Wireless LANs

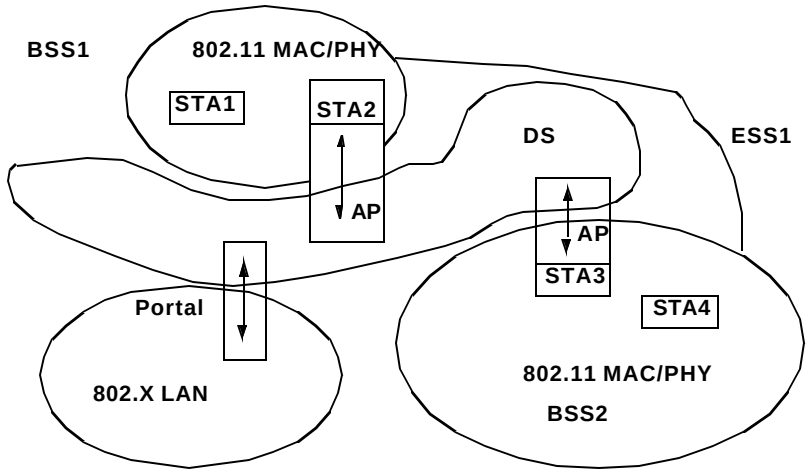
General Characteristics

- Wireless channel noisy, subject to fading, error rate is high and errors are bursty.
- Transmission speeds typically much lower, especially at reasonable cost.
- Hence QoS issues are significant and are a mismatch with wired LANs, requiring special interworking systems.
- Most systems are experimental and most research work has concentrated on physical layer and MAC, e.g. CDMA, TDMA.
- Commercial systems use Ethernet-based MAC protocols and range from 38 kb/s to 5.7 Mb/s.
- There is a new standard IEEE 802.11 for wireless LANs.
- Higher bandwidth, multimedia LANs are a major current research topic.

Introduction to IEEE 802.11

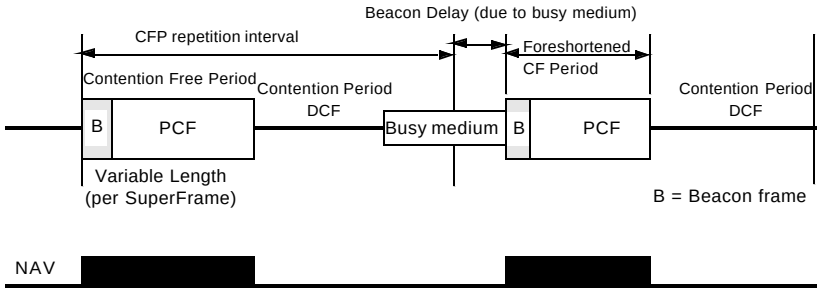
- IEEE 802.11 draft standard for wireless LANs:
  - 1-2 Mb/s on radio, ISR band;
  - 1-10 Mb/s infrared.
- Introduces a wireless MAC algorithm that includes:
  - DCF: Distributed control function for contention access, (ethernet style of contention);
  - PCF: Point control function for polling control by master station.
  - Hence MAC chips and cards will become available.
- Physical layer has several options:
  - 1 and 2 Mb/s frequency hopping spread spectrum;
  - 1 and 2 Mb/s direct sequence spread spectrum;
  - 1 and 2 Mb/s direct-modulated infrared;
  - 4 Mb/s carrier-modulated infrared;
  - 10 Mb/s multi-subcarrier-modulated infrared.

802.11 Architecture



DS: Distribution system (non-radio backbone).
AP: Access Point, interface between DS and wireless cell.
BSS: Basic service set: Stations controlled by single Coordination Function (CF).

802.11 MAC: CFP/CP Alternation



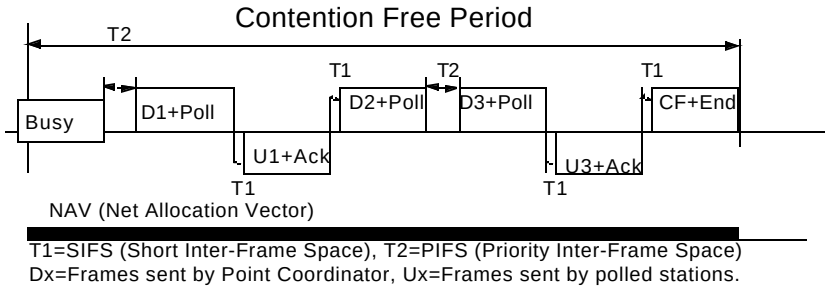
- Alternating periods of contention and contention-free period.
- Contention period uses Distributed Coordination Function (DCF) similar to Ethernet access.
- Contention-free period uses Point Coordination Function (PCF) based on polling plus access requests received during contention period.
- PCF located in Access Point.
- PCF permits QoS suited to delay-bounded, synchronous traffic.
- NAV: Network Allocation Vector (time allocated to stations during PCF)

CFP/CP Alternation: Notes

- Alternating periods of contention and contention-free period.
- Contention period uses Distributed Coordination Function (DCF) similar to Ethernet access.
- Contention-free period uses Point Coordination Function (PCF) based on polling plus access requests received during contention period.
- PCF permits QoS suited to delay-bounded, synchronous traffic.

Point Coordination Function of 802.11

- PCF Uses a point coordinator polling user stations to determine which station currently has the right to transmit.



T1=SIFS (Short Inter-Frame Space), T2=PIFS (Priority Inter-Frame Space)
Dx=Frames sent by Point Coordinator, Ux=Frames sent by polled stations.