SNS COLLEGE OF ENGINEERING

An Autonomous Institution

Coimbatore-107

19IT503-INTERNET OF THINGS

UNIT-1 IoT INTRODUCTION AND APPLICATIONS

Topic:7 – IOT Levels and Deployment Templates

IoT Levels and Deployment Templates

An IoT system comprises the following components:

Device, Resource, Controller Service, Database, Web service, Analysis Component and **Application.**

Device :

An IoT device allows identification, remote sensing, remote monitoring capabilities.

Resource:

• Software components on the IoT device for

-accessing, processing and storing sensor information,

-controlling actuators connected to the device.

- enabling network access for the device.

Controller Service:

• Controller service is a native service that runs on the device and interacts with the web services.

•It sends data from the device to the web service and receives commands from the application (via web services) for controlling the device.

Database:

•Database can be either local or in the cloud and stores the data generated by the IoT device.

Web Service:

•Web services serve as a link between the IoT device, application, database and analysis components.

•It can be implemented using HTTP and **REST** principles (REST service) or using the **WebSocket** protocol (WebSocket service).

Analysis Component:

• Analysis Component is responsible for analyzing the IoT data and generating results in a form that is easy for the user to understand.

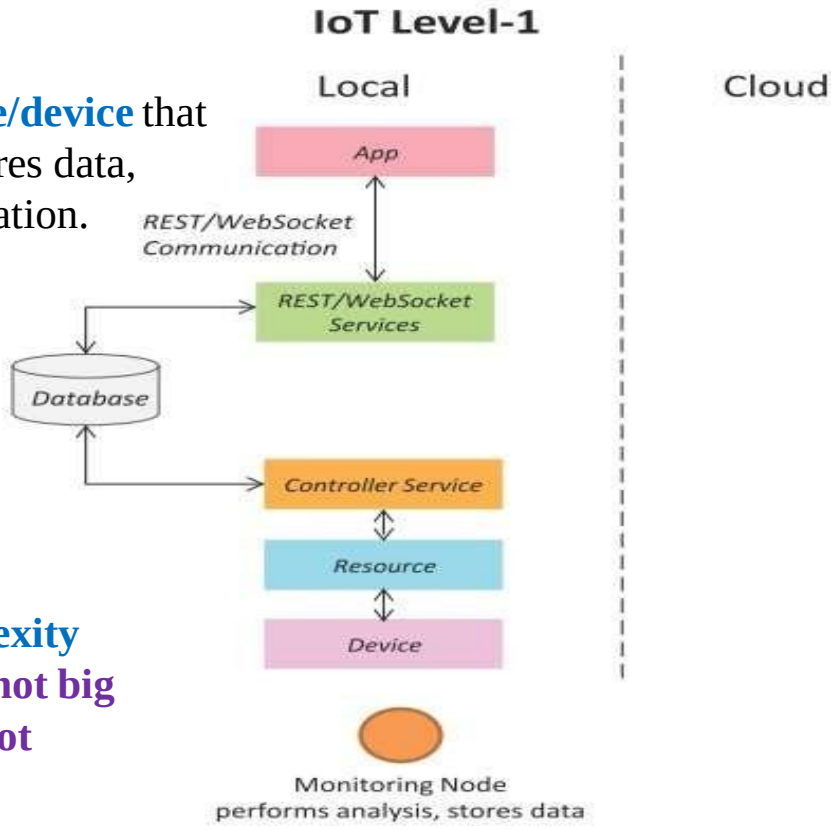
Application:

•IoT applications provide an interface that the users can use to control and monitor various aspects of the IoT system.

•Applications also allow users to view the system status and the processed data.

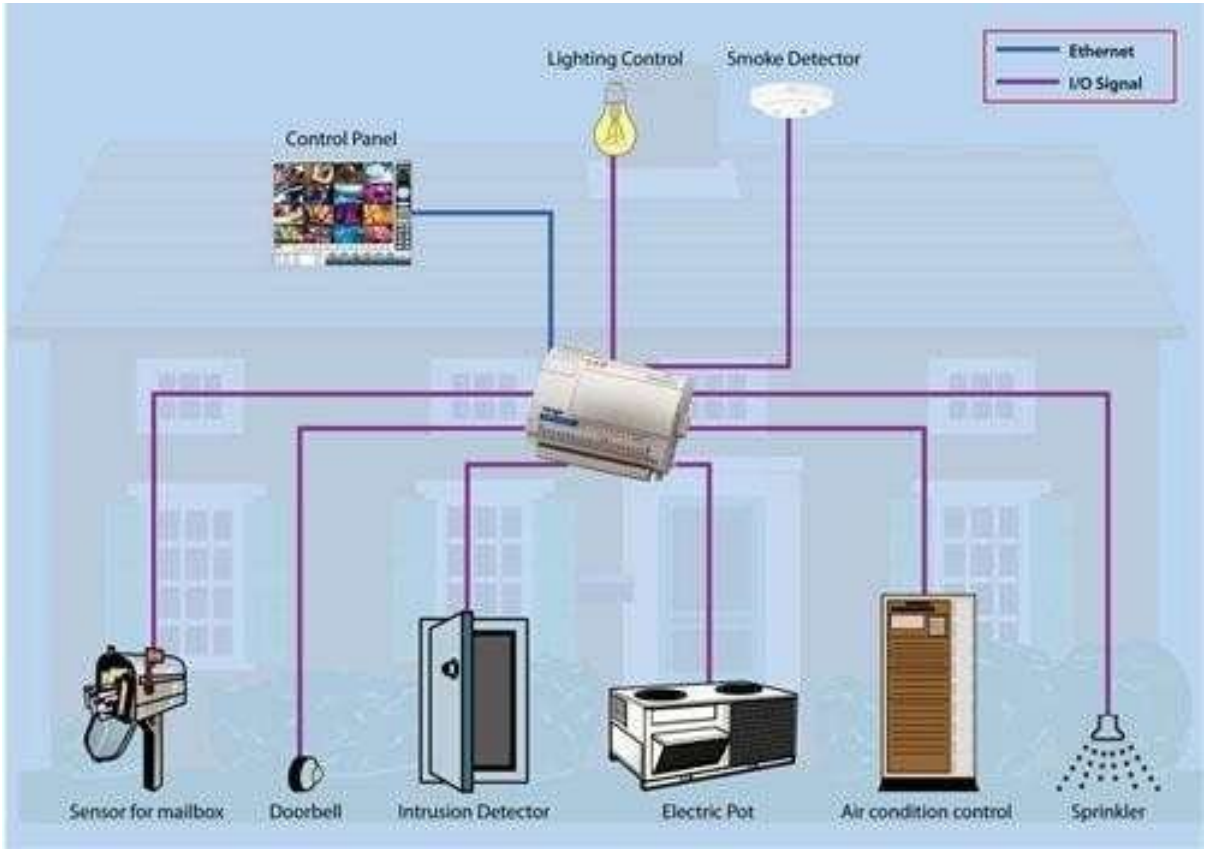
IoT Level-1

A level-1 IoT system has a **single node/device** that performs sensing and/or actuation, stores data, performs analysis and hosts the application.



Level-1 IoT systems are suitable for modelling **low- cost and low-complexity** solutions where the data involved is **not big** and the **analysis requirements** are **not computationally intensive.**

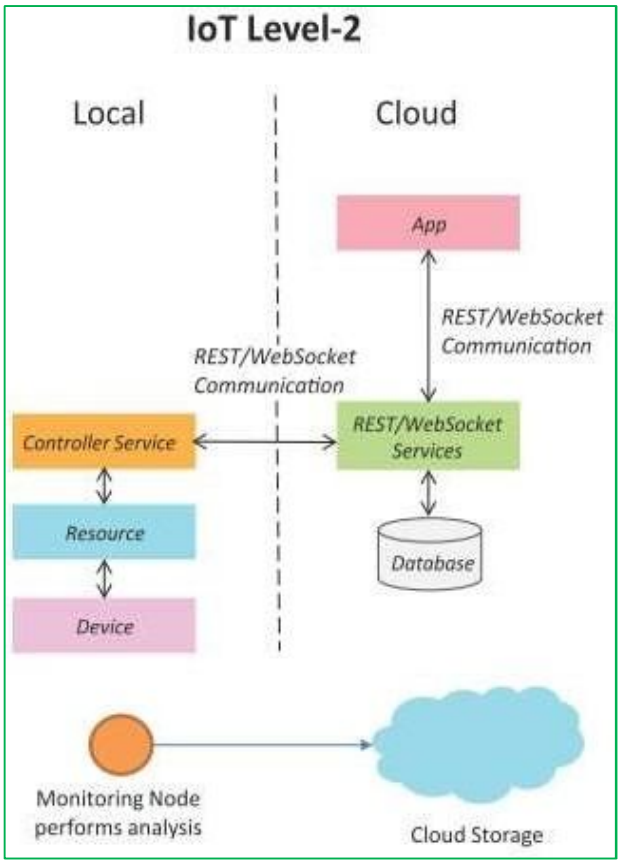
IoT – Level 1 Example : Home Automation System



IoT Level-2

•A level-2 IoT system has a **single node** that performs sensing and/or actuation and **local analysis**. **Data is stored in the cloud** and the **application is usually cloud-based**.

•Level-2 IoT systems are suitable for solutions where the **data involved is big**; however, the **primary analysis** requirement is **not computationally intensive** and can be done locally.

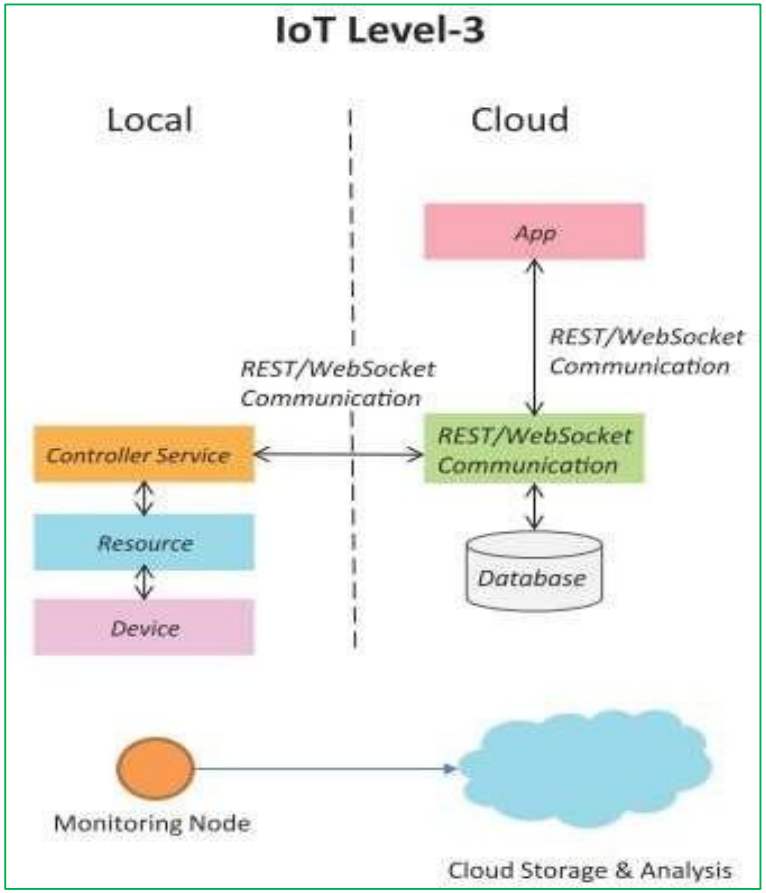


IoT – Level 2 Example: Smart Irrigation

IoT Level-3

A level-3 IoT system has a **single node**. Data is stored and **analyzed in the cloud** and the **application is cloud-based.**

Level-3 IoT systems are suitable for solutions where the **data involved is big** and the **analysis requirements are computationally intensive**.



IoT – Level 3 Example: Tracking Package Handling

Sensors used

Accelrometer

sense movement or vibrations

Gyroscope

Gives orientation info

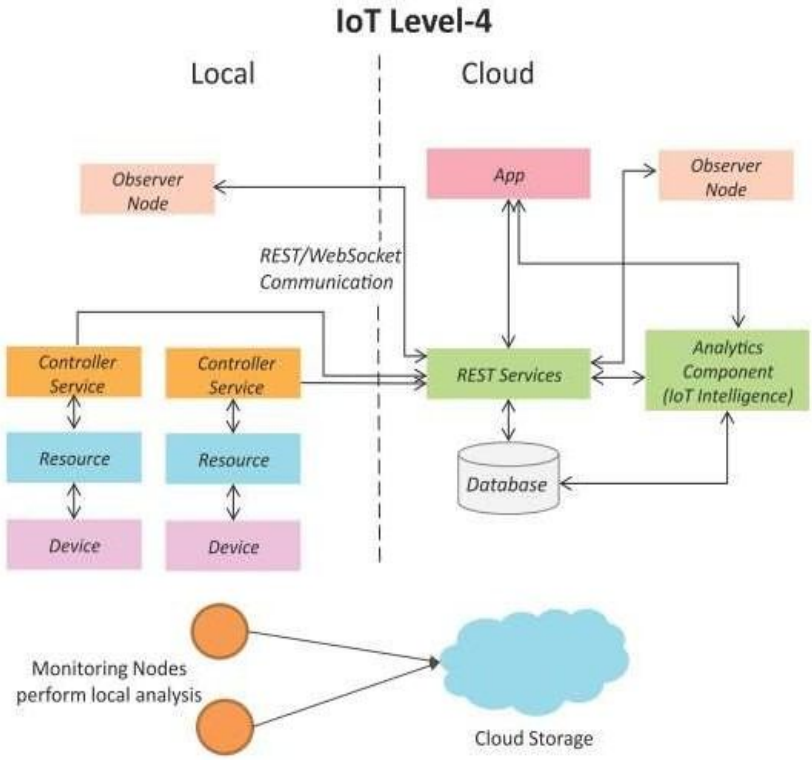
Websocket service is used because sensor data can be sent in real time.

IoT Level-4

A level-4 IoT system has **multiple nodes** that perform **local analysis**. **Data is stored in the cloud** and the application is cloud-based.

Level-4 contains local and cloud-based **observer nodes** which can subscribe and receive information collected in the cloud from IoT devices.

Level-4 IoT systems are suitable for solutions where **multiple nodes are required**, the **data involved is big** and the **analysis requirements are computationally intensive.**

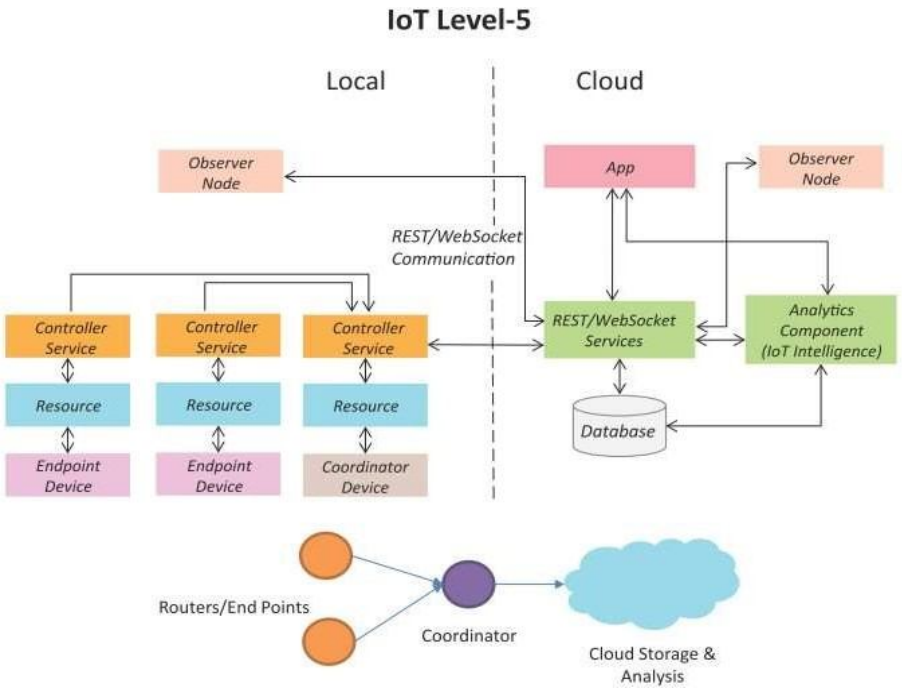


IoT – Level 4 Example: Noise Monitoring

Sound Sensors are used

IoT Level-5

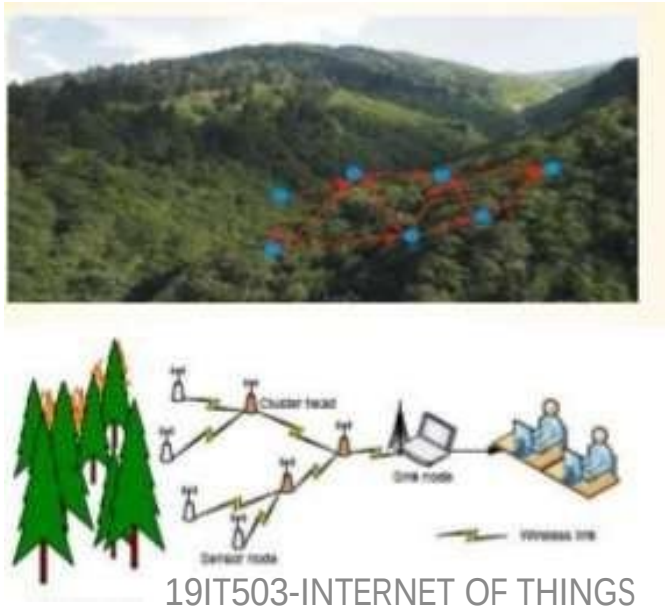
•A level-5 IoT system has **multiple end nodes** and **one coordinator node.**
•The end nodes perform sensing and/or actuation.
•The coordinator node **collects data from the end nodes and sends it to the cloud.**
•Data is stored and **analyzed in the cloud** and the **application is cloud- based.**



Level-5 IoT systems are suitable for **solutions based on wireless sensor networks**, in which the **data involved is big** and the **analysis requirements are computationally intensive.**

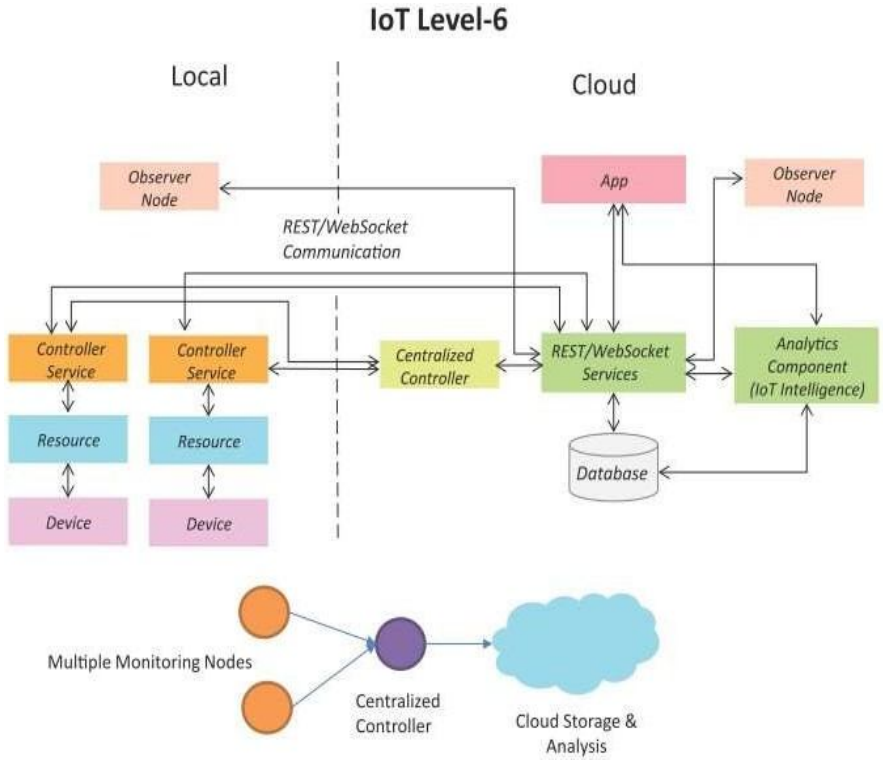
IoT – Level 5 Example: Forest Fire Detection

Detect forest fire in early stages to take action while the fire is still controllable.
Sensors measure the temperature, smoke, weather, slope of the earth, wind speed, speed of fire spread, flame length



IoT Level-6

•A level-6 IoT system has **multiple independent end nodes** that perform sensing and/or actuation and send data to the cloud.
•**Data is stored in the cloud** and the **application is cloud-based**.
•The **analytics** component analyzes the data and stores the results in the **cloud database**.
•The results are visualized with the cloud-based application.
•The **centralized controller** is aware of the status of all the end nodes and **sends control commands to the nodes**.



IoT – Level 6 Example: Weather Monitoring System

Sensors used

Wind speed and direction
Solar radiation
Temperature (air, water, soil)
Relative humidity
Precipitation
Snow depth
Barometric pressure
Soil moisture

IoT Issues and Challenges

Security

- Cyber Attacks, Data Theft

Privacy

- Controlling access and ownership of data.

InterOperability

- Integration Inflexibility

Legality and Rights

- Data Protection laws be followed, Data Retention and destruction policies

Economy and Development

- Investment Incentives, Technical Skill Requirement