Characteristics Of IOT

1) Dynamic and self-adapting

→ Iot devices and systems have the capability to dynamically adapt with changing environment

Eg: According to the data sensed by temperature sensor the AC degree gets set.

2) Self-configuring

→ Iot devices may have self-configuring capability, allowing large number of devices to work together

3) Interoperable communication protocols:

→ Iot devices may support a numbers of interoperable communication protocols to communicate with other device.

4) Unique Identity:

→ Each IOT device has a unique identity and a unique identifier such as IP addresses, URI (uniform resource identifier)

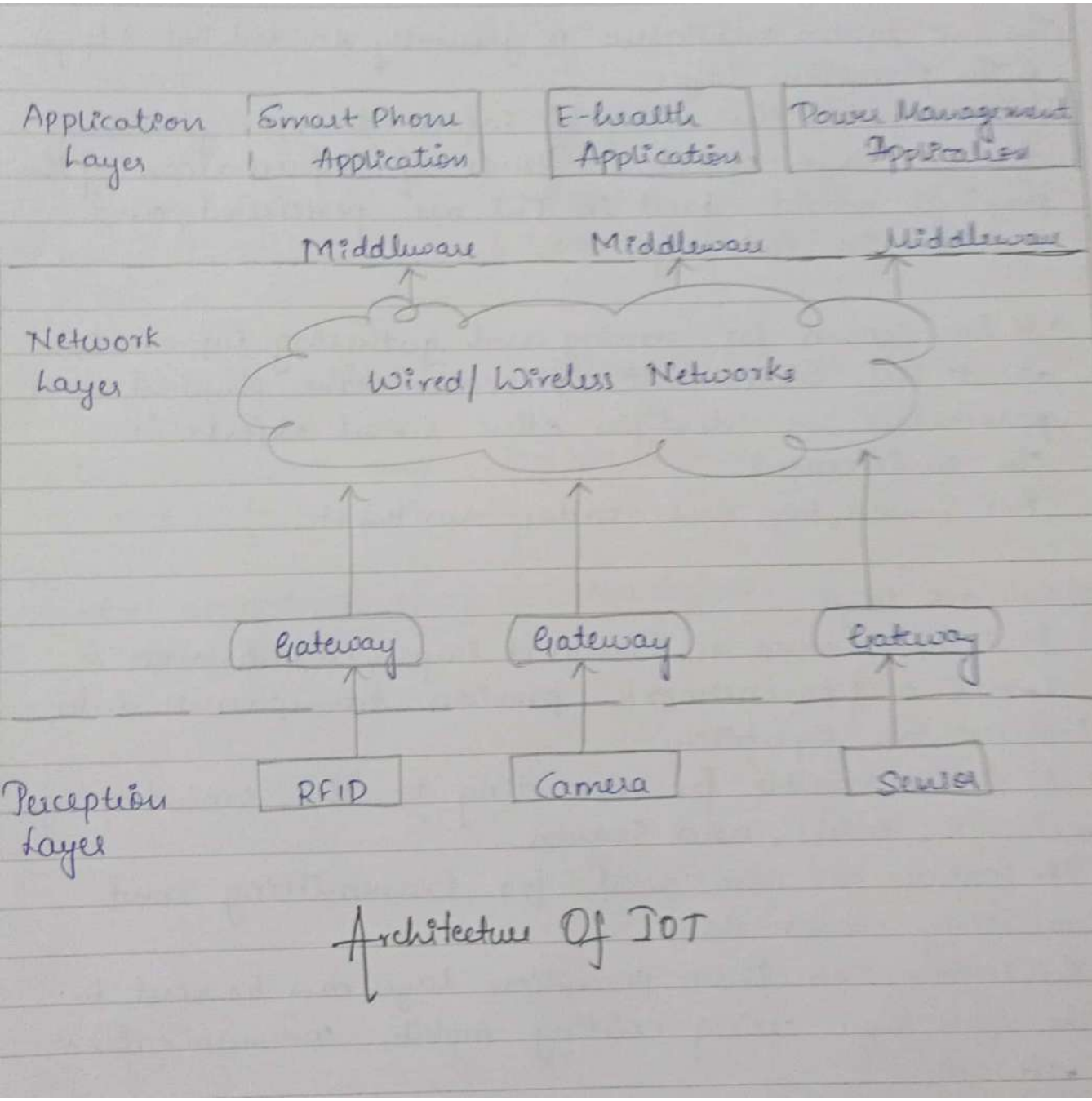
5) Integrated into information network.

→ IOT devices are usually integrated into the information network that allows them to communicate and exchange data with other devices

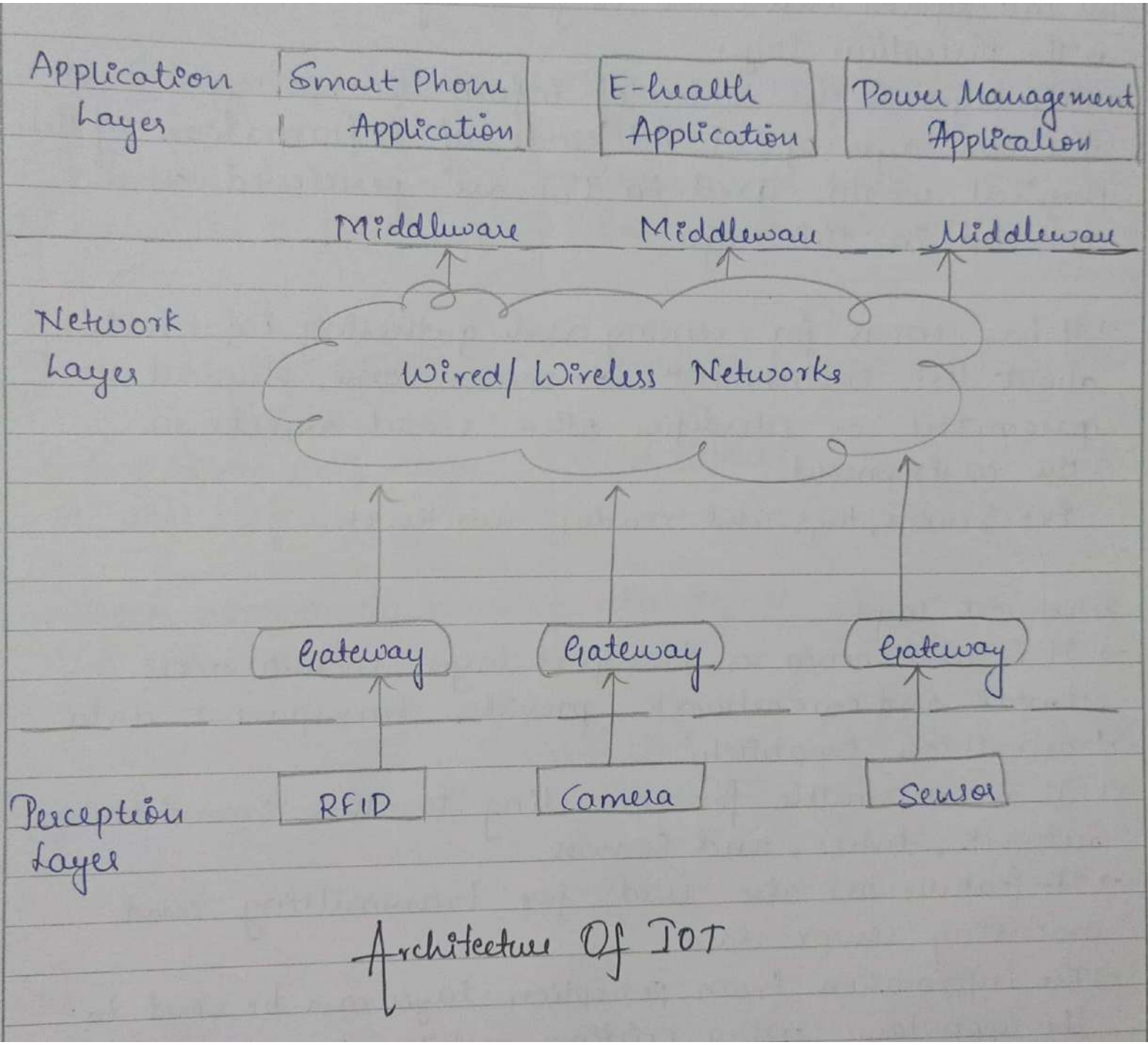
Feature	Rest-based	Web-Socket
→ State	Stateless	Stateful
→ direction	unidirectional	bidirectional
→ model of communication	Request-Response Model	Exclusive-pair model
→ TCP connection	Each request has a setting up of a new TCP connection	Single TCP handshake persists for all incoming requests unless client requests to close the connection.
→ Overhead	more chances of network overhead	does it involve overhead of headers
→ Scalability	It is both horizontally and vertically scalable	It is vertically scalable.
→ Cost	Low compared to Web-Socket API's	More compared to Rest-based communication API

	Bluetooth LE	Zigbee
→Topology	Point-to-point, Broadcast and Mesh topologies	Mesh topology
→Average range	10-100 meters	10-100 meters
→Power consumption	10-100 mWatts	10-100 mWatts
→Standard	IEEE 802.15.1	IEEE 802.15.4
→Network type	WPAN (Wireless Personal Area Network)	WPAN (Wireless Personal Area Network)
→Security	EAP (Extensible Authentication Protocol)	128-bit AES (Advanced Encryption Standard)

Feature	NB-Iot	LoRA
→ Licensed / Unlicensed Spectrum	Licensed Band	Unlicensed Band
→ Reuse of Cellular Network	Yes	No
→ Development Status	Yet to develop	Existing
→ Modulation	QPSK	SS Chirp
→ Bandwidth	180 kHz	500 Hz - 125 kHz
→ Data rate	250 kbps max	290 bps - 50 kbps
→ Device cost / Complexity	<5$ per module (REF - IETF)	1-5 $ (REF - LPWA survey)
→ Latency and Battery lifetime	<10 seconds, >10 years battery (REF - IETF)	>10 years
→ Type of Standard	Open	Proprietary.



Architecture Of IOT



Architecture Of IOT

The IoT system architecture is generally divided into 3 layers:

1) The perception layer.

→ This layer is the source of information origin and the core layer of IoT. All kinds of information of the physical world used in IoT are percieved and collected in this layer.

→ It has sensors for sensing and gathering information about the environment. It senses some physical parameters or identifies other smart objects in the environment.

Ex: Sensors, tags and readers - writers etc.

2) Network layer

→ It is also known as transport layer, includes access network and core network, provides transparent data transmission capability

→ It is responsible for connecting to other smart things, network, devices, and sensors.

→ It features are also used for transmitting and processing sensor data

→ The information from perception layer can be sent to the upper layer using existing mobile communication network.

3) Application layer
→ It is also called as Service Layer.
→ It is made of two sub-layers
1) Data management sub layer
2) Application service sub layer

1) Data management sub layer provides complex data and uncertain information
2) Application service sub layer is responsible for delivering application specific services to the users. It defines various applications in which the Internet of things can be deployed.

Ex:- Smart Homes, Smart cities and smart health.

Middleware helps in communication between L2 or network layer and L3 or Application layer

802.11	802.11ab
→ Frequency range is 1-6GHz	→ Frequency range is Sufrequencies of 1GHz
→ Frequency GHz - 2.4 → Bandwidth in MHz is 22	→ Frequency GHz is 0.7 / 0.8 / 0.9 → Bandwidth is 1-16 MHz
→ Data rate is 1,2 Mbit/s	→ Data rate is upto 8.67 (@2 MHz)
→ Indoor approximate range is 20m / 66ft	→ Not defined
→ Outdoor approximate range is 100m / 330ft	→ Not defined.

Technical specification	Bluetooth	Bluetooth Low Energy (BLE)
→ Frequency	2.4 to 2.483 GHz	2.4 to 2.483 GHz
→ Modulation Technique	Frequency Hopping	Frequency Hopping
→ Modulation Scheme	GFSK	GFSK
→ Network type	WPAN (Wireless Personal Area Network	WPAN (Wireless personal area network)
→ Application	It can handle a lot of data, but consumes battery life quickly and costs a lot more	Used for applications that do not need to exchange large amounts of data, and can therefore run on battery power for years at a cheaper cost
→ Data transfer rate	2-3 Mbps	200 Kbps
→ No. of channels	79	40
→ Channel Bandwidth	1 MHz	2 MHz
→ Security	56-128 bit	128-bit AES
→ Topology	Point-to-point	Point-to-point, Broadcast and Mesh topologies
→ Time for sending data	Typically 100ms	Typically 3ms.