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Bluetooth

- Bluetooth is a wireless technology standard for exchanging data over short distances
- It was invented by Ericson in 1994
- Bluetooth is managed by the Bluetooth special Interest Group (SIG)

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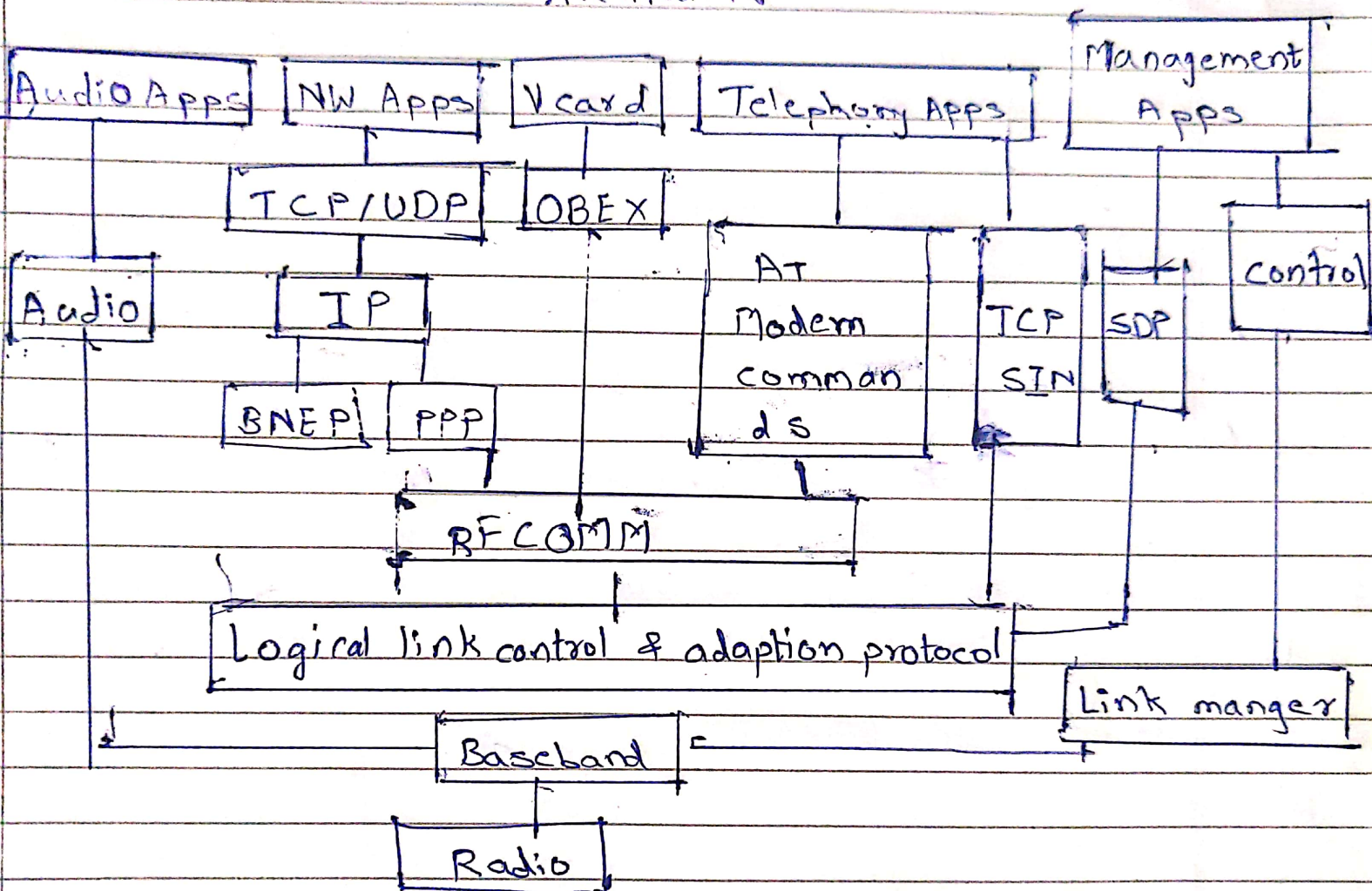
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## Bluetooth Protocol Architecture



- It is also known as Bluetooth Protocol Stack.

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## Core Protocols

### ① Radio Layer

- The radio layer defines the requirements for a bluetooth transceiver.
- Bluetooth uses 2.4 GHz ISM Band

### ② Baseband layer

- Baseband layer uses frequency hopping technique.
- It defines physical links and timing and power control algorithm required for establishing connection between bluetooth devices within piconet.

### ③ Link Manager Protocol

- The LMP is used by the link managers for line set-up and control
- It performs:
  - ① Authentication
  - ② Encryption
  - ③ Power Control
  - ④ QoS Negotiation.



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#### ④ Logical Link Control and Adaptation Protocol.

- It is the layer over the baseband layer and resides in the data link layer.
- LLCAP take care of both connection oriented and connectionless services.

#### ⑤ Service Discovery Protocol.

- Service related queries including device information can be taken care at this protocol so that connection can be established between bluetooth devices.

#### Cable Replacement Protocol

- Serial ports are used to provide serial communication between devices.
- Bluetooth uses RFCOMM as cable replacement protocol
- RFCOMM functions as virtual serial port and does transport of binary digital data bits.

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### Telephony Control Protocols

- TCS - BIN is the protocol used as TCP.
- It is bit oriented protocol
- It specifies call control signals and mobility management procedures

### Adopted Protocols

- These protocols are already defined by other standard bodies which are incorporate without any change in the Bluetooth Protocol Stack Architecture.
- Protocols:
  - PPP is a point to point protocol
  - TCP/UDP and IP
  - OBEX is an Object Exchange Protocol

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SON

- SON stands for Self Organizing networks
- This concept of SON is introduced in LTE and LTE-advanced based networks to provide simple and fast installation and maintenance of the cellular networks
- The LTE SON features can be applied to all available types of network architectures viz. centralized, hybrid and distributed
- LTE SON is further divided into 3 major subcategories:
  - ① Self configuration
  - ② Self optimization
  - ③ Self healing



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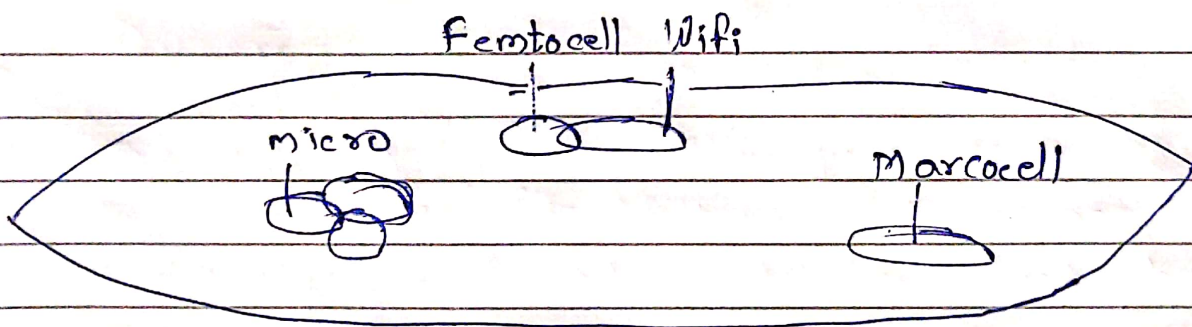
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Hetnet :

- Hetnet stands for Heterogeneous Network
- Heterogeneous networks (HETNET) is a term used for modern mobile communication networks
- A modern mobile communication network is comprised of a combination of different cell types and different access technologies
- A hybrid Hetnet uses a combination of legacy systems (GSM and UMTS) and modern radio access technologies such as LTE.
- Architecture of HetNet.



Architecture of HetNet.