IoT levels and deployment templates

Based upon the number of monitoring nodes used, type of data base used, complexity/ simplicity of analysis, computation there are 6 levels of IoT. Different applications are implemented based on this level. The IoT systems consist of these following components.

- ✓ Device
- ✓ Resources
- ✓ Controller Service
- ✓ Database
- ✓ Web Service
- ✓ Analysis Component
- ✓ Application
- ✓

Device: The Io T device allows identification, remote sensing, actuating, and remote monitoring capabilities.

Resource: Resources are the software components on the IoT device for accessing, processing and storing sensor information, or controlling actuators connected to the device Resources include the software components that enable network access for the device.

For ex:

The programs that we have written for object detection using IR sensor, to find out the distance using ultra sonic sensor etc.

Controller Service: Controller service is a native service that runs on the device and interacts with the web services. Controller service sends data from the device to the web service and receives commands from the application for controlling the web services. For ex: The ESP 8266 programming, setting of API keys, SSID etc.

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

Web Service: This act as an interface between IoT device, application, database and analysis components. Web services can be implemented using HTTP and REST principle or using Web Socket protocol.

Analysis Component: The analysis component is responsible for analysing the IoT data and generates results inform which are easy for the user to understand. Analysis can be performed either locally or in the clouds.

Application: IoT applications provide an interface that the user can use to control and monitor various aspects of the IoT system.

IoT level -1:

- It has single node/device for sensing, monitoring, actuating, storing data, performing analysis and hosting application.
- Data involved is not big. So data is stored in local database.
- It is suitable for modelling design low cost and low complexity solution.
- Primary analysis requirement is not computationally intensive. So can be analysed locally.
- EX: Home automation

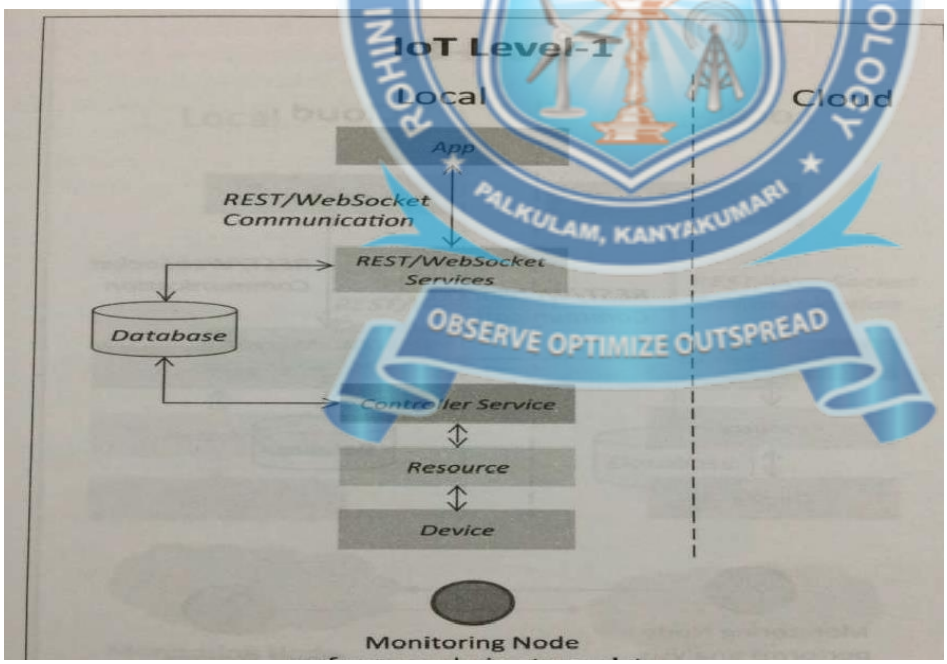

Fig. 1.5 IoT level -1

IoT level -2:

- It has single node/device for sensing, monitoring, actuating, performing analysis and hosting application.
- Data involved is big. So data is stored in cloud.It uses cloud based application to visualise data.
- Primary analysis requirement is not computationally intensive. So can be analysed locally.
- EX: smart irrigation.

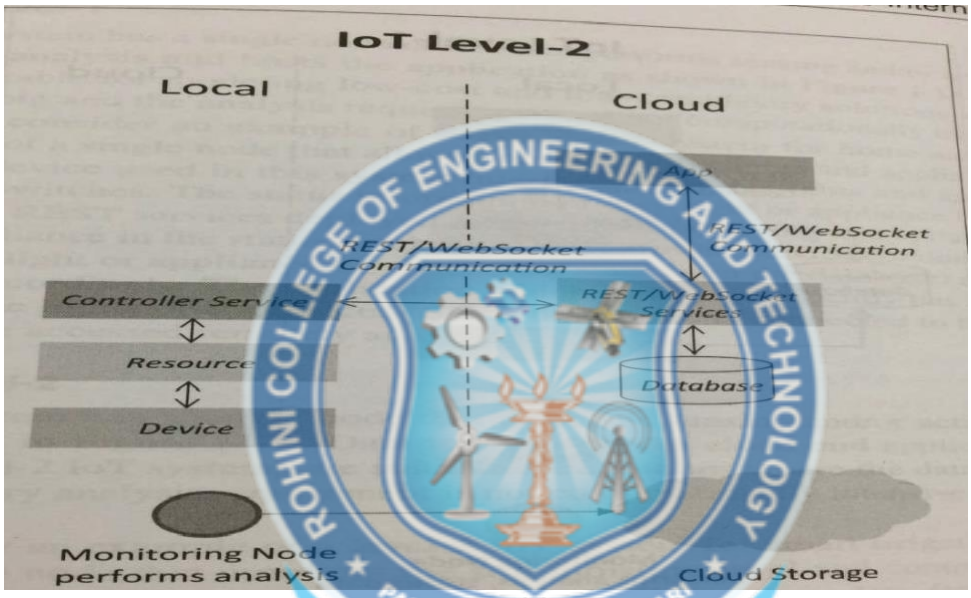

Fig. 1.6 IoT level -2

IoT level -3:

- It has single node/device for sensing, monitoring, actuating and hosting application.
- Data involved is big. So data is stored in cloud.
- It uses cloud based application to visualize data.
- Primary analysis requirement is computationally intensive. So can be aggregated and analyzed in cloud. EX: tracking package handling

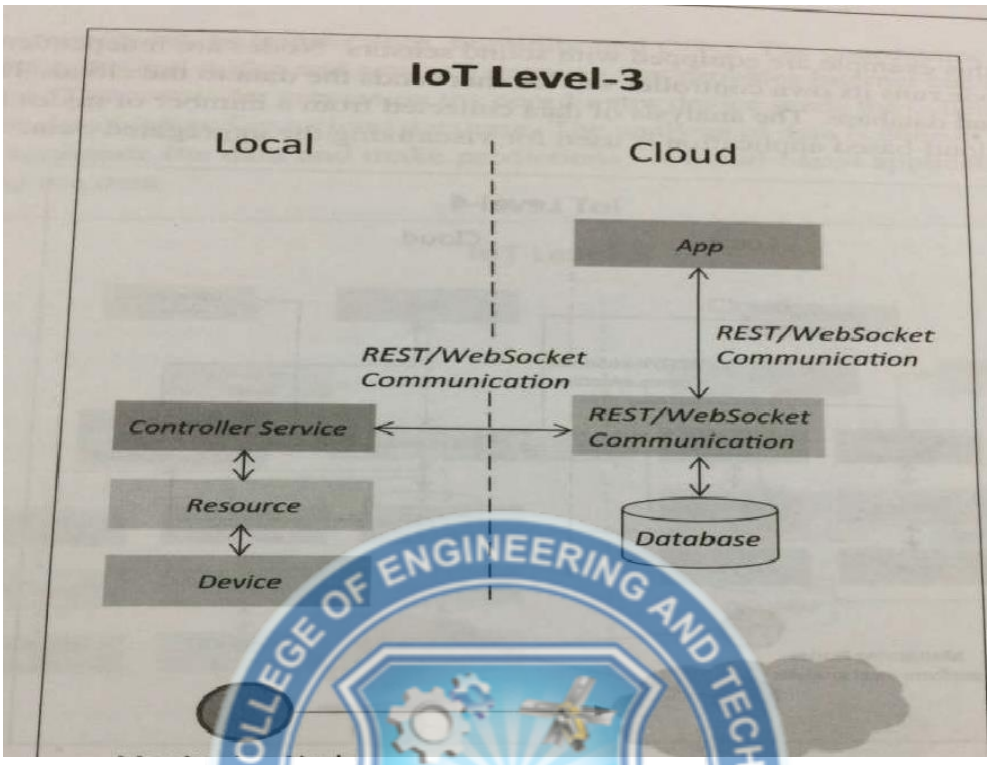

Fig. 1.7 IoT level -3

IoT level 4:

- It has multiple nodes/devices for sensing, monitoring, actuating, performing analysis and hosting application.
- Data involved is big. So data is stored in cloud. It uses cloud based application to visualise data.
- Primary analysis requirement is computationally intensive. So can be aggregated and analysed in cloud.
- It has two observer nodes i.e local and cloud based. They can subscribe to and receive information collected in cloud from IoT device. They can process and use that information for various applications
- Observer node does not perform any control function.
- EX: Noise monitoring

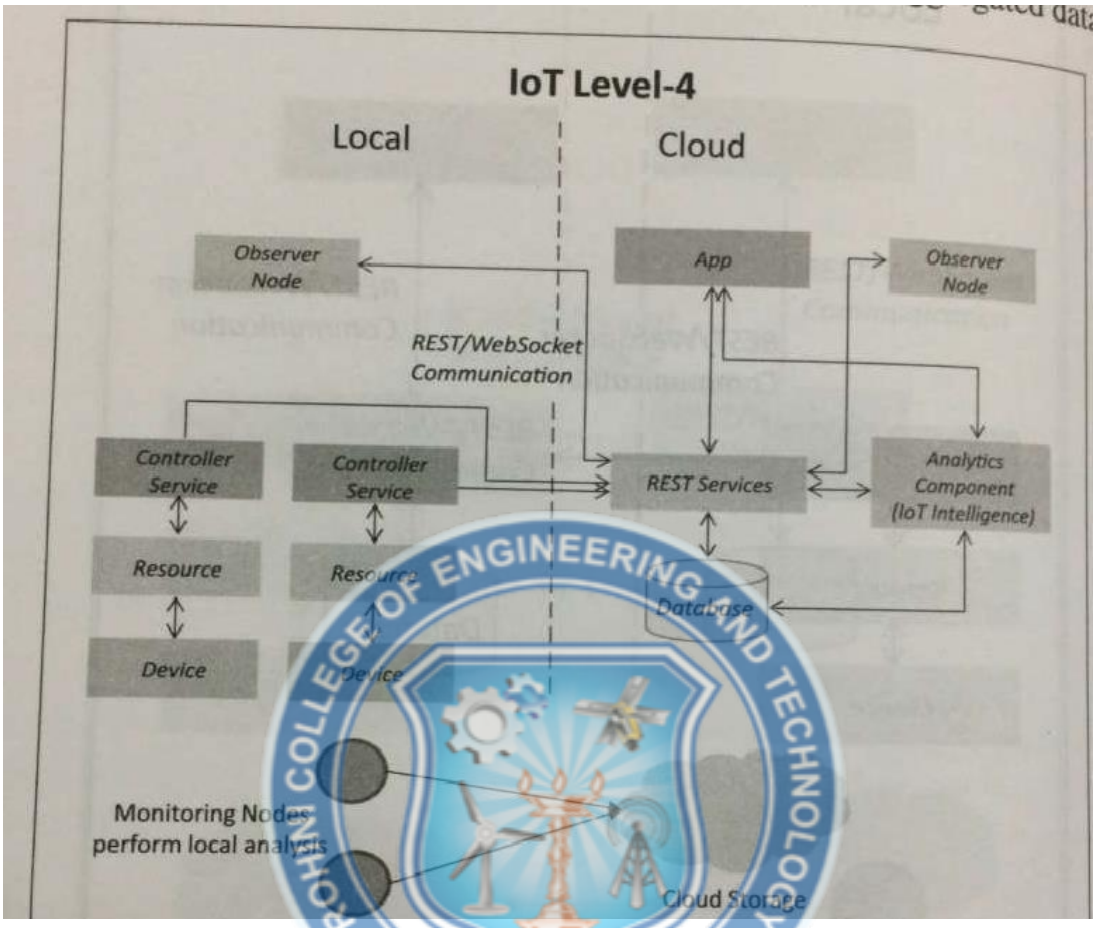

Fig. 1.8 IoT level -4

IoT level 5:

- It has multiple nodes/devices for sensing, monitoring, actuating.
- One coordinator node for collecting and sending the data to cloud by controller service.
- Data involved is big. So data is stored in cloud. It uses cloud based application to visualise data. Suitable for wireless sensor network.
- Primary analysis requirement is computationally intensive.
- Analytic component analyse the data and stores result in cloud and make prediction.
- Ex: Forest Fire Detection

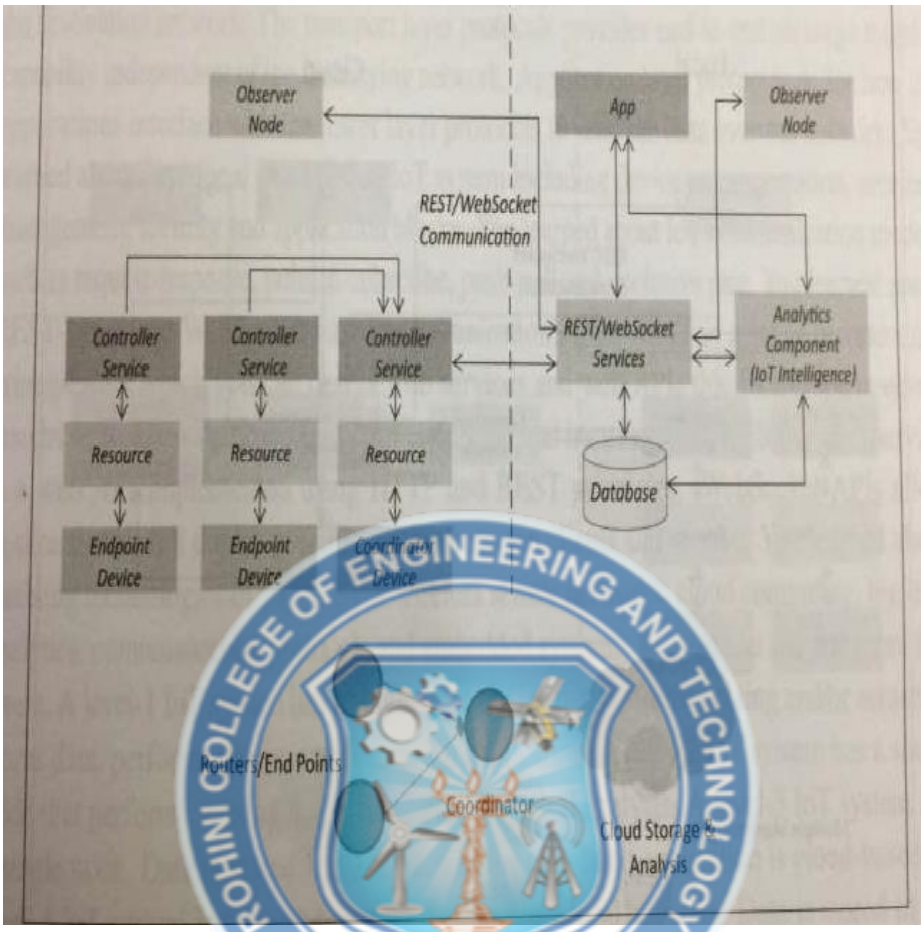

Fig. 1.9 IoT level -5

IoT level- 6:

- It has multiple independent nodes/devices for sensing, monitoring, actuating and sending the data to cloud by controller service.
- Data involved is big. So data is stored in cloud. It uses cloud based application to visualize data. Primary analysis requirement is computationally intensive.
- Analytic component analyse the data and stores result in cloud.
- It has centralized controller which is aware of the status of all the end nodes and sends control command to the nodes.
- Ex:Weather monitoring and structural health monitoring.