IoT & M2M

3.1 Introduction

In Chapter-1, you learned about the definition and characteristics of Internet of Things (IoT).

Another term which is often used synonymously with IoT is Machine to Machine (M2M).

Though loT and M2M are often used interchangeably, these terms have evolved from different backgrounds.

This chapter describes some of the differences and similarities between loT and M2M.

3.2 M2M

Machine-to-Machine (M2M) refers to networking of machines (or devices) for the purpose of remote monitoring and control and data exchange.

Figure 3.1 shows the end-to-end architecture for M2M systems comprising of M2M area networks, communication network and application domain.

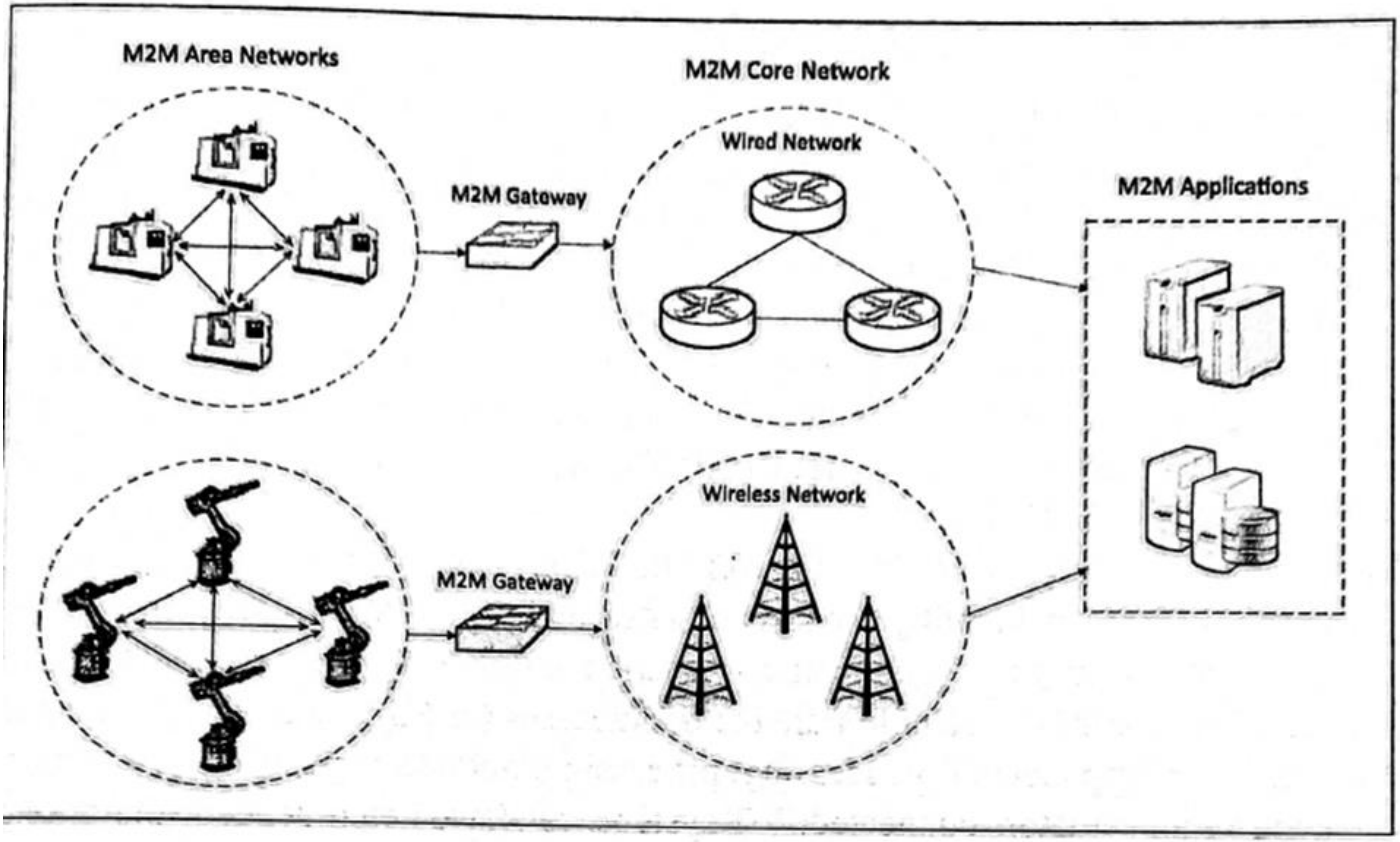

Figure 3.1: M2M system architecture

- An M2M area network comprises of machines (or M2M nodes) which have embedded hardware modules for sensing, actuation and communication.
- Various communication protocols can be used for M2M local area networks such as
- ZigBee, Bluetooth, ModBus, M-Bus, Wireless M-Bus, Power Line Communication (PLC), 6LoWPAN, IEEE 802.15.4, etc.
- These communication protocols provide connectivity between M2M nodes within an M2M area network.
- The communication network provides connectivity to remote M2M area networks.
- The communication network can use either wired or wireless networks (IP-based).

- While the M2M area networks use either proprietary or non-IP based communication protocols, the communication network uses IP-based networks.

- Since non-IP based protocols are used within M2M area networks, the M2M nodes within one network cannot communicate with nodes in an external network.

- To enable the communication between remote M2M area networks, M2M gateways are used.

- Figure 3.2 shows a block diagram of an M2M gateway.

- The communication the M2M nodes and the M2M gateway is based on the communication protocols which are native to the M2M area network.

- M2M gateway performs protocol translation to enable IP-connectivity for M2M area networks.

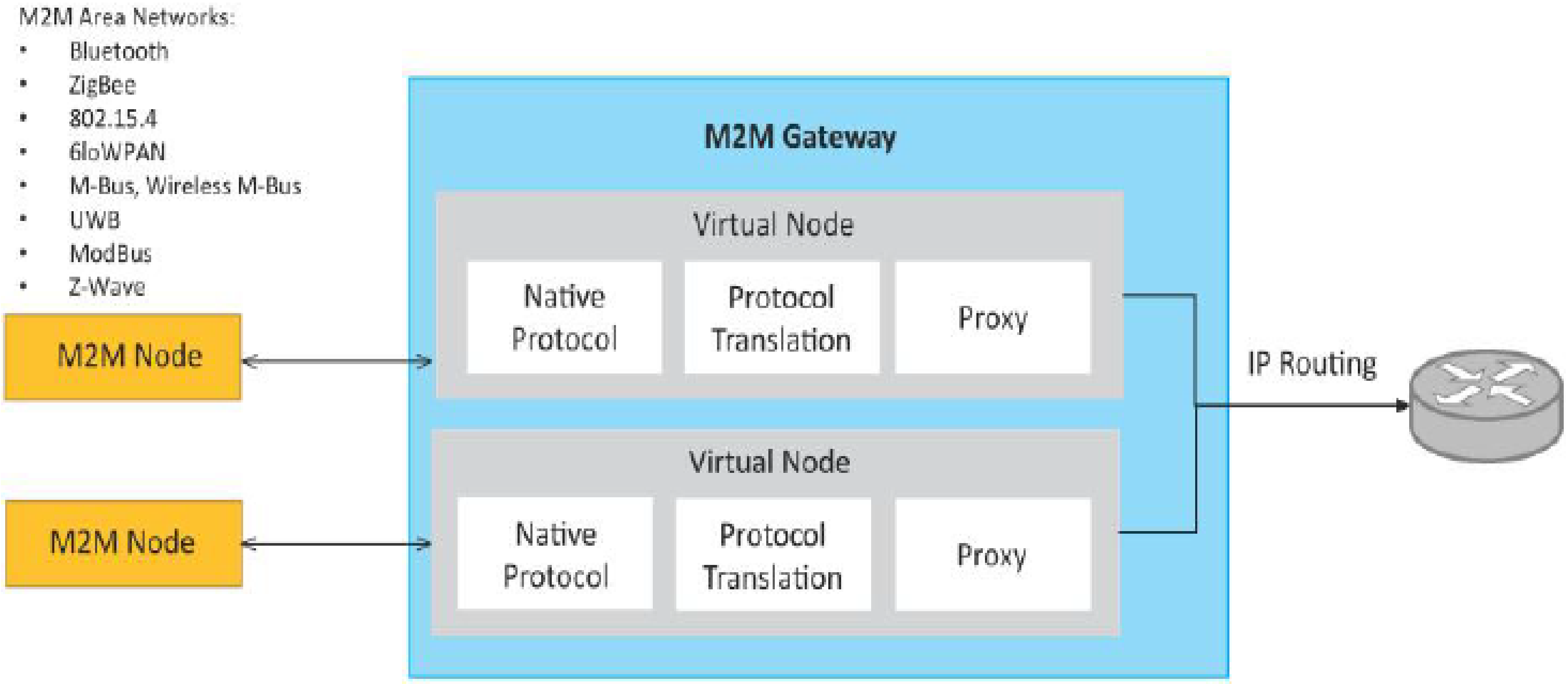

Figure 3.2 a block diagram of an M2M gateway

- M2M gateway acts as a proxy performing translations from/to native protocols to/from Internet Protocol (IP).
- Within an M2M gateway, each node in an M2M area network appears as a virtualized node for external M2M area networks.
- The M2M data is gathered into point solutions such as enterprise applications, service management applications, or remote monitoring applications.
- M2M has various application domains such as smart metering, home automation, industrial automation, smart grid etc.
- M2M solution designs (such as data collection and storage architectures and applications) are specific to the M2M application domain.

3.3 Difference between loT and M2M

Though both M2M and IoT involve networking of machines or devices, they differ in the underlying technologies, systems architectures and types of applications.

The differences between M2M and IoT are described as follows:

Communication Protocols:

M2M and IoT can differ in how the communication between the machines or devices happens.

M2M uses either propriety or non-IP based communication protocols for communication within the M2M area networks.

Commonly uses M2M protocols include ZigBee, Bluetooh, ModBus, M-Bus, Power Line Communication (PLC), 6LoWPAN, IEEE 802.15A, Z-Wave, etc.

The focus of communication in M2M is usually on the protocol below the network layer.

The focus of communication in IoT is usually on the protocol above the network layer such as HTTP, CoAP, Websockets, MQTT, XMPP, DDS, AMQP etc., as shown in Figure 3.3.

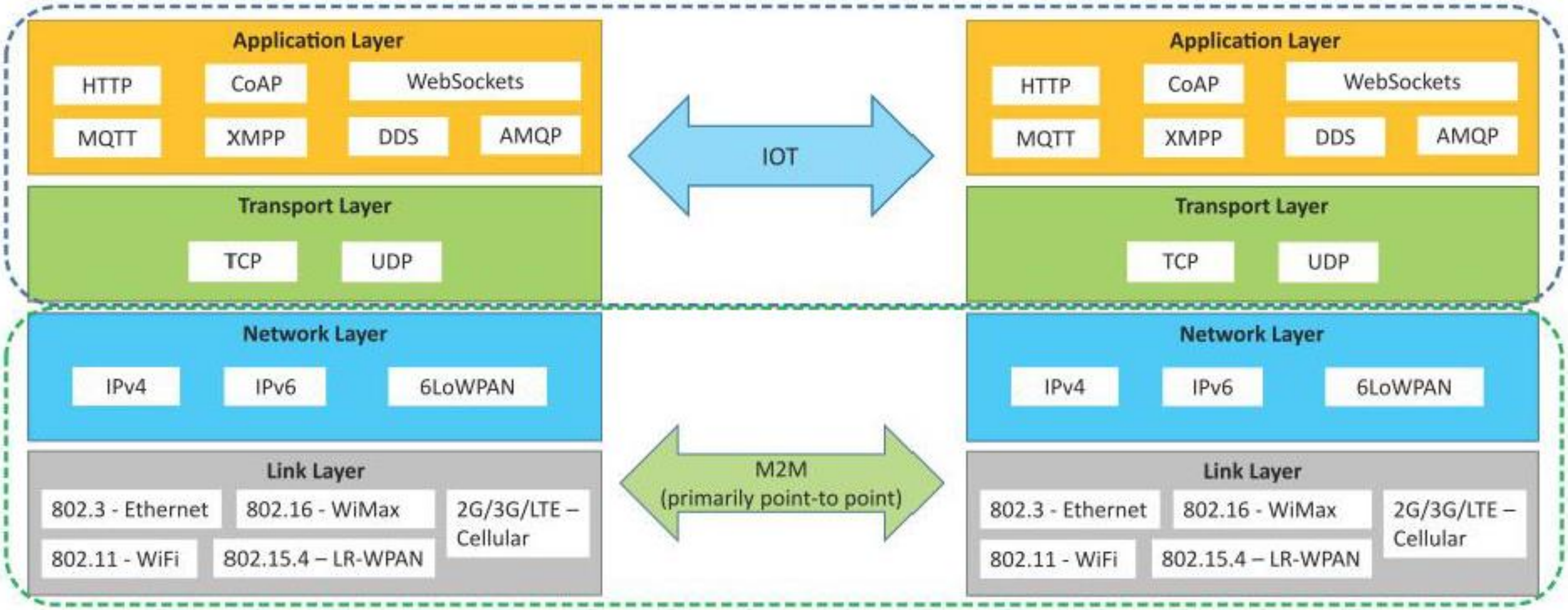

Figure 3.3: Communication in IoT is IP-based whereas M2M uses non-IP based networks.

Communication within M2M area networks is based on protocols below the network layer whereas IoT is based on protocols above the network layer.

Machines in M2M vs Things in loT:

- The "Things" in loT refers to physical objects that have unique identifiers and can sense and communicate with their external environment (and user applications) or their internal physical states.
- The unique identifiers for the things in loT are the IP addresses (or MAC addresses).
- Things have software components for accessing, processing, and storing sensor information, or controlling actuators connected.
- IoT systems can have heterogeneous things (eg, a home automation loT system can include IoT devices of various types, such as fire alarms, door alarms, lighting control devices, etc.)
- M2M systems, in contrast to loT, typically have homogeneous machine types within an M2M area network.

Hardware vs Software Emphasis:

- While the emphasis of M2M is more on hardware with embedded modules, the emphasis of IoT is more on software.
- loT devices run specialized software for sensor data collection, data analysis and interfacing with the cloud through IP-based communication.
- Figure 3.4 shows the various components of loT systems including the things, the Internet, communication infrastructure and the applications.

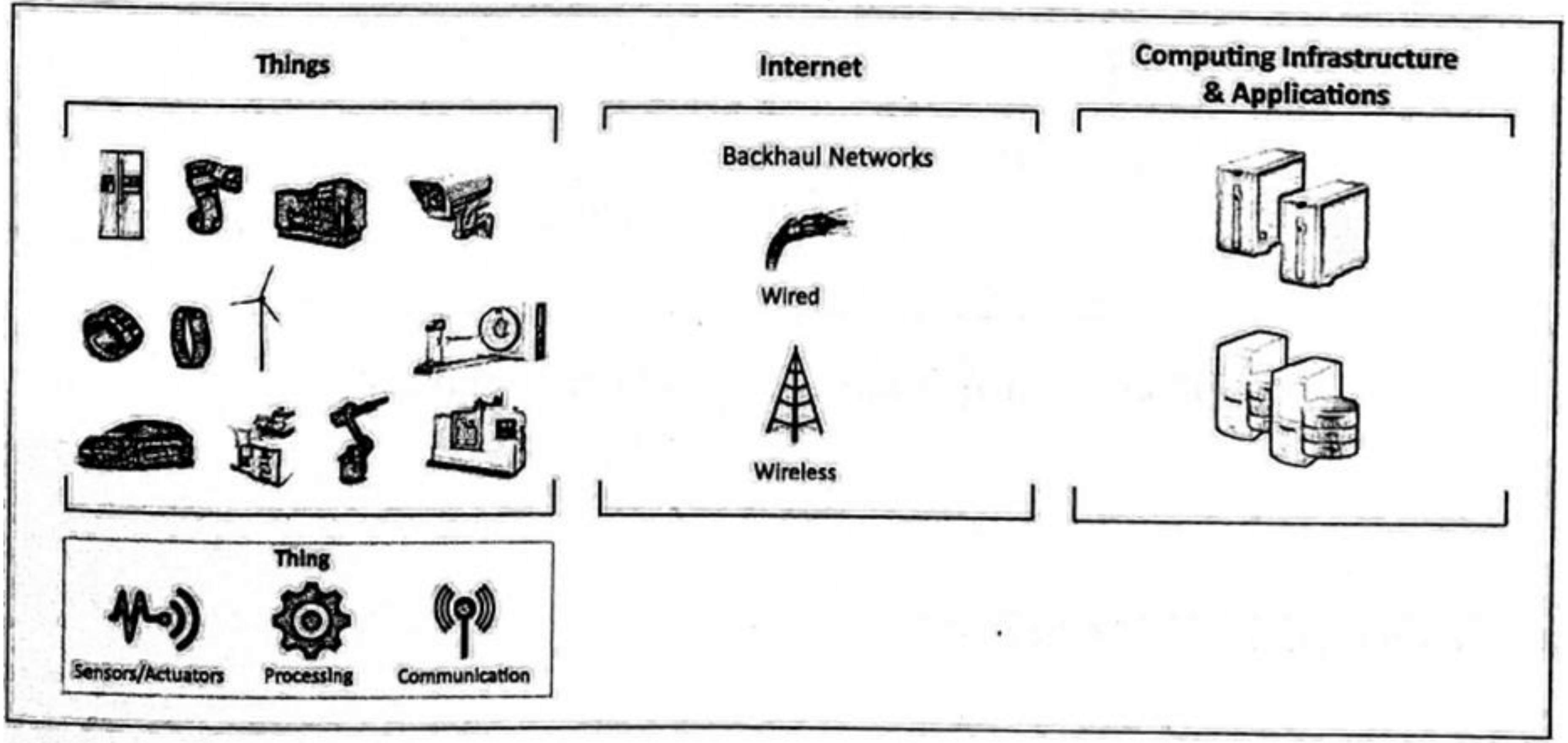

Figure 3.4: IoT components

Data Collection & Analysis:

M2M data is collected in point solutions and often in on-premises storage infrastructure.

In contrast to M2M, the data in IoT is collected in the cloud (can be public, private or hybrid cloud).

- Figure 3.5 shows the various IoT-levels, and the loT components deployed in the cloud.
- The analytics component analyzes the data and stores the results in the cloud database.
- The IoT data and analysis results are visualized with the cloud-based applications.
- The centralized controller is aware of the status of all the end nodes and sends control commands to the nodes.
- Observer nodes can process information and use it for various applications; however observer nodes do not perform any control functions.

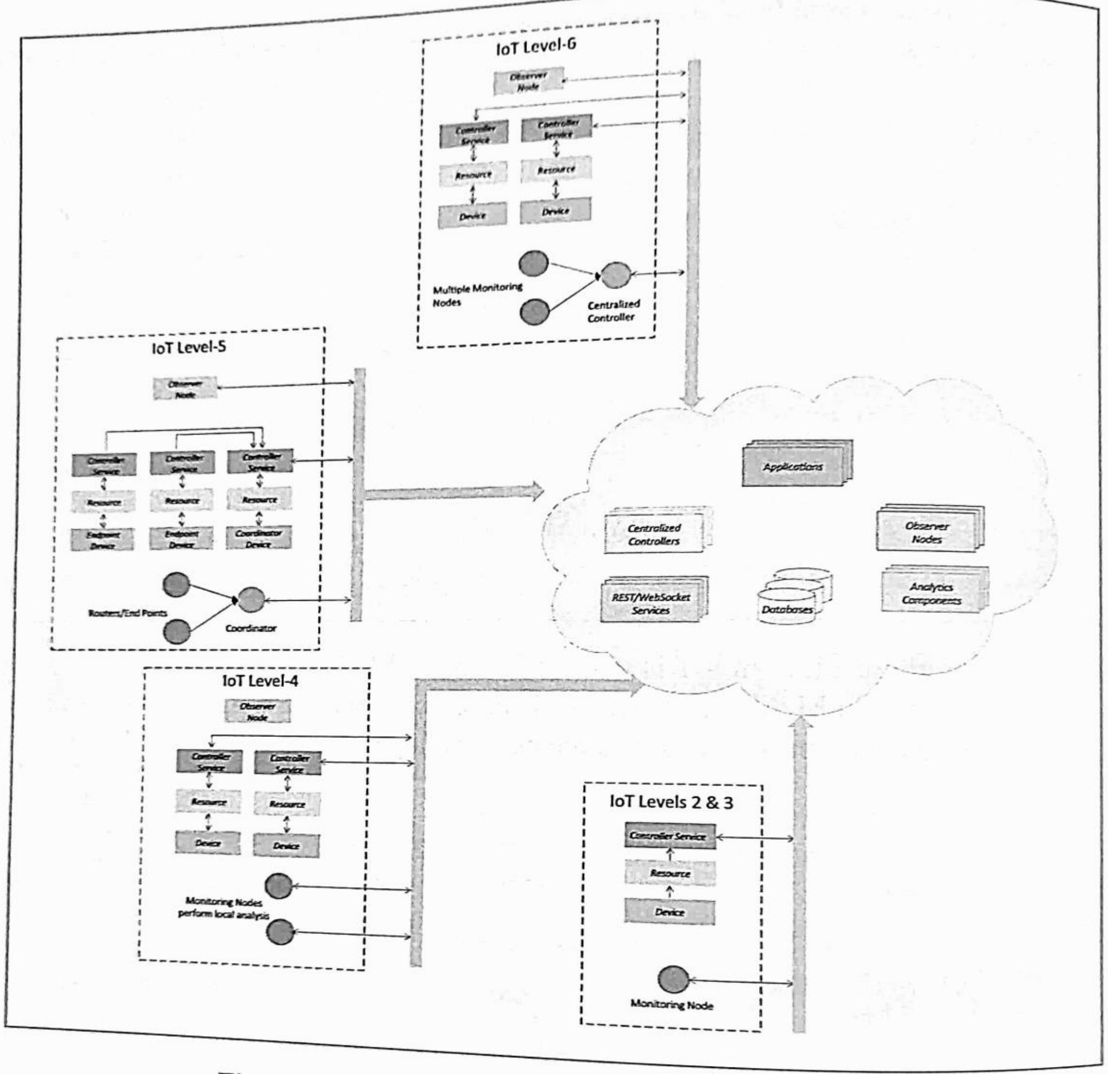

Figure 3.5: IoT levels and IoT cloud components