BLUETOOTH

- It is a Wireless Personal Area Network (WPAN) technology and is used for exchanging data over smaller distances. This technology was invented by Ericson in 1994.

- It operates at 2.4 GHz to 2.485 GHz.

- Maximum devices that can be connected at the same time are 7. Bluetooth ranges upto 10 meters. It provides data rates upto 1 Mbps or 3 Mbps depending upon the version

- Open Wireless techology based on mobile computing

Features of Bluetooth

- Wireless and Automatic

- Not Expensive

- Handles both data and voice

- Can pass through walls

- Speed of data transmission =1 MBPS

Application

- Speakers
- Headphone and Headsets
- Wireless Mouse and Keyboards

Advantages

- Wireless
- Cheap
- Low energy consumption
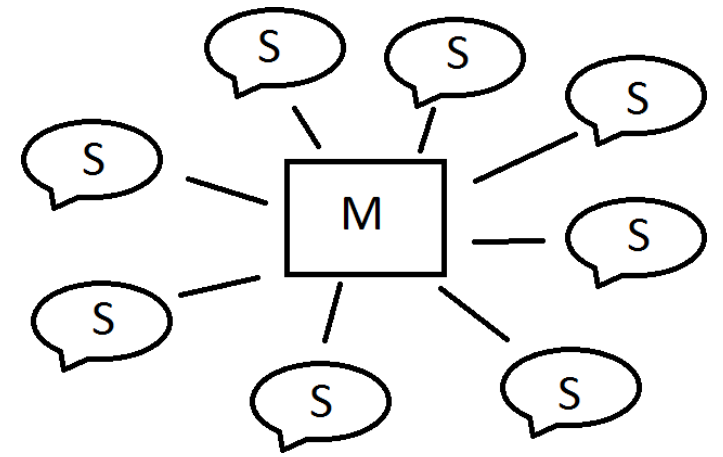- Robust
- Low bandwidth

Disadvantages

- Low Bandwidth
- Low Data transmission range

Blue tooth architecture

- There are two types of Bluetooth network
- Piconets
- Scatternets

Piconets

The first type of Bluetooth network is called as a **piconet** or a **small net.** It can have at the most eight stations.

One of them is called as a **master** and all others are called as **Slaves.**

All the slave's stations are synchronized in all aspects with the master.

A piconet can have only one master station shows piconet. A master can also be called as a primary station and slaves are the secondary station. The communication between a master and slaves can be one-to-one or one-to-many. Note that the communication takes place between the master and slaves but no direct communication takes place between slaves
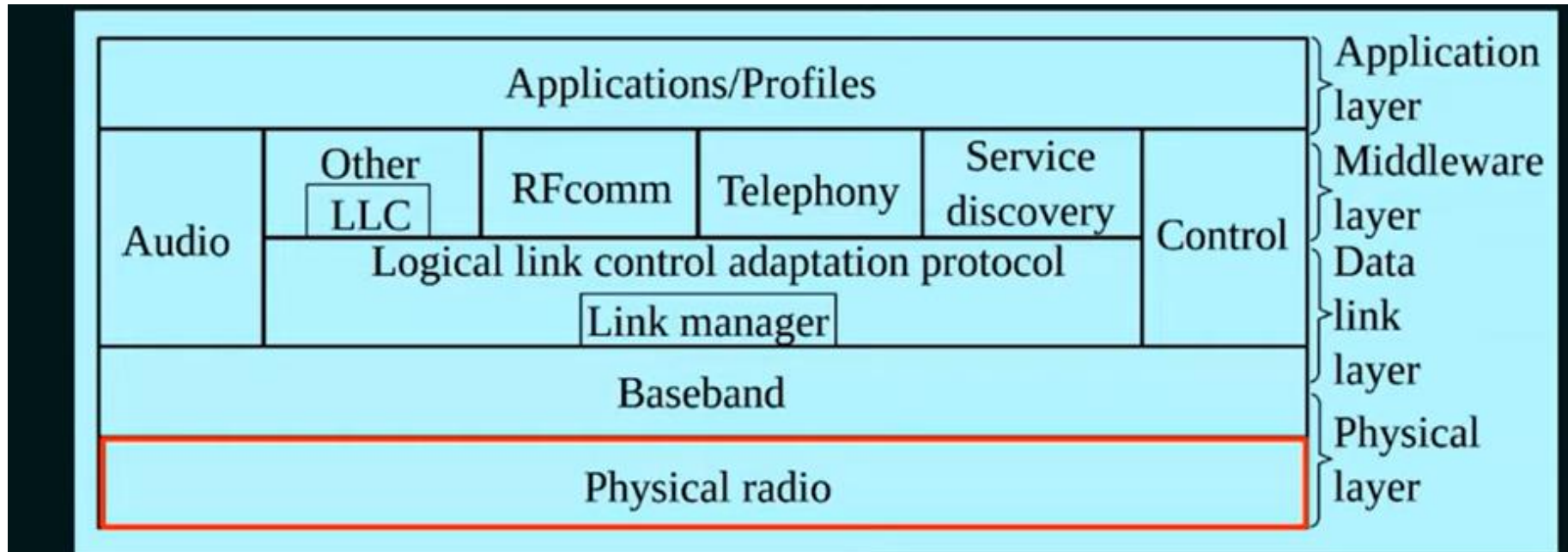
Scatternets

Many piconets may exist simultaneously in a given area and they may even overlap each other.
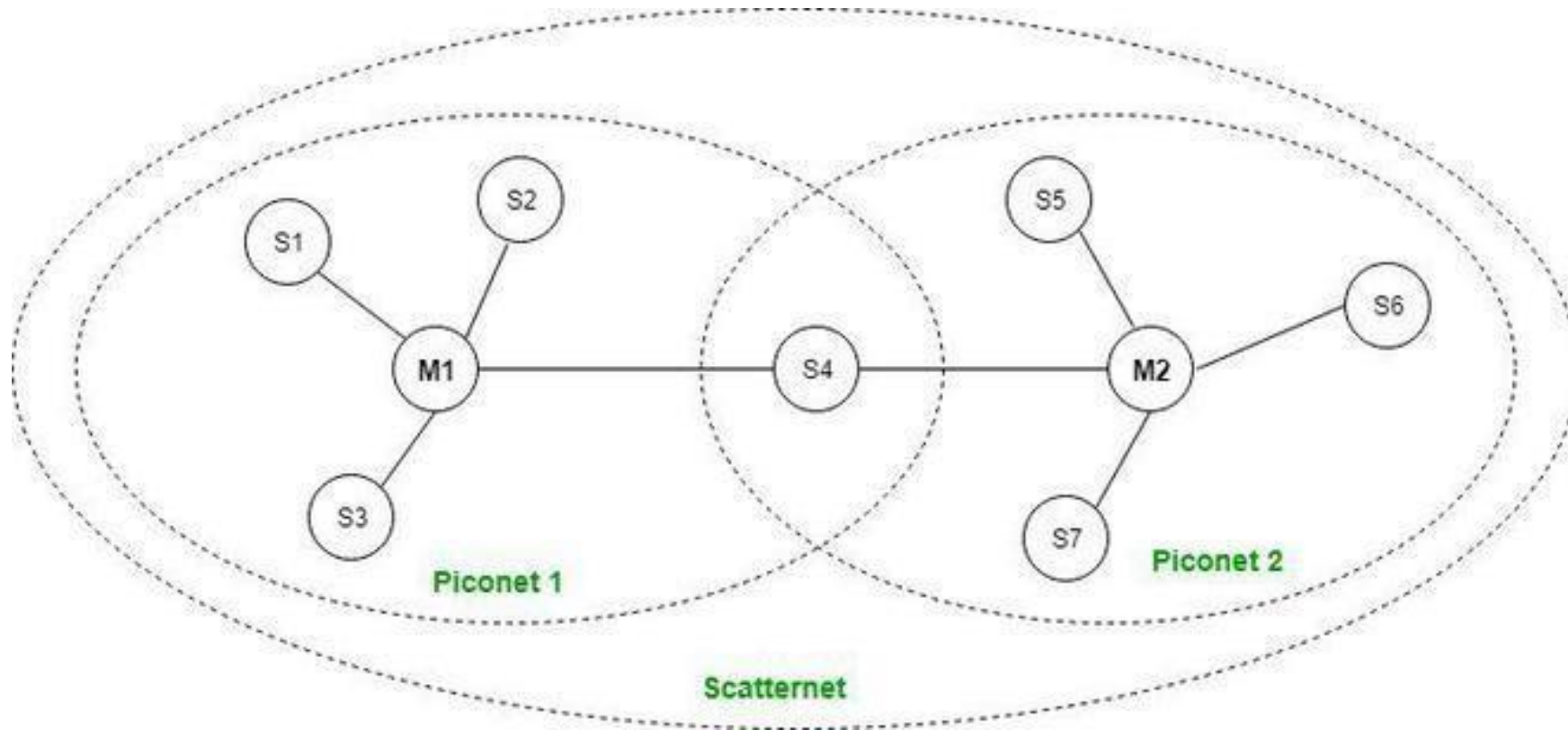
- The fig shows a scatternet consisting two piconets. A slave in the first piconet can act as a master in the second piconet. It will receive the messages from the master in the first piconet by acting as a slave and then delivers the message to the slaves in the second piconet as shown in the figure. So the Number of piconets, the possibility of collisions increases.

- This will result in degradation of performance.

Bluetooth Protocol Stack

| | | | | | |
Applications/Profiles					Application layer
Audio	Other LLC	RFcomm	Telephony	Service discovery	Control
	Logical link control adaptation protocol				
	Link manager				
Baseband					
Physical radio					

- Radio (RF) layer: It specifies the details of the air interface, including frequency, the use of frequency hopping and transmit power. It performs modulation/demodulation of the data into RF signals. It defines the physical characteristics of Bluetooth transceivers. It defines two types of physical links: connection-less and connection-oriented.

- Baseband Link layer: The baseband is the digital engine of a Bluetooth system and is equivalent to the MAC sublayer in LANs. It performs the connection establishment within a piconet, addressing, packet format, timing and power control.

- Link Manager protocol layer: It performs the management of the already established links which includes authentication and encryption processes. It is responsible for creating the links, monitoring their health, and terminating them gracefully upon command or failure.

- Logical Link Control and Adaption (L2CAP) Protocol layer: It is also known as the heart of the Bluetooth protocol stack. It allows the communication between upper and lower layers of the Bluetooth protocol stack. It packages the data packets received from upper layers into the form expected by lower layers. It also performs segmentation and multiplexing.

- Service Discovery Protocol (SDP) layer: It is short for Service Discovery Protocol. It allows discovering the services available on another Bluetooth-enabled device.

- RF comm layer: It is short for Radio FrontendComponent. It provides a serial interface with WAP and OBEX.

- OBEX: It is short for Object Exchange. It is a communication protocol to exchange objects between 2 devices.
- WAP: It is short for Wireless Access Protocol. It is used for internet access.
- TCS: It is short for Telephony Control Protocol. It provides telephony service. The basic function of this layer is call control (setup & release) and group management for the gateway serving multiple devices.
- Application layer: It enables the user to interact with the application.

Bluetooth Frame Format

Blutooth frame format
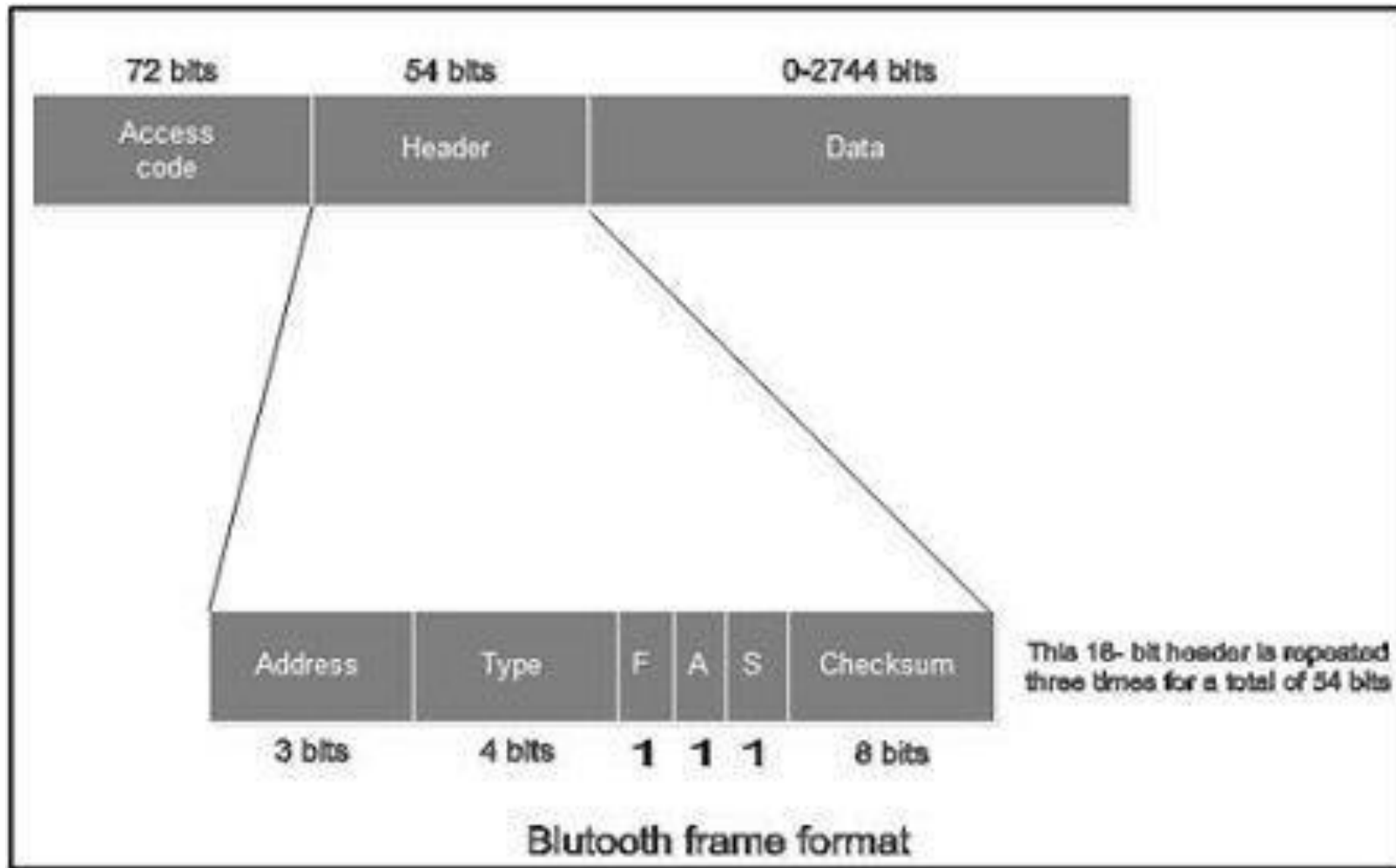
- 1. Access Code: It is 72 bit field that contains synchronization bits. It identifies the master.
- 2. Header: This is 54-bit field. It contain 18 bit pattern that is repeated for 3 time.
- The header field contains following subfields:
- (i) Address: This 3 bit field can define upto seven slaves (1 to 7). If the address is zero, it is used for broadcast communication from primary to all secondaries.
- (ii)Type: This 4 bit field identifies the type of data coming from upper layers.
- (iii) F: This flow bit is used for flow control. When set to 1, it means the device is unable to receive more frames. (iv) A: This bit is used for acknowledgement.

(iv) A: This bit is used for acknowledgement.

(v) S: This bit contains a sequence number of the frame to detect retransmission. As stop and
wait protocol is used, one bit is sufficient.

(vi) Checksum: This 8 bit field contains checksum to detect errors in header.

3. Data: This field can be 0 to 2744 bits long. It contains data or control information coming
from upper layers