



A-IOT reference model and reference architecture(notes)

Internet Of Things (University of Mumbai)



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CHAPTER 2: Topics covered REFERENCE MODEL AND REFERENCE ARCHITECTURE:

Q1) Explain IOT Reference Architecture's Deployment and Operational View?

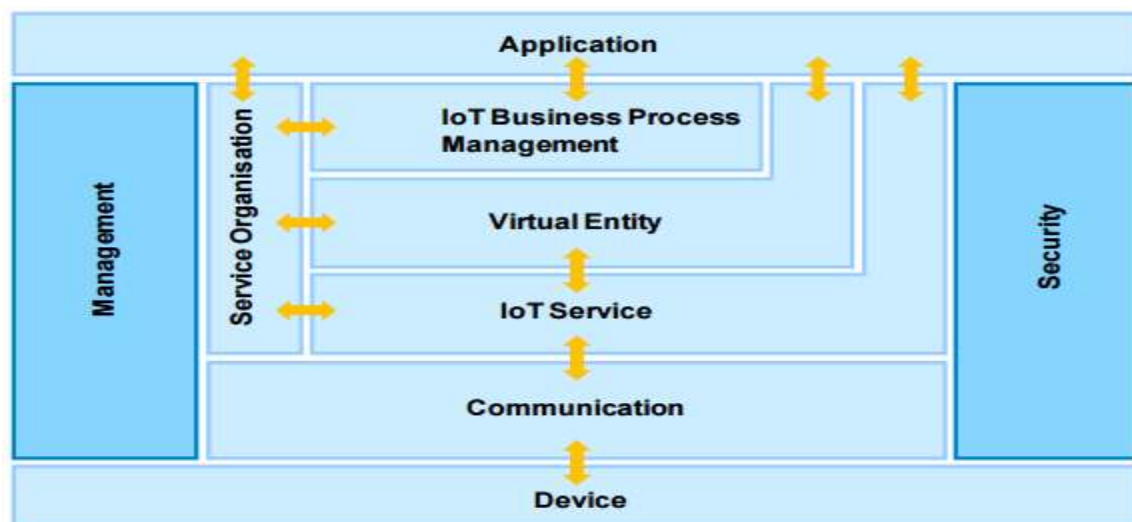
ANS:

- Deployment view and Operational view are very important in Addressing how the actual system can be realized by selecting technologies and making them communicate and operate in a comprehensive way.
- this view is depending upon actual use case and requirements.
- let's take an example of the parking lot system.
- As we can see in the figure, there are two sensor nodes #1 and #2, each of which is connected to eight car presence sensors.
- They are also connected to the payment stations through wireless or wired communication.
- The payment station acts both as a user interface for the device to pay and get a payment receipt as well as a communication gateway that connects the two sensor nodes and payment interface physical devices with the internet through WAN.
- The occupation sign also acts as a communication gateway for the actuator node, and we assume that because of the deployment, a direct connection to the payment station is not feasible.
- The physical gateway devices connect through WAN to the internet and towards a data center where the parking lot management system software is hosted as one of the virtual machine on a platform as service configurations.
- The two main application connected to this management system are human user mobile phone applications and parking operation center applications.

Q2) Describe Functional View of IOT?

ANS: Functional Model:

It aims at describing mainly the F.G and their interaction with the ARM while the functional view of a Reference Architecture describes the functional components of a FG interfaces and interactions between the components. The functional view is typically derived from the functional model in conjunction with high-level-requirement.



1) Device and application Functional Group:

The device functionally includes sensing, actuators, processing, storage and identification components, the Sophistication of which depends on the devices capabilities. Application function group contains the standalone application.

2) Communication Functional Group:

It contains the components for end to end communication, network communication, and hop-by-hop communication.

3) IOT Services functional group:

It corresponding mainly to the service class from the IOT domain model and contains single IOT services exposes by resources hosted on devices or in the network.

4) Virtual Entity Functional group:

The virtual entity functional group contains functions that support the interactions between users and physical things through virtual entity service.

5) IOT service organization Functional group:

It acts as a communication hub between several other functional groups by composing and orchestrating services of different level of abstraction.

6) IOT Process Management Functional Group:

It is a collection of functionalities that allows smooth integration of IOT related Services with the business process.

7) Management Functional Group:

It is responsible for composition and tracking of actions that involve in the other functional groups.

8) Security functional group:

It is responsible for security and privacy matters in IOT-A compliant IOT systems.

Q3) Describe IOT Reference Domain Model?

Ans: **IOT DOMAIN Model: -**

1)It captures the basic attributes of the main concepts and the relationship between these concepts.

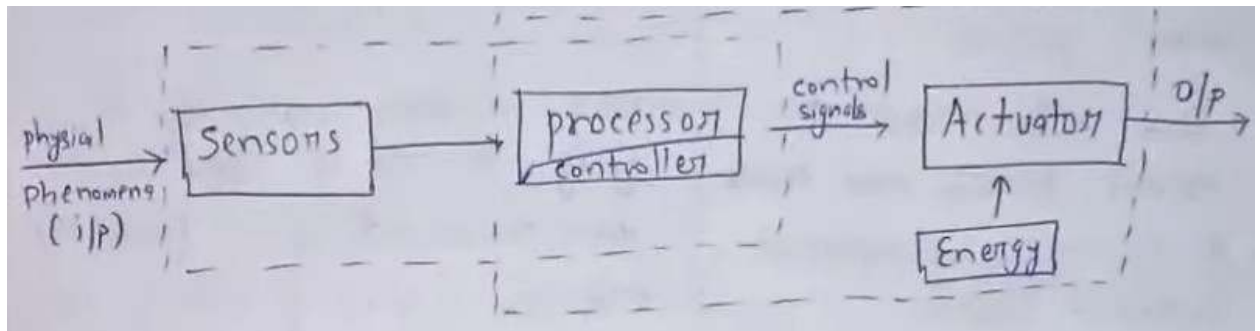
2) Abstraction level of the IOT Domain model has been chosen I such a way that its concepts are independent of specific technologies and use cases.

3)The idea is that these concepts are not expected to change much over the next decades or longer.

Three types of device types for the IOT Domain Model:

Sensors:

- sensors are devices that detect external information replacing it with a signals that human and machines can distinguish.
- IOT Sensors used to detect and measure various physical phenomena such as heat and pressure as well as 5 human senses sight, hearing, touch, taste and smell.



Actuators:

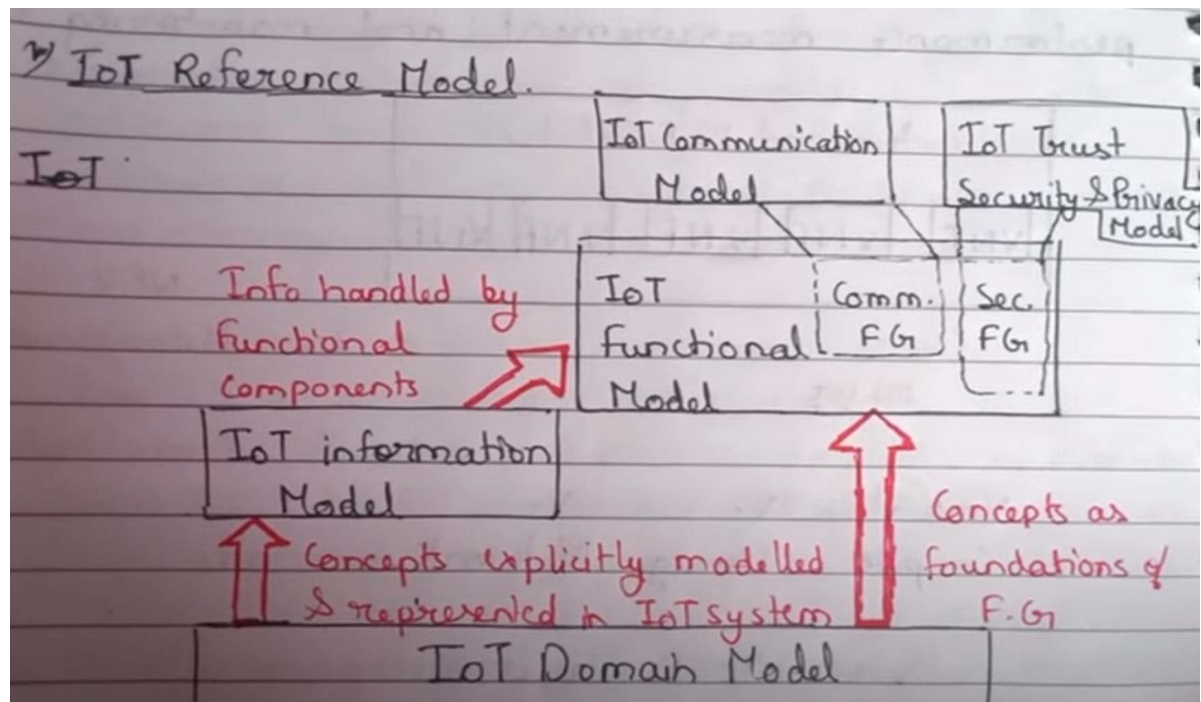
- An actuator is a machine component or system that moves or controls the mechanism or the system. Sensors in the device sense the environment, then control signals are generated for the actuators according to the actions needed to perform.

Tags:

- In general, it is use to identify the physical Entity that they are attached to. It can be devices or physical entities but no both as the domain model shows. Example: tag as a device Radio Frequency ID. Tag as a physical entity – paper printed immutable barcode or Quick Response (QR) code.

Q4) What is Reference Model Architecture?

Ans: A reference model describes the domain using a number of sub-domain.



IOT Domain Model:

- It captures the basic attributes of the main concepts and the relationship between these concepts.
- Abstraction level of the IOT Domain model has been chosen in such a way that its concepts are independent of specific technologies and use cases.
- The idea is that these concepts are not expected to change much over the next decades or longer.

IOT information Model:

- Virtual entity in the IOT Domain Model is the thing in the IOT, the IOT Domain model is the thing in the IOT, the IOT information model captures the details of a virtual entity centric model, the IOT Information model is presented using Unified modelling language(UML) diagrams.

Functional Model:

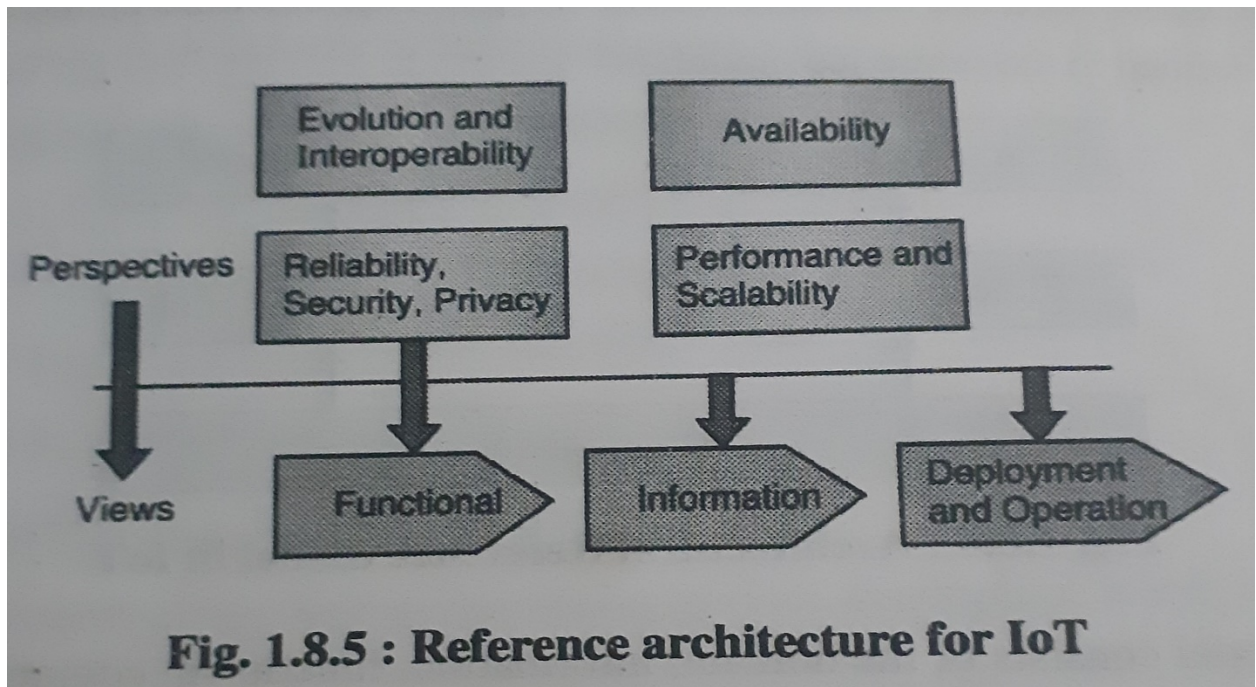
- It aims at describing mainly the F.G and their interaction with the ARM while the functional view of a Reference Architecture describes the functional components of a FG interfaces and interactions between the components. The functional view is typically derived from the functional model in conjunction with high-level requirement.

Communicational Model:

- It aims at determining the main communications paradigm for connecting elements as defined in IOT domain model. It contains the components for end to end communication, network communication, and hop-by-hop communication.

Q5) Explain Reference Architecture for IOT?

Ans: It is a starting point for generating concrete architecture and actual systems. A reference architecture, serves as a guide for one or more concrete system architecture.



Architectural view:

- It is presented as set of architectural view. View are useful for reducing the complexity of the reference.
- Views are used during the design and implementation phase of a concrete system architecture.
- A view is composed of viewpoints which is a collection of patterns, templates and conventions for constructing one type of view.

Functional view:

- Describes what the system does and it main functions.
- The unified requirements are mapped to the different functionality groups of the IOT functional Model.
- Next, clusters of requirements of similar functionality are formed and a functional component for these requirements defined.

Informational view:

- It describes the information that the system handles and the components that handles this information.

- The pieces of information handled by an IOT system Complying to an ARM such as the A-IOT are the following:
- Virtual Entity context information i.e. attributes (Simple or complex) as represented by parts of the IOT information model.
- IOT Service output itself is another important part of information generated by an IOT System.
- Virtual Entity descriptions and its association with other virtual entity.

Deployment and Operational View:

- Description of the main real world components of the system such as devices, network routers, servers etc. It aims at providing users of the IOT Reference Model with a set of guidelines to drive them through the different design choices that they have to face while designing the actual implementation of their services.
- It will discuss how to move from the service description and the identification of the different functional elements to the selection among the many available technologies in the IOT to build up the overall networking behavior for the deployment.