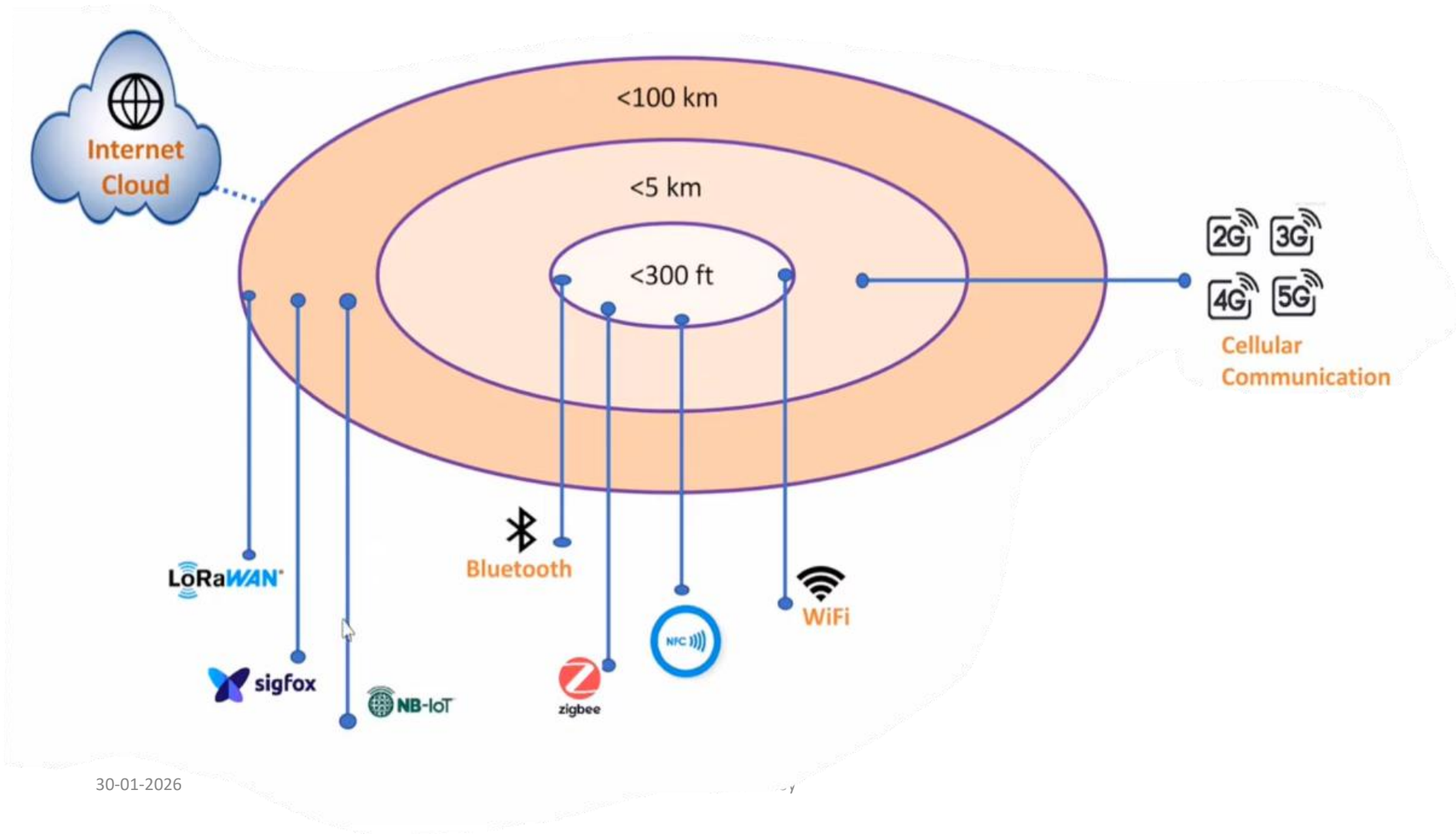


2. Connectivity and Gateway

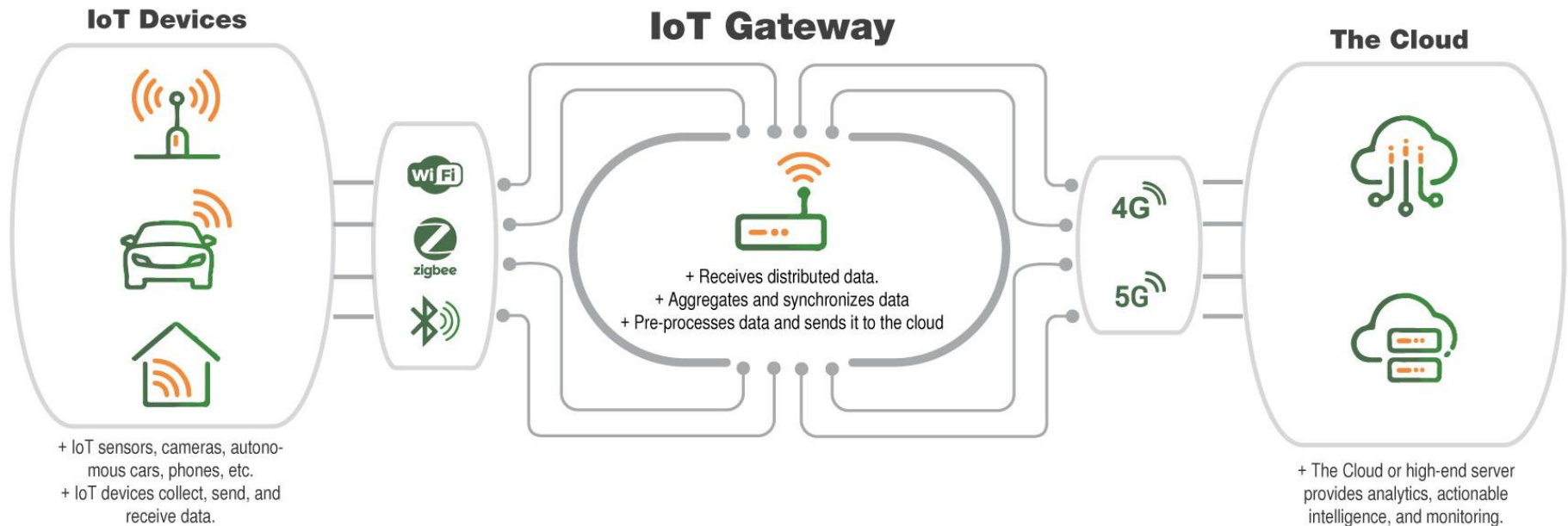
□ Roles of Connectivity Protocols

- It plays a crucial role in connecting sensors and actuators with IoT ecosystem.
- Based on medium and range, various protocols are available.
- E.g Cellular, Bluetooth, WI-FI, LoRaWAN, etc.

Various IOT Protocols



IOT Gateways



- It provides an effective communication bridge in between edge devices and IoT Cloud.

❑ Role of a Gateway

- Ensures seamless communication
- Easy management of data traffic.
- Offers security
- Latest encryption practices
- Data Preprocessing
- Minimizing the large data
- Intelligent IoT gateways

3. IOT Cloud



☐ Role of an IoT cloud

- Data needs to be processed
- To make or break a deal. (Based on processed data)
- Latency cannot be compromised. (For The real-time applications)
- IoT Cloud is The brain of the IoT ecosystem
- Cloud is optional
- Edge computing (It is used for local processing)

4. IOT Analytics and Data Management



Data Extraction



Data Analytics

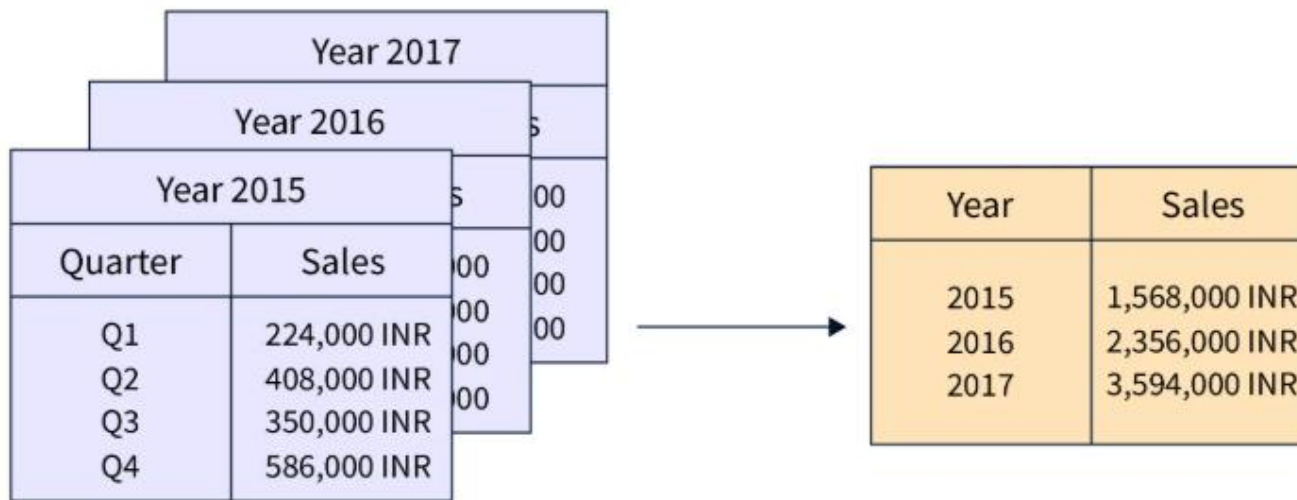


Data Aggregation

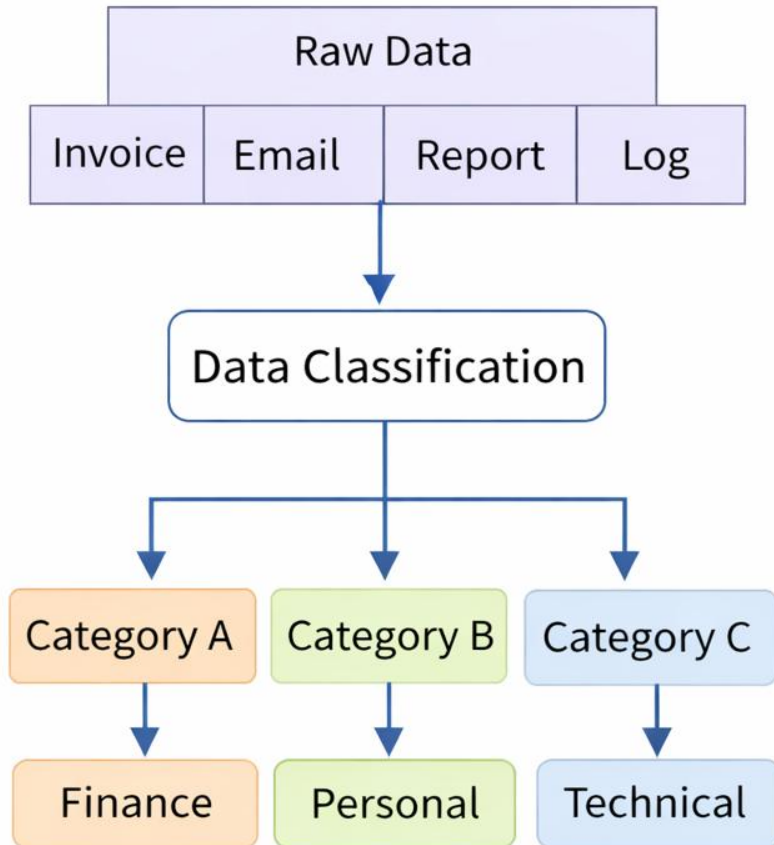


Data Classification

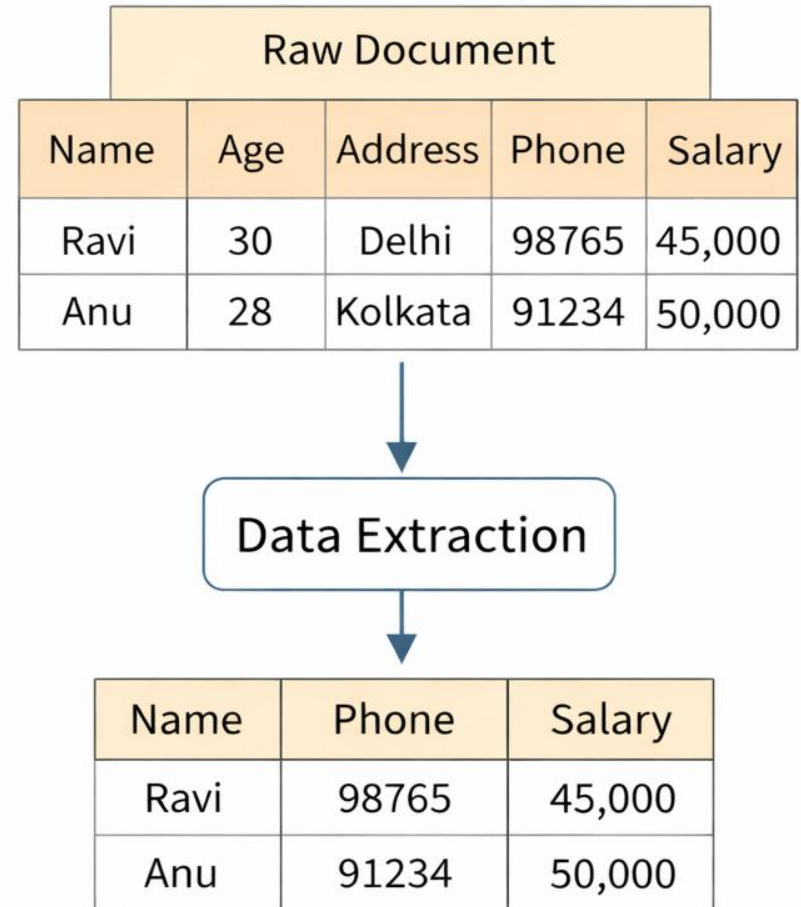
Aggregated Data



Data Classification



Data Extraction



- Data is the fuel for IoT Applications.
- Converting raw data into useful insights
- Data extraction, data aggregation, data classification are major tasks of IoT Analytics and data management.
- Deep learning (It can be for data prediction for some applications)
- Storage power and intelligent computation are key parameters of IoT Analytics and data management.

5. User Interfaces



Notification



Alerts



Remote Control



Live Trends

- Taks is to monitor and control the field device for the user.
- Types of notification (Notification, Email, Alerts, Alarms etc.)
- It can also send back the command to the field devices

Thank You