Management and Control Services

- Association management
- Handoff
- Security: authentication and privacy
- Power management
- QoS
802.11: Infrastructure

- **Station (STA)**
  - Terminal with access to the wireless medium and radio contact to the access point

- **Access Point**
  - Station integrated into the wireless LAN and the distribution system

- **Basic Service Set (BSS)**
  - Group of stations using the same AP

- **Portal**
  - Bridge to other (wired) networks

- **Distribution System**
  - Interconnection network to form one logical network (ESS: Extended Service Set) based on several BSS
Service Set Identifier - SSID

- Mechanism used to segment wireless networks
  - Multiple independent wireless networks can coexist in the same location
  - Effectively the name of the wireless network
- Each AP is programmed with a SSID that corresponds to its network
  - Client computer presents correct SSID to access AP

Security Compromises
- AP can be configured to “broadcast” its SSID
- Broadcasting can be disabled to improve security
- SSID may be shared among users of the wireless segment
Association Management

- Stations must associate with an AP before using network
  - AP must know about them so it can forward packets
  - Often also must authenticate
- Initiated by the wireless host
- Scanning
  - Finding out what access points are available
- Selection
  - Deciding what AP (or ESS) to use
- Association
  - Protocol to “sign up” with AP – involves exchange of parameters
- Authentication
  - Needed to gain access to secure APs – many options possible
- Disassociation
  - Station or AP can terminate association
Association Management: Scanning

- Stations can detect AP based by scanning
- **Passive Scanning**
  - Station simply listens for Beacon and gets info of the BSS
    - Beacons are sent roughly 10 times per second
    - Power is saved
- **Active Scanning**
  - Station transmits Probe Request; elicits Probe Response from AP
    - Saves time + is more thorough
    - Wait for 10-20 msec for response
- **Scanning all available channels can become very time consuming!**
  - Especially with passive scanning
  - Cannot transmit and receive frames during most of that time – not a big problem during initial association
Association Management: Selecting an AP and Joining

- Selecting a BSS or ESS typically involves the user
  - What networks do you trust? Are you willing to pay?
  - Can be done automatically based on stated user preferences (e.g. the “automatic” list in Windows)

- The wireless host selects the AP it will use in an ESS based on vendor-specific algorithm
  - Uses the information from the scan
  - Typically simply joins the AP with the strongest signal

- Associating with an AP
  - Synchronization in Timestamp Field and frequency
  - Adopt PHY parameters
  - Other parameters: BSSID, WEP, Beacon Period, etc.
Association Management: Roaming

- **Reassociation**
  - Association is transferred from active AP to a new target AP
    - Supports mobility in the same ESS – layer 2 roaming
  - Initiated by wireless host based on vendor specific algorithms
    - Implemented using an Association Request Frame that is sent to the new AP
    - New AP accepts or rejects the request using an Association Response Frame
Association Management: Reassociation Algorithms

- **Failure driven**
  - Only try to reassociate after connection to current AP is lost
    - Typically efficient for stationary clients since it not common that the best AP changes during a session
    - Mostly useful for nomadic clients
    - Can be very disruptive for mobile devices

- **Proactive reassociation**
  - Periodically try to find an AP with a stronger signal
    - Tricky part: cannot communicate while scanning other channels
    - Trick: user power save mode to “hold” messages
    - Throughput during scanning is still affected though
      - Mostly affects latency sensitive applications