

Introduction

Tuesday, 1 October 2024 7:07 PM

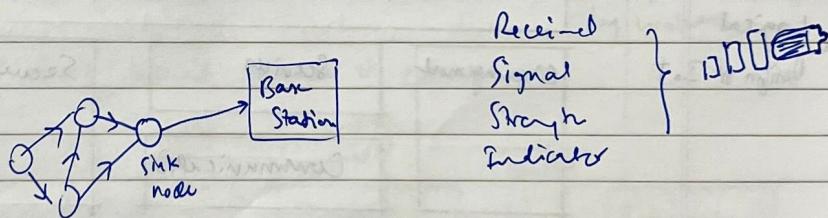
I VI] Heterogeneous devices, embedded devices Self adapting
 (watch, toilet), interopability
 Uniquely identifiable: Eg: IP Address.

3 keywords) Data, info, knowledge
 $25 \rightarrow 25^{\circ}\text{C} \rightarrow$ some
 env. action
 temp

Block Diagram (IoT device) (Refer textbook)

5 ways of connecting
 LAN
 WiFi
 WiMax
 Zigbee/bluetooth
 GSM

19/9/24



★
 Communication

Protocols used
 Link layer: 802.3 (Ethernet)
 802.11 (WiFi)
 802.16 (WiMax)
 802.15.4 - LR-WPAN
 2G / 3G / 4G - Cellular

Network / Internet Layer:

IPv4

IPv6

6LoWPAN

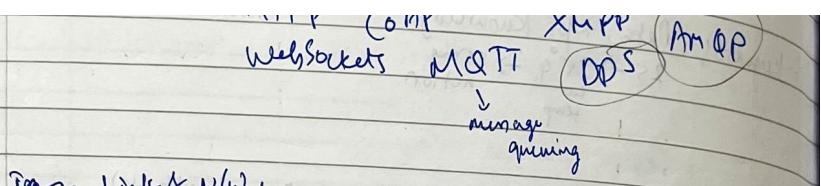
Transport Layer

TCP

UDP

Application Layer:

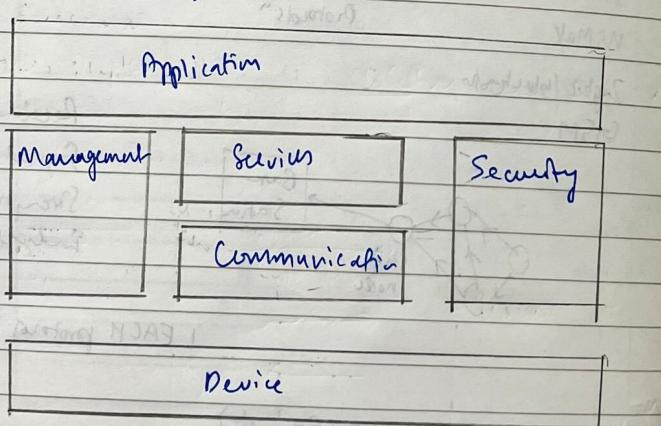
HTTP contained applicat
 ↓ protocol
 ↓ exclusiv
 ↓ markup



Transport & App. layer

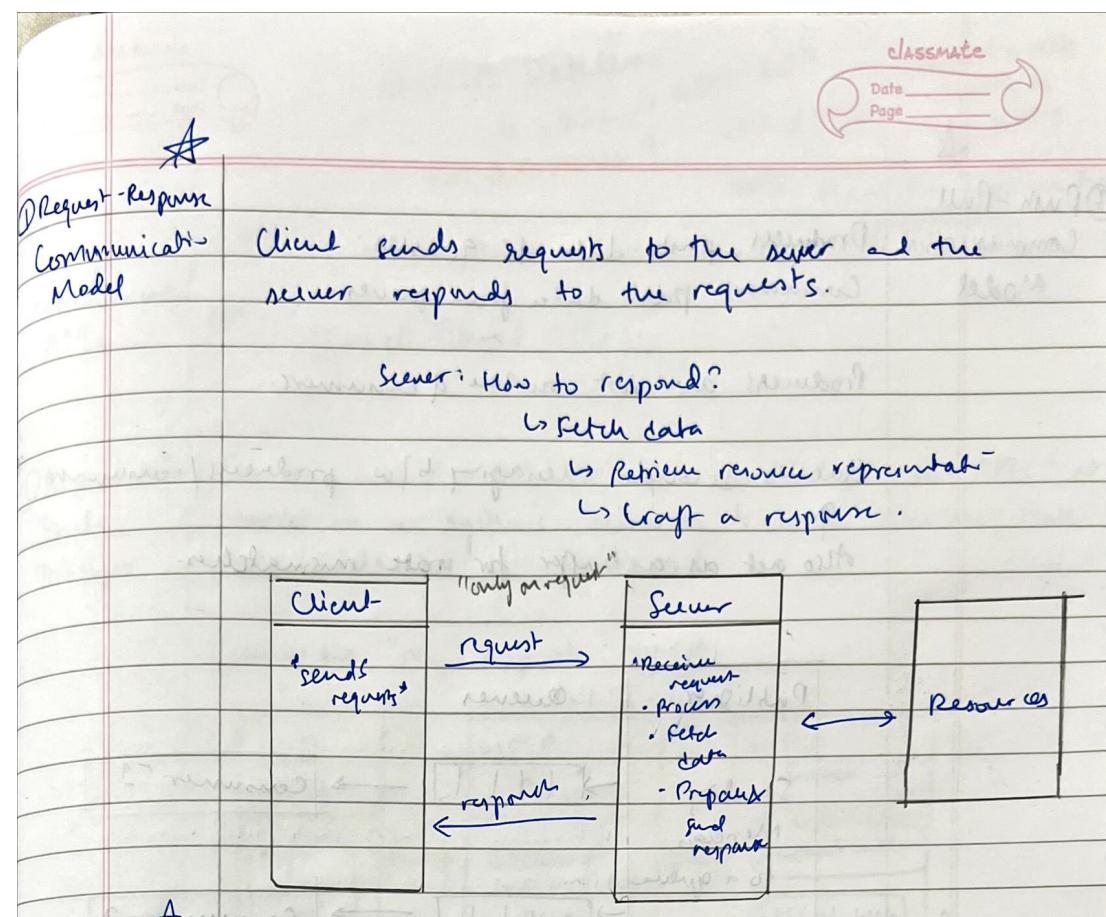
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* Logical Design of IoT



Management: Database, device management.

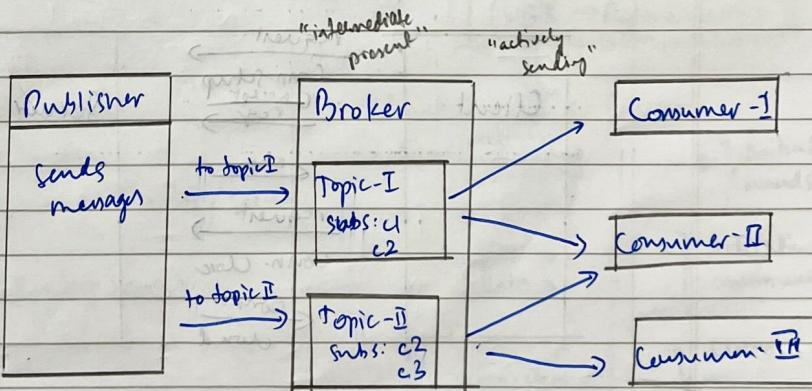
⇒ 4 Communication Models



② Publisher-
Subscriber
Communication
Model

Three aspects: ① Publishers → Source of data
 ② Brokers → Manage "topics" (data sent by pubs)
 ③ Consumers → Subscribe to topics managed by brokers

Publishers aren't aware of consumers!



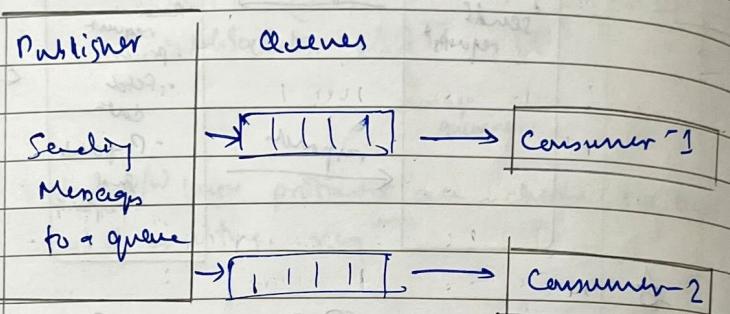
③ Push-Pull
Communication
Model

Produces push data to queues.
 Consumers pull data from queues.

Producers are not aware of consumers.

Queues decouple messaging b/w producers/consumers.

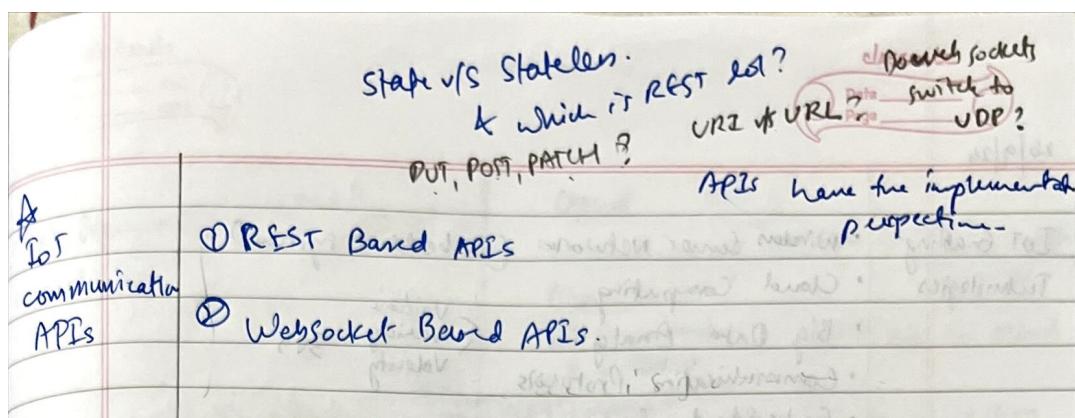
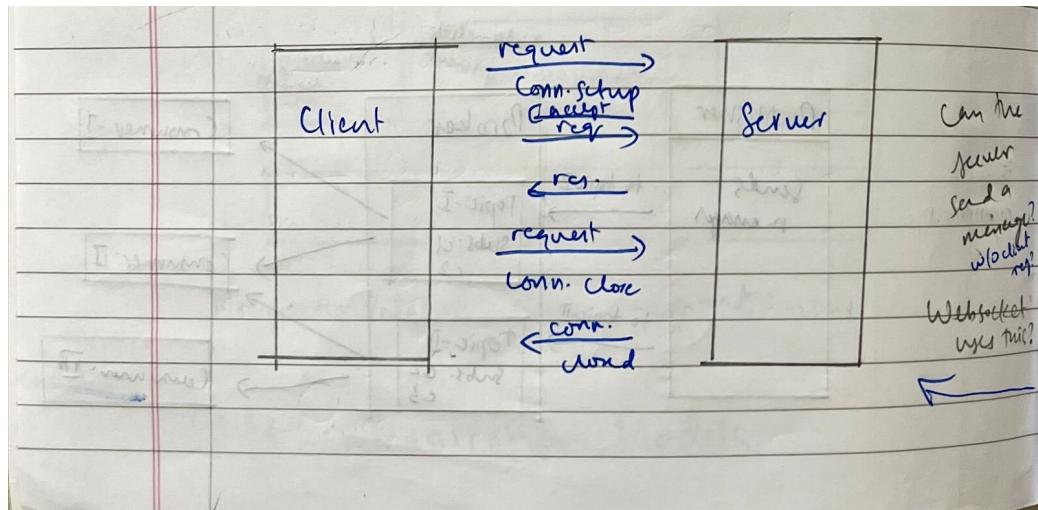
Also act as a buffer for rate mismatches.



④ The

Exclusive Pair × Bidirectional
 Communication × Fully Duplex
 Model × Persistent Connection

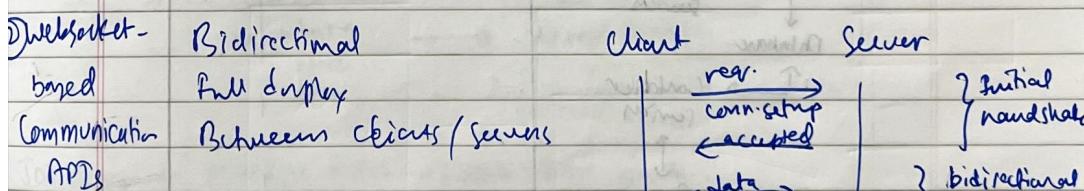
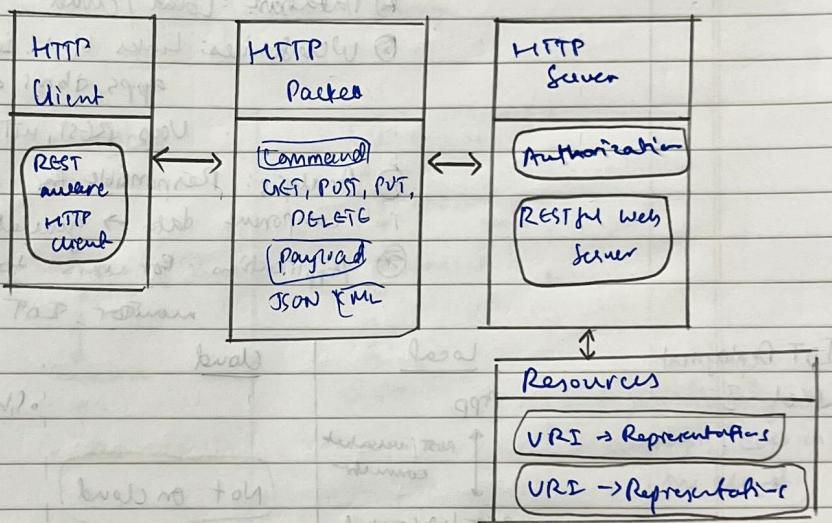
- ① Setup connection (Dedicated)
- ② Close connection (Commit)



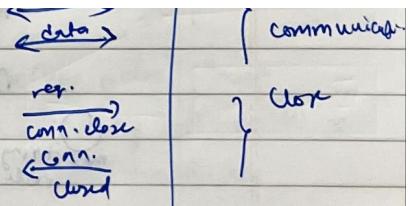
① Representational State Transfer (REST) APIs

Focus on a system's resources & how resource states are addressed & transformed.

Follows the "req-response" model.



Basically user:



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IoT Enabling
Technologies

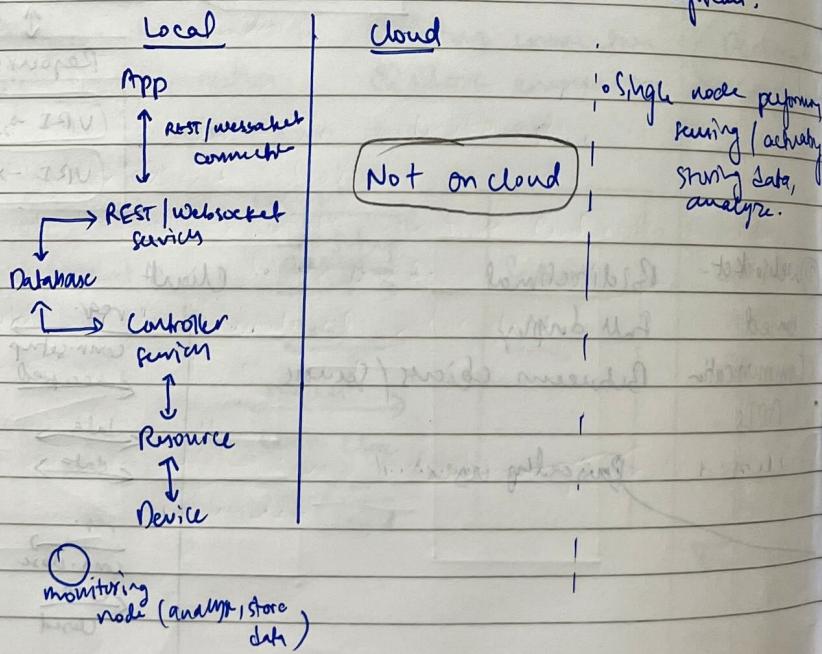
- Wireless Sensor Networks (Embedded systems)
- Cloud Computing
- Big Data Analytics
- Communication Protocols
- Embedded Systems

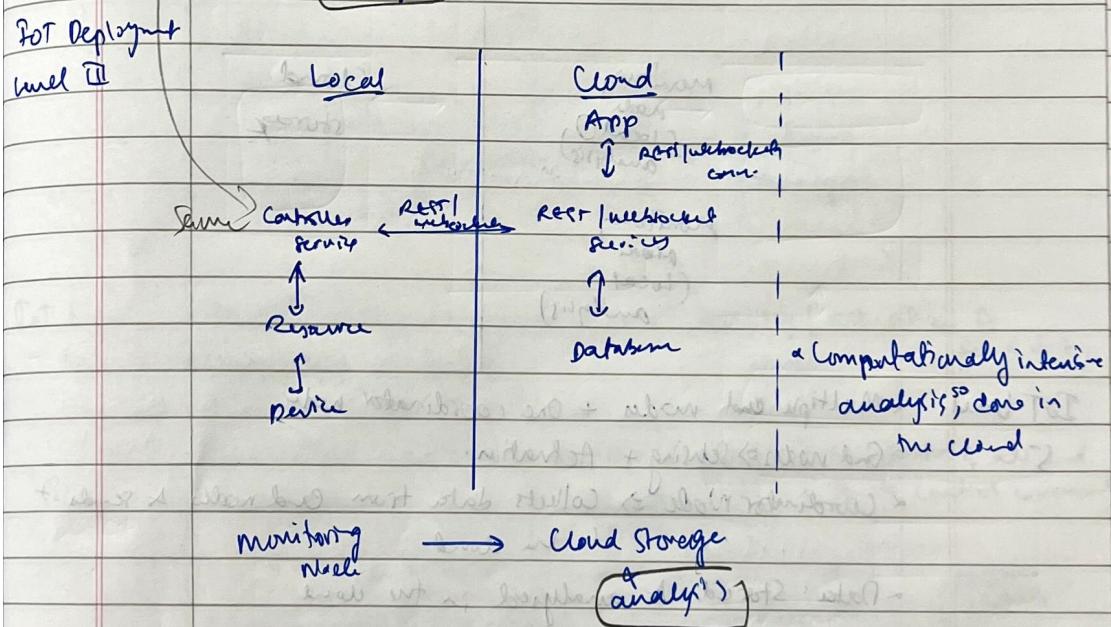
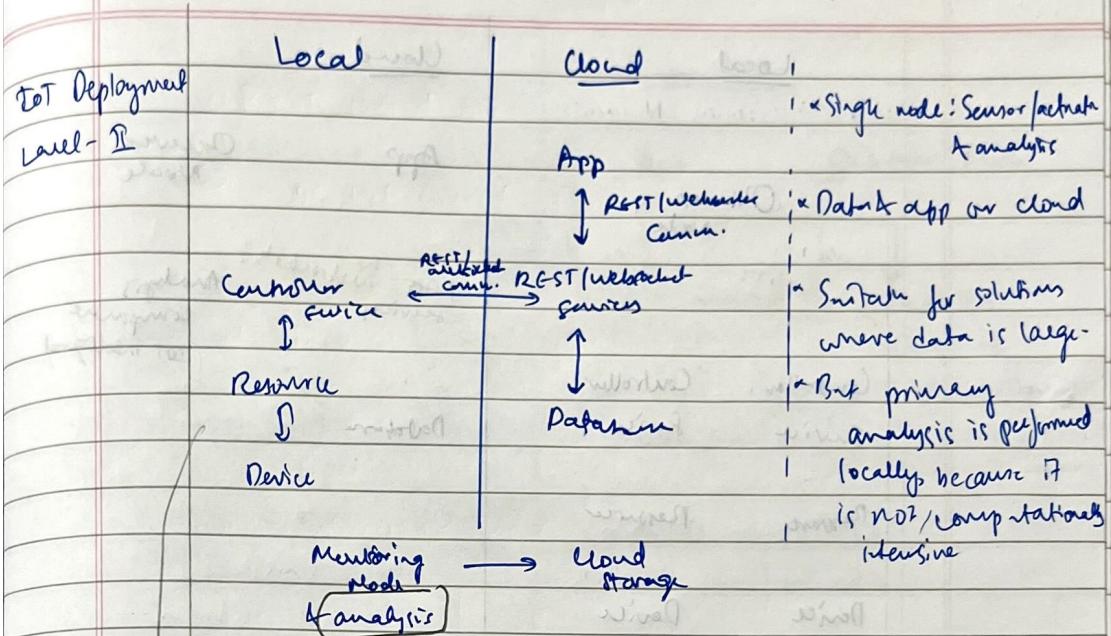
Volume
Variety
Velocity
3Vs

IoT Levels
Deployment
Templates

- IoT components:
- ① Device : Remote sensing & actuating
 - ② Resource : storage, software, network access
 - ③ Controller Service : Services that run on the device itself to do stuff
 - ④ Database : Local / cloud.
 - ⑤ Web Services: Links b/w IoT devices & apps, dbms, analysis, etc
Uses REST, MQTT, websocket, etc
 - ⑥ Analysis: Responsible for analysing IoT component data → generate results.
 - ⑦ Applications: For users to control & monitor IoT system.

IoT Deployment
Level - I:

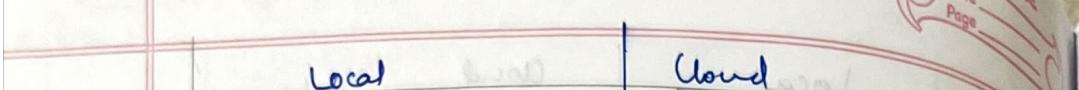


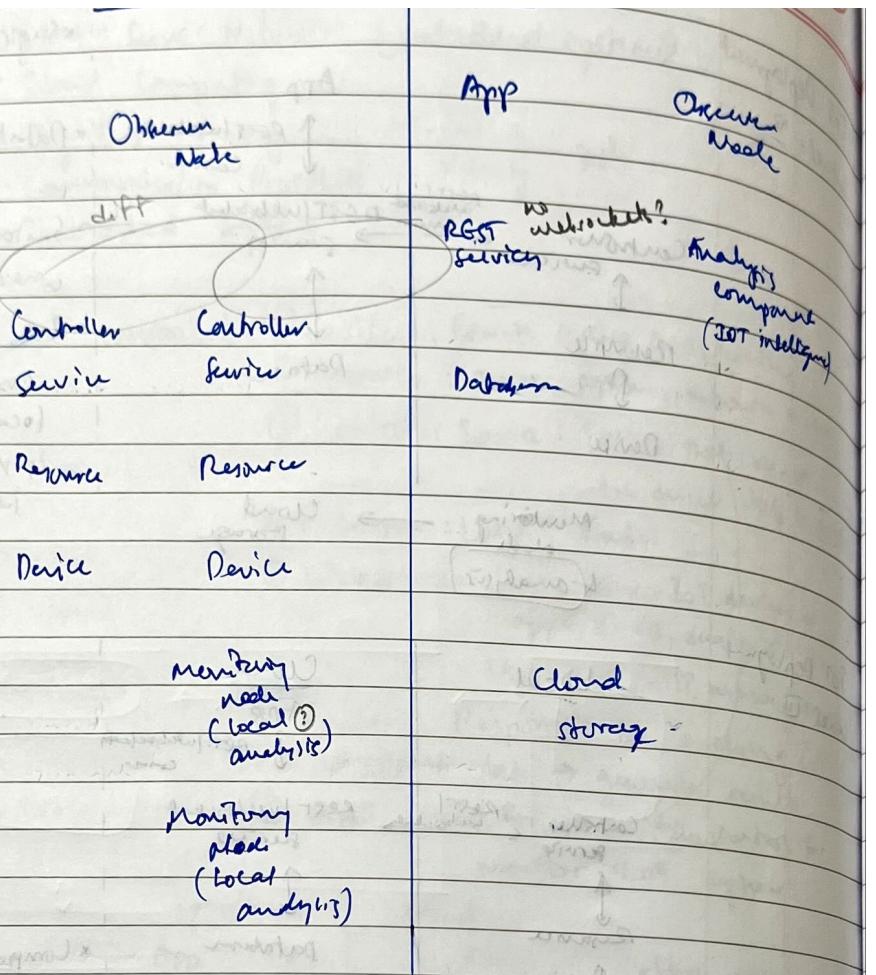


IoT Deployment Level - IV

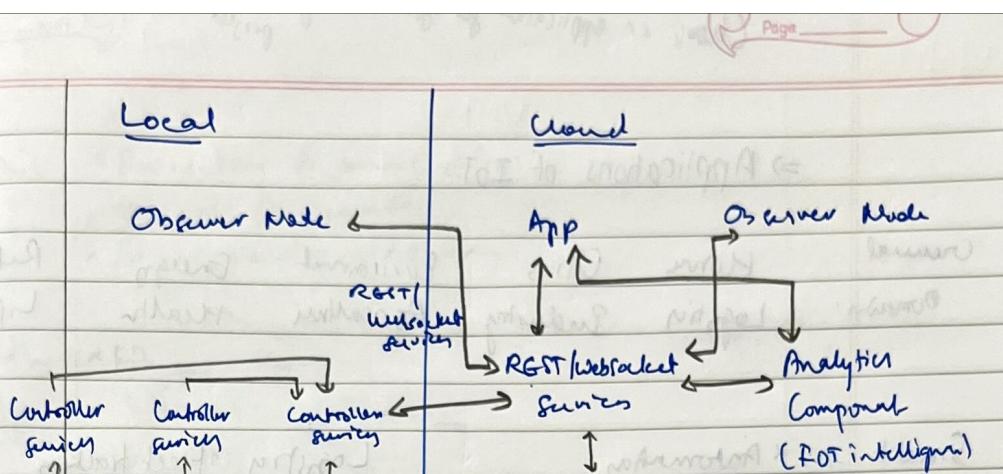
- Multiple nodes → perform local analysis;
- Data, app on cloud
- Has local & cloud based "observer nodes" that subscribe for info. collected in the cloud by IoT devices
- Useful for: Expensive computation, big data, multi-node

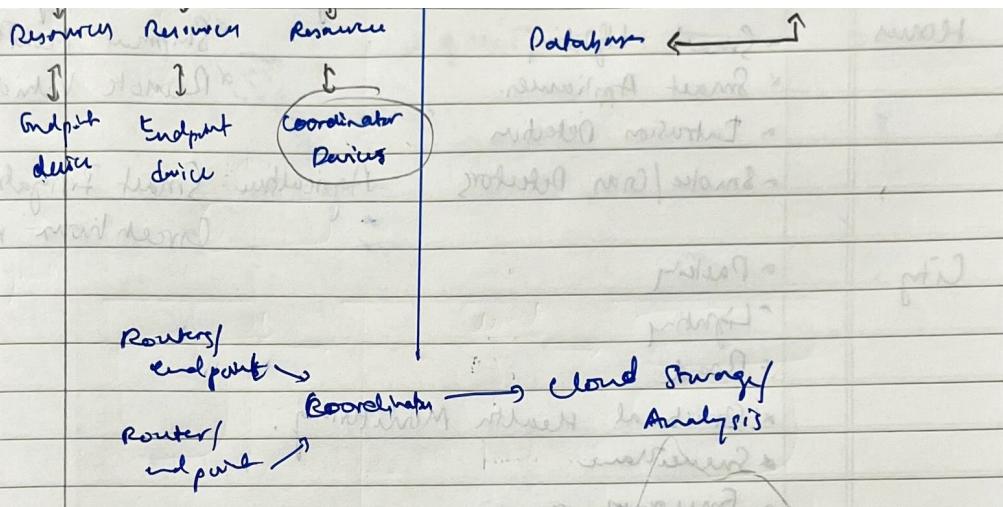
look at all directions



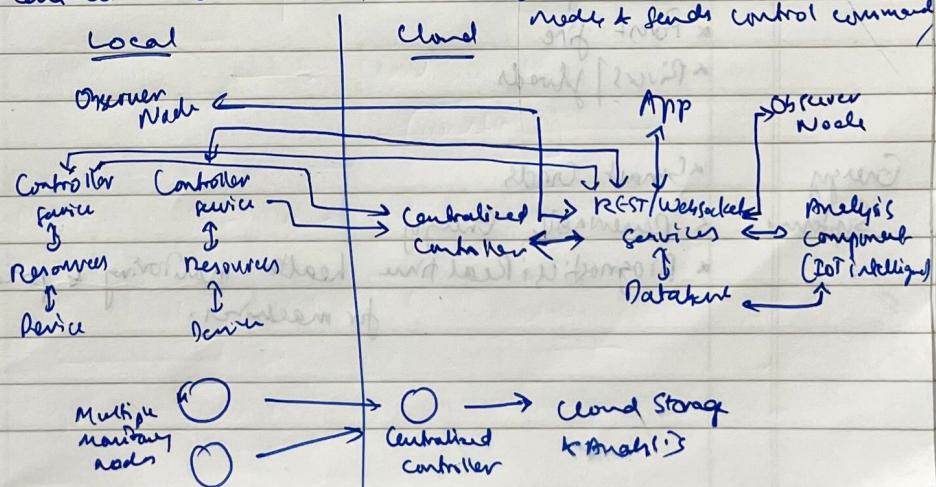


- IoT Level
- Multiple end nodes + One coordinator node
 - End nodes \Rightarrow sensing + Activation.
 - Coordinator Node \Rightarrow Collects data from end nodes & sends it to the cloud.
 - Data: Stored & analysed in the cloud
 - Apps are cloud hosted.
 - Suitable for Wireless Sensor Networks, big data, computation intensive.





- IoT Level 6
- * Multiple independent end nodes → sensing / actuation & send data
 - * Data, app on cloud.
 - * Analytics component in cloud.
 - Centralized controller in the cloud (knows the states of all end nodes & sends control command)



Choose an application for your IoT group project

⇒ Applications of IoT:

Domain	Home	Cities	Environment	Energy	Health	Retail	Lifestyle
	Logistics	Industry	Agriculture	Health			
Criminal							

Smart Homes	<ul style="list-style-type: none"> Automation Smart Lighting Smart Appliances Intrusion Detection Smoke/Gas Detectors 	<ul style="list-style-type: none"> Fleet tracking Shipment Monitoring Remote Vehicle Diagnosis
		<ul style="list-style-type: none"> Smart Irrigation

		Green house monitoring
City	<ul style="list-style-type: none"> o Park o Lighting o Road o Structural Health Monitoring. o Surveillance o Emergency response. 	
Environment	<ul style="list-style-type: none"> o weather o Air pollution o Noise pollution o Forest fire o Rivers / Jheels 	<ul style="list-style-type: none"> o Industry & Machine Diagnosis & prognosis o Indoor Air Quality o Maint.
Energy Systems	<ul style="list-style-type: none"> o Smart Grids o Renewable Energy o Prognostics; Real time health monitoring & prediction for machines. 	

01-07-2020 Date Page classmate Date _____ Page _____ 4.9.2020	Completed work papers - 12 : problem set 05/07 Date 05-07-2020 Page 1402 S-100 AS-M Date 05/07/2020 Page 1402 S-100 AS-M
Report	<ul style="list-style-type: none"> o Inventory Management o Smart Payments. o Smart Verify machine.
Health & Lifestyle	<ul style="list-style-type: none"> o Fitness tracker. o Wearable electronics.
<u>End of Unit - 1</u>	