IoT Levels and Deployment Templates

IoT – Components

Device

Allows identification, remote sensing, actuating and remote monitoring capabilities.

IoT devices include wireless sensors, software, actuators, and computer devices.

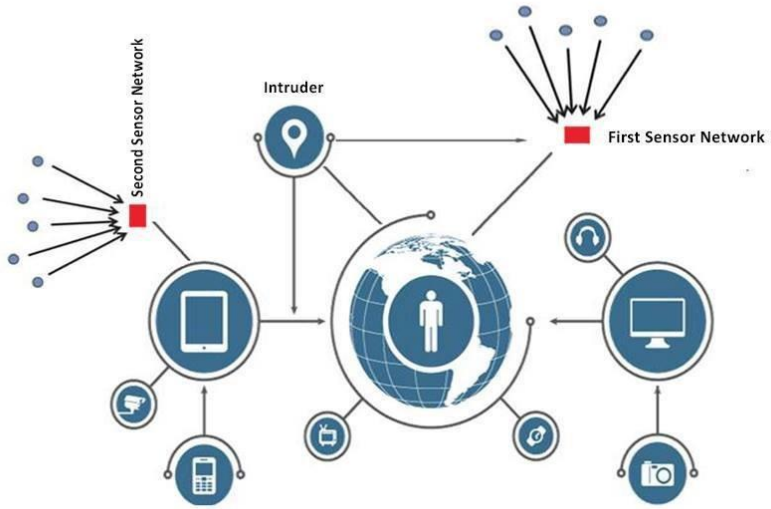
They are attached to a particular object that operates through the internet, enabling the transfer of data among objects or people automatically without human intervention.

IoT – Components

Resource

Resources are software components on the IoT device for accessing, processing, and storing sensor information, or controlling actuators connected to the device.

Resources also include the software components that enable network access for the device.

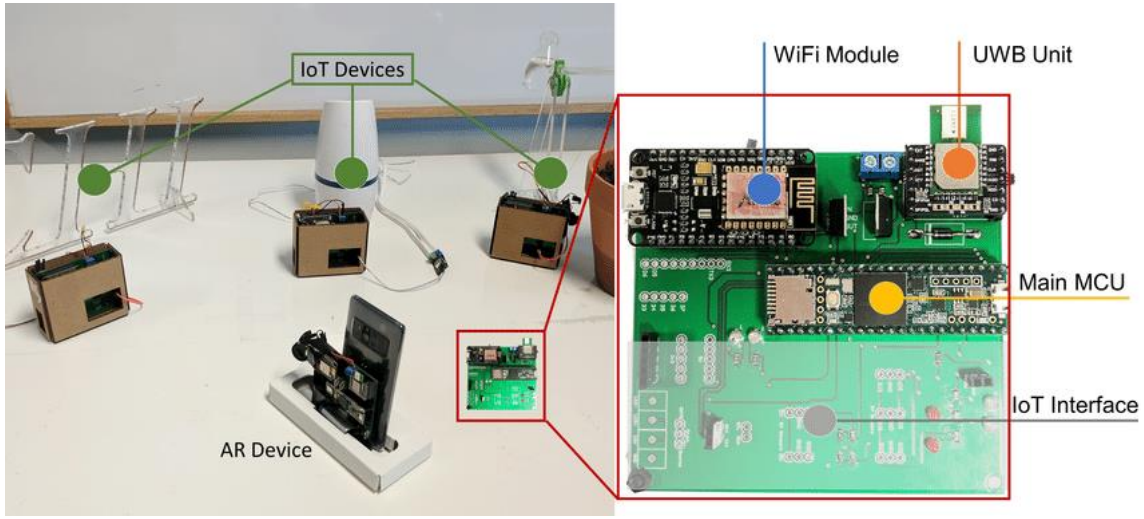


IoT – Components

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 (via web services) for controlling the device.



IoT – Components

Database

A storage place for Collected or generated data.

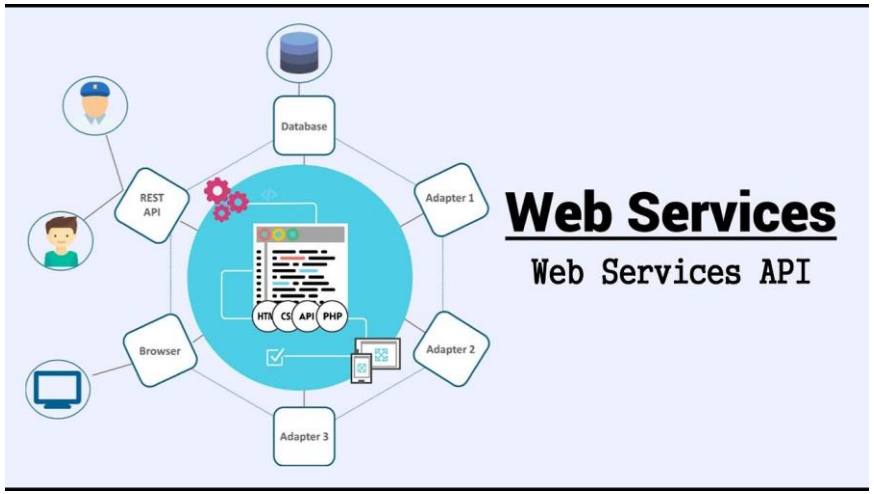
Database can be either local or in the cloud and stores the data generated by the IoT device.

IoT – Components

Web Service

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

Web service can be either implemented using HTTP and REST principles (REST service) or using WebSocket protocol (WebSocket service).



IoT – Components

Analysis Component

Responsible for analyzing the IoT data and generate results in a form which are easy for the user to understand.

IoT – Components

Application

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

It allow users to view the system Monitor and processed data.

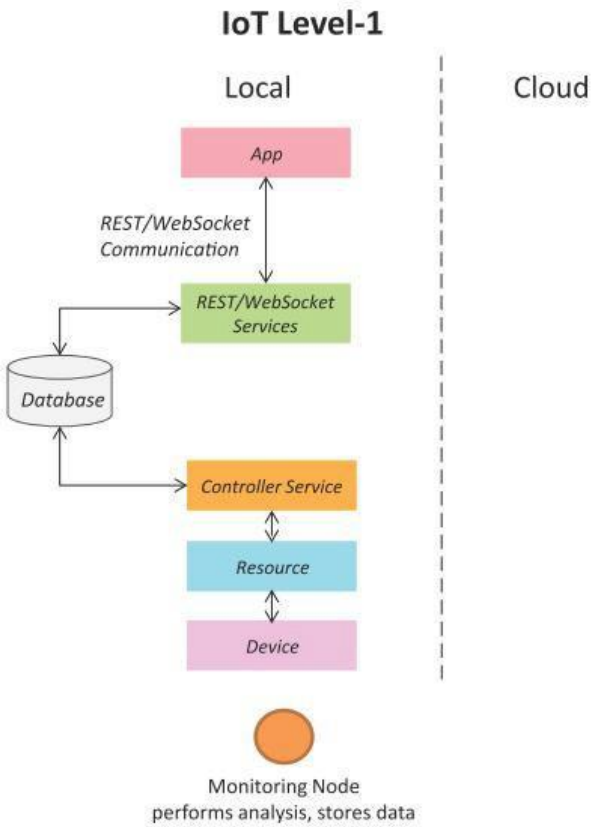
IoT – Levels

With amount of complexity involved,

One could categorize IoT as IoT level 1/2/3/4/5/6

IoT Level1

- 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 modeling low-cost and low-complexity solutions where the data involved is not big and the analysis requirements are not computationally intensive.



Reference : Bahga & Madisetti, © 2015 Book website: http://www.internet-of-things-book.com

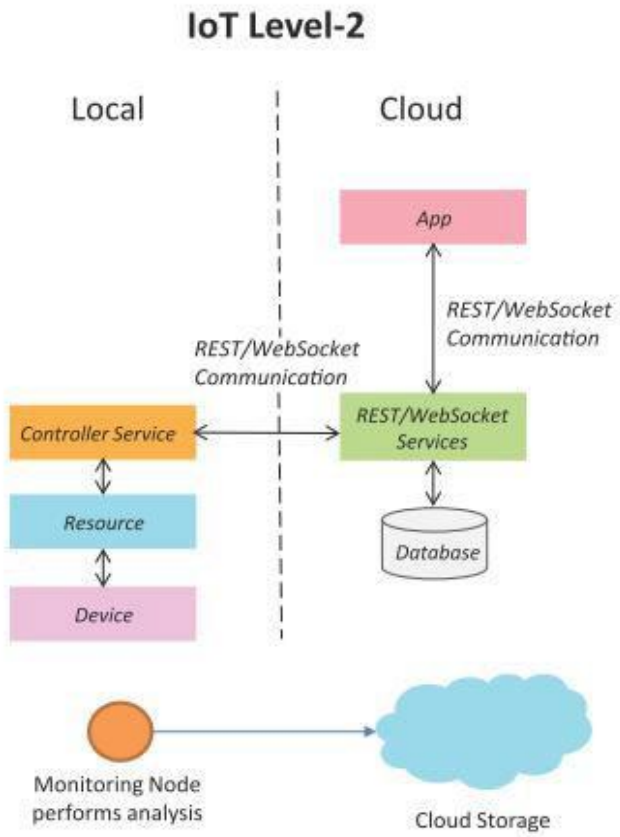
IoT Level1

- Have one sensor/device to sense. (Could be Temp Sensor / Pressure Sensor etc)
- The Data to be stored in locally…..
- Monitoring/Controlling to be done through an Application (.apk or web app)
- This is used for simple applications with less complexity or no complexity
- Data is not big here

Reference : IoT by Shriram K Vasudevan

IoT level 2

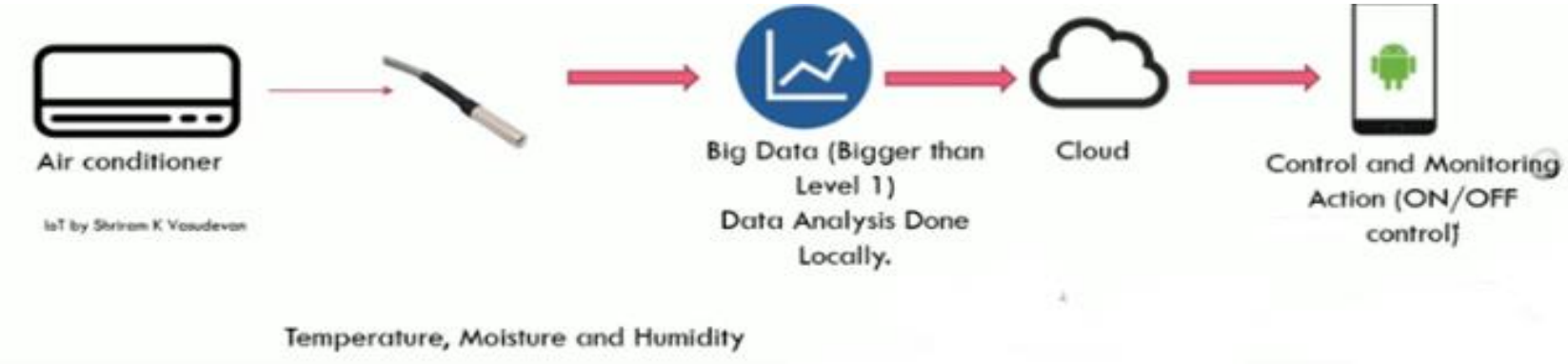
- A level-2 IoT system has a single node that performs sensing and/or actuation and local analysis.
- Data is stored in the cloud and application is usually cloud-based.
- Level-2 IoT systems are suitable for solutions where the data involved is big, however, the primary analysis requirement is not computationally intensive and can be done locally itself.



Reference : Bahga & Madisetti, © 2015 Book website: http://www.internet-of-things-book.com

IoT level 2

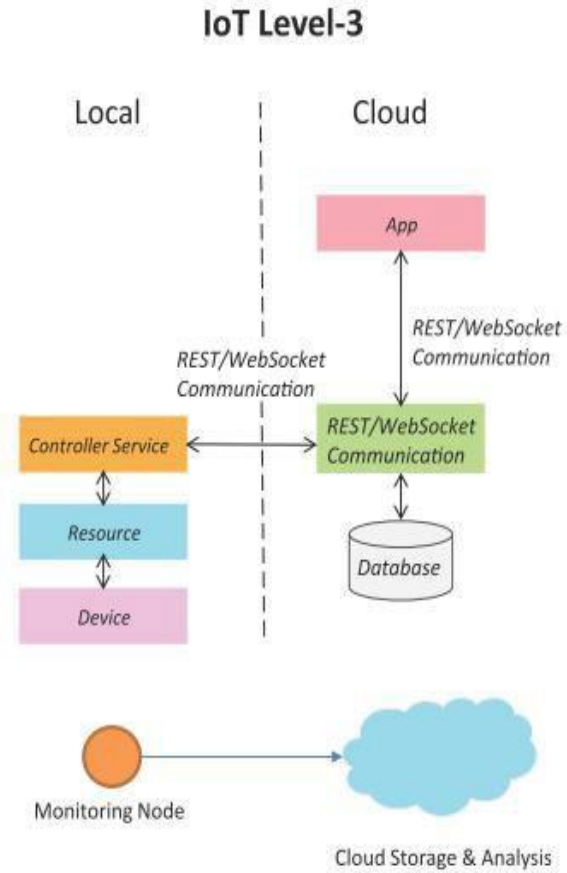
- Here, the data is voluminous
- Means the frequency of sensing done by sensor is faster
- Cloud storage is preferred
- Analysis is done locally, cloud meant for storage alone
- Examples : Agricultural Applications, Room freshening solutions based on odor etc



Reference : IoT by Shriram K Vasudevan

IoT Level 3

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



Reference : Bahga & Madisetti, © 2015 Book website: http://www.internet-of-things-book.com

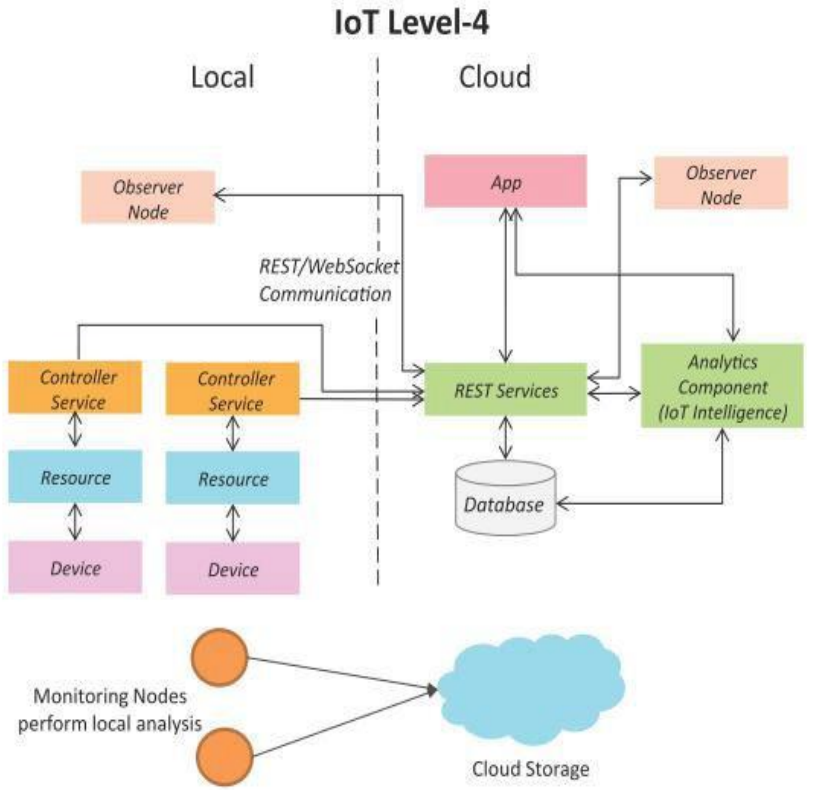
IoT Level 3

- Here, the data is definitely voluminous
- Means the frequency of sensing done by sensor is faster
- Storage and analysis done in Cloud

Reference : IoT by Shriram K Vasudevan

IoT Level 4

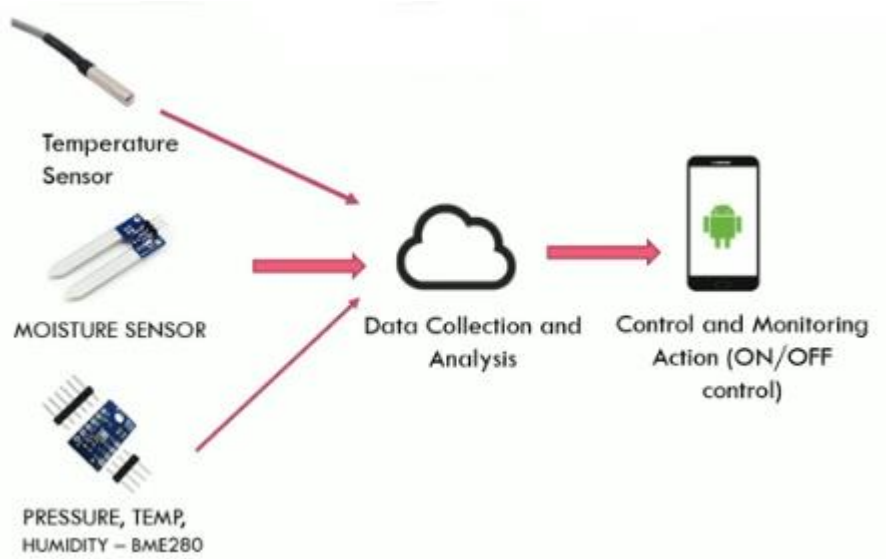
- A level-4 IoT system has multiple nodes that perform local analysis. Data is stored in the cloud and application is cloud-based.
- Level-4 contains local and cloud-based observer nodes which can subscribe to and receive information collected in the cloud from IoT devices.
- Level-4 IoT systems are suitable for solutions where multiple nodes are required, the data involved is big and the analysis requirements are computationally intensive.



Reference : Bahga & Madisetti, © 2015 Book website: http://www.internet-of-things-book.com

IoT Level 4

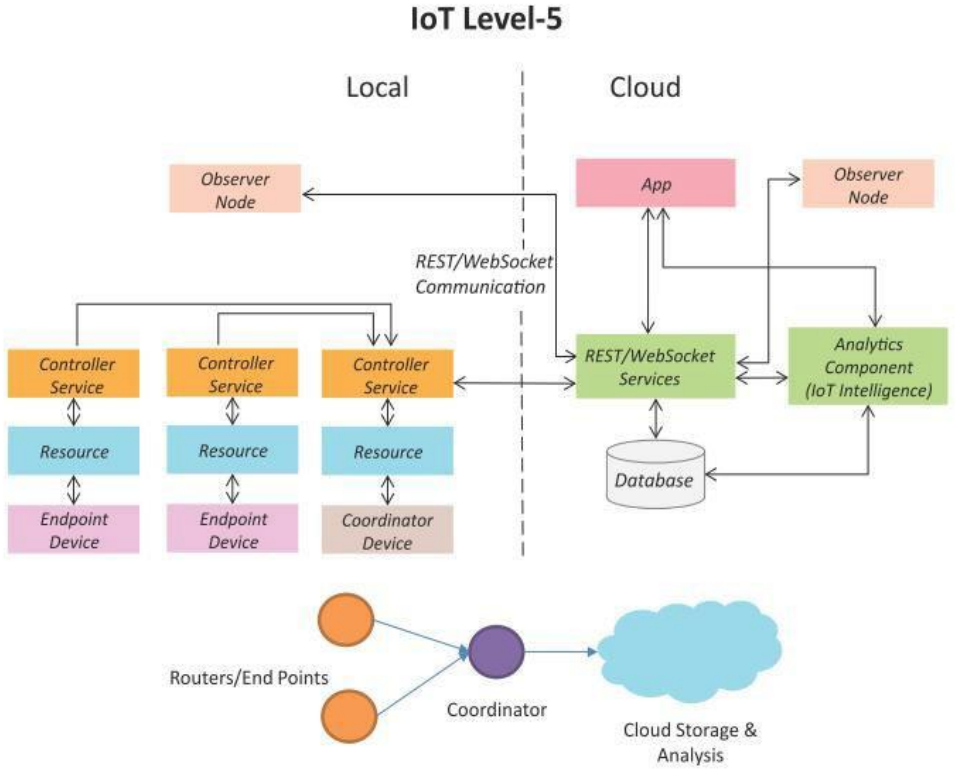
- Here, the data is definitely voluminous
- Multiple sensors / nodes are there and they are independent of each other
- Also, they upload the data onto the cloud with the help of microcontroller
- Storage and analysis done in Cloud



Reference : IoT by Shriram K Vasudevan

IoT Level 5

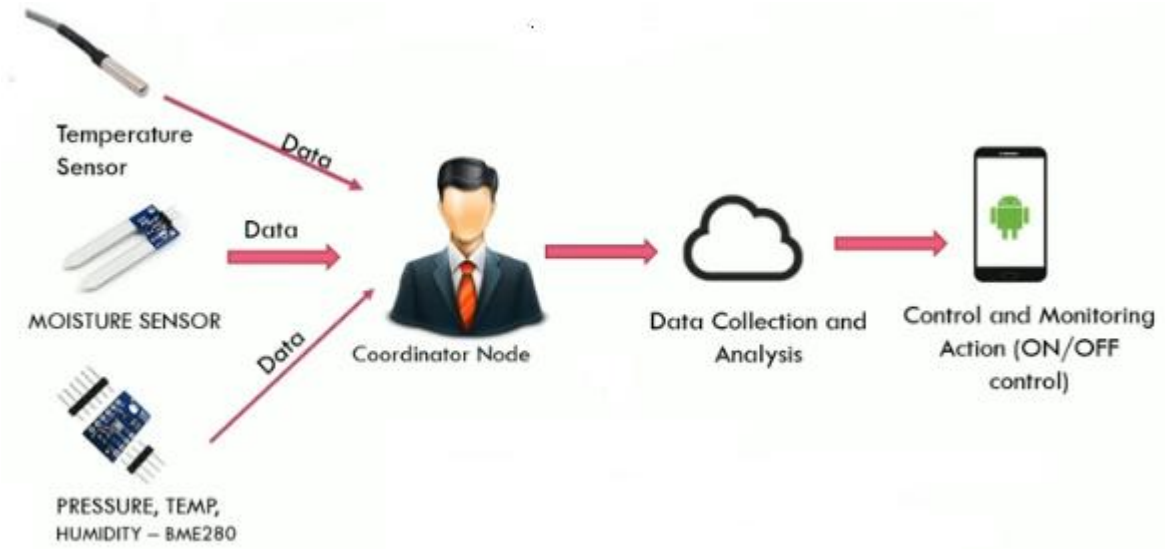
- A level-5 IoT system has multiple end nodes and one coordinator node.
- The end nodes that perform sensing and/or actuation.
- Coordinator node collects data from the end nodes and sends to the cloud.
- Data is stored and analyzed in the cloud and application is cloud-based.
- Level-5 IoT systems are suitable for solutions based on wireless sensor networks, in which the data involved is big and the analysis requirements are computationally intensive.



Reference : Bahga & Madisetti, © 2015 Book website: http://www.internet-of-things-book.com

IoT Level 5

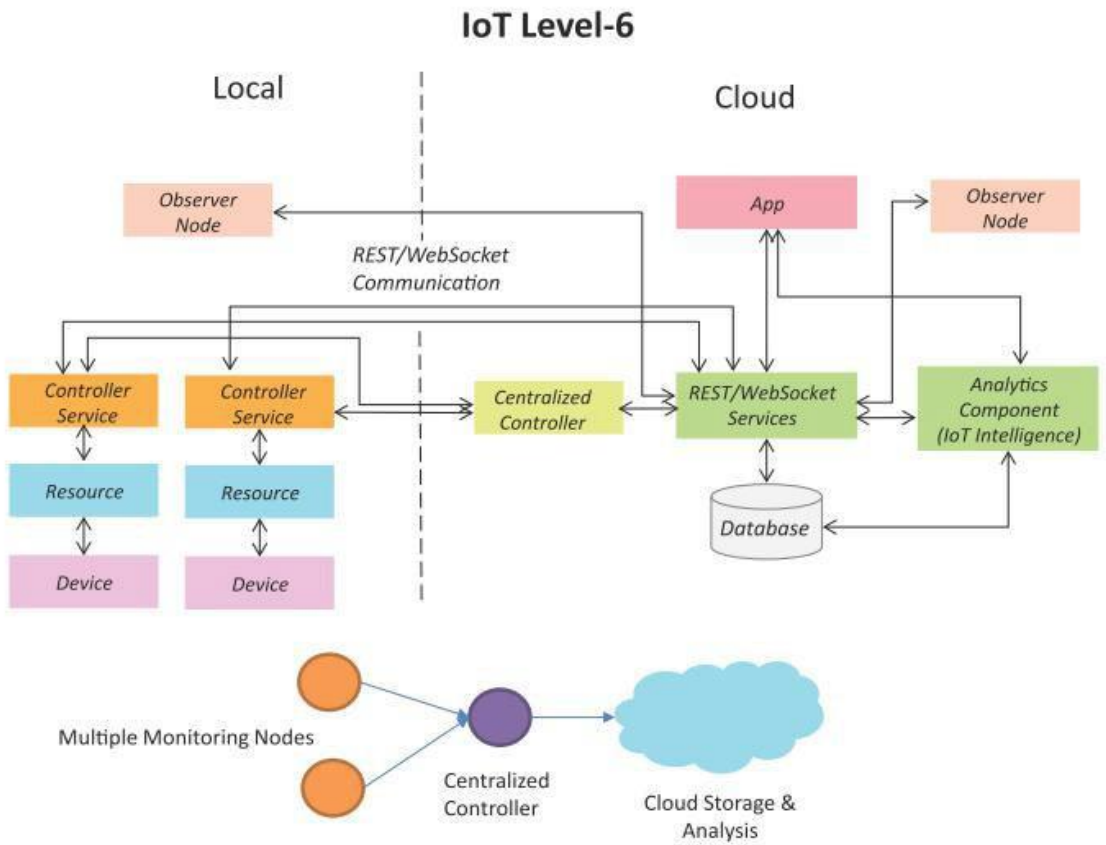
- Here, the data is definitely voluminous
- Coordinator node for collecting data from different sensors and pushing it on cloud
- Storage and analysis done in Cloud
- Computationally very intensive
- Real time



Reference : IoT by Shriram K Vasudevan

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 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.



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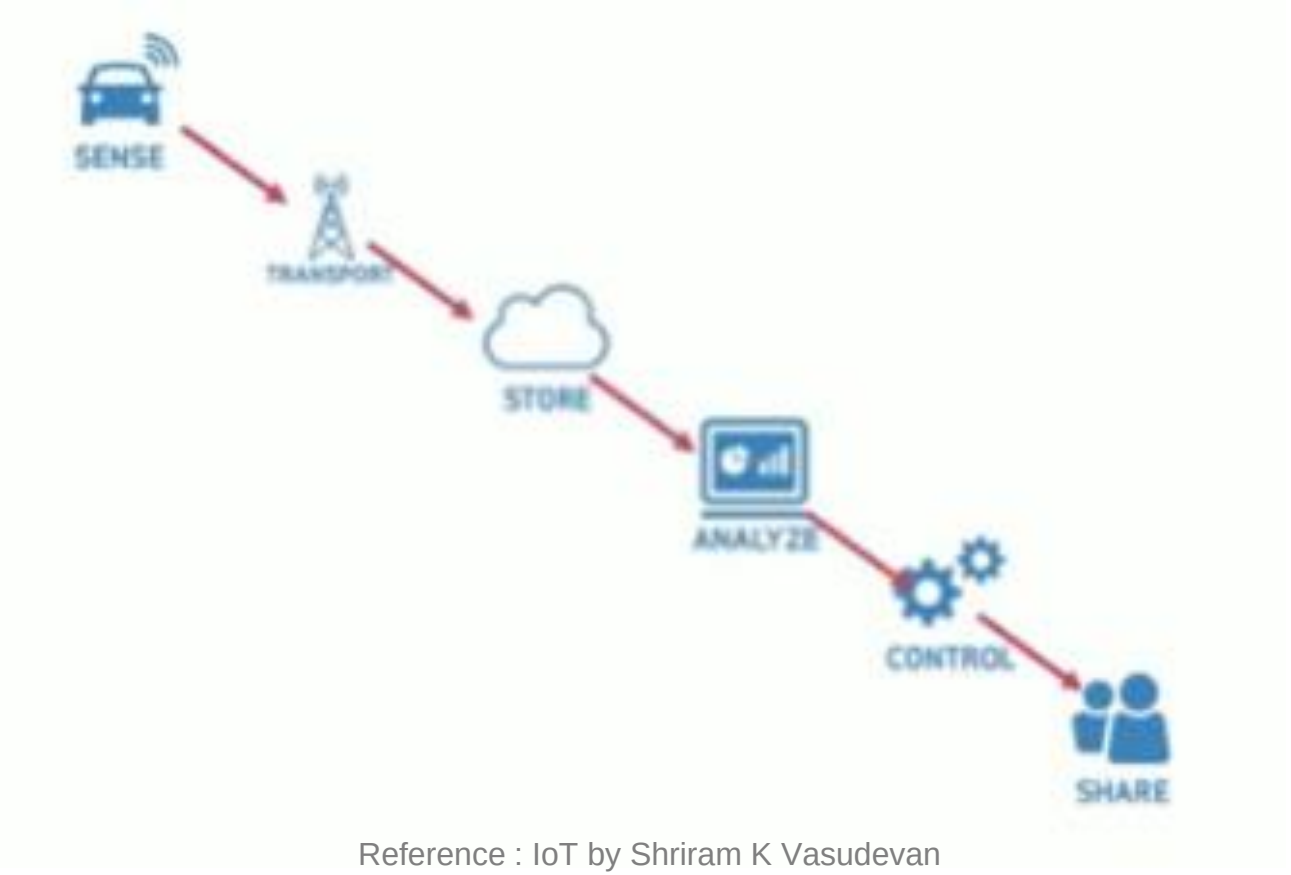
So, what have we understood?



- Acquire
- Analyze
- Control

Reference : IoT by Shriram K Vasudevan

Thank you!