Developing an **IoT Level Template** system consists of the following components:

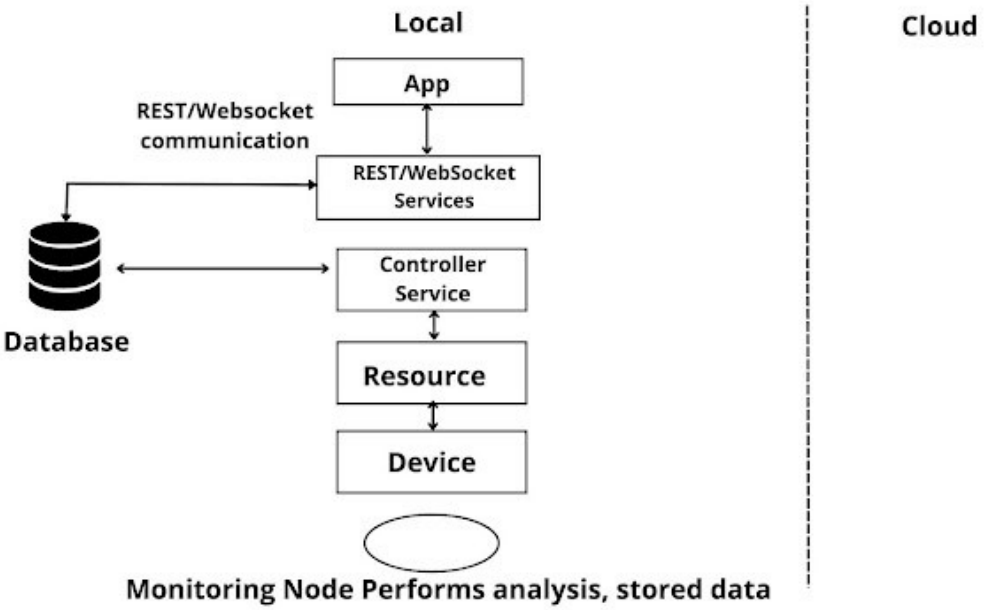
1. **Device:** These may be sensors or actuators capable of identifying, remote sensing, or monitoring.
2. **Resources:** These are software components on IoT devices for accessing and processing. storing software components or controlling actuators connected to the device. Resources also include software components that enable network access.
3. **Controller Service:** It is a service that runs on the device and interacts with web services. The controller service sends data from the device to the web service and receives commands from the application via web services for controlling the device.
4. **Database:** Stores data generated from the device
5. **Web Service:** It provides a link between IoT devices, applications, databases, and analysis components.
6. **Analysis Component:** It performs an analysis of the data generated by the lol device and generates results in a form which are easy for the user to understand.
7. **Application:** It provides a system for the user to view the system status and view product data. It also allows users to control and monitor various aspects of the IoT system.

IoT Levels

IoT level 1

IoT systems have a single device that performs sensing or actuation, stores a. analyses it, and hosts the application, IoT system-level-l is the best example for modeling low complexity and low-cost solution where the analysis requirement is not comprehensive and the data involved is not big.

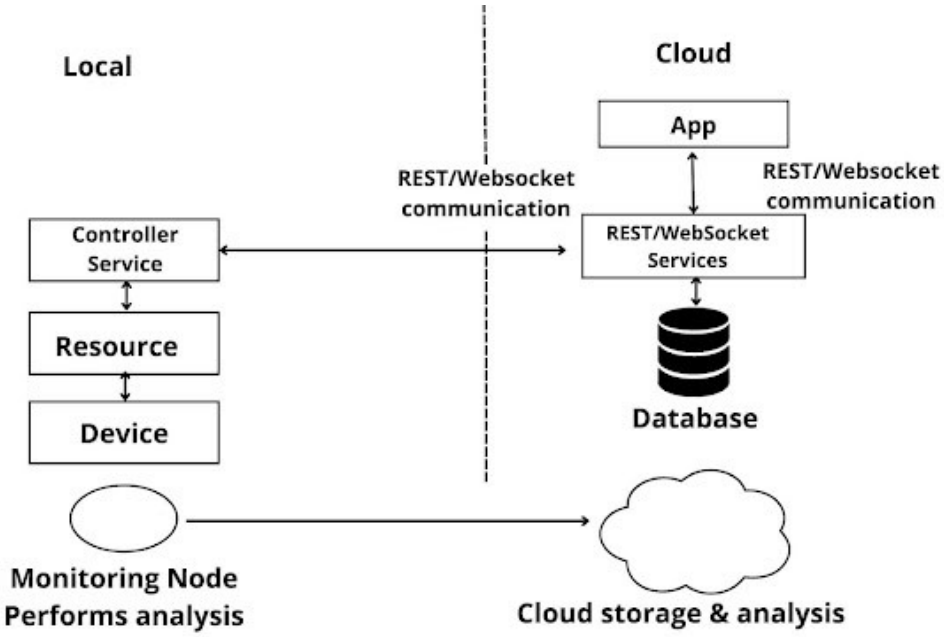
Example: We can understand with the help of an eg. Let's look at the IoT device that monitors the lights in a house. The lights are controlled through switches. The database has maintained the status of each light and also REST services deployed locally allow retrieving and updating the state of each light and trigger the switches accordingly. For controlling the lights and applications, the application has an interface. The device is connected to the internet and hence the application can be accessed remotely as well.



IoT level 2

A node performs sensing/actuation and local analysis. Data is stored in the cloud. this level is facilitated where the data involved is big and the primary analysis is not comprehensive.

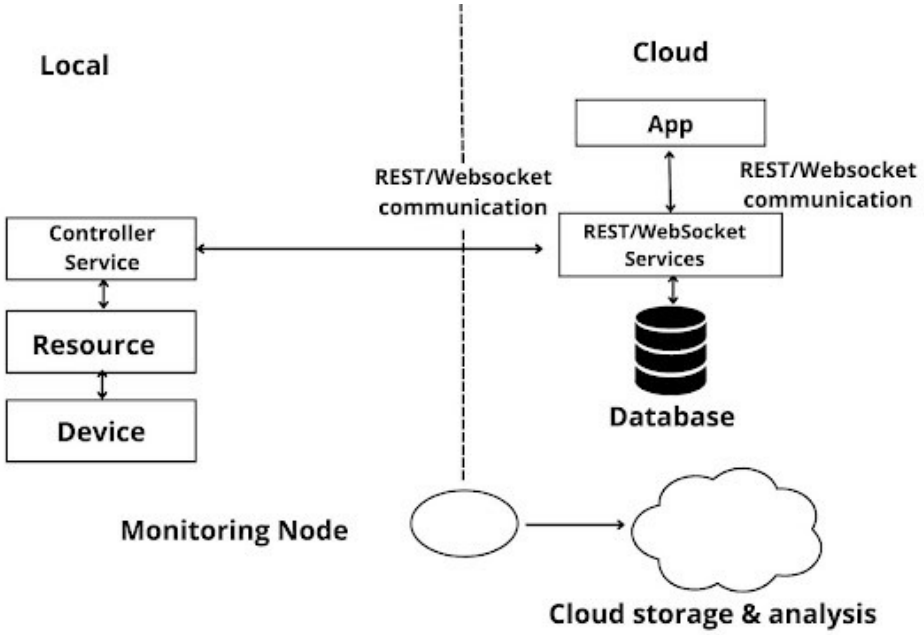
Example: Cloud-based application is used for monitoring and controlling the IoT system A single node monitors the soil moisture in the field Which is sent to the database on the cloud using REST APIS. The controller service continuously monitors moisture levels.



IoT level 3

At this level, the application is cloud-based. A single node monitors the environment and stores data in the cloud. This is suitable where data is comprehensive and analysis 1 computationally intensive.

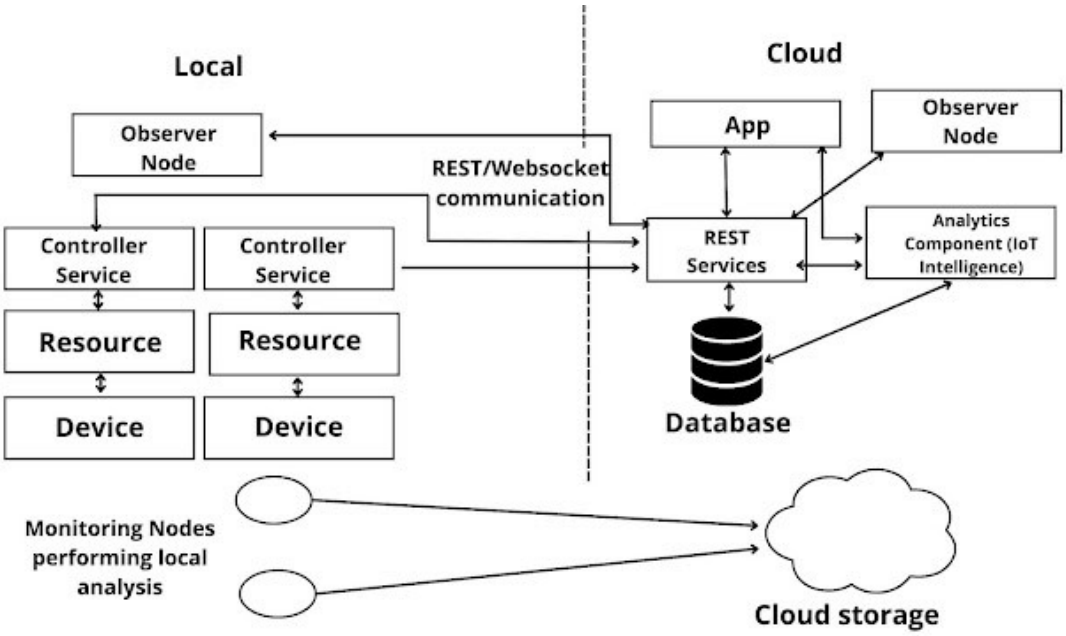
Example: A node is monitoring a package using devices like an accelerometer and gyroscope. These devices track vibration levels. controller service sends sensor data to the cloud in the rear time using WebSocket APL. Data is stored in the cloud and visualized using a cloud-based application. The analysis component triggers an alert if vibration levels cross a threshold.



IoT level 4

At this level, Multiple nodes collect information and store it in the cloud. Local and rent server nodes are used to grant and receive information collected in the cloud from various devices. Observer nodes can process information and use it for applications but not perform control functions, This level is the best solution where data involvement is big, requirement analysis is comprehensive and multiple nodes are required,

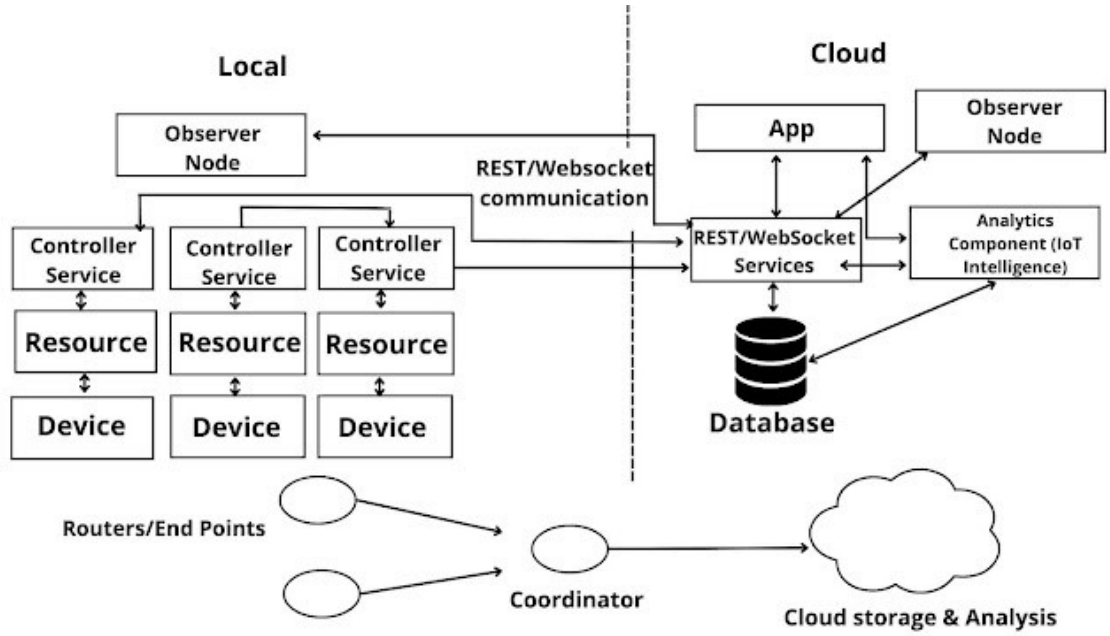
Example: Analysis is done on the cloud and the entire IoT system has monitored the cloud using an application. Noise monitoring of an area requires various nodes to function independently of each other. Each has its own controller service. Data is stored in a cloud database.



IoT level 5

In this level Nodes present locally are of two types end odes and coordinator nodes End nodes collect data and perform sensing or actuation or both. Coordinator nodes collect data from end nodes and send it to the cloud. Data is stored and analyzed in the cloud. This level is best for WSN, where the data involved is big and the requirement analysis is comprehensive.

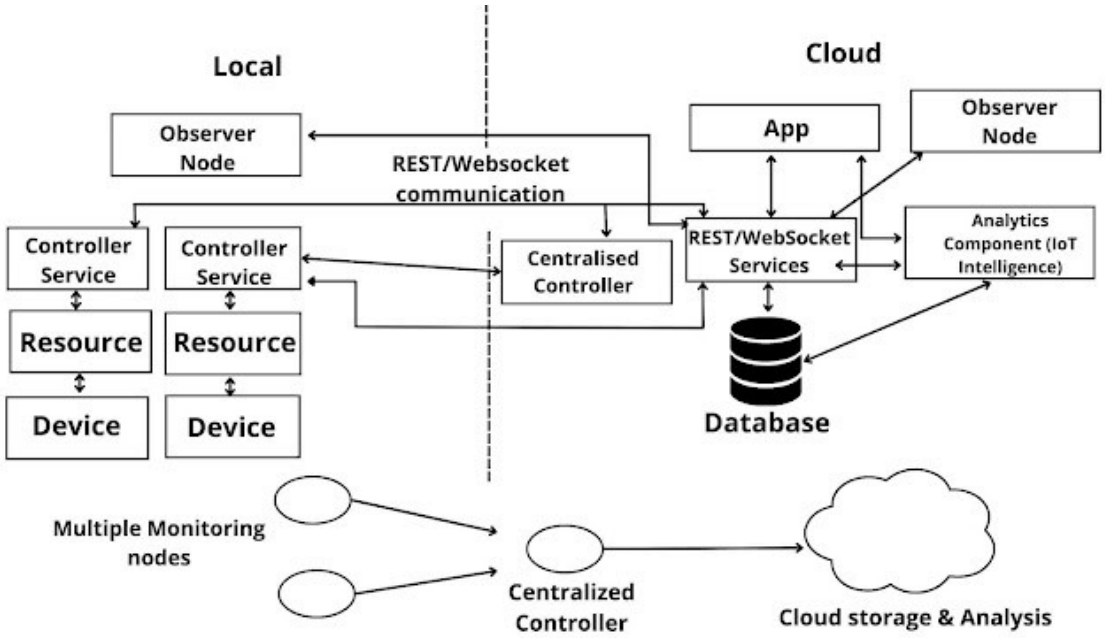
Example: A monitoring system has various components: end nodes collect various data from the environment and send it to the coordinator node. The coordinator node acts as a gateway and allows the data to be transferred to cloud storage using REST API. The controller service on the coordinator node sends data to the cloud.



IoT Level 6

At this level, the application is also cloud-based and data is stored in the cloud-like of levels. Multiple independent end nodes perform sensing and actuation and send d to the cloud. The analytics components analyze the data and store the results in the cloud database. The results are visualized with a cloud-based application. The centralized controller is aware of the status of all the end nodes and sends control commands to the nodes.

Example: Weather monitoring consists of sensors that monitor different aspects of the system. The end nodes send data to cloud storage. Analysis of components, applications, and storage areas in the cloud. The centralized controller controls all nodes and provides inputs.


Local
Cloud
Observer Node
REST/Websocket communication
App
Observer Node
Controller Service
Controller Service
Centralised Controller
REST/WebSocket Services
Analytics Component (IoT Intelligence)
Resource
Resource
Device
Device
Database
Multiple Monitoring nodes
Centralized Controller
Cloud storage & Analysis