SNS COLLEGE OF TECHNOLOGY

Coimbatore–35
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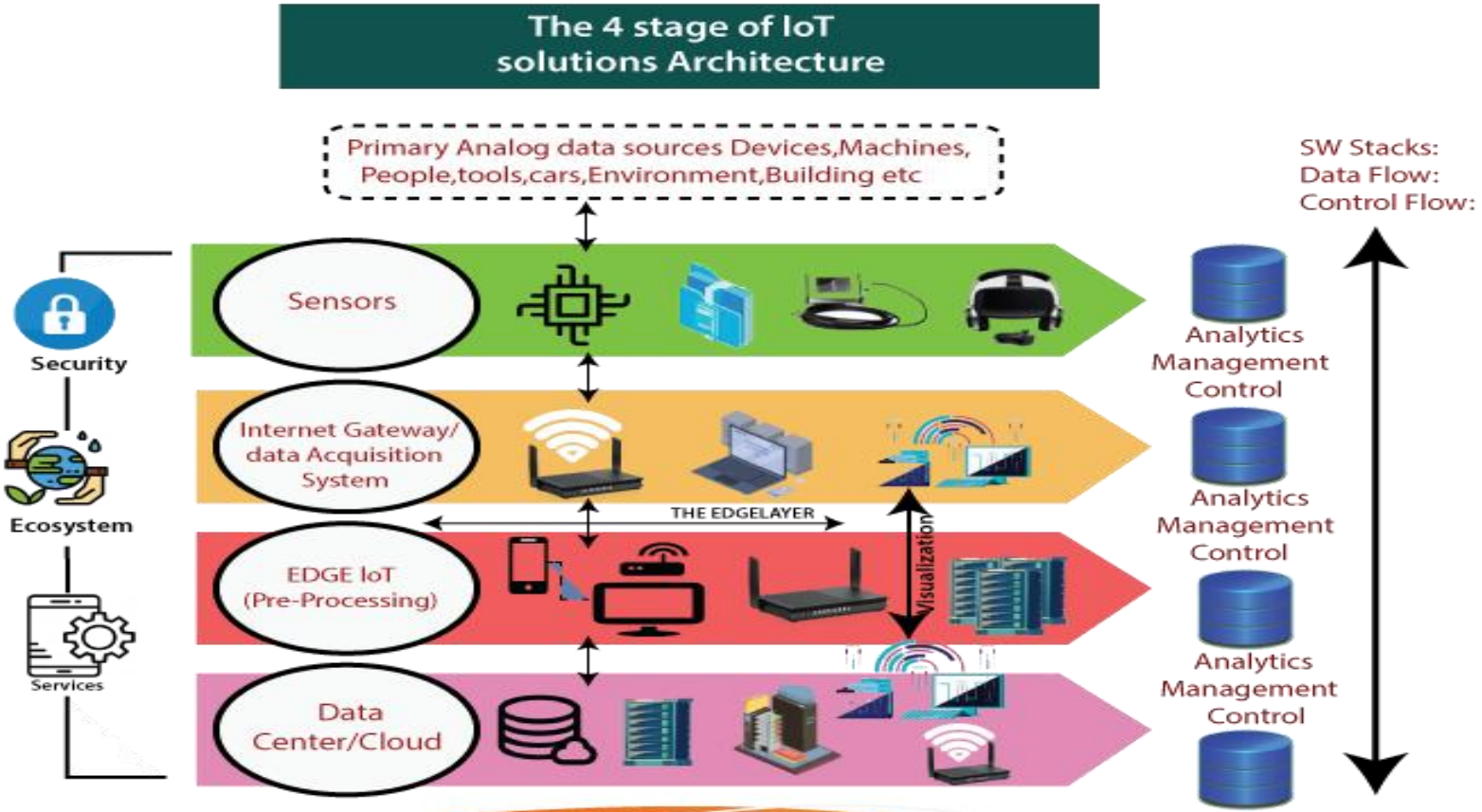
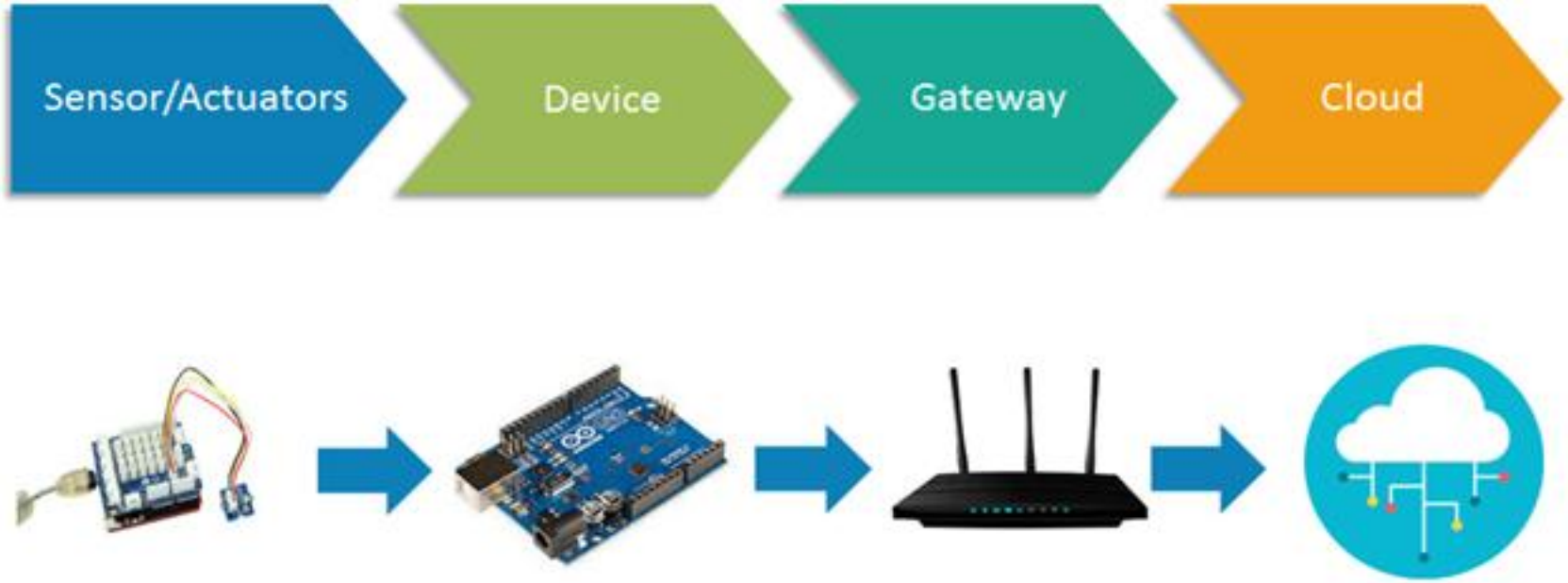
DEPARTMENT OF MECHANICAL ENGINEERING

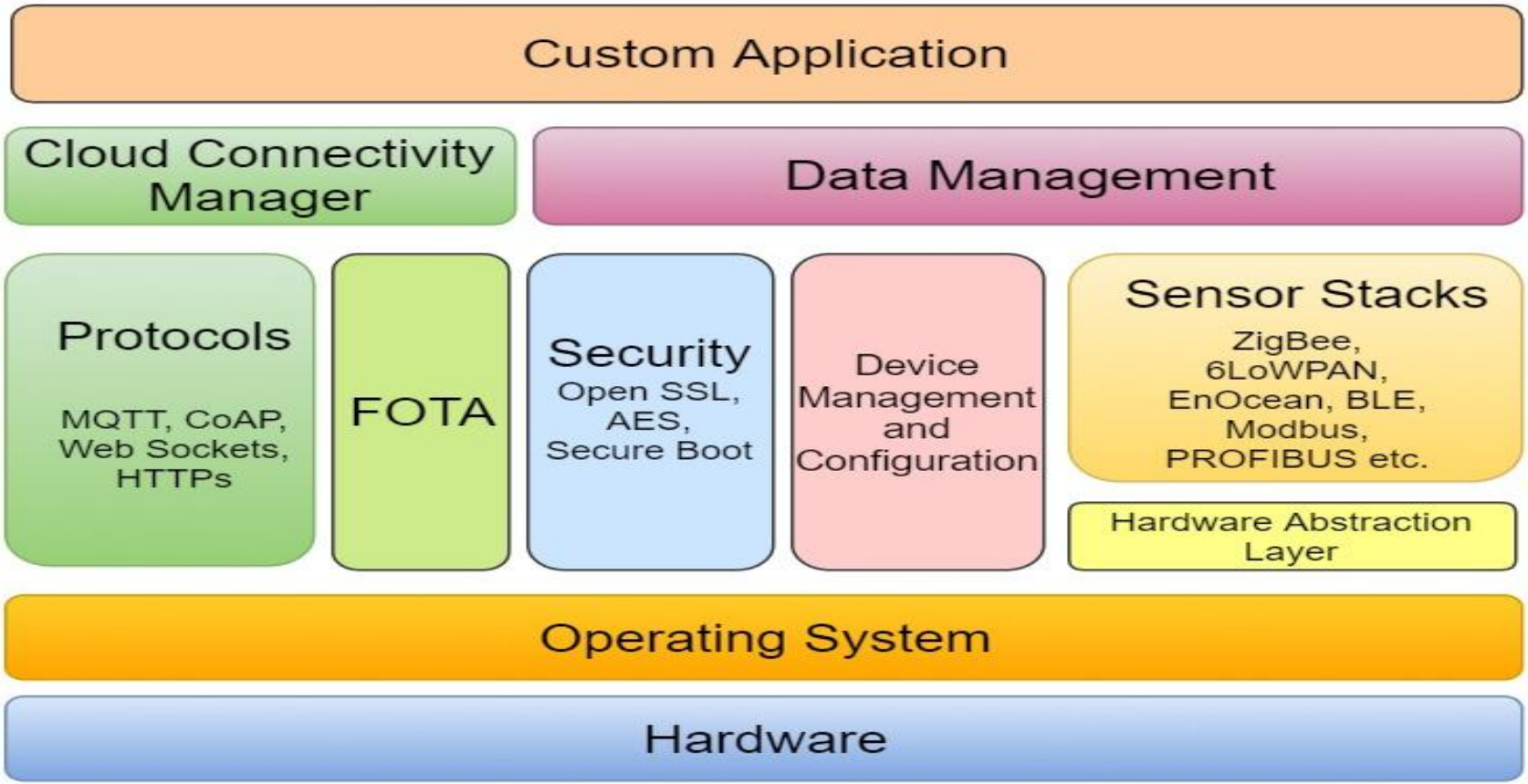
19MEB204 IoT FOR PRODUCTION SYSTEM

TOPIC – IOT Architecture

Four Stages of IOT Architecture




Sensor/Actuators
Device
Gateway
Cloud


Custom Application
Cloud Connectivity Manager
Data Management
Protocols
MQTT, CoAP, Web Sockets, HTTPs
FOTA
Security
Open SSL, AES, Secure Boot
Device Management and Configuration
Sensor Stacks
ZigBee, 6LoWPAN, EnOcean, BLE, Modbus, PROFIBUS etc.
Hardware Abstraction Layer
Operating System
Hardware

- **GATEWAY**
- Gateways and Data Acquisition, As the large numbers of data are produced by this sensors and actuators need the high-speed Gateways and Networks to transfer the data.
- This network can be of type Local Area Network (LAN such as WiFi, Ethernet, etc.), Wide Area Network (WAN such as GSM, 5G, etc.).

- **HARDWARE**
- IoT gateway hardware comprises a
  - microprocessor or controller depending on processing speed and memory required,
  - a connectivity module (cellular, Wi-Fi, Bluetooth, etc.),
  - IoT sensors
  - Circuitry.

- **Operating system**
- The OS is software that runs gateway hardware and other programs on the device.
- Choice of an OS such as Java, Linux, RTOS, etc., depends on the gateway's application.

- **Hardware abstraction Layer**
- The abstraction layer allows the software to be developed and controlled independently of the hardware.
- This adds flexibility and agility to application design and makes software updates and evolution easier.

- **Sensor Stacks**
- This layer serves as the interface between the device and sensors and modules.
- Specific stacks are integrated depending on what the application demands.

- **Device management and configuration**
- IoT gateways need to keep track of all the connected devices and sensors it communicates with.
- This layer tracks and manages sensors' configurations, settings, properties and connected devices within its ecosystem.

- **Security**
- Security is a crucial consideration in gateway architecture.
- This layer ensures that gateways have trusted identities, strong encryption, and crypto authentication schemes.
- It provides a secure boot to protect devices from intrusion and ensure data integrity and confidentiality.

- **Firmware Over the Air Updates**
- Keeping device firmware updated and enabling security patches and fixes to defend against ever-evolving threats is paramount to maintaining device integrity.
- This layer ensures that Firmware Over The Air (FOTA) updates are managed securely and efficiently to preserve device memory, power, and network bandwidth.

- **Communication protocols**
- IoT gateway protocols are selected according to the amount and frequency of data communicated to the cloud.
- Gateways need to connect via a cellular module (5G/4G/3G), Ethernet, and/or Wi-Fi, but the underlying communication protocol layer is typically TCP IP protocol.

- **Data management**
- IoT gateways manage data from sensors and connected devices and data coming from the cloud.
- The data management layer controls streaming, filtering, and data storage, and it provides data traffic control to minimise delays and ensure device fidelity.

- **Cloud connectivity manager**
- This layer is responsible for seamless, secure connectivity with cloud platforms and device and cloud authentication.

- **Custom software applications**
- IoT gateways integrate custom software to manage specific application needs.
- This layer interacts with all other layers to efficiently, securely, and efficiently manage data needs specific to the IoT application.

- **Gateway data transfer**
- This layer controls the gateway's connection to the Internet using either a
  - 5G/4G/3G/GPRS modem or
  - IoT module,
  - Ethernet, or
  - Wi-Fi.
- It also analyses and determines which data needs to be communicated to the cloud and which data should be cached for processing offline to save processing power and data plan fees.

- **EDGE IT**
- Edge in the IoT Architecture is the hardware and software gateways that analyze and pre-process the data before transferring it to the cloud.
- If the data read from the sensors and gateways are not changed from its previous reading value then it does not transfer over the cloud, this saves the data used.

- **CLOUD:**
- The Data Center or Cloud comes under the Management Services which process the information through analytics, management of device and security controls.
- Beside this security controls and device management the cloud transfer the data to the end users application such as Retail, Healthcare, Emergency, Environment, and Energy, etc.

THANKS!