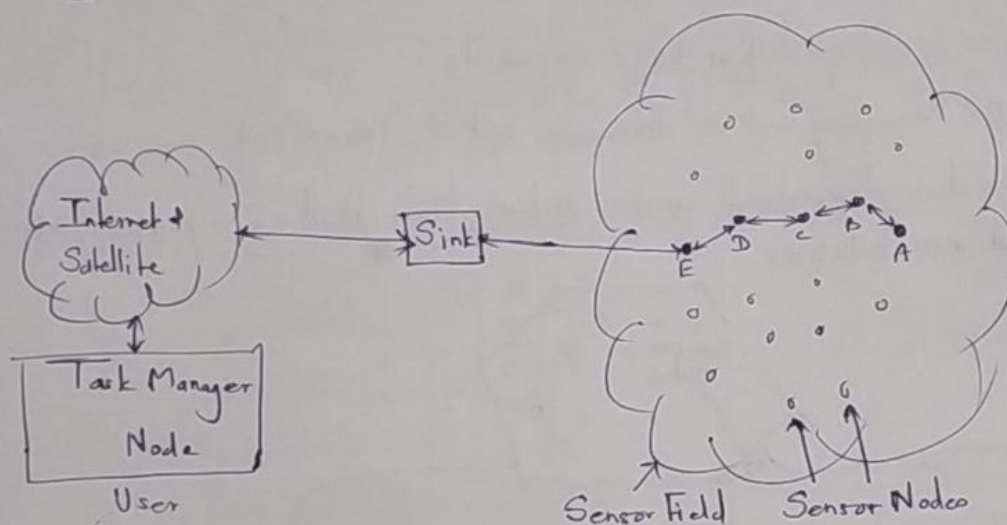


Wireless Sensor Network

- Wireless sensor networks (WSN) can be defined as a self configured and infrastructureless wireless networks to monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants and to cooperatively pass their data through the network to a main location or sink where the data can be observed and analysed.
- Wireless sensor node is equipped with sensing and computing devices, radio transceivers, and power components.
- Working mode of sensor node ① Continuous ② Event driven



'A Typical Wireless Sensor Network'

Applications: Military applications (battlefield surveillance, target systems), Area monitoring, Transportation (Real time traffic info), Health applications, Environmental sensing (sensing volcanoes, oceans, glaciers, forest etc), Industrial monitoring, Agricultural sector

* Design issues of a wireless sensor network:

- If a node get damaged, the protocols deployed in a sensor network should be able to detect these failures as soon as possible and be robust enough to handle a relatively large number of failures while maintaining the overall functionality of the network. (Specially relevant to routing protocol)

Scalability:

Production Costs:

Hardware constraints:

Sensor Network Topology:

* Structure of a wireless sensor node:

A sensor node is made up of four basic components:

① Sensing unit ② Processing unit ③ Transceiver unit ④ Power unit

Additional application dependent units: ① Location finding system, a power generator and a mobilizer.

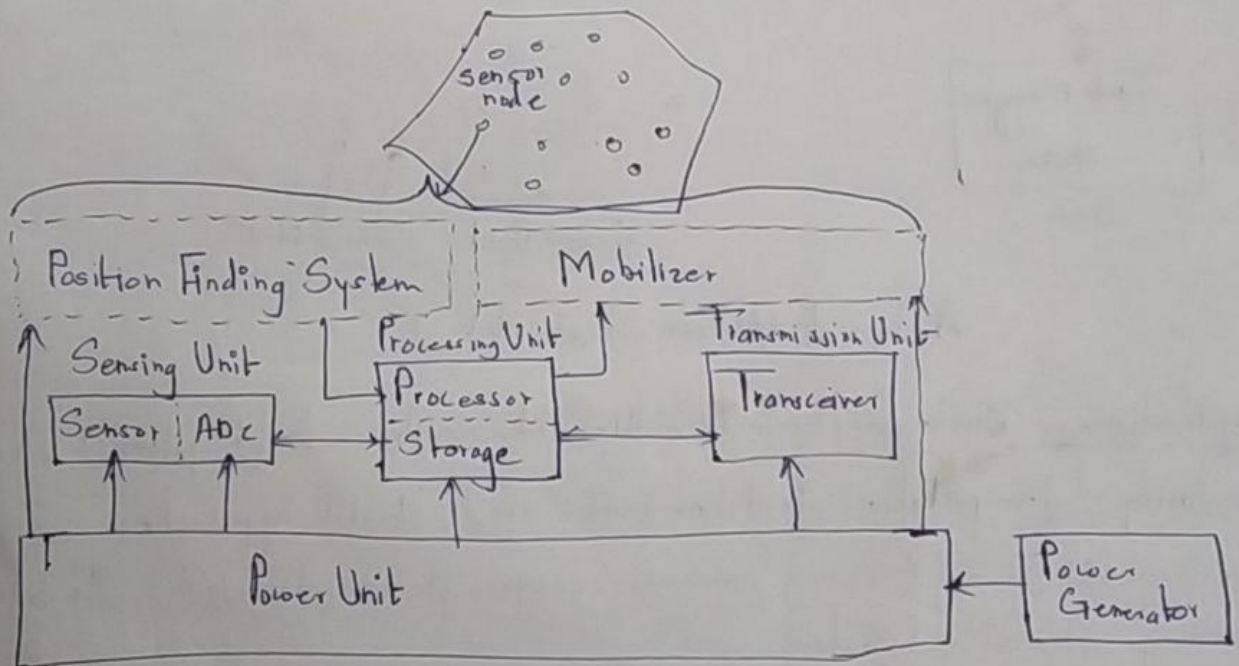


Fig. The Components of a sensor node.

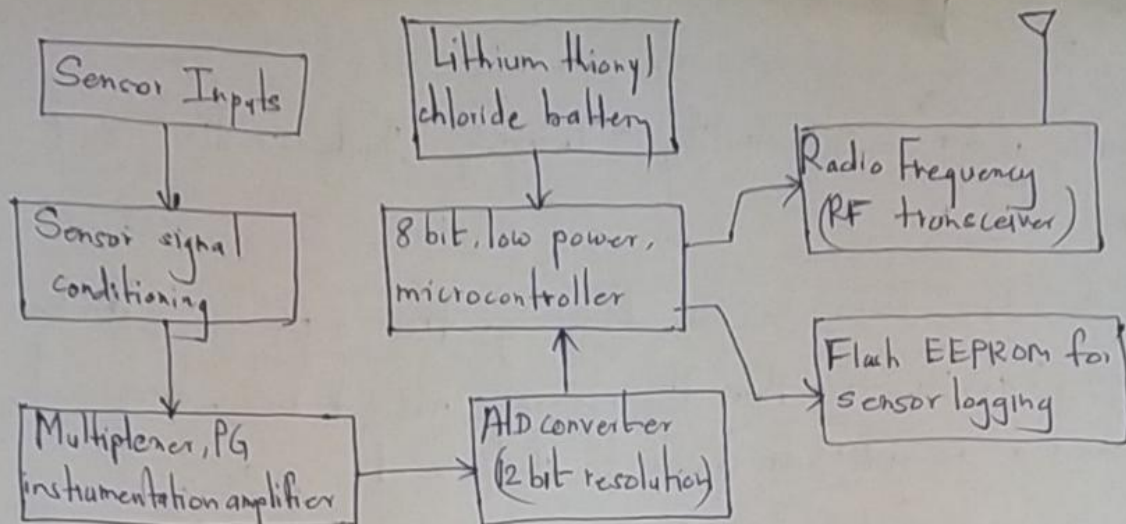


Fig. Functional Block Diagram of a sensor node.

The microprocessor has a number of functions including :

- Managing data collection from the sensors.
- Performing power management- functions.
- Interfacing the sensor data to the physical radio layer.
- Managing the radio nlw protocol.

Communication structure of a wireless sensor network :

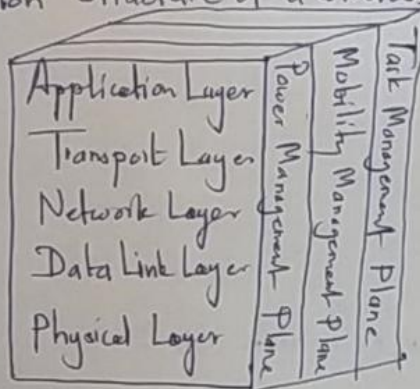


Fig. Wireless Sensor Network Protocol Stack.

- The WSN protocol stack consists of the application layer, transport layer, network layer, data link layer, physical layer, power management, mobility management plane and task management plane.
- In addition, the power, mobility and task management planes monitor the power, movement and task distribution among the sensor nodes. These planes help the sensor nodes coordinate the sensing task and lower the overall energy consumption.

* Security issues in wireless sensor network:

Security goals: Confidentiality, Integrity, Authentication and Availability.

Confidentiality: ability to conceal message from a passive attacker.

Integrity: ability to confirm the message has not been tampered, altered or changed while it was on the network.

Authentication: need to know if the messages are from the node it claims to be from.

Availability: It is to determine if a node has the ability to use the resources and the n/w is available for the messages to move on.

* Routing issues:

① Node deployment

② Energy consumption without losing accuracy.

③ Fault Tolerance.

④ Production Cost.

* Further I am planning to do ^{some} research on:

1] Wireless Power Transfer (WPT) in mmWave WSN.

2] Routing protocols in mmWave WSN.

Any suggestions?

✶ Some ideas:

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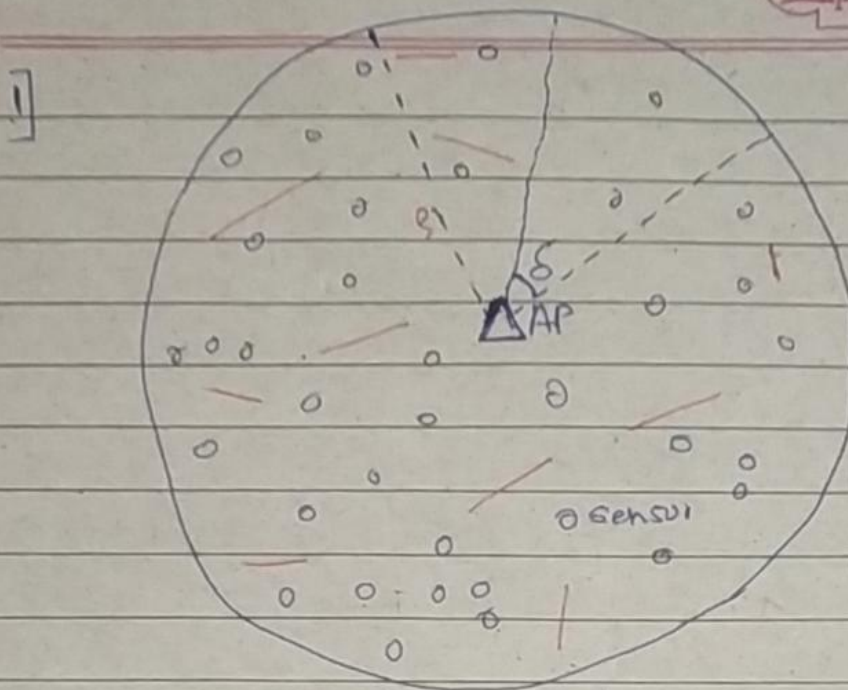


Fig. Considered System Model

- Here power is transferred to sensors wirelessly using mmWave MIMO.
- But mmWave is susceptible to environmental changes eg. rain, dust, fog etc.
- In this case power transferred to sensors won't be efficient or even not possible.
- So, Can we use drone to transfer power to sensors wirelessly?

2] In above system model we, sectors also need to be selected for power transfer.
Can we apply ML here for sector selection?