# Physical Design of IOT →

→ The "Things" in IOT usually refers to IOT devices which have unique identities and can perform remote sensing, actuating & monitoring.

IOT devices can

- Exchange data with connected devices
- Collect data from other devices & process the data
- Send data to centralized servers
- Perform some tasks locally.

SDN (Software Defined Networking) ⇒

→ SDN is a networking architecture that separates the control plane from the data plane and centralizes the network controller.
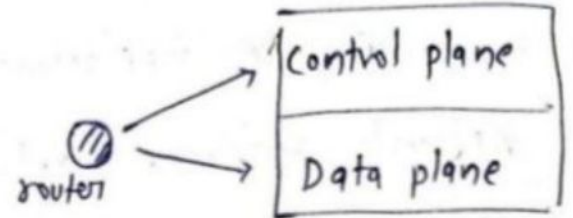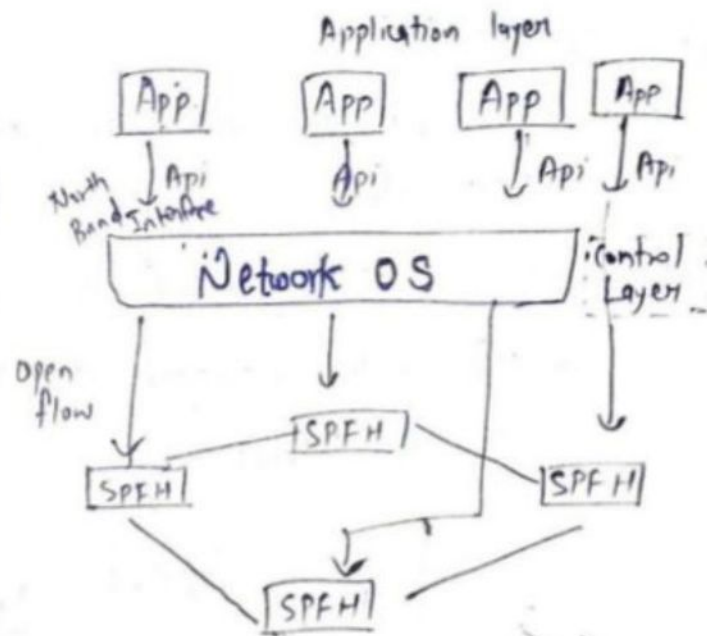

→ Software based SDN controllers maintain a unified view of network and make configuration, management & provisioning simpler.
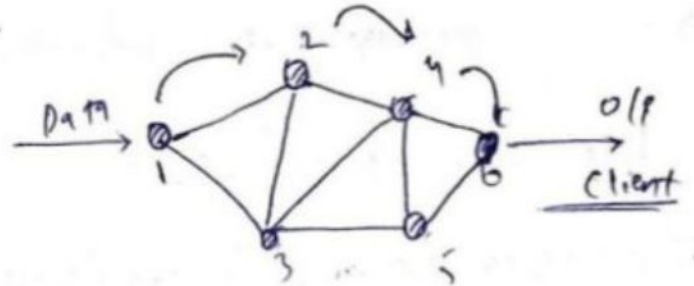
→ SDN uses simple packet forwarding hardware as opposed to specialized h/w in conventional networks.

→ Increase the efficiency of network resource sharing & improve IoT service-level agreements.

key Elements of SDN

➀ Centralized Network Controller
   (Network administrators can rapidly configure the network)

➁ Programmable Open APIs
   (Interface b/w SDN application & control layers) (NorthBound)

➂ Standard Commⁿ Interface (OpenFlow)
   [Interface b/w control & Infrastructure Layers] (SouthBound)

NFV (Network function Virtualization) ⇒

→ NFV is the replacement of network appliance hardware such as routers & firewalls with virtual machines, operating on standard servers.

→ NFV provides the infrastructure on which SDN can run.

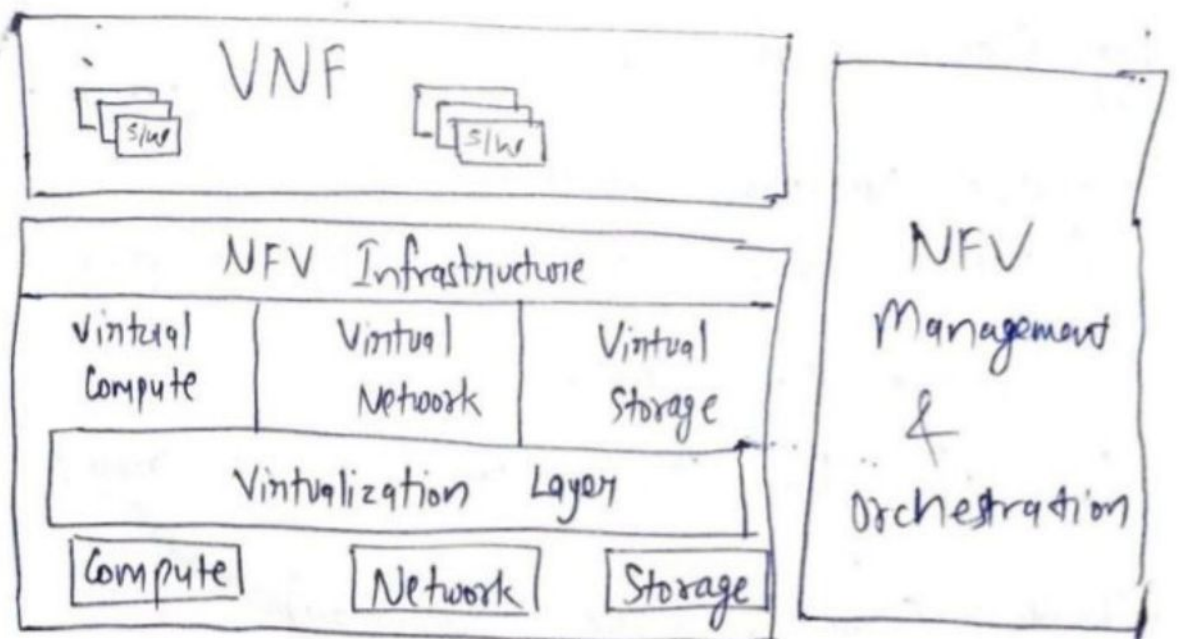## Key Elements of NFV :-

◉ Virtualized Network function (VNF)

→ It is a s/w which is capable of running over NFVI.

◉ NFVI

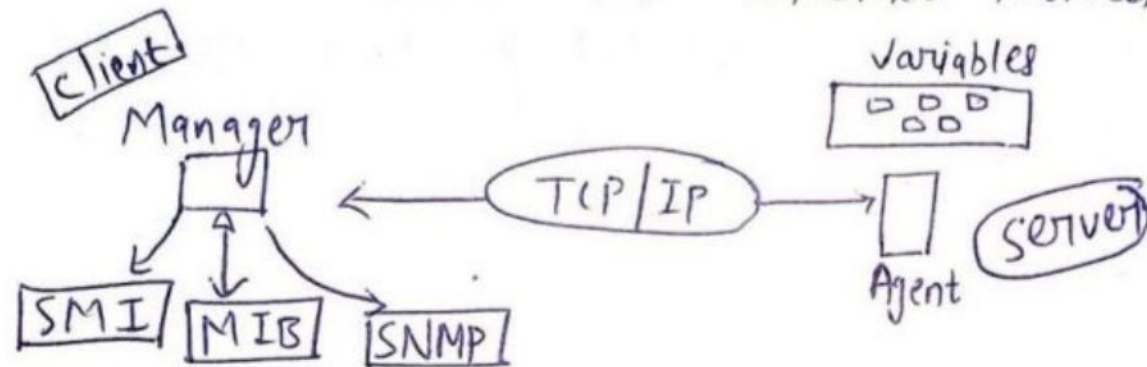→ It includes compute, network & storage resources that are virtualized.

◉ NFV Management & Orchestration

→ life cycle management of physical &/or s/w resources that supports VNFS.

SNMP (Simple Network Management Protocol) :- It is a networking protocol used for management & monitoring of network-connected devices in Internet Protocols networks.


NETCONF (Network Configuration Protocol):- It is a network management protocol developed & standardized by IETF.

→ NETCONF provides mechanisms to install, manipulate & delete the configuration of network devices.

→ NETCONF protocol uses an XML based data encoding for the configuration data

MQTT Protocols :—

- Message Queue Telemetry Transport is an ISO standard publish-subscribe based light weight messaging protocol for use on top of the TCP/IP protocol.
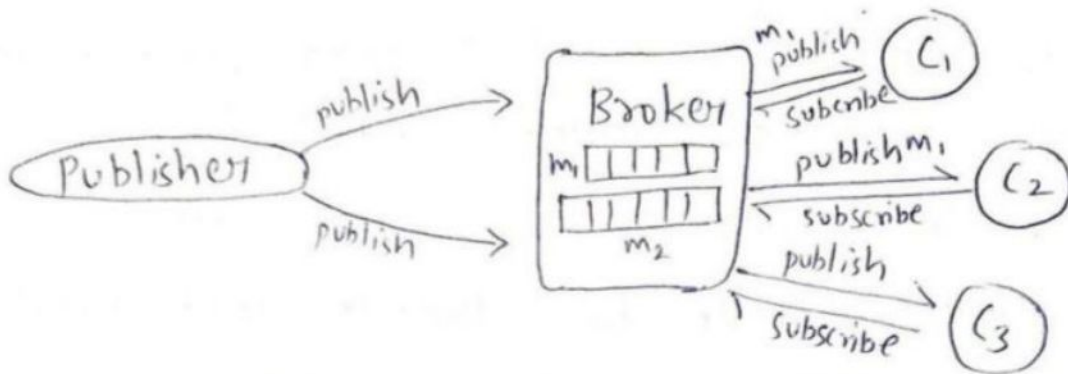
- It is designed for connections with remote locations where a "small code footprint" is required or the network bandwidth is limited.

AMQP Protocol :—

- Advanced Message Queuing Protocol is an open standard application layer protocol for message oriented middleware.
- The defining features of AMQP are message orientation, queuing, routing, reliability & security.
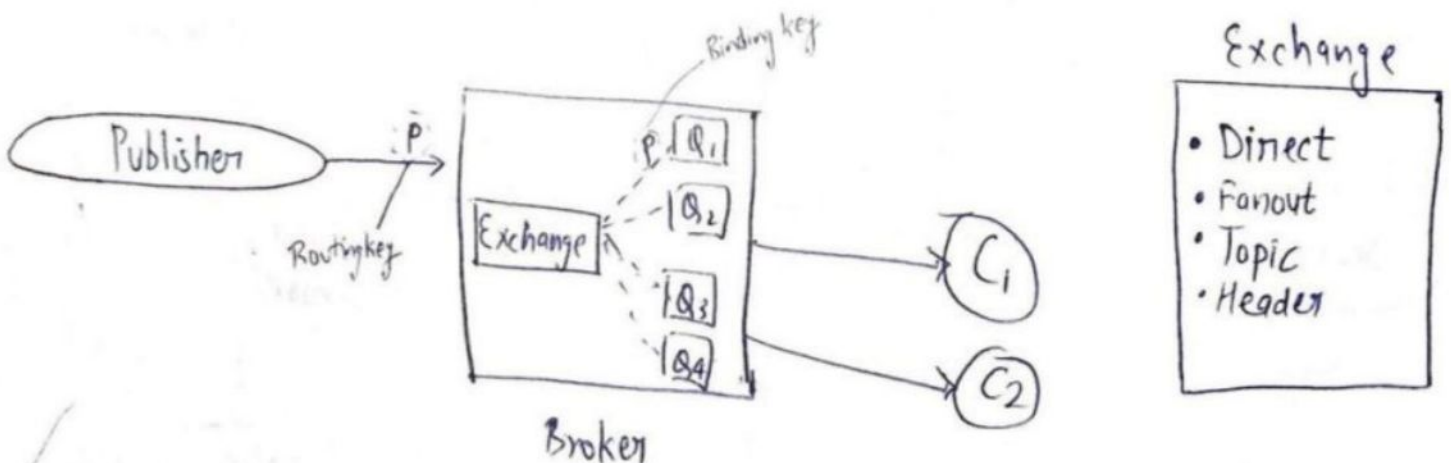
- <u>Temperature Sensor</u> ⇒ Temperature sensors measure the amount of heat energy in a source, allowing them to detect temperature changes & convert these changes to data.
- → It requires a thermocouple or RTD.
- → The change in the temperature, correspond to change in its physical property like resistance or voltage.

<u>Working</u> :-

The working of the sensor is the voltage that read across to the diode. If increment in voltage, then temp. increases & there is a voltage decrement b/w the transistors terminals of emitter & base. That data saved by sensor.

If the difference in voltage is amplified, then analog signal is generated by device & it's directly proportional to the temperature.

<u>Application</u> :-

- In rubber, plastic, biomedical industries.
- In mechanical engine for measuring engine oil temperature
- In electric cables for internal temperature.
- In electric motors for measuring motor winding temp, bearing temp, brushes temp.

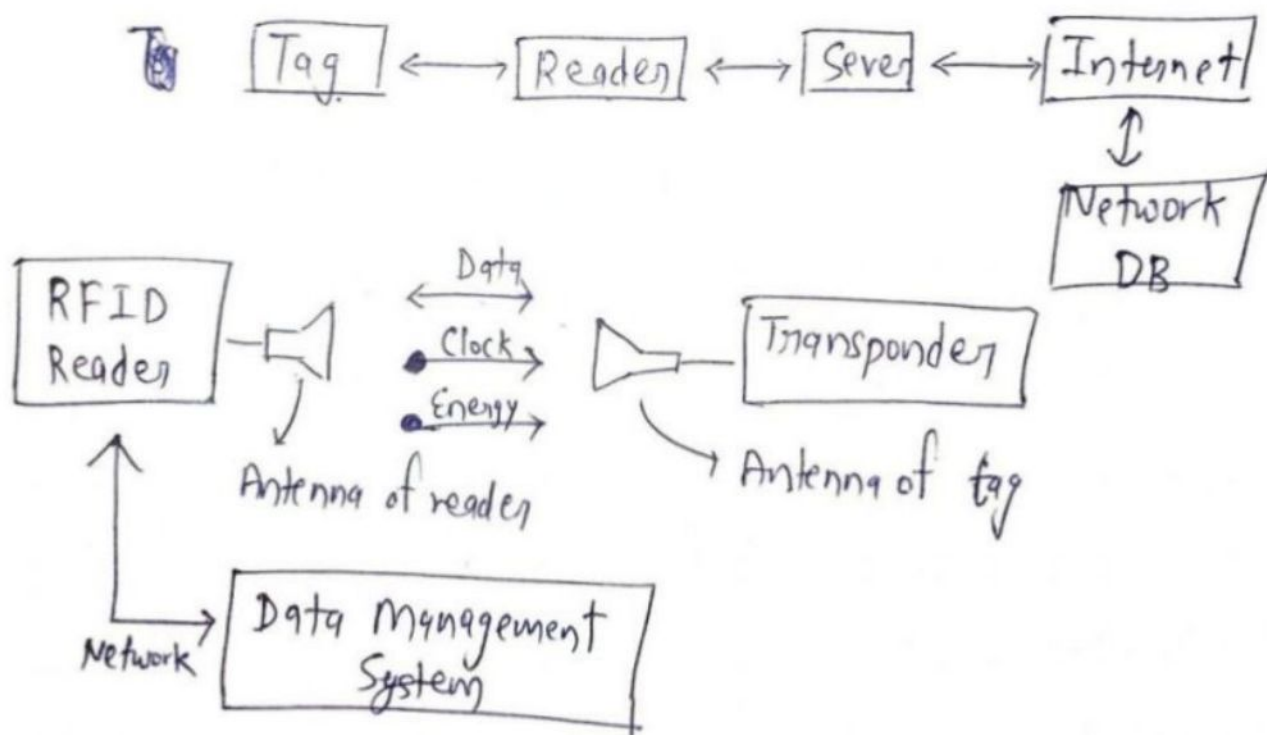# RFID (Radio frequency Identification Technology) ⇒

RFID tags are primarily used to make everyday objects comm^n with each other & the main hub & report their status.

It is mainly used in Healthcare for

• Asset tracking & management
• Patient & staff tracking
• Infection control
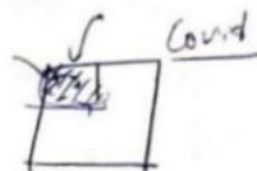
→ RFID tags uses <u>wireless</u> <u>non-contact</u> radio frequency waves in which data is digitally encoded in RFID tags which can be read by reader through radio waves.

Tag ⟷ Reader ⟷ Server ⟷ Internet
↕
Network DB

RFID Reader ⟷ Data ⟷ Transponder
← Clock →
← Energy →
Antenna of reader   Antenna of tag

Network → Data Management System

WOT

WOT → Web of things is all about making devices accessible over the web using web protocols like HTTP, webSocket, JSON etc agnostic to anything below the <u>Application Layer</u>, so that any device can be part of universal • WoT regardless of what protocols it uses connect to the internet.
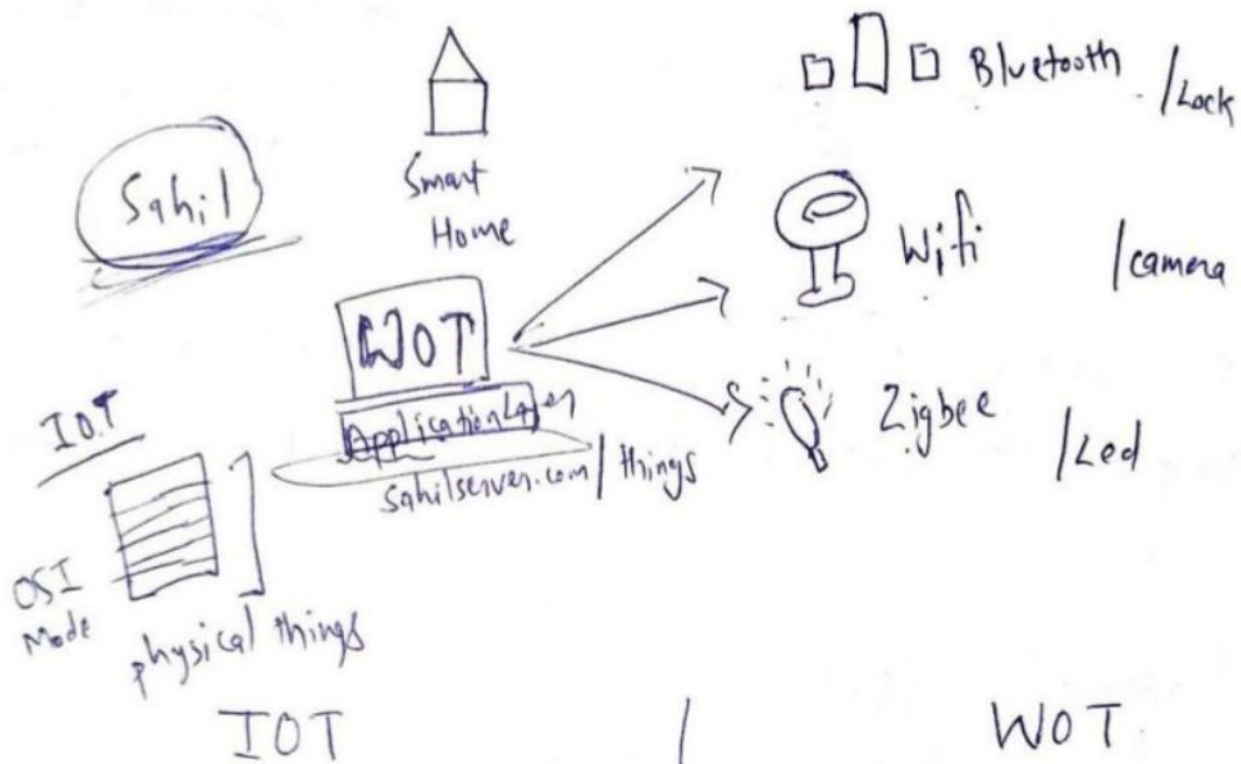
IOT	WOT
→ IOT is about creating a network of objects, things, system.	WOT tries to integrate them to web.
• No scalability security.	• Building WOT has various scalability security
• Scope of IoT is broader	• Scope of WOT includes web (WSN & RFID system)

Lite OS :- It is a lightweight, open source IOT device & smartphone OS.

→ It is designed to have a low footprint, which saves space & reduces the load of the OS on the device.

→ It supports smartphones, wearables, smart homes, Internet of vehicles.

→ It simplifies IOT device development & connectivity while focusing on enhancing user experience.

→ The smallest kernel (6KB) on market offers fast-start & low power consumption feature.

Riot OS :- It is an open source embedded OS.

→ It is designed for networked & memory constrainted systems.

→ Based on microkernel architecture & written in ANSI C.

features ⇒
→ Modularity
→ Tickless Scheduler
→ Straight forward interrupt handler
→ Support various h/w vendors
→ Reliability & real time features

Contiki OS :- → It is an open source OS for IoT.

→ It supports full standard IPv6 & IPv4 along wireless standards 6lowpan, CoAP.

→ It can fit into 10kB of RAM & 100kB of ROM.

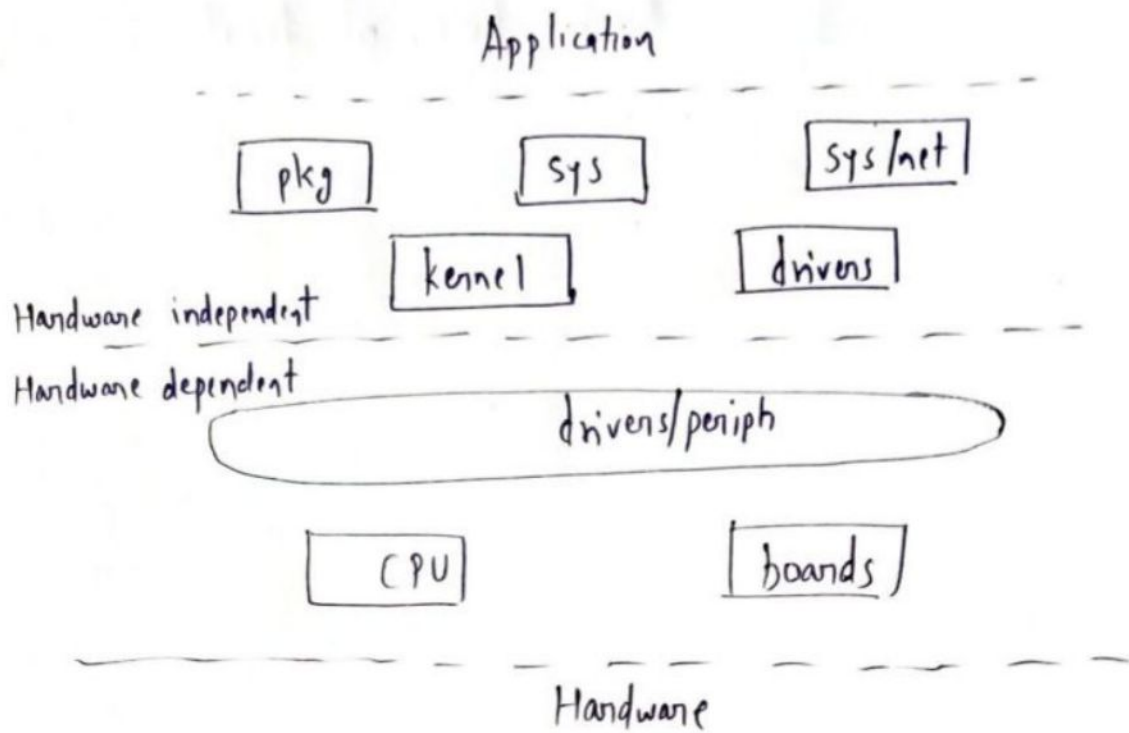→ Application → small web browser
web server
calcu.
shell
email client

Application

- -

| pkg | | sys | | sys/net |

| kernel | | drivers |

Hardware independent
- -
Hardware dependent

(drivers/periph)

| CPU | | boards |

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Hardware

fig:- Architecture of RIOT OS

Contiki OS
| Application 1 |
| Application 2 |
⋮

Node
Management

Sensor Data Manager
Code Updater
Sensor Configurator
Network Configurator

Contiki Core

| uip | | Loader | | Proto Threads |
↕ ↕ ↕

Driver

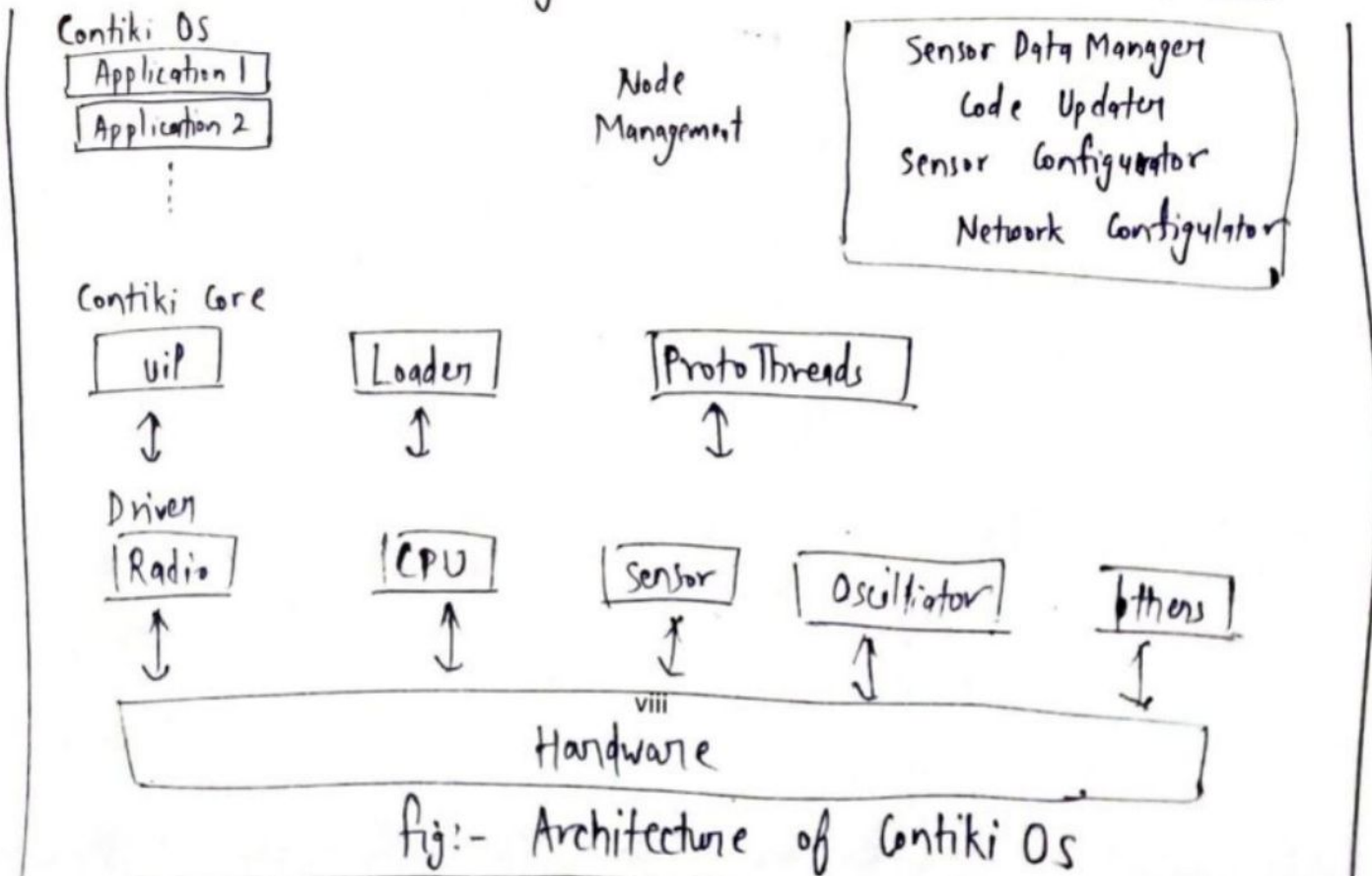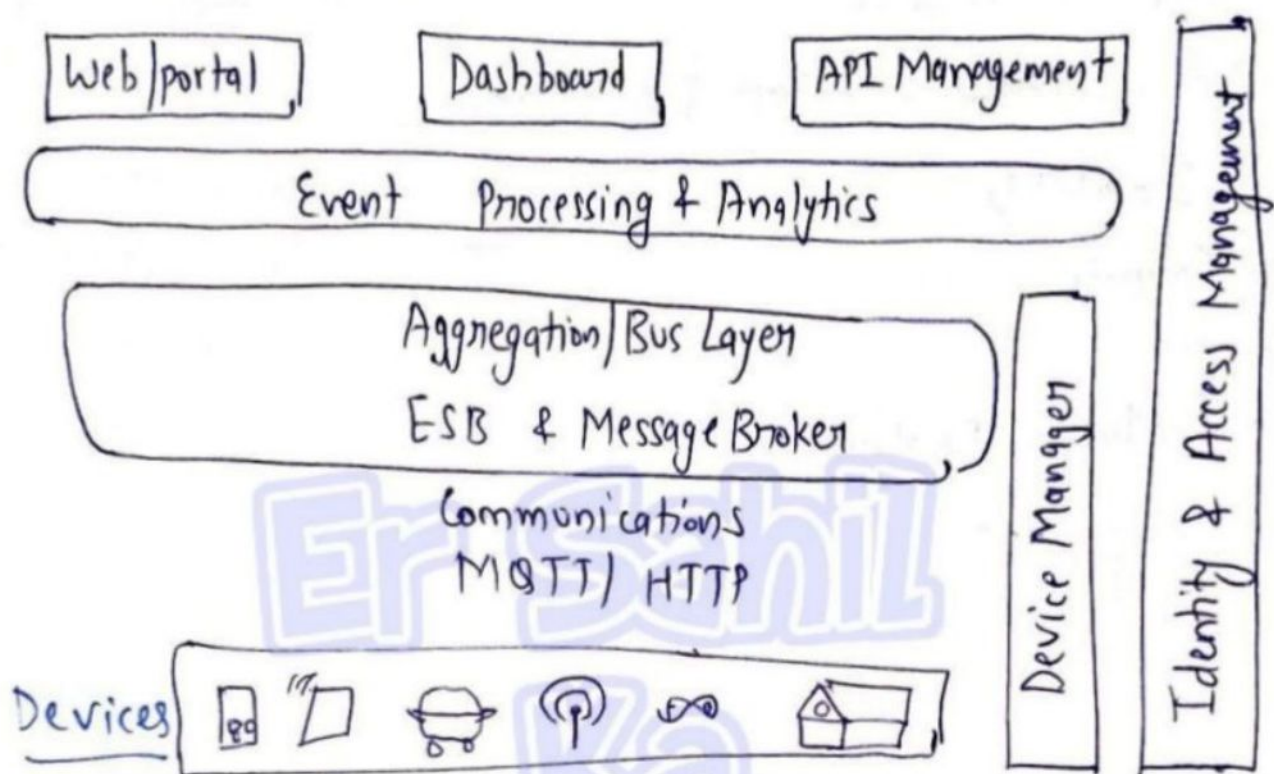| Radio | | CPU | | Sensor | | Oscillator | | Others |
↕ ↕ ↕ ↕ ↕

viii

Hardware

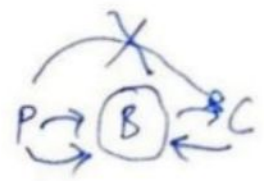fig:- Architecture of Contiki OS

IoT Reference Architecture:-

The reference architecture consists of a set of components. Layers can be realized by means of specific technologies.

The Layers are :-

- Client comm⁹ - Web/portal, Dashboard, APIs
- Event Processing - (Data Storage) include
- Aggregation /Bus - ESB & Message Booker   P→(B)←C
- Relevant transports - MQTT/ HTTP/ XMPP/ CoAP✓
- Devices

Cross cutting Layers are :-

- Device Manager
- Identity & Access Management

Purchase the Notes

100₹

Per semester
(All subjects)

For specific
Subject - 50₹

Notes (Hand written) ✅
Most Questions ✅

All Branches

Min 100%
amount will go
into charity 🌟

UPI ID -
sahilkagyan337@ybl

🔥 **Steps for getting NOTES and Most Questions -**

👉 Do payment using UPI ID -

sahilkagyan337@ybl

👉 Take screenshot of transaction and send me on Email –

ersahildrive@gmail.com

Then finally access all Notes and most questions 🔥

Scan & Pay Using PhonePe App

SAHIL KHAN