



SNS COLLEGE OF TECHNOLOGY
An Autonomous Institution
Coimbatore-35



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECT308-WIRELESS TECHNOLOGIES FOR IoT

III YEAR/ VI SEMESTER

UNIT 4 – PROTOTYPING AND DESIGNING SOFTWARE FOR IOT APPLICATIONS

**TOPIC - DEVICES, GATEWAYS, INTERNET AND WEB/CLOUD SERVICES SOFTWARE
DEVELOPMENT**



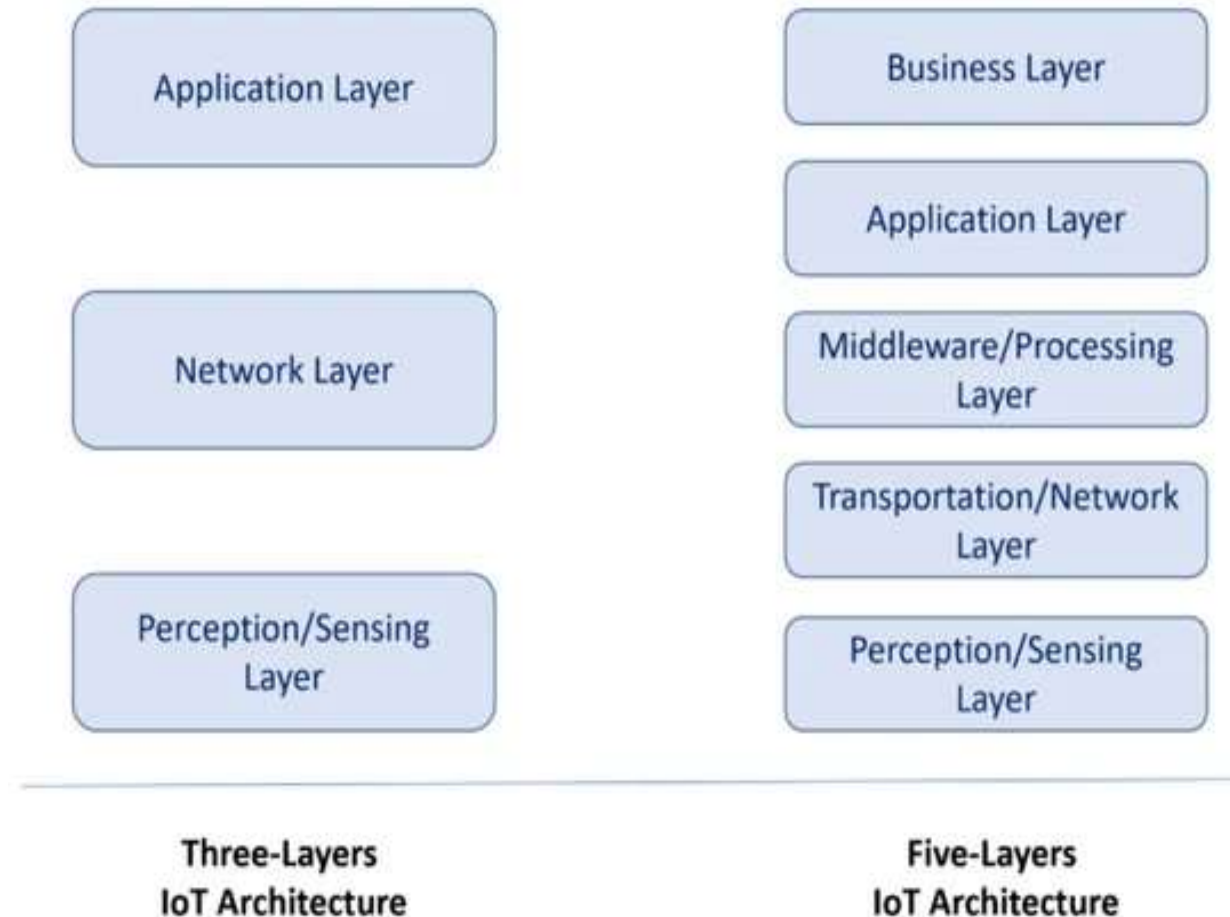
DEVICES, GATEWAYS, INTERNET AND WEB/CLOUD SERVICES SOFTWARE DEVELOPMENT



- Analyse and program the devices, gateways, Internet Connectivity, web and cloud applications using the open source implementations of Eclipse IoT stack.
- Connected devices in IoT/M2M use the CoAP and LWM2M web-communication protocols and messaging-protocols, such as message-cache, Message Queue Telemetry Transport (MQTT), and Extensible Messaging and Presence (XMPP).
- MQTT is a publish/subscribe (Pub/Sub) protocol. The devices connect, network and communicate over the web. They use the communication gateway, SOAP, REST, RESTful HTTP and Web Sockets.



- Five levels for software development for applications and services for IoT or M2M





- Software, such as Eclipse IoT, enable the development of software for the first, second and third levels.
- The software enables the device gateways connectivity to the Internet and cloud server.
- Eclipse IoT enables open source implementations of IoT protocols.
- The implementable protocols include MQTT CoAP, OMA-DM and OMA LWM2M and Internet connectivity protocols.



- Use of Software Stack for an Intended Complete Solution Consider the software for higher levels.
- Each level has characteristic complexity and fragments.
- The connected devices use a variety of protocols, such as LWM2M, CoAP, MQTT, and methods for connecting to the web.
- Web communication uses the Gateway, SOAP, REST, RESTful HTTP and WebSockets functions.
- A stack is a full set, consisting of frameworks, applications and services that are minimum needs for intended complete solution.



- End-to-End IoT Solutions with Java using Eclipse IoT Stack Open Services Gateway Initiative (OSGi) provides and maintains open standard specifications.
- OSGi describes the specification of management of Java packages/classes in a modular system, which enables the implementation of a complete and dynamic component model.
- A component means software which can reuse a core set of frameworks and services for provisioning the solutions.
- The components and applications deploy in the form of bundles and can be remotely installed, started, stopped, updated, and uninstalled without requiring system reboot.



The features of Eclipse IoT stack are:

- Provides open source specifications which are as per open OSGi standard specifications.
- Provisions for simpler open source implementations, and programs, services and bundles development using the open source Java frameworks and services
Consists of the components and frameworks for IoT solutions.
- The stack takes care of the complexity of creating IoT solutions and enables fast development of the solutions
- Provisions for open source technologies which enables easy programming in Java for the device platforms, and running the codes in JVM or Eclipse Concierge (a lightweight implementation of OSGi runtime)



- Software such as Eclipse IoT, enable the development of software for first, second and third levels.
- The software enables the device gateways connectivity to the Internet and cloud server.
- Eclipse IoT enables open source implementations of IoT protocols.
- It uses both web communication protocol CoAP and LWM2M and message protocols MQTT & XMPP.



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- The stack takes care of the complexity of creating IoT solutions and enables fast development of the solutions
- Provisions for open source technologies which enables easy programming in Java for the device platforms, and running the codes in JVM or Eclipse Concierge (a lightweight implementation of OSGi runtime)
- Support of large number of institutions including Cisco and IBM
- Eclipse IoT stack includes device platform for physical/data-link and adaptation layers.



Implementations and frameworks included in Eclipse IoT stack



Eclipse Implementation/Framework	Description
Eclipse Pi4J	A framework based on WiringPi and PiFace, Gertboard and other shields, which support the 12C/SPI/GPIO interfaces in actuators and device platforms, for the RPi. Similar sensors framework is for BB platform and capes used with BB.
Eclipse Koneki	A set of functions for embedded Lua language based development of device applications.
Eclipse Mihini	An embedded Lua runtime which provides provisions for hardware abstraction and other services.
Eclipse Krikkit	Provisions a system of rules when programming edge devices. For example, when configuring the device platforms.



Eclipse IoT Stack Applications for Projects.

Eclipse SmartHome	A set of implementations for projects for smart homes using wireless and wired protocols and network protocols
Eclipse SCADA	A set of SCADA (Supervisory Control and Data Acquisition) functions for usages, such as in factory automation, industrial processes buildings and health systems
Eclipse OM2M	An open source implementation of SmartM2M and oneM2M standard that enables developing services on a horizontal M2M service platform, the implementation is independently of the underlying network and facilitates the deployment of vertical applications and heterogeneous devices.



- Enables usages of protocol functions provided in lightweight M2M (OMA M2M standard), MQTT (OASIS IoT standard), CoAP (IETF IoT standard) and standard network protocols.
- The functions provide the connectivity and interoperability of the device gateways.
- Provisions the IoT gateway services for remote management and applications management.
- Provisions for new solutions for devices connectivity to the Internet and the remote management and application management functions and APIs for using server or cloud provided functions.
- Support of large number of institutions including Cisco and IBM.
- Eclipse IoT stack includes device platform for physical/data-link and adaptation layers.
- Table gives the implementations and frameworks for (Gather + Consolidate) and local network and gateway software (connect) levels



Thank You