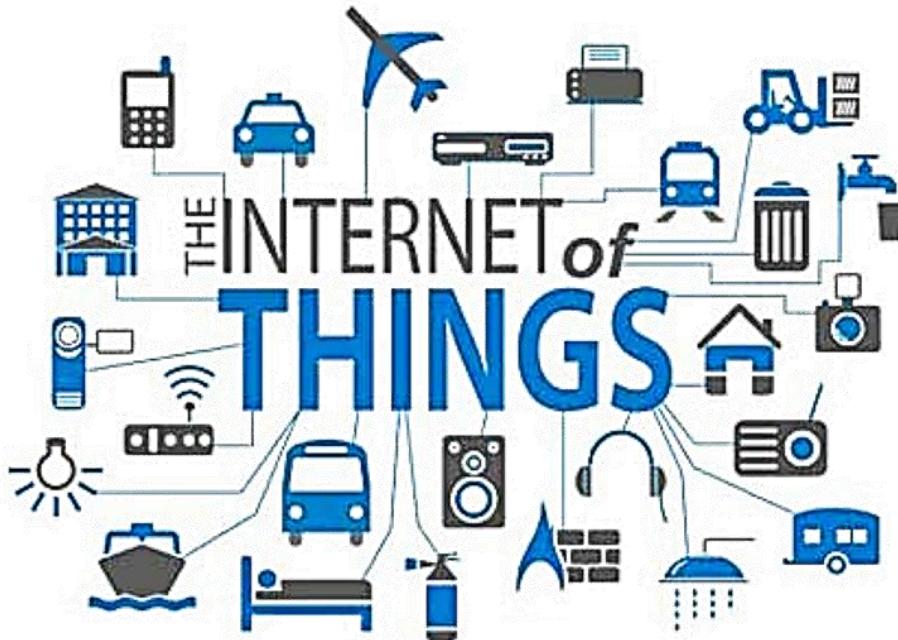


Introduction to IOT



How IOT Works

IoT devices collect data about their surroundings



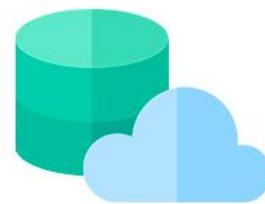
Devices connect to the internet via Bluetooth or Wi-Fi



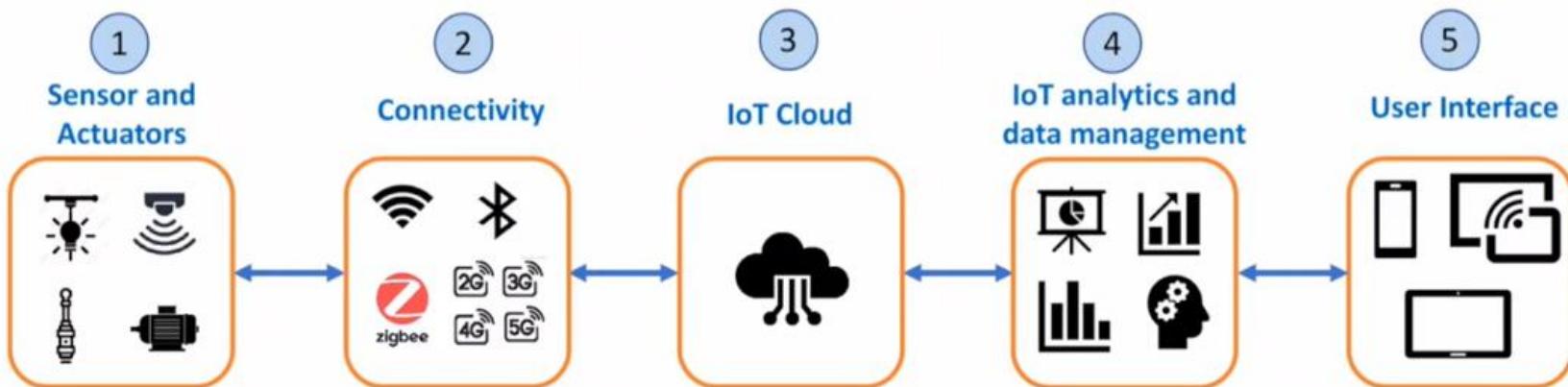
Data becomes accessible for authorized users



Data is sent to the cloud



How IOT Works (continued)



- Capture Physical I/P
- Gives Physical O/P
- Detect Real-Time Data
- Real Time Response
- Wired/Wireless
- It connects sensors and actuator to IoT cloud
- Stores and process collected data.
- Data Structuring for application.
- Monitor application
- User interaction with system.

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, Figure print, 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

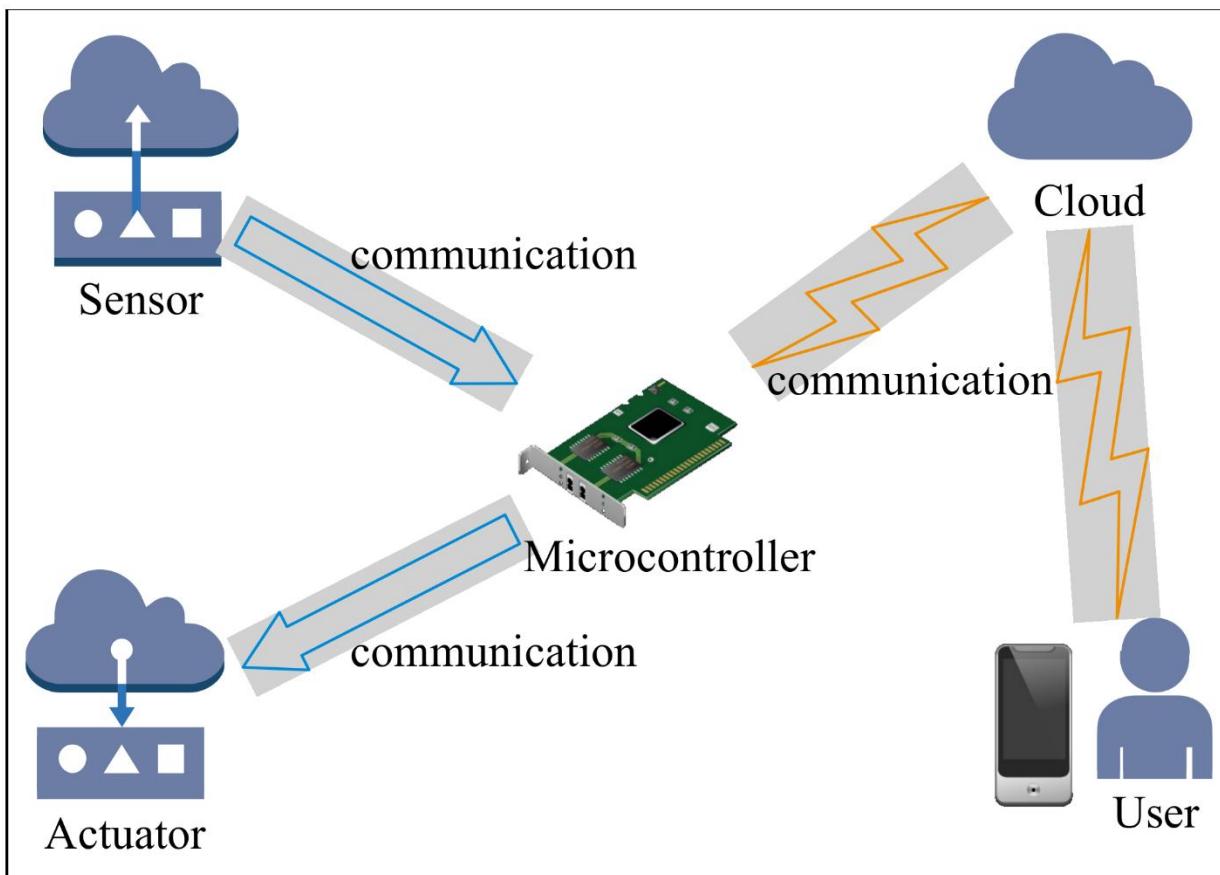


Speaker

- 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

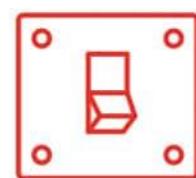


Temperature
sensor detects
heat.

Control Center



Sends this
detect signal to
the control
center.



Control center
sends command
to sprinkler.



Actuator



Sprinkler turns
on and puts
out flame.

Sensor to **Actuator** Flow

Sensor Vs Actuators

SENSOR

A device that detects events or changes in the environment and sends that information to other electronic devices

Connected to the input ports of the system

Help to monitor the changes in the environment

Output is an electrical signal

Ex: biosensors, image sensors, motion sensors, chemical sensors

ACTUATOR

A component of a machine that is responsible for moving and controlling mechanism

Connected to the output ports of the system

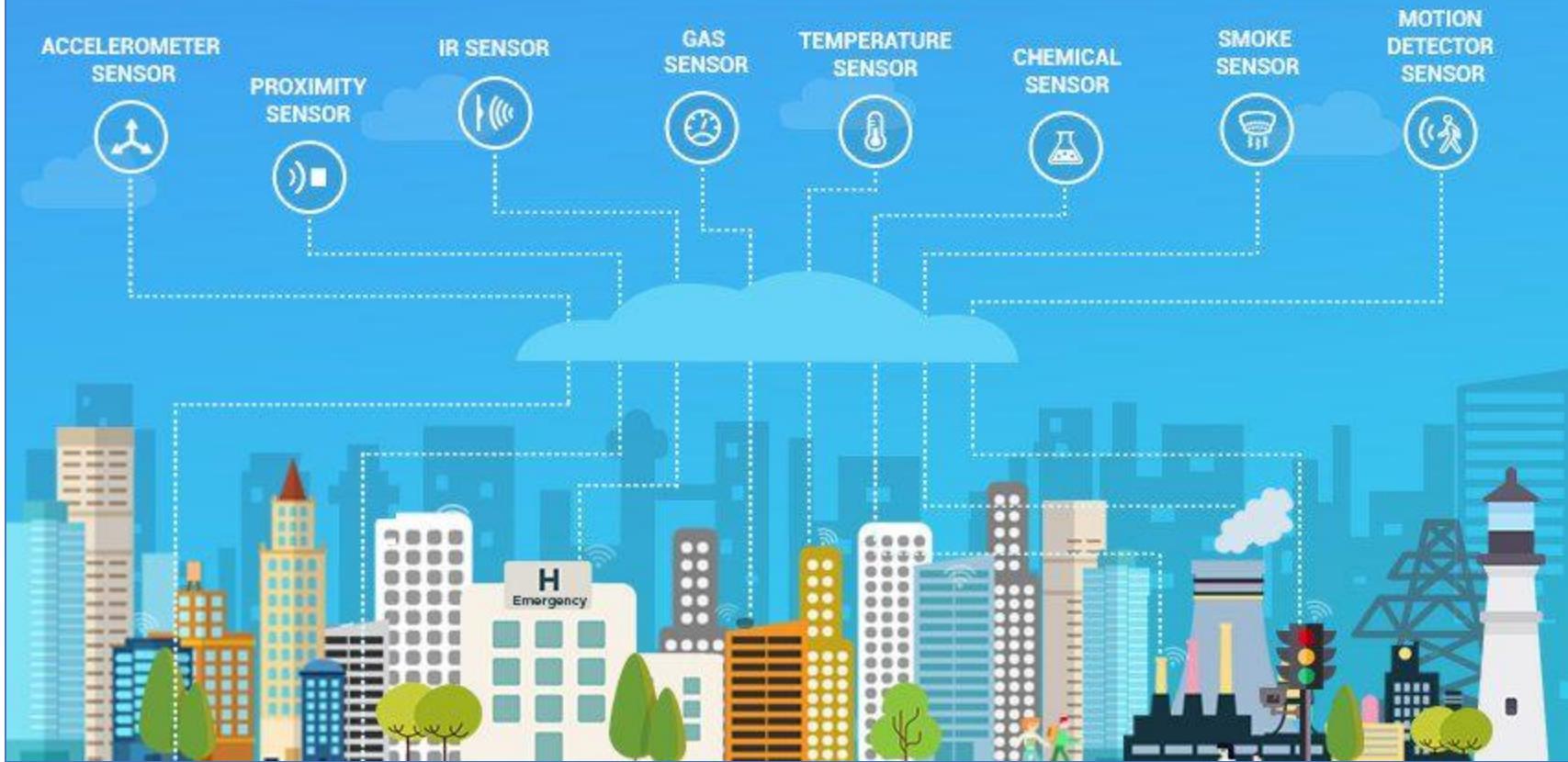
Helps to control the environment or physical changes

Output is a movement

Ex: electric motors, stepper motors, comb drives, and hydraulic cylinders

Visit www.PEDIAA.com

Top sensor types in IoT



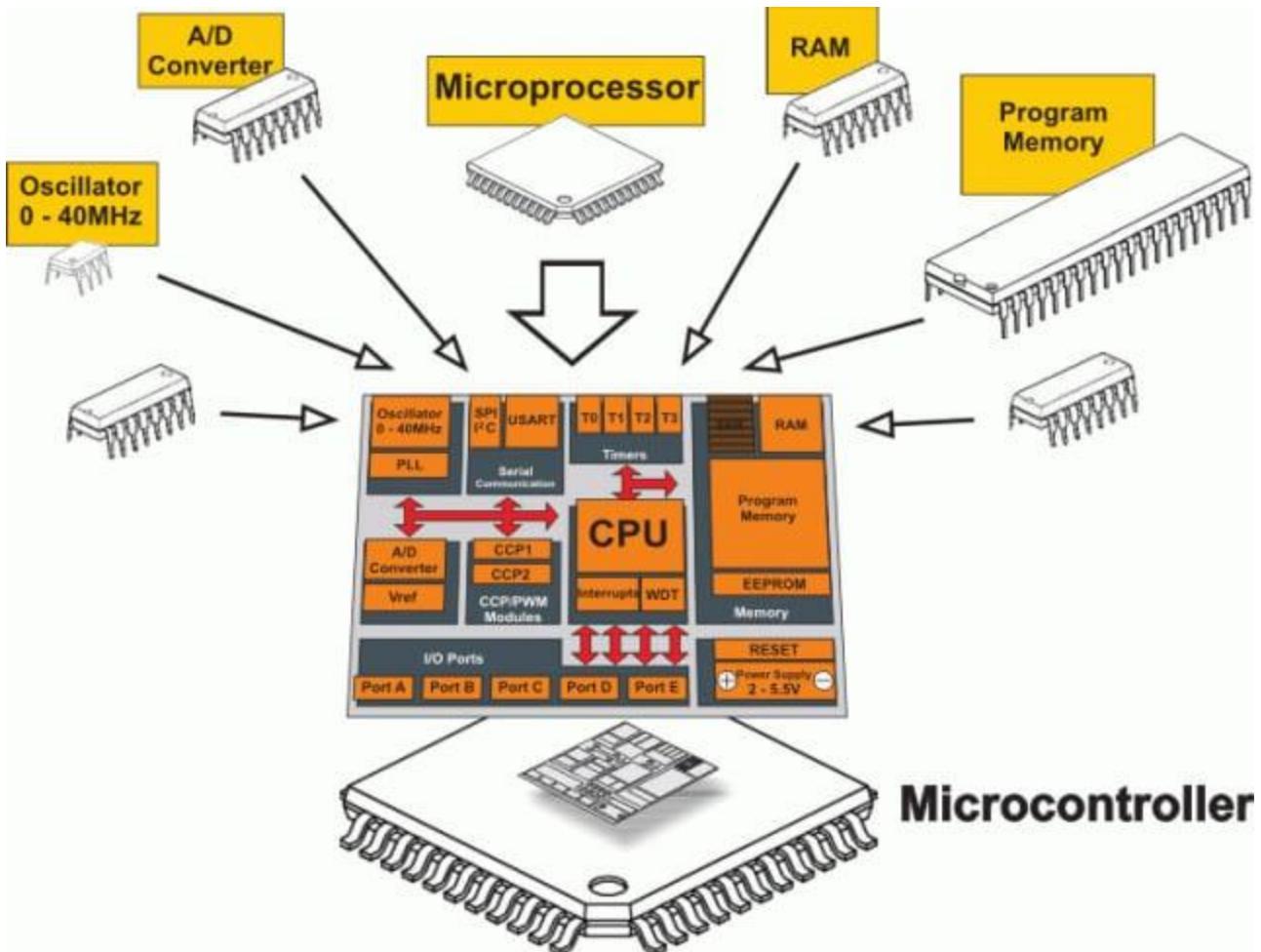
Types of Sensor

Type of Sensor	Context Sensed	Sensor Examples
Temperature Sensor	Temperature	Thermometer, Thermocouple, Thermistor
Heat Sensor	Heat	Bolometer, Calorimeter
Magnetism Sensor	Orientation	Magnetic Compass, Fluxgate, 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

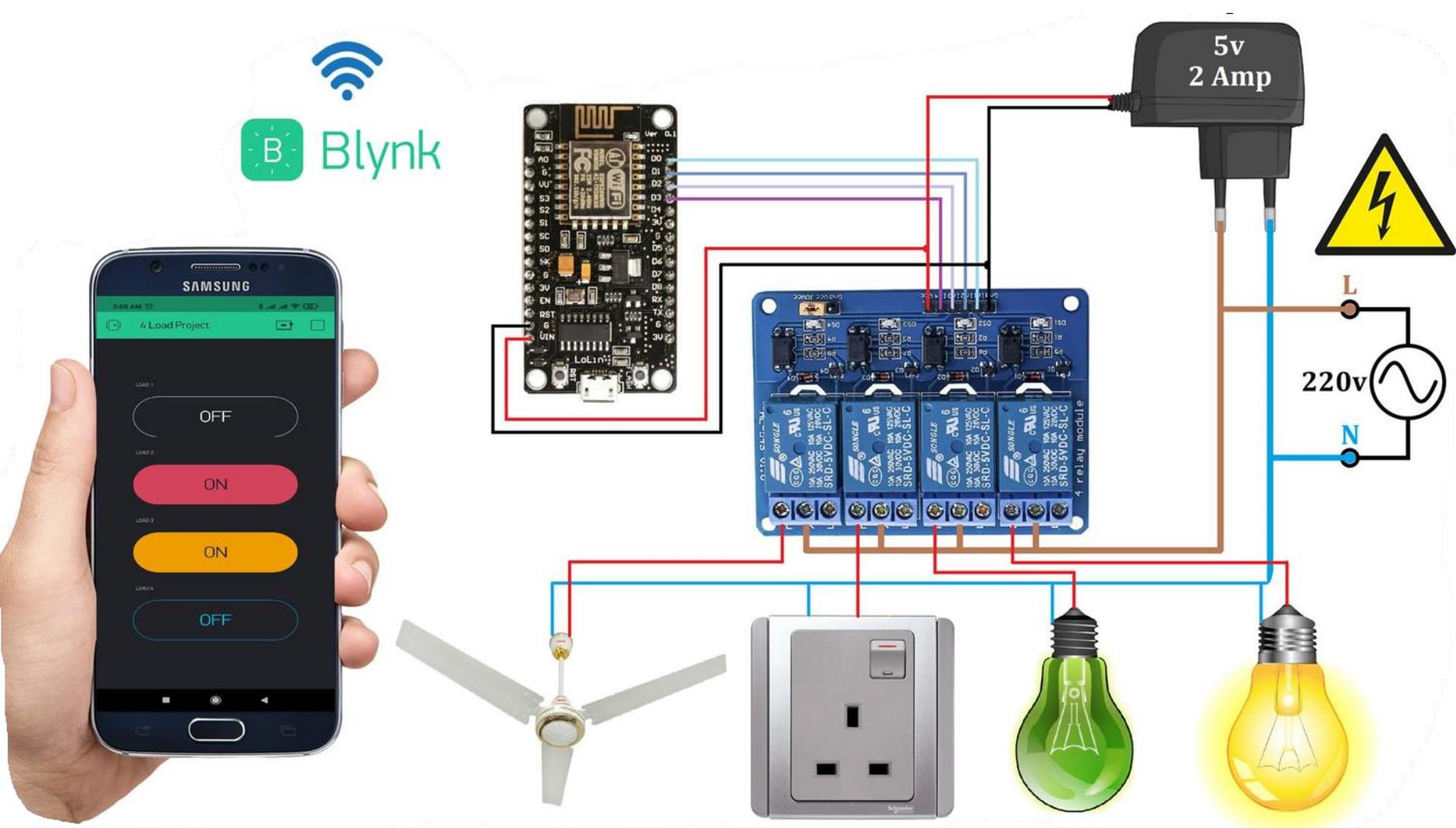
Characteristics of Sensor

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

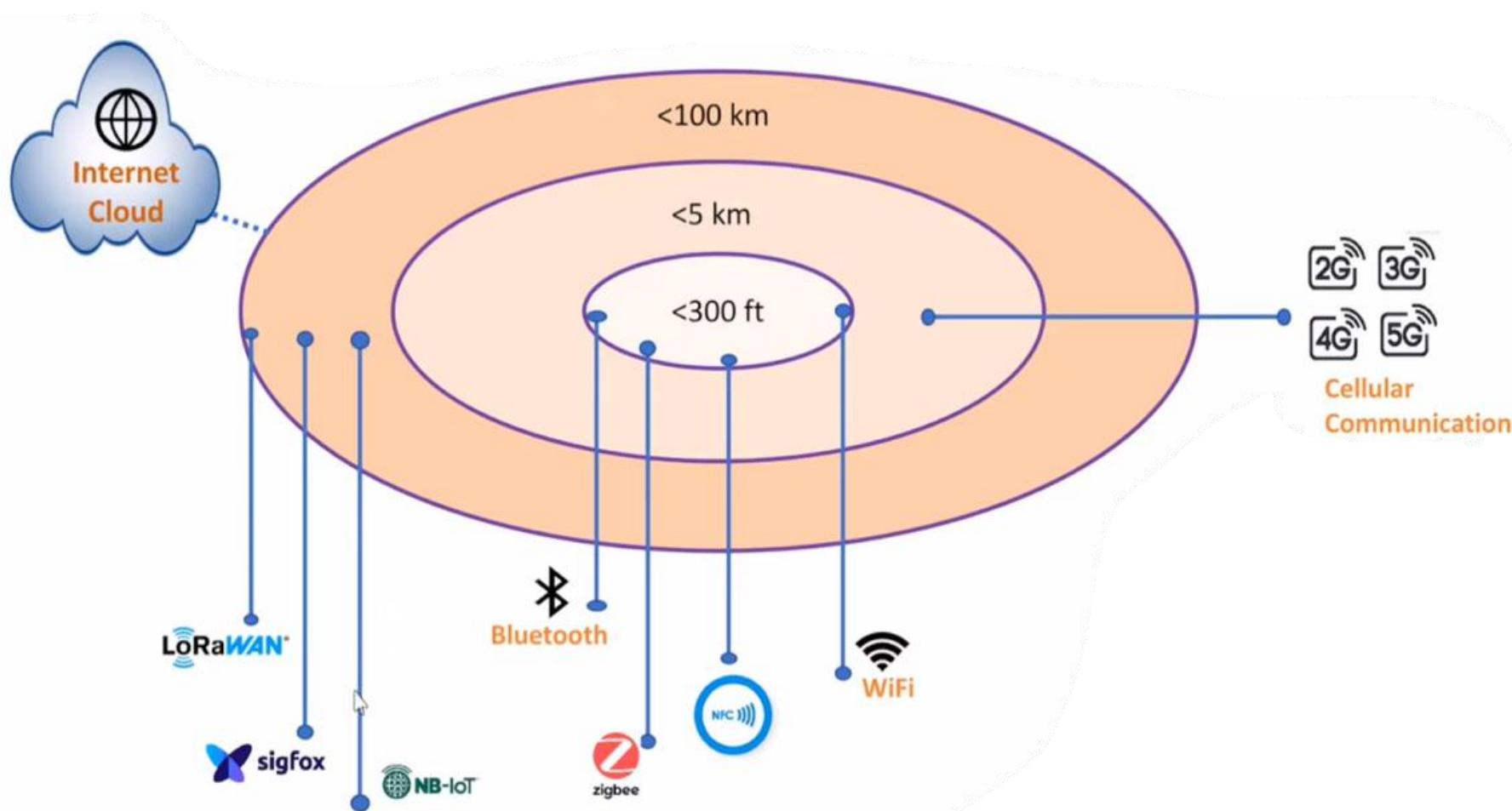


2. Connectivity and Gateway

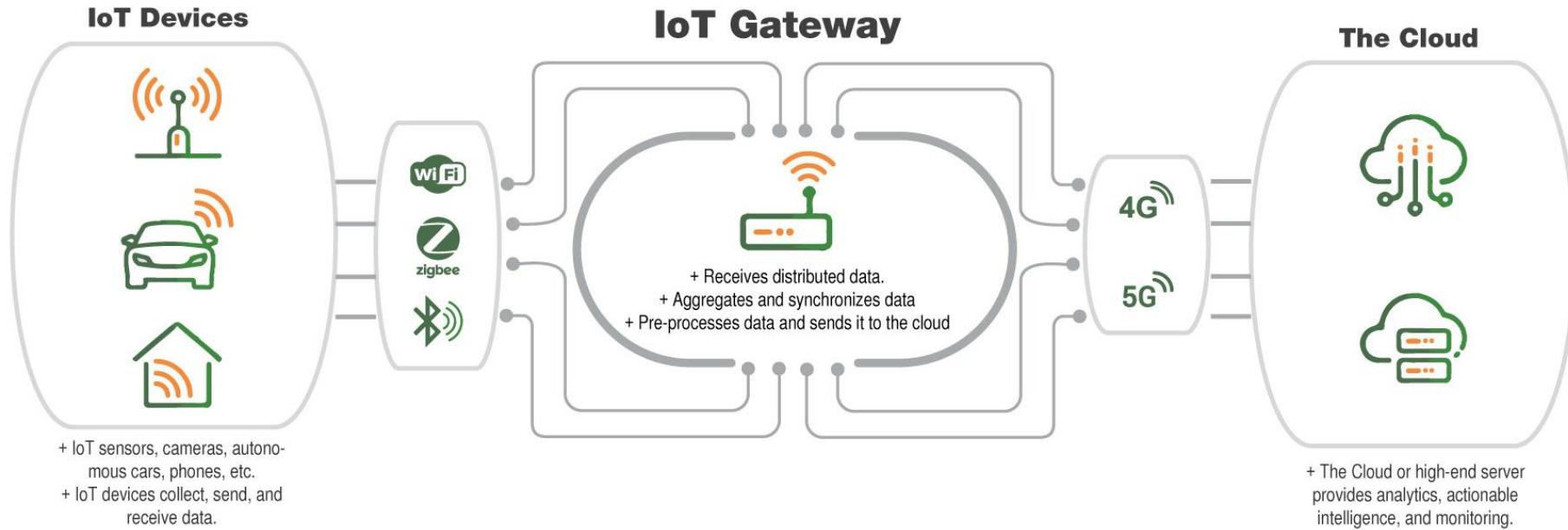
□ Roles of Connectivity Protocols

- 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

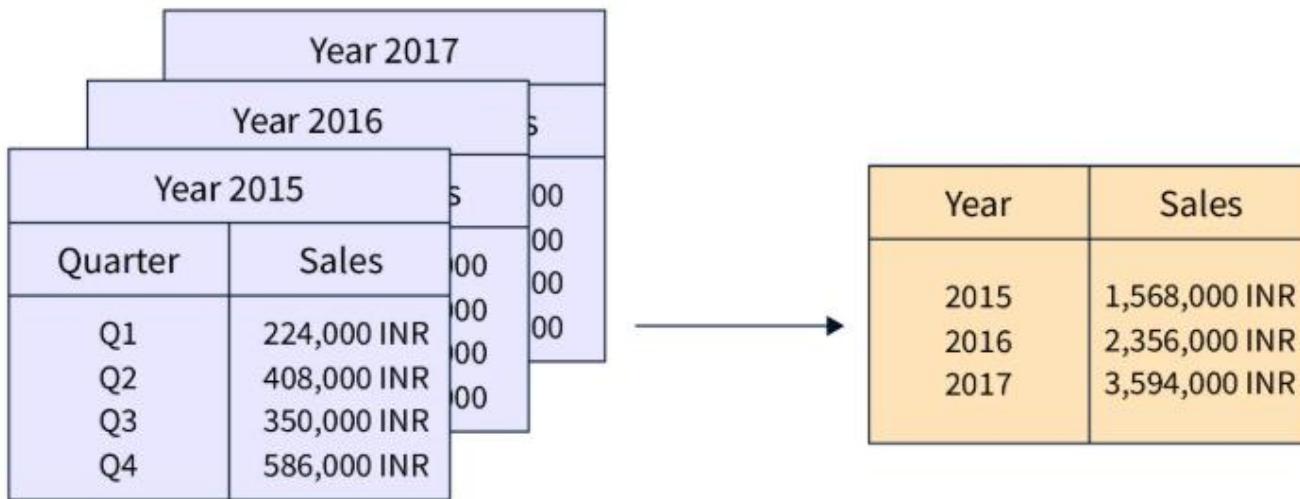


Data Aggregation

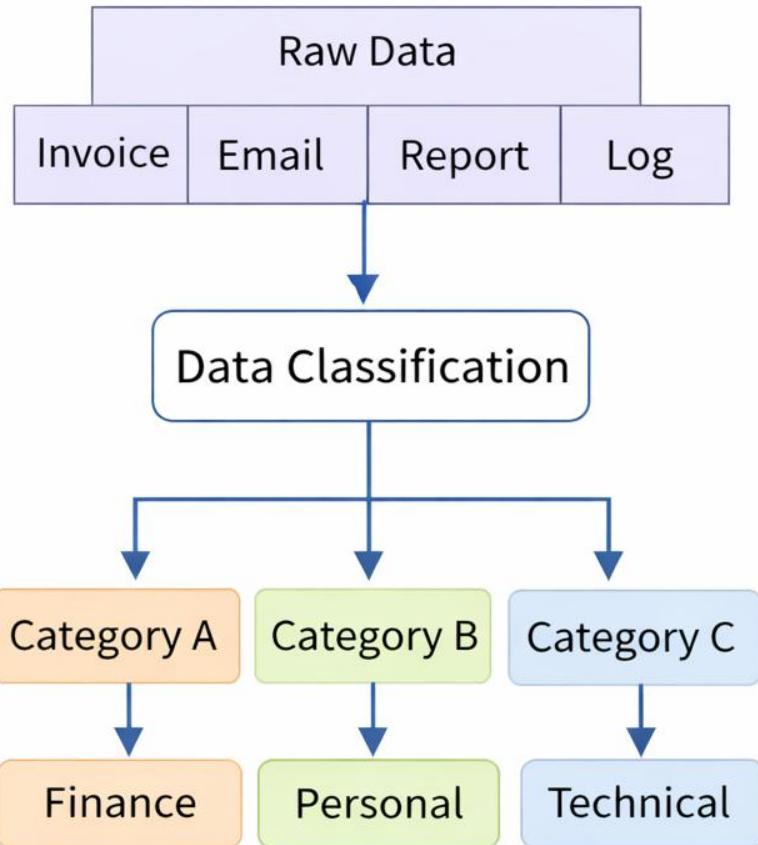


Data Classification

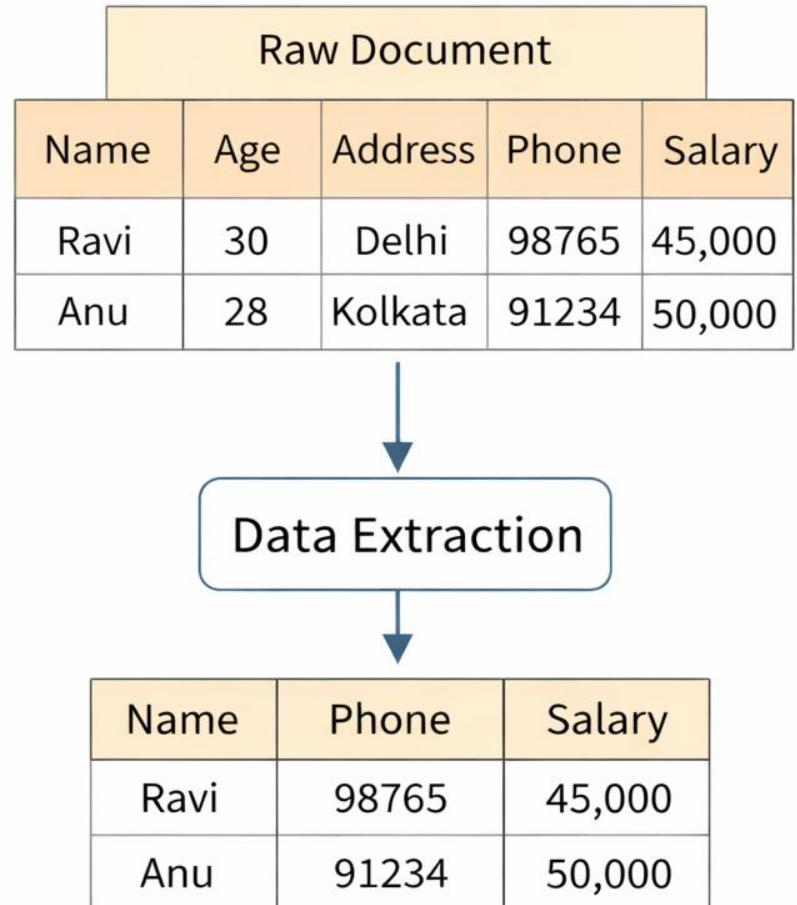
Aggregated Data



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

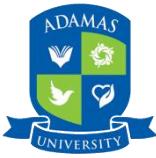


Remote Control



Live Trends

- Tasks 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