SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 107

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Department of Information Technology

Introduction to Mobile Communication

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Wireless Networks

UNIT III WIRELESS NETWORKS **9**

Wireless LANs and PANs – IEEE 802.11 Standard – Architecture – Services – Blue Tooth- Wi-Fi – WiMAX

Wireless LANs and PANs

Advantages of Wireless LANs

- Flexibility
- Planning
- Design
- Robustness
- Cost

Wireless LANs and PANs

Disadvantages of Wireless LANs

- Quality Of Service
- Proprietary Solutions
- Restrictions
- Safety and Security

Wireless LANs and PANs

Before designing a WLAN

- Global Operations
- Low Power
- License-Free Operation
- Robust transmission Technology
- Simplified Spontaneous Cooperation.

Wireless LANs and PANs

Before designing a WLAN

- Easy to use
- Protection of Investment
- Safety and Security.
- Transparency for applications.

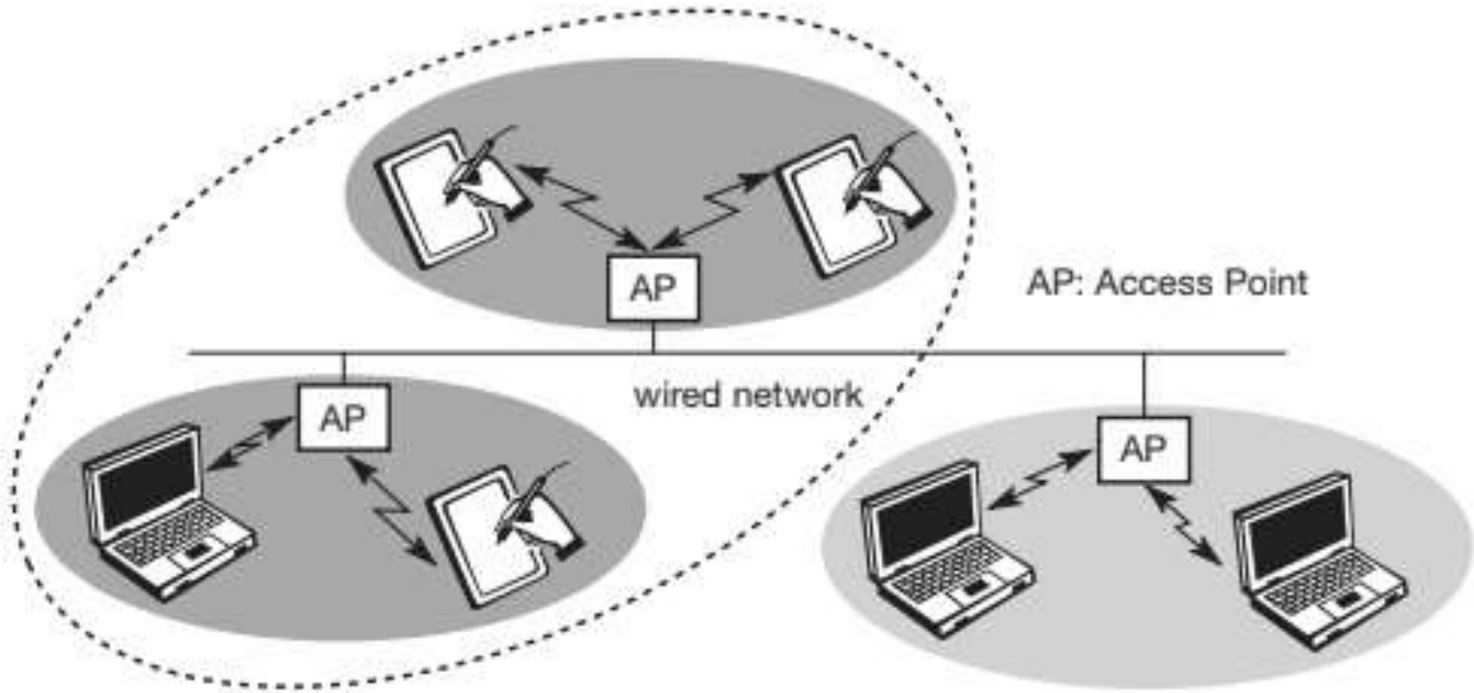
Wireless LANs and PANs

Basic Transmission Technologies

- **Infra Red Light**
- Advantages: simple
  Disadvantages: low bandwidth
- **Radio Transmission**
- Advantages: Can cover larger Areas
  Disadvantages: Interference

Infrastructure and ad-hoc networks

Figure 7.1
Example of three infrastructure-based wireless networks



IEEE 802.11Standard Architecture

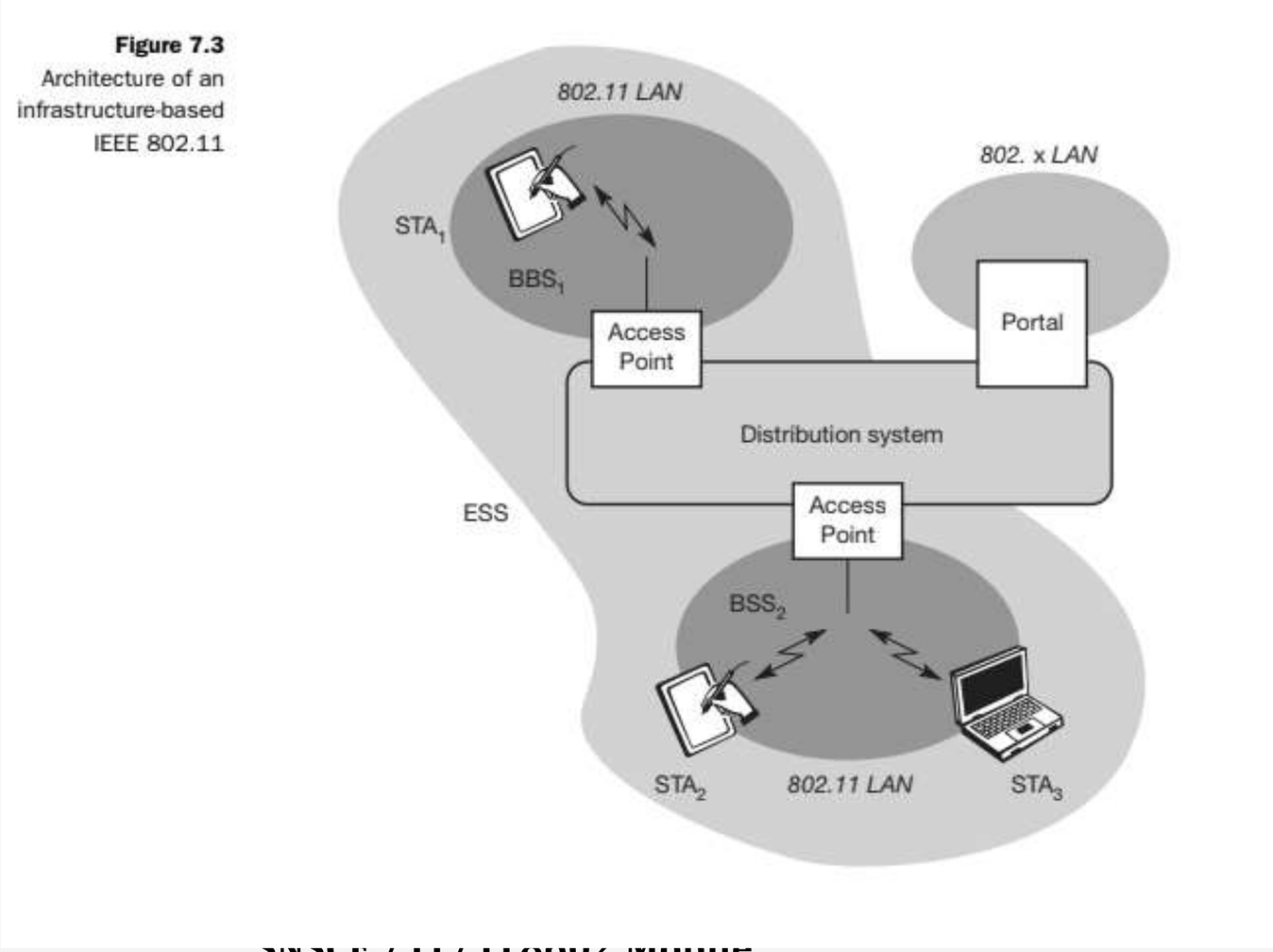


Figure 7.3 Architecture of an infrastructure-based IEEE 802.11

IEEE 802.11Standard Architecture

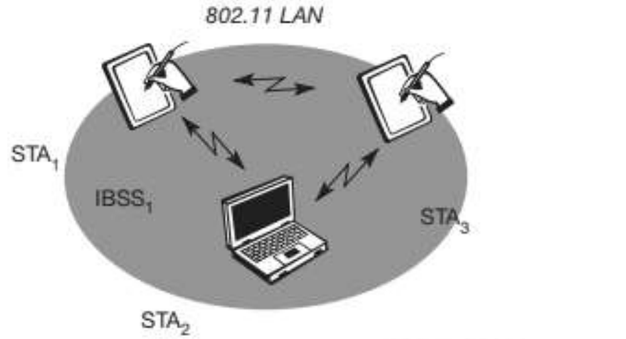


Figure 7.4
Architecture of IEEE 802.11 ad-hoc wireless LANs

IEEE 802.11Protocol Architecture

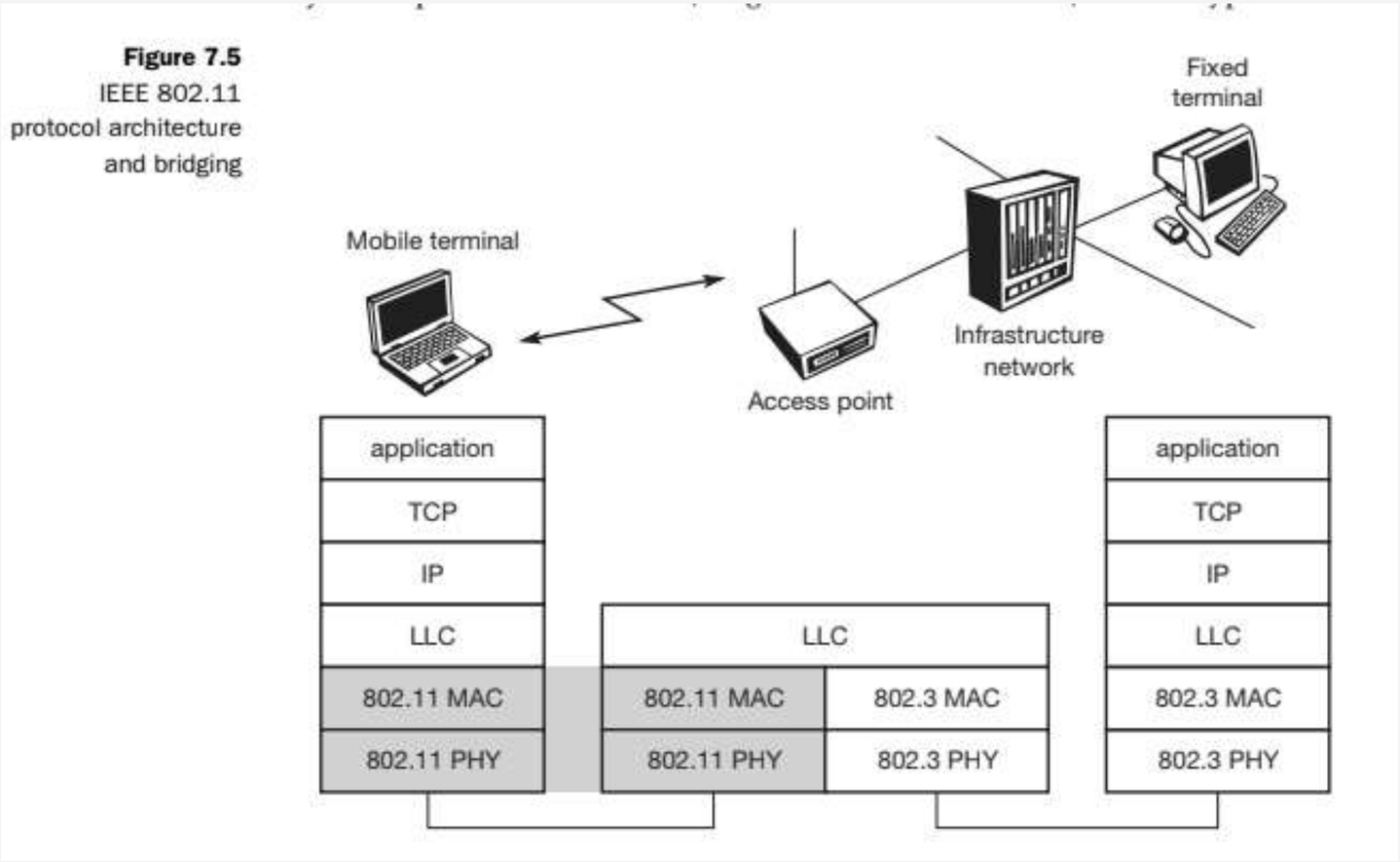


Figure 7.5 IEEE 802.11 protocol architecture and bridging

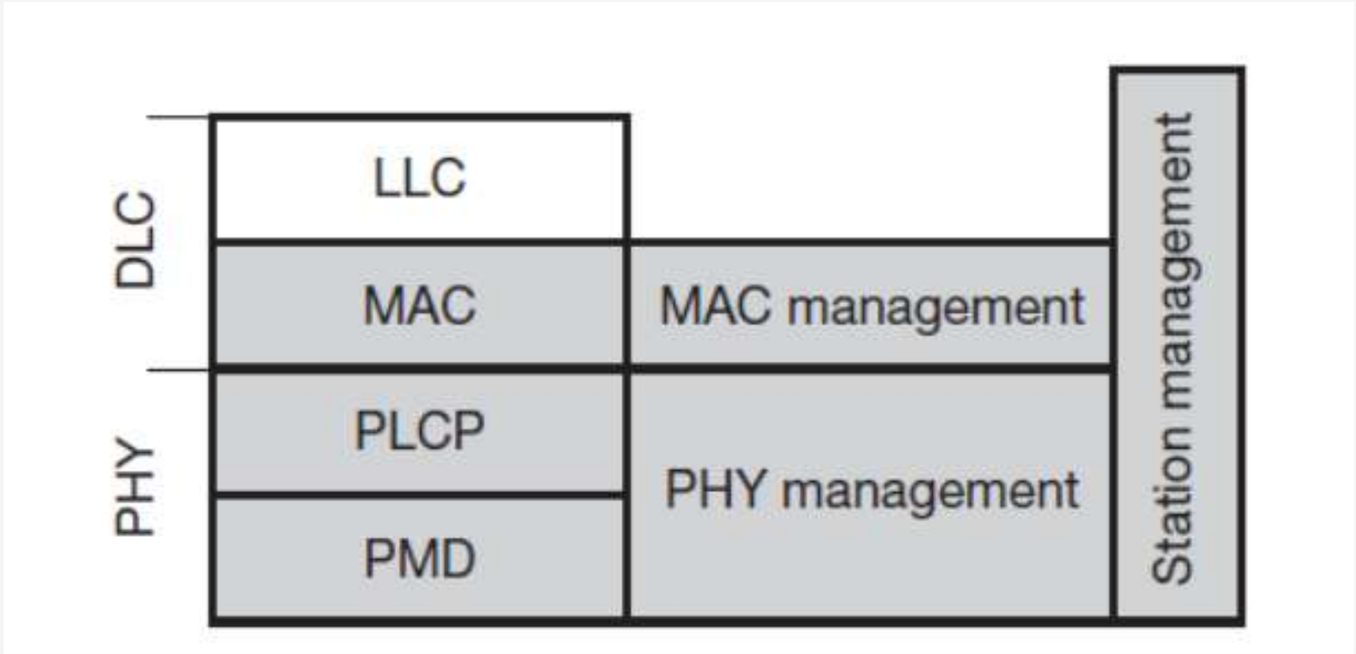
IEEE 802.11Protocol Architecture

Physical Layer:

- It is divided onto two sublayers
  - Physical layer convergence protocol(PLCP)
  - Physical Medium Dependent(PMD)

The basic tasks of MAC layer comprises of medium access, fragmentation of user data and encryption.

IEEE 802.11Protocol Architecture



IEEE 802.11Protocol Architecture

PLCP:

Carrier Sense Signal (Clear Channel Assessment)

Service Access Point(SAP)

PMD:

Modulation

Encoding/Decoding of signals

MAC management supports the association and re-association of a station to an access point and roaming between different access points.

IEEE 802.11Protocol Architecture

- Authentication mechanisms
- Encryption
- Synchronization of a station
- Power Management
- Management Information Base

PHY management include channel tuning and PHY MIB maintenance

IEEE 802.11Protocol Architecture

- MAC Management
- Power Management
- Roaming

MAC Management

- **Synchronization:** Functions to support finding a wireless LAN, synchronization of internal clocks, generation of beacon signals.
- **Power management:** Functions to control transmitter activity for power conservation, e.g., periodic sleep, buffering, without missing a frame.
- **Roaming:** Functions for joining a network (association), changing access points, scanning for access points.
- **Management information base (MIB):** All parameters representing the current state of a wireless station and an access point are stored within a MIB for internal and external access. A MIB can be accessed via standardized protocols such as the simple network management protocol (SNMP).

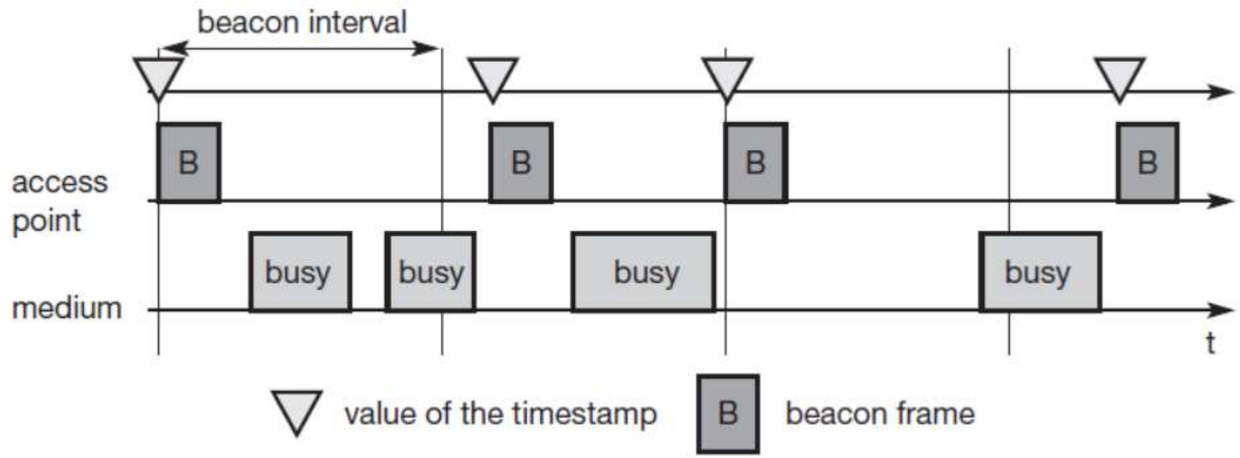
Synchronization

- Each node of the network maintains an internal clock to synchronize the clock of all nodes it specifies a timing synchronization function(TSF).
    - Power Management
    - Coordination of Frames
    - Synchronization of the hopping Sequence.

Synchronization

- The access point performs synchronization by transmitting the periodic beacon signals where all other wireless nodes adjust their local timer to the timestamp.

Figure 7.18
Beacon transmission in a busy 802.11 infrastructure network



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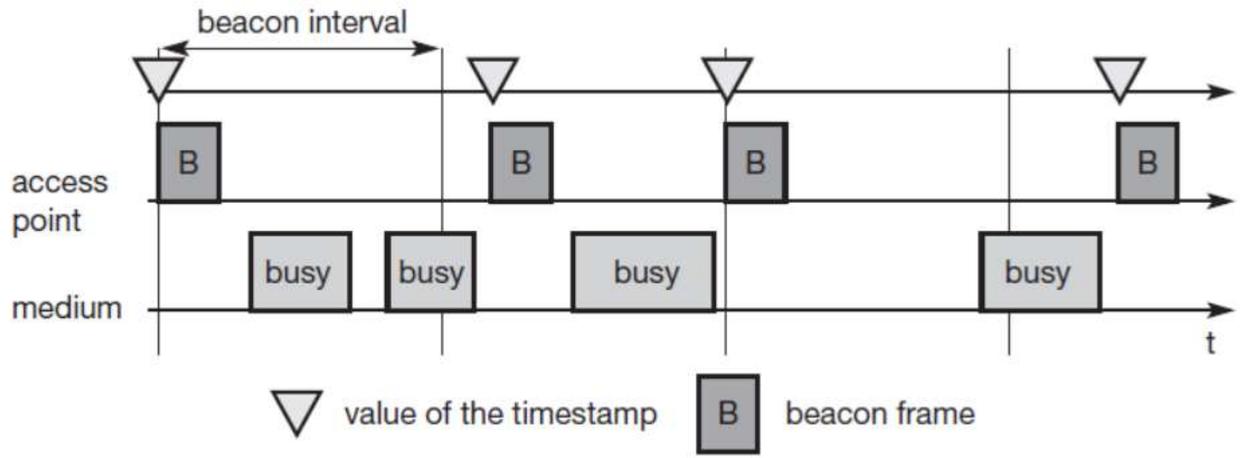

Bluetooth

- Bluetooth technology are local Area Networks with very limited coverage and without the need for an infrastructure.
- This is a different type of network is needed to connect different small devices in close proximity.
- The range is typically 2m within the built in Interfaces.
- It does not need internet .

Bluetooth

- The main advantage is its low cost and it can be found in any mobile devices.(laptops,pda,mobile phones)
- A Bluetooth chip is enough instead of a wireless adapter.
- A very important term in the Bluetooth is piconet.
- A piconet is a collection of Bluetooth devices which are synchronized to the same hopping sequence.

Bluetooth

- One device in the piconet can act as master(M).
- All other devices to the master must act as slaves(S).
- The master determines the hopping pattern in the piconet and the slaves have to synchronize to this pattern.
- There are two types of devices parked devices and stand by devices.
- The master will send its clock and device ID.
- The unit establishing the piconet becomes master

Bluetooth

- The hopping pattern is determined by the device ID ,a 48- bit world wide unique identifier.
- The phase in the hopping pattern is determined by the master's clock.
- The internal clock is adjusted.
- Active devices(Active Member Address (AMA).
- Parked devices(Parked Member Address (PMA).

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Bluetooth

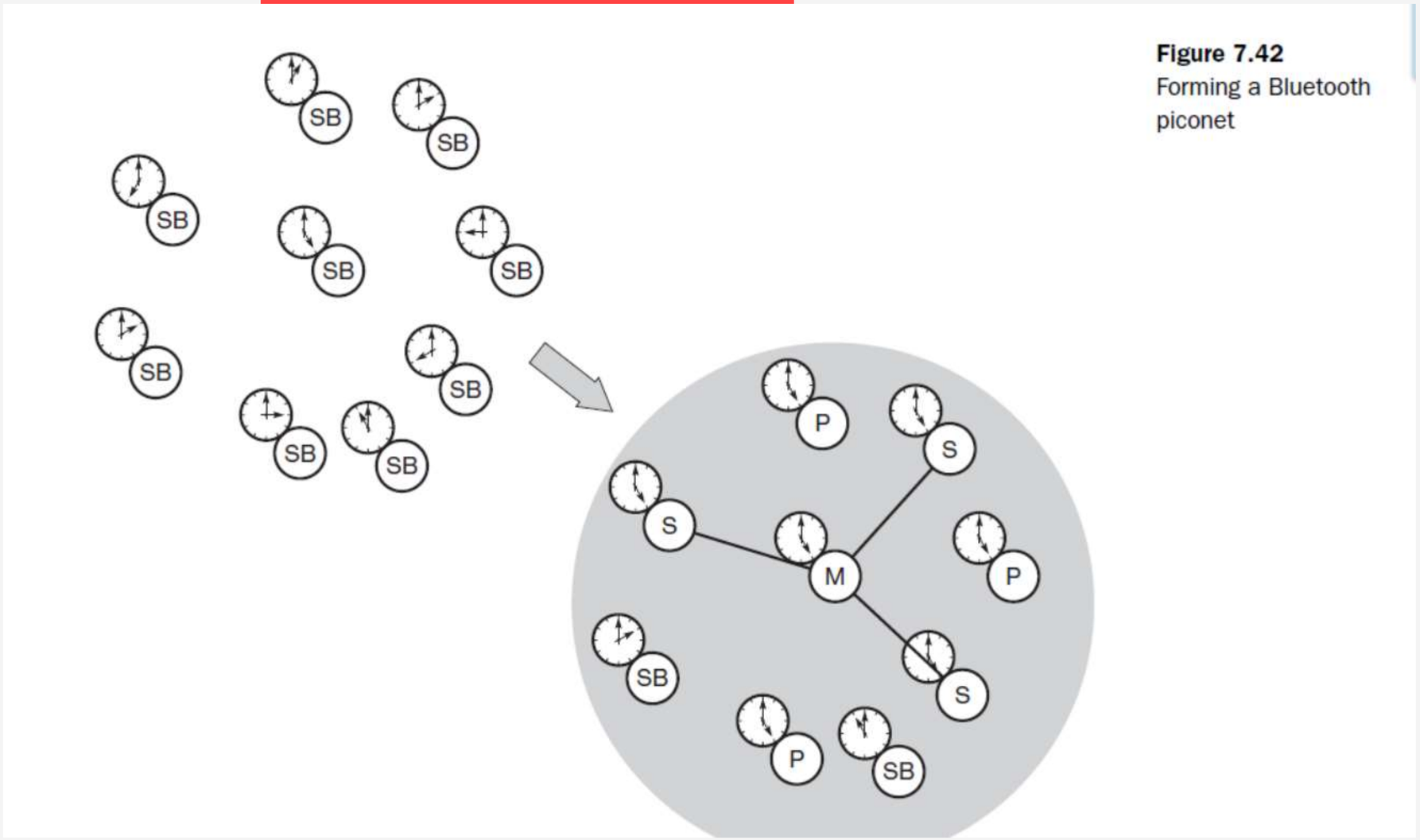


Figure 7.42
Forming a Bluetooth piconet

Bluetooth

- Bluetooth uses FH-CDMA technology.
- **Radio**: Specification of the air interface , i.e., frequencies ,modulation and transmit power.
- **Baseband**: Description of basic connection establishment, packet formats ,timing and basic QoS Parameters.
- **Link Manager Protocol:** Link set up and management between devices including security functions and parameter negotiation.

Bluetooth

- Logical Link Control and Adaptation Protocol: Adaptation of higher layers to the baseband.

- Service Discovery Protocol: Device discovery in close proximity plus querying of service characteristics.

Bluetooth Protocol Stack

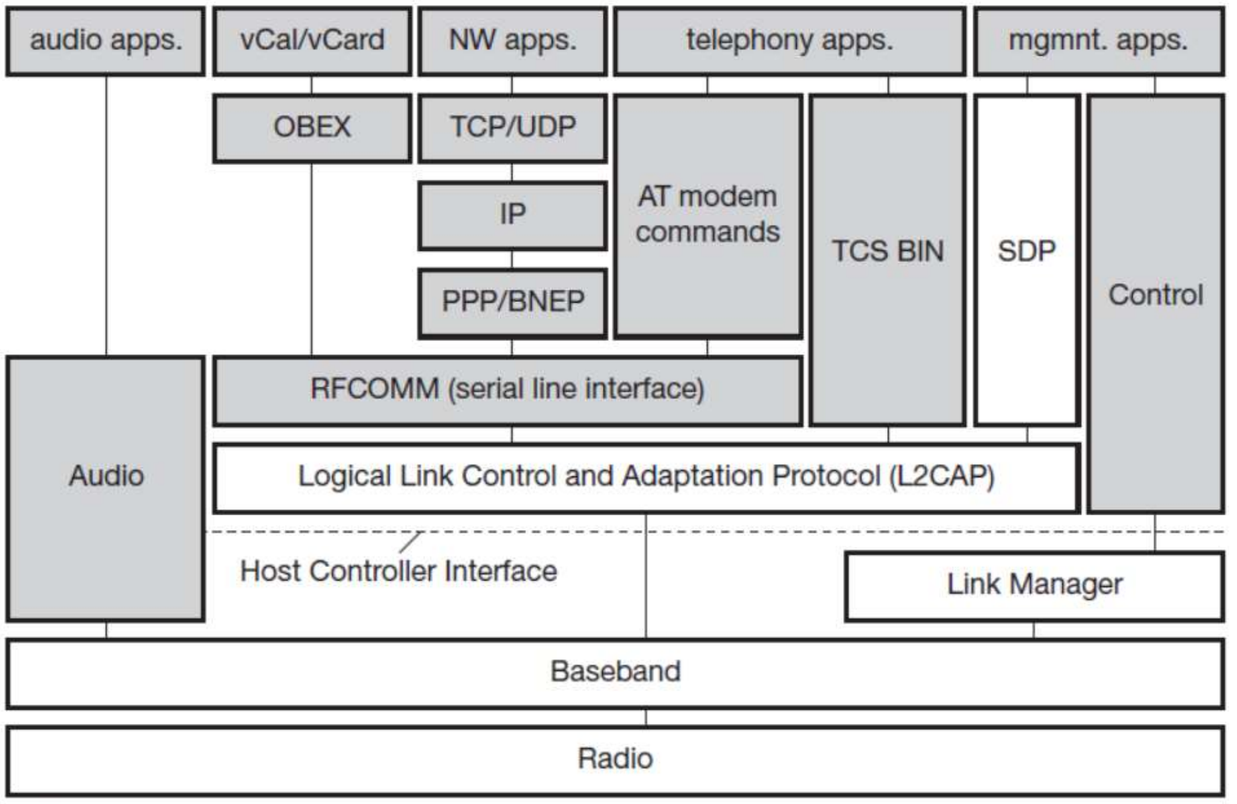
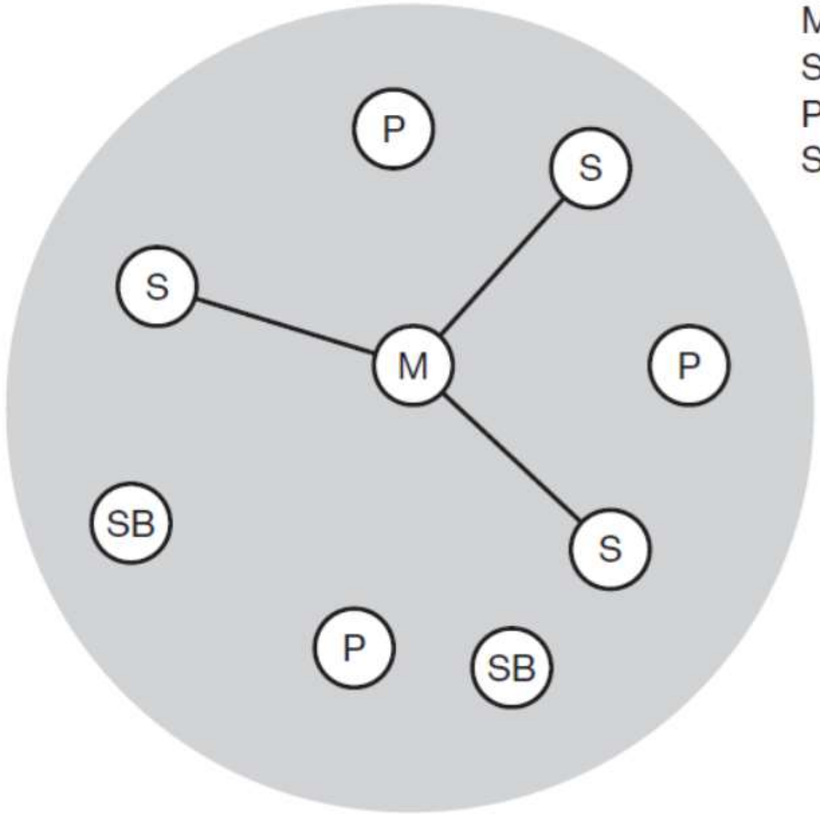


Figure 7.44
Bluetooth protocol stack

AT: attention sequence
OBEX: object exchange
TCS BIN: telephony control protocol specification – binary
BNEP: Bluetooth network encapsulation protocol
SDP: service discovery protocol
RFCOMM: radio frequency comm.

Bluetooth

Figure 7.41
Simple Bluetooth piconet



M = Master
S = Slave
P = Parked
SB = Standby