Tutorial 1 : IoT System Design Methodology

Dr. Bibhas Ghoshal

Assistant Professor

Department of Information Technology
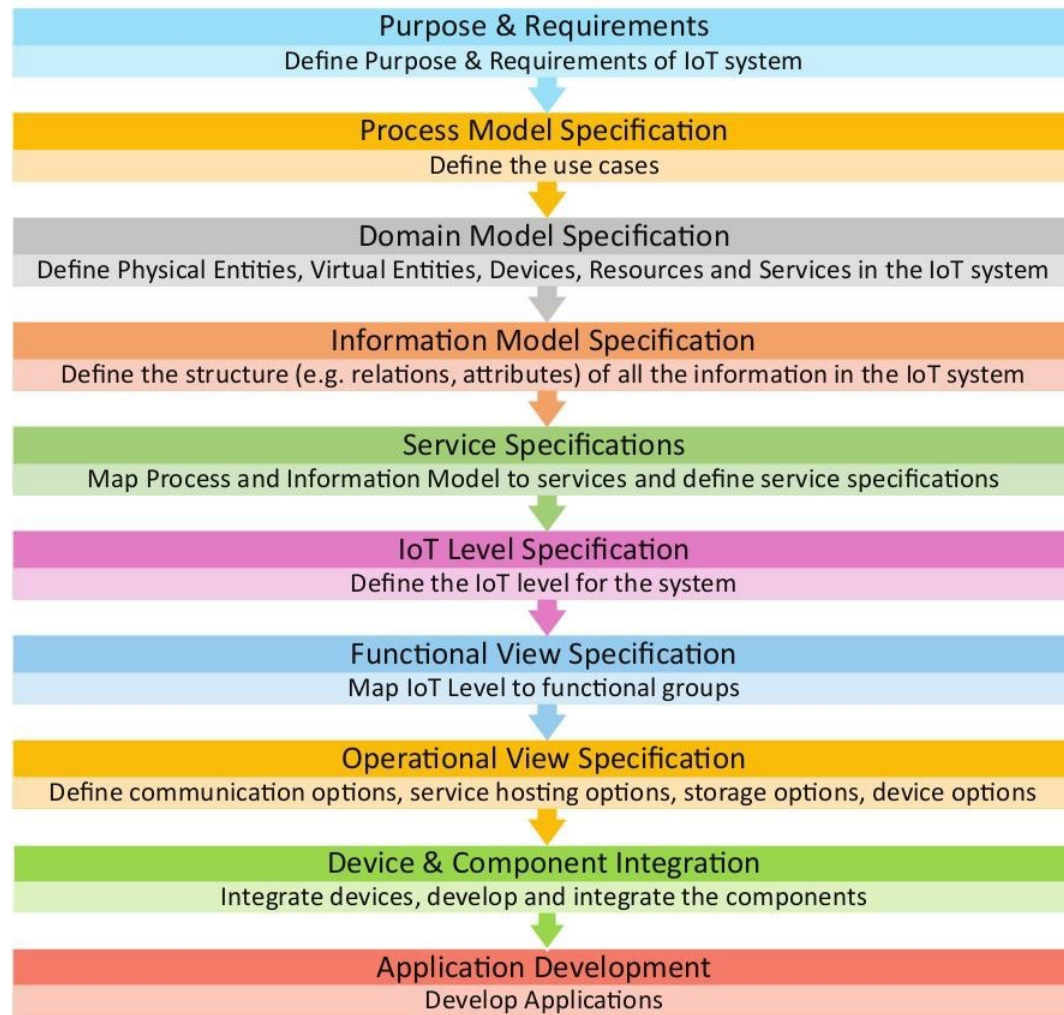
Indian Institute of Information Technology Allahabad

IoT Design Methodology

Purpose & Requirements
Define Purpose & Requirements of IoT system

Process Model Specification
Define the use cases

Domain Model Specification
Define Physical Entities, Virtual Entities, Devices, Resources and Services in the IoT system

Information Model Specification
Define the structure (e.g. relations, attributes) of all the information in the IoT system

Service Specifications
Map Process and Information Model to services and define service specifications

IoT Level Specification
Define the IoT level for the system

Functional View Specification
Map IoT Level to functional groups

Operational View Specification
Define communication options, service hosting options, storage options, device options

Device & Component Integration
Integrate devices, develop and integrate the components

Application Development
Develop Applications

Source: Book website: http://www.internet-of-things-book.com

IoT System Design : Home Automation

Step:1 - Purpose & Requirements

• Purpose : A system that allows controlling of the lights in a home remotely using a web application

• Behaviour : The home automation system should have auto and manual modes.

Auto mode - the system measures the light level in the room, switches light when dark.

Manual mode - the system provides the option of manually and remotely switching on/off the light.

• System Management Requirement : The system should provide remote monitoring and control

functions.

• Data Analysis Requirement : system should perform local analysis of data

• Application Deployment Requirement : The application should be deployed locally on the device, but should be accessible remotely.

• Security Requirement : The system should have basic user authentication capability.

IoT System Design : Home Automation
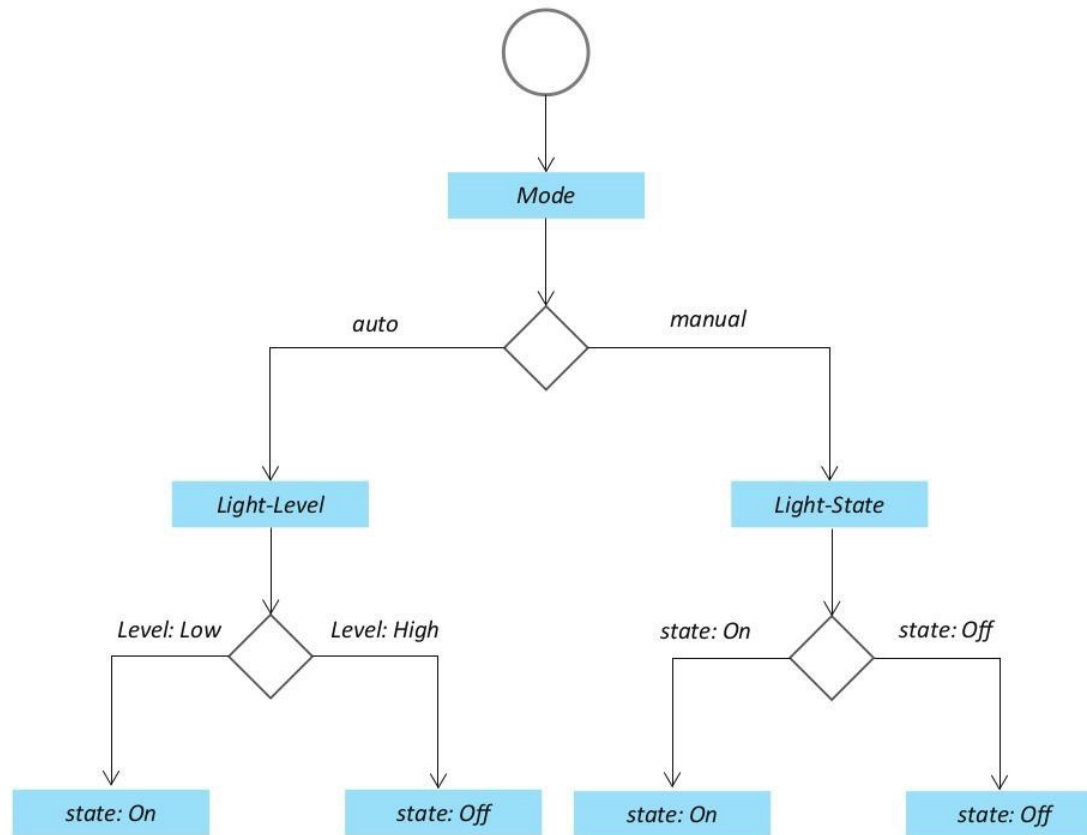
Step : 2 - Process Specification

Step : 3 - Domain Model Specification
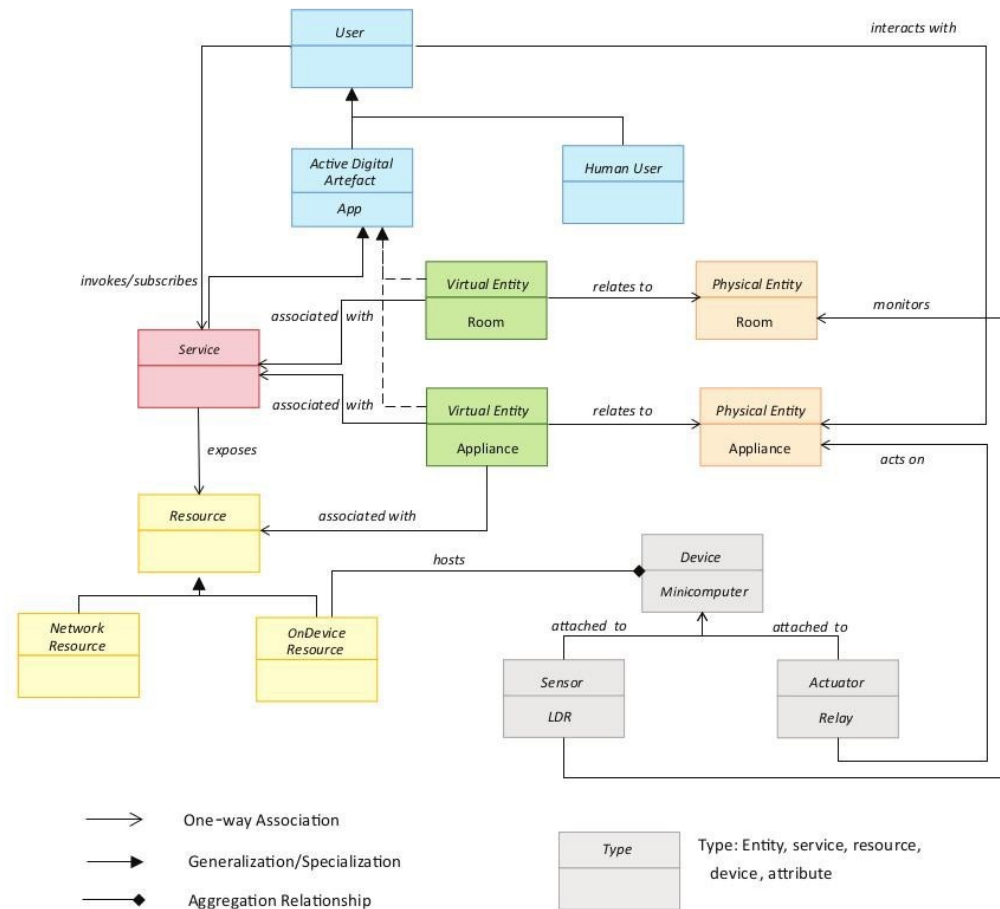
Objects:
1. Room
2. Appliance
3.
4.

Attributes:
Virtual/real

Relationships:
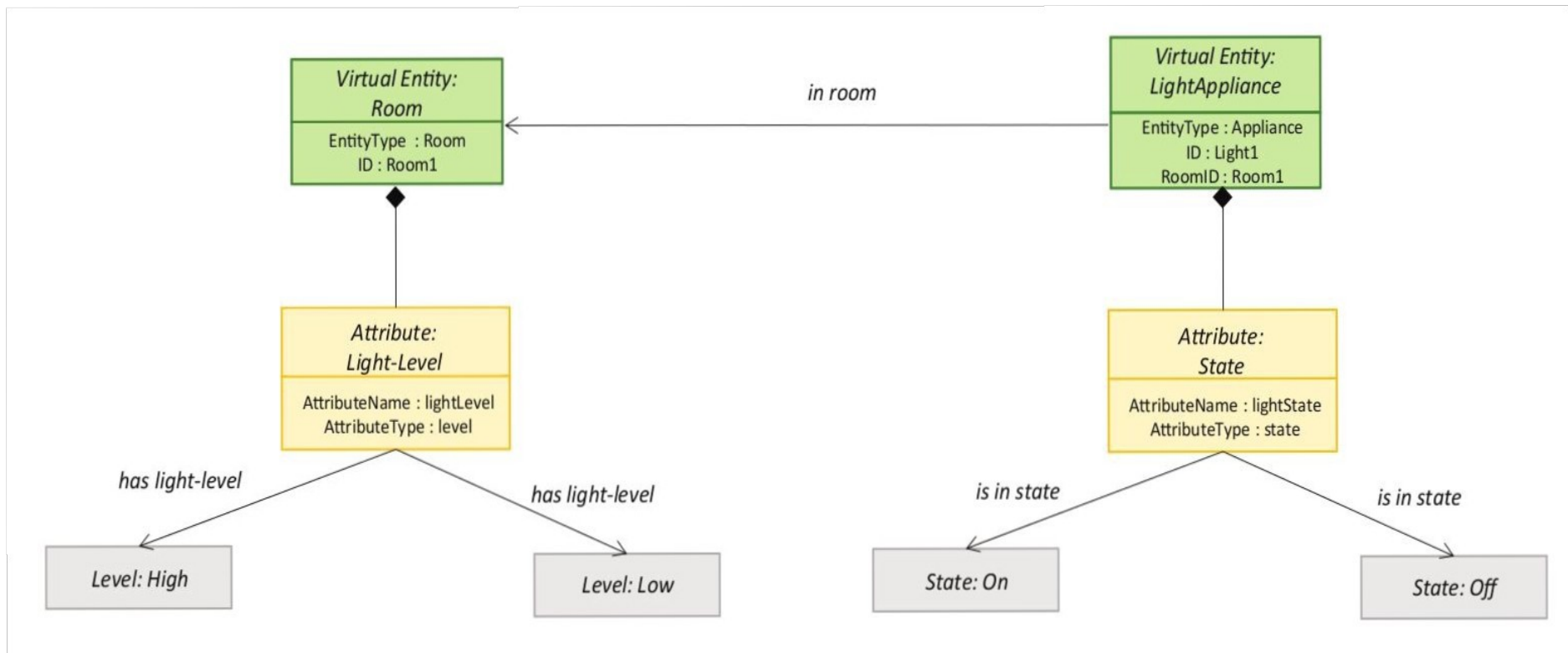monitors
associated with
hosts

Source: Book website: http://www.internet-of-things-book.com

IoT System Design : Home Automation

Step : 4 - Information Model Specification

IoT System Design : Home Automation

Step : 5 - Service Specification
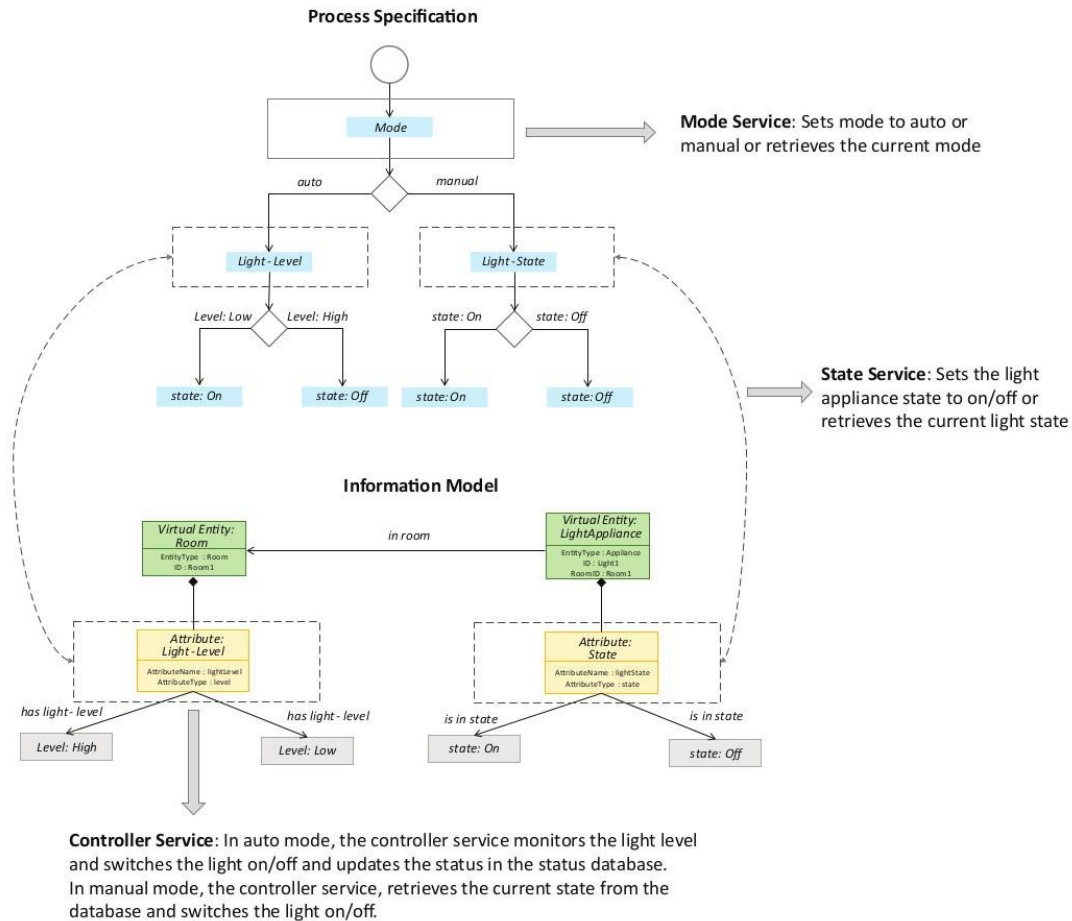
Source: Book website: http://www.internet-of-things-book.com

IoT System Design : Home Automation
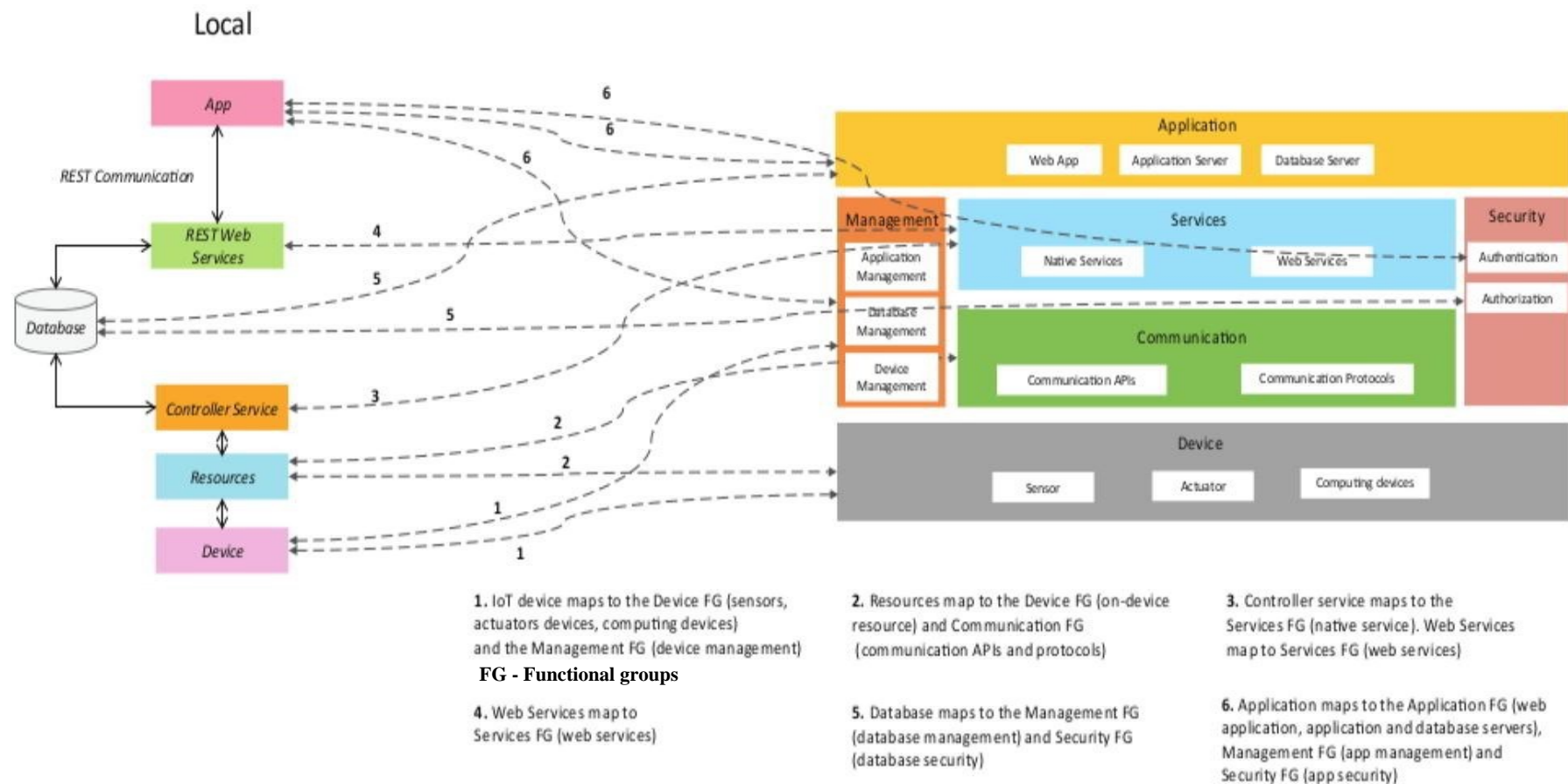
Step : 6 – IoT Level Specification
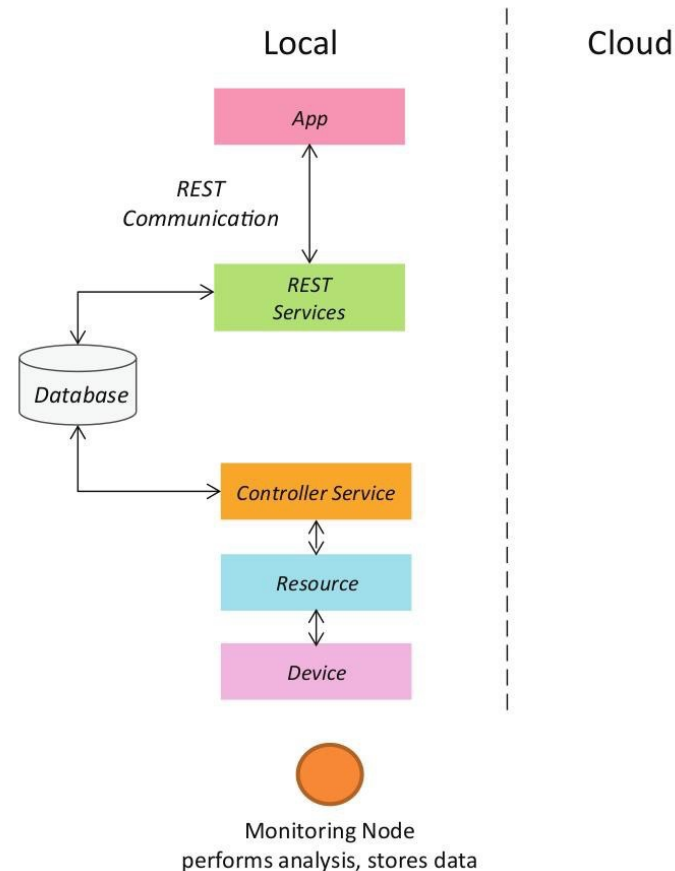
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IoT System Design : Home Automation

Step : 7 – Functional View Specification

Local

App

REST Communication

REST Web Services

Database

Controller Service

Resources

Device

Application
Web App | Application Server | Database Server

Management
Application Management
Database Management
Device Management

Services
Native Services | Web Services

Security
Authentication
Authorization

Communication
Communication APIs | Communication Protocols

Device
Sensor | Actuator | Computing devices

1. IoT device maps to the Device FG (sensors, actuators devices, computing devices) and the Management FG (device management)
FG - Functional groups

2. Resources map to the Device FG (on-device resource) and Communication FG (communication APIs and protocols)

3. Controller service maps to the Services FG (native service). Web Services map to Services FG (web services)

4. Web Services map to Services FG (web services)

5. Database maps to the Management FG (database management) and Security FG (database security)

6. Application maps to the Application FG (web application, application and database servers), Management FG (app management) and Security FG (app security)

Source: Book website: http://www.internet-of-things-book.com

IoT System Design : Home Automation

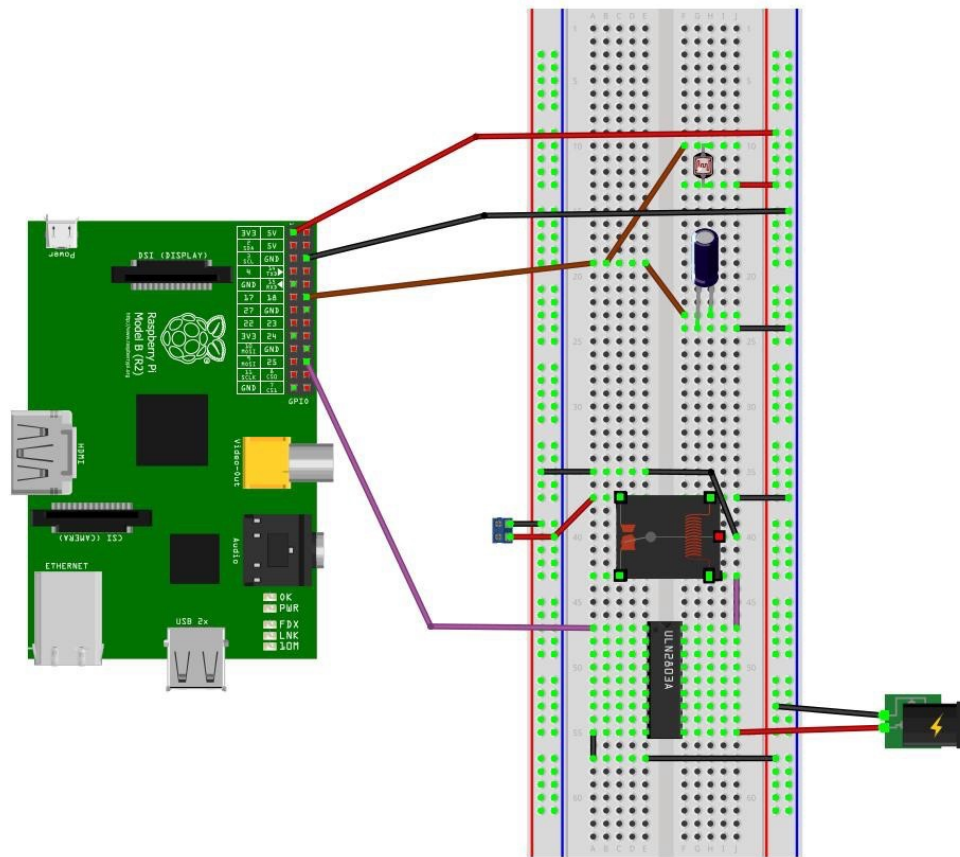**Step : 8 – Operational View Specification**
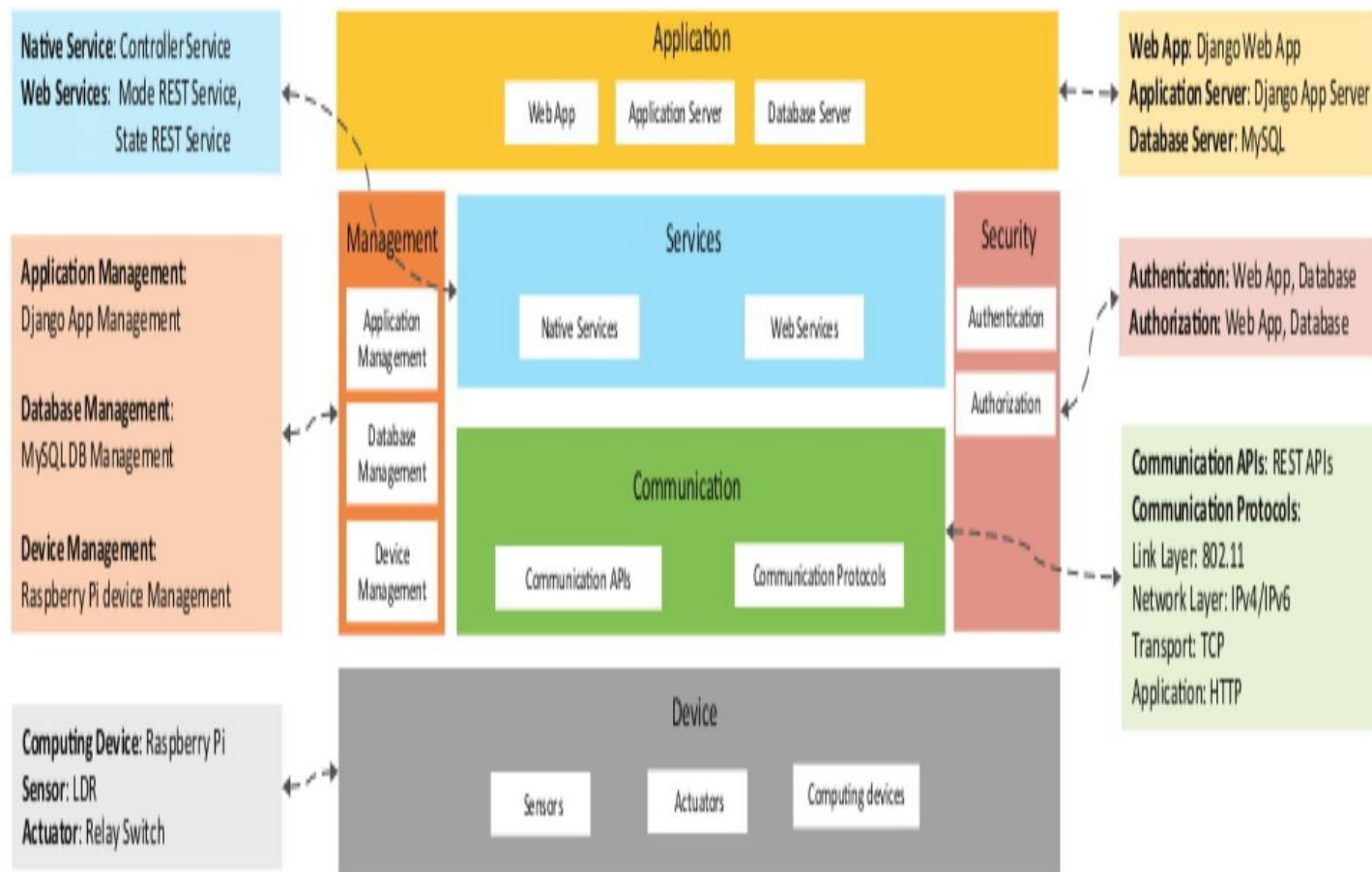
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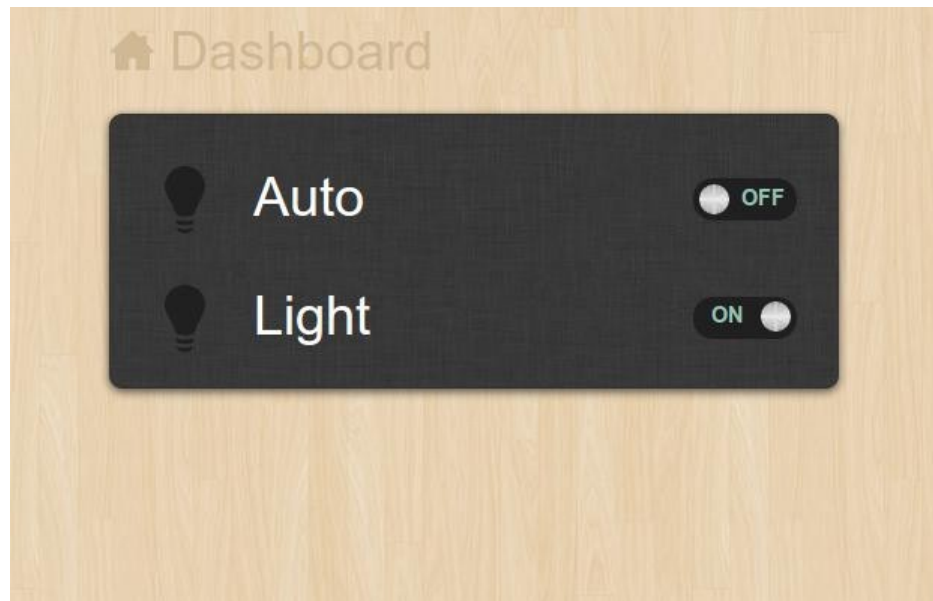
Step : 9 – Device and Component Integration

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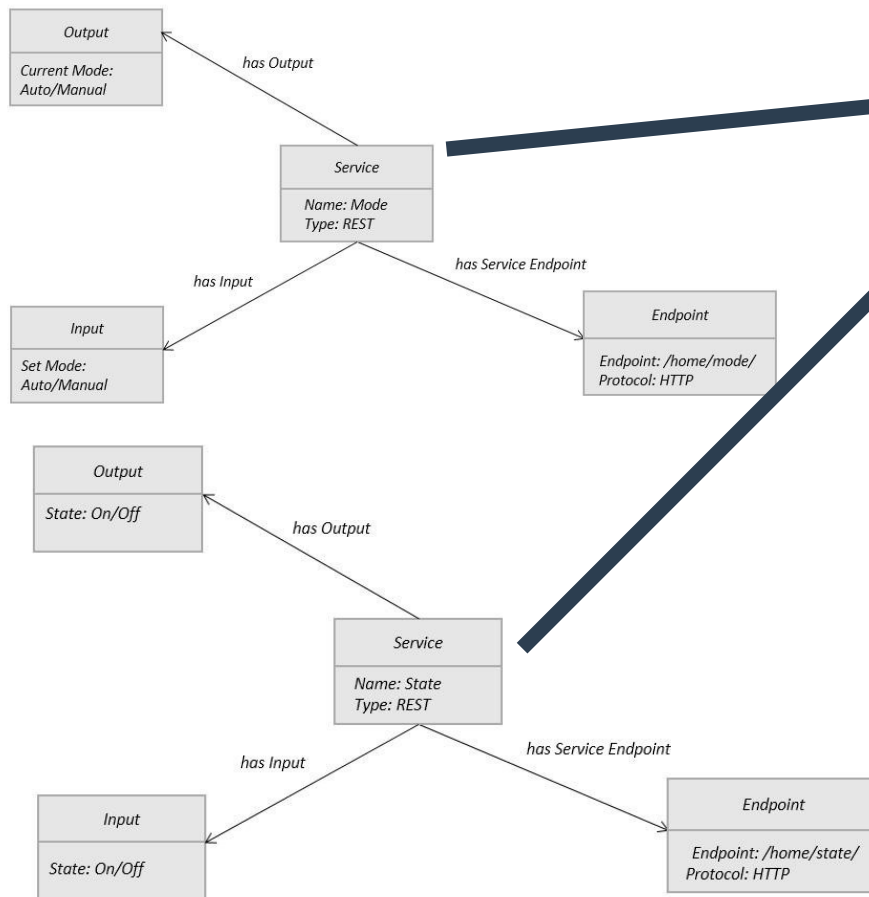**Step : 10 – Application Development (Interface)**

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IoT System Design : Home Automation

Step : 11 – Web Services Development

1. Map services to models. Model fields store the states (on/off, auto/manual)

2. Write Model serializers. Serializers allow complex data (such as model instances) to be converted to native Python datatypes that can then be easily rendered into JSON, XML or other content types.
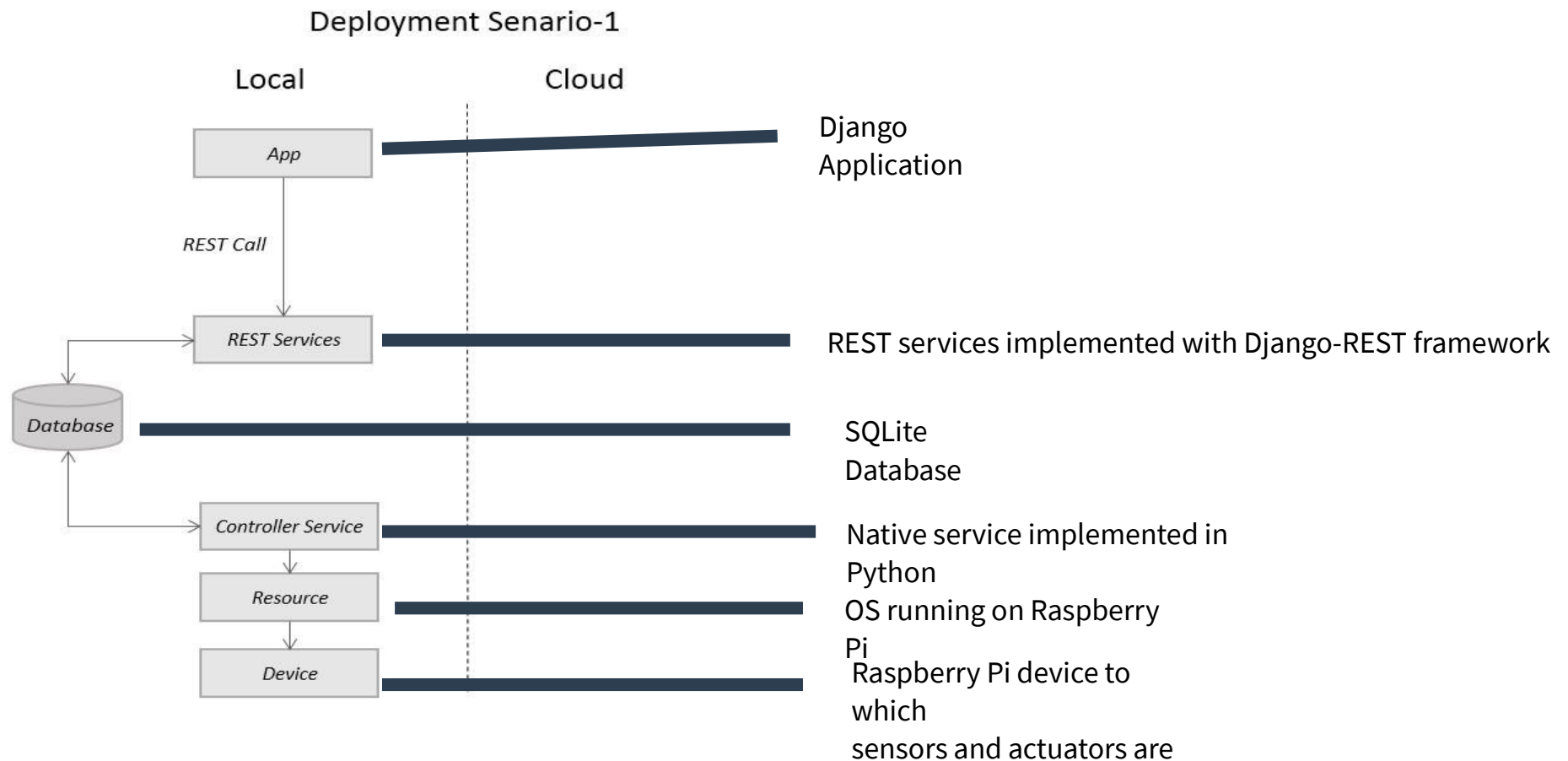
Source: Book website: http://www.internet-of-things-book.com

IoT System Design : Home Automation

Step : 12 – Integrating the System

Deployment Senario-1

Local	Cloud

App — Django Application

REST Call

REST Services — REST services implemented with Django-REST framework

Database — SQLite Database

Controller Service — Native service implemented in Python

Resource — OS running on Raspberry Pi

Device — Raspberry Pi device to which sensors and actuators are connected

Source: Book website: http://www.internet-of-things-book.com