# Chapter 7 – Internet and Higher-Level Protocols

* In infrastructure mode, base station connects mobiles to wired networks.
* Handoff – When mobile changes base station providing connection into different wired network.
* AD Hoc Mode
  + It is a mode where there is no base station.
  + Nodes can transmit to those nodes that are linked in a coverage area.
  + In this mode, nodes organize themselves into network and route amongst each other.
* Wireless Network Topology - Single Hop
  + Infrastructure Mode
    - Host connects to base station and the base station connect to Internet
  + AD HOC Mode
    - There are no base station and hence cannot be connected to Internet
* Wireless Network Topology - Multi Hop
  + Infrastructure Mode
    - Node relays thru’ several wireless connections to connect to the internet
  + AD HOC Mode
    - It can relay thru’ different wireless node but cannot connect to the internet
* Wireless Link Characteristics – Differences from Wired Link
  + Decreased signal strength – attenuation of the signal over propagation.
  + Interference from other sources
  + Multipath propagation – R/F signals reflects from objects while travelling and are slightly different when arriving at destination.
  + Larger Signal-Noise-Ratio (SNR)
* Code Division Multiple Access (CDMA)

Every user shares same frequency but have a unique code (chipping sequence) to encode data, which identifies every user.

It allows the users to ‘coexist’ as well as transmit simultaneously without any interference

Decoding – The inner product of the encoded signal and chipping sequence.

* IEEE 802.11 Wireless LAN

It is a LAN cable with a spectrum of 2.4 -5 GHz of unlicensed spectrum

802.11b – Has 11 channels - up to 11 Mbps

802.11a – spectrum of 5-6 GHz - up to 54 Mbps

802.11g – up to 54 Mbps

802.11n – up to 200 Mbps

* IEEE 802.11 Wireless LAN Architecture
  + Every wireless host communicates with base station
  + Base Service Set (BSS) – It is present in infrastructure mode. Every coverage area contains
    - Wireless Host
    - Access Points (Base Station)
    - AD HOC Mode – there are hosts only
* How to Avoid Collision in IEEE 802.11 MAC Protocol: CSMA/CA

Allow sender to send a ‘reserve’ channel rather than random access of data frames.

1. Sender first transmits an Request-to-send (RTS) to Base station via CSMA
2. BS broadcasts Clear-to-send (CTS) to everyone so that it is heard by all nodes and now sender can transmit data.

* Cellular Network Architecture

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* 2G Voice Network Architecture  
  Every Public Telephone Wired Network has multiple Gateway Mobile Switching Center (G-MSC). These G-MSC consists of multiple MSC which further consists of Base Station Controllers (BSCs).  
  These BSCs help in maintaining the BTS or BS which further helps public network connect to individual APs.
* 4G Voice Network Architecture  
  There are multiple stages in this N/w arch.   
  1) It contains Public Network which is further extended to General Packet Radio Service (GPRS) core network  
  The GPRS N/w consists of Gateway GPRS Support Node (GGSN) and Serving GPRS Support Node (SGSN) which helps to operate data N/w in parallel.

2) It has Mobility Management Service (MME) and Host Subscriber Service (HSS) which maintains the flow control of every node and GGSN and SGSN are responsible for data transmission. This portion is the Evolved Packet Core (EPC) which executes the base idea of parallel functioning.

* Home Agent – Is an entity that will perform all the mobility functions on behalf of the mobile, when it is remote.
* Home Network – It is the permanent ‘home’ of mobile. It carries a permanent address using which we can contact the mobile.
* Foreign Network – It is the network other than Home network in which the mobile currently resides. It has a foreign agent which performs all the mobility functions on behalf of the Foreign N/w
* Correspondent Node - A Node in the public N/w who wants to communicate with the mobile device irrespective of what N/w it is in.
* Mobility Approach:
  + Let routing handle it
  + Let end-systems handle it
    - Indirect Routing – Correspondent -> Home Agent -> Remote
    - Direct Routing – Correspondent -> Foreign Addr. of Mob -> Remote