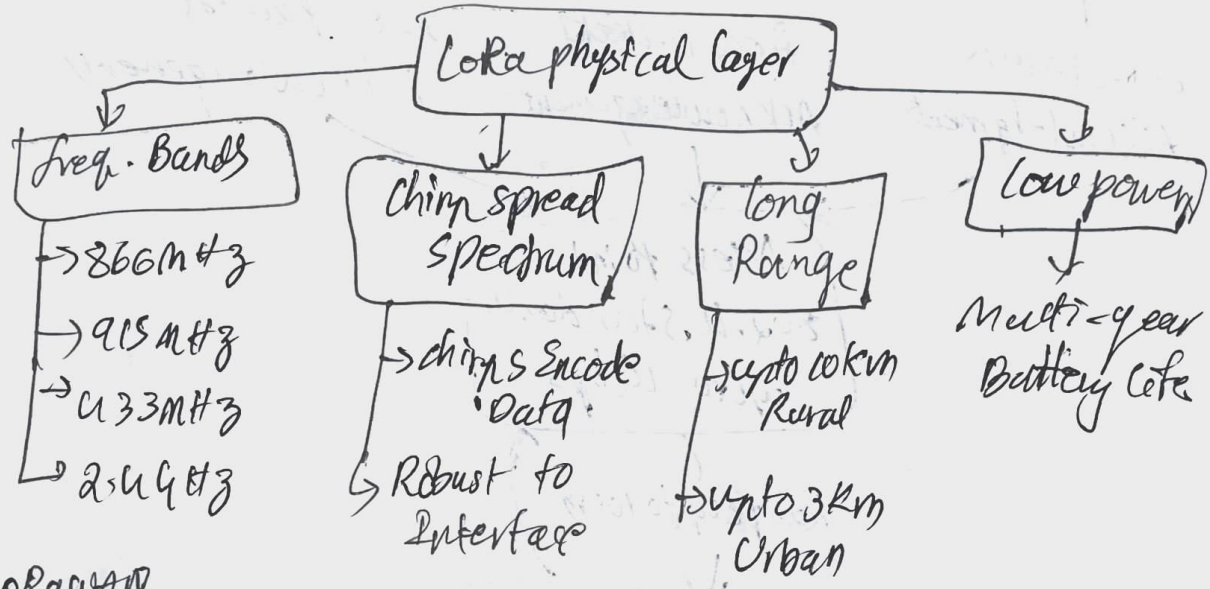
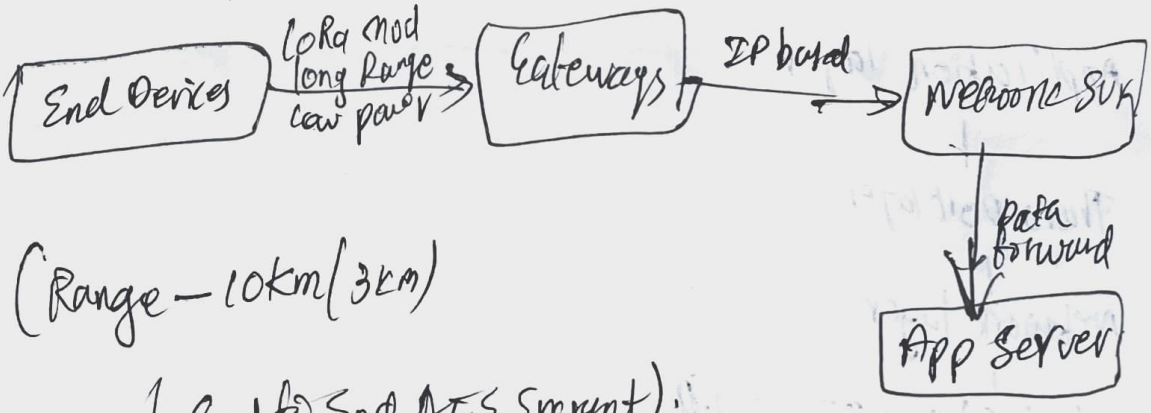
LoRa

- operates in 868MHz, 915MHz, 433MHz (optionally 2.4GHz freq band)
- uses Chirp Spread Spectrum modulation for robustness against the interface.
- Supports very long-range transmissions
- very low power consumption - Enables multi-year battery life.



LoRaWAN

- comprises End Devices (sensors), Gateways, Network Server and Application Server.
- End Devices communicate with Gateways using mod of LoRa.
- Gateways forward data to Network server over IP.
- features End to End AES-128 Encryption for secured data

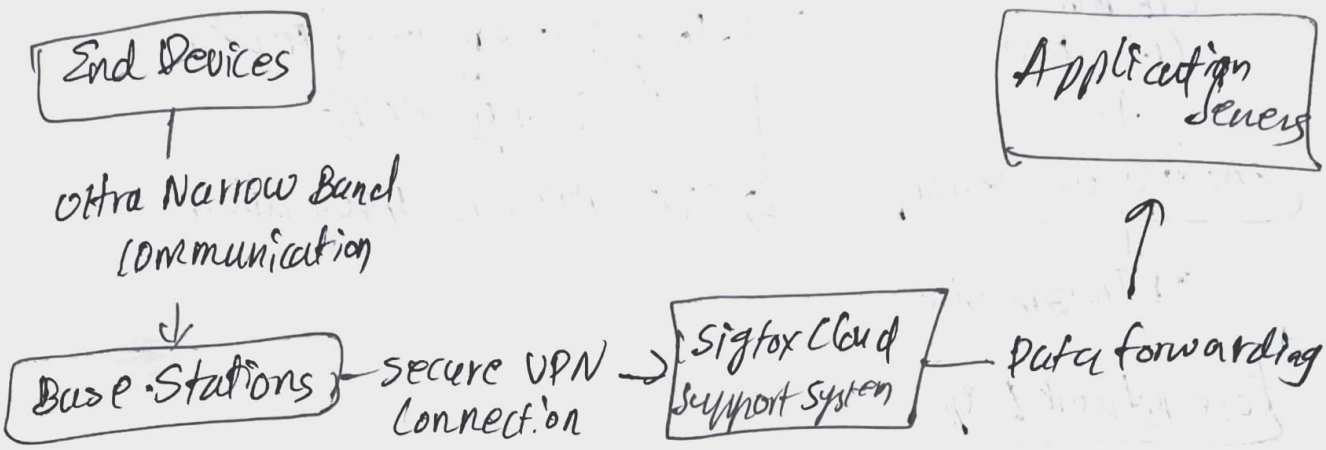


(Range - 10km (3km)

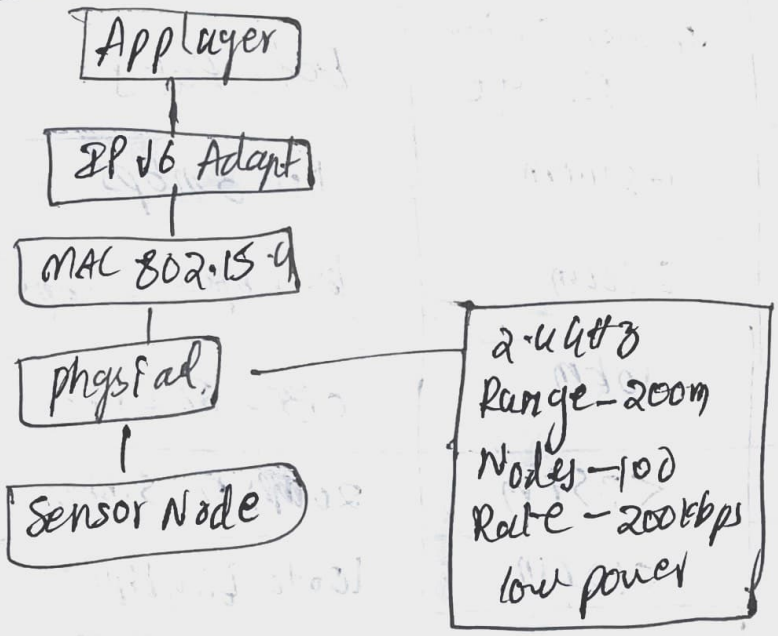
(End to End AES Encrypt).

Sigfox

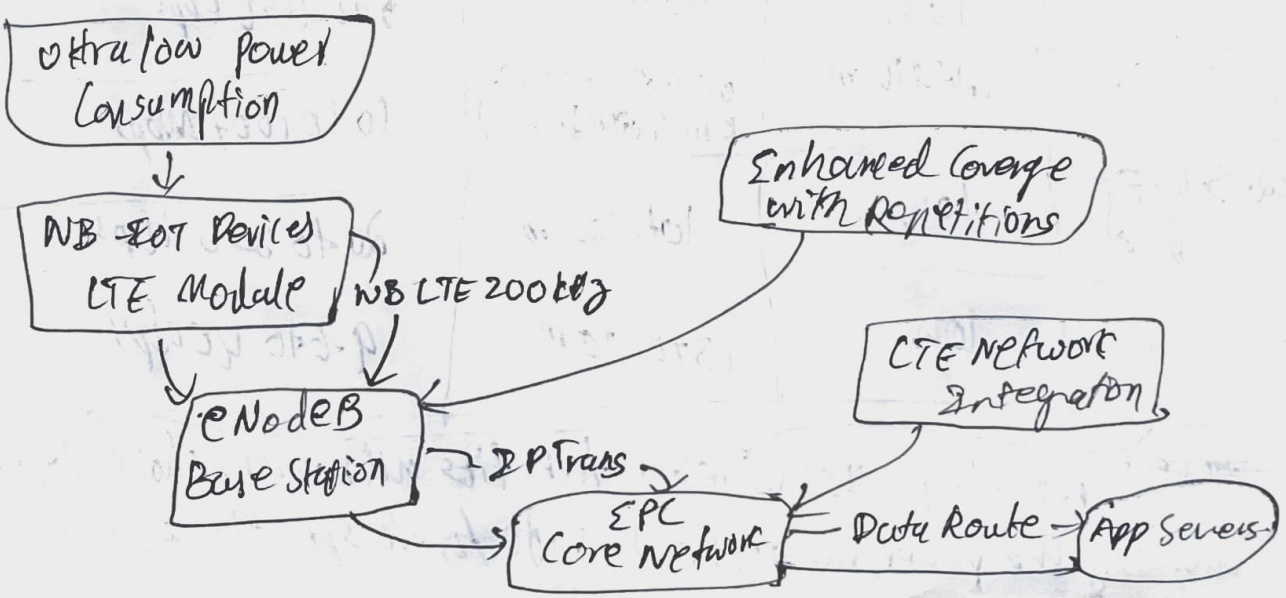
Long Range – 10 to 50 km | High – Network Capacity
Low power Consumption | Random Access with freq. Diversity.



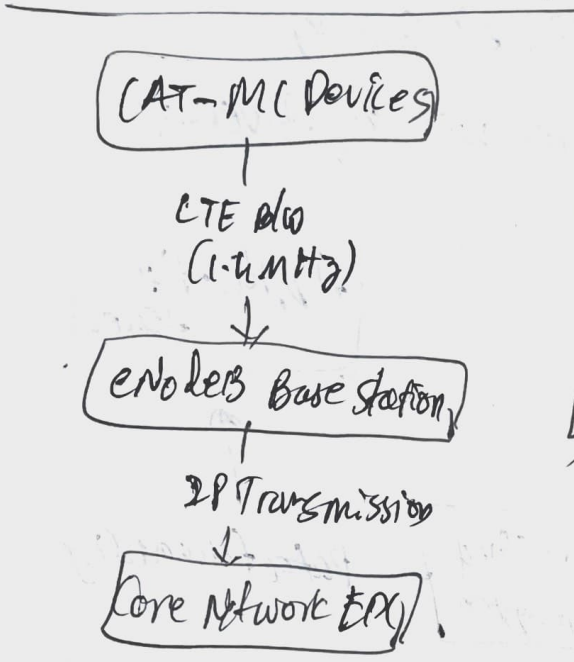
6LoWPAN



NB-IoT Network Architecture



CAT-M1 Network Architecture:



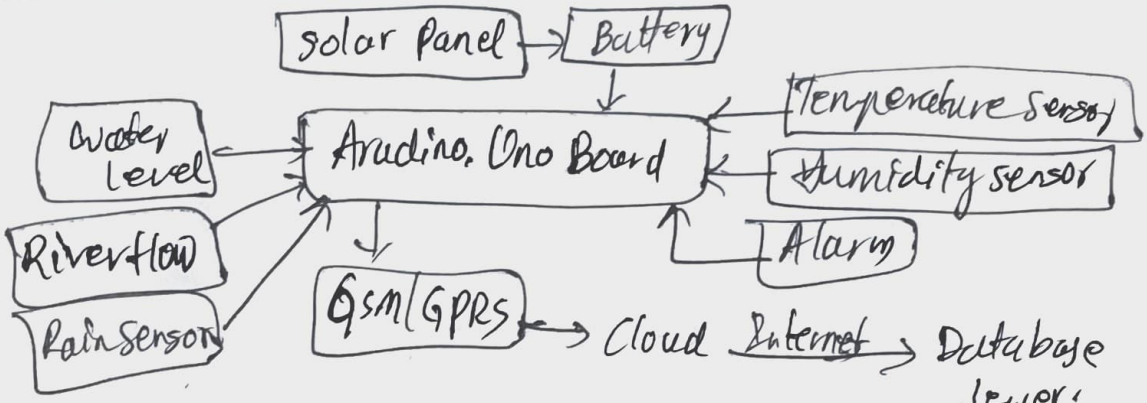
- High datarate upto 1 Mbps.
- Low latency vs NB-IoT.
- Long Battery life (Power Saving Mode).
- LTE Network Integration.

Smart wireless Sys. Tech Comparison

Wireless standard	Power	Transmission Range	Data Rate
Bluetooth	Medium	1 to 100m	1 to 3 mbps
Bluetooth LE	Lower	>100m	125 kbps to 2 mbps
LoRaWAN	Low	10km	0.3 to 50 kbps
NB-IoT	low	<35km	20 kbps to 5 mbps
NFC	low	<10 cm	106 to 424 kbps
Sigfox	low	3 to 50km	100 to 600 bps
6LoWPAN	low	100m	0 to 250 kbps
802.11/wi-fi	medium	100m to several km (with boosters)	0 to 1001 Mbps
802.15.4/Zigbee	low	10 to 100 m	20 to 250 kbps
Z-wave	low	1.5 to 150m	9.6 to 40 kbps

No single IoT wireless tech fits all needs, choice depends on balancing the power, range & data rate for the specific application.

Case-study – Vijayawada flood.



→This System uses an Arduino Uno board as the core controller for flood Monitoring & response. Solar panels & battery ensure autonomous operation, vital during disaster conditions.
→Sensors Monitor critical parameters - water level, river flow, rainfall, temperature & humidity. The system triggers an alarm for early warning & transmits readings via GSM/GPRS to a remote database server over the Internet.
→Real-time data supports effective flood management through timely alerts and centralized monitoring.

Question

↳ Why FastTag can be scanned with less distance b/w reader & Tag by using only low-wavelength, high-frequency Radio waves :- The Toll-Gates - why not high & low ? Radio waves?

Answer

Because, Near-field Communication principle (NFC) – High freq waves (13.56 Mhz) in low range Enable Efficient inductive coupling b/w reader & tag. Ensuring reliable power transfer & a communication within a short range. Also due to Interference Regulation, Precise Reading zone & Power, Cost Efficiency - Longer wavelength signals would allow farther reads but need bigger antenna, increased power and more complexity, Interference & Security risks. So we use high & low Radio waves in FasTags.