

**Final Review {February 25, 2013}**

## F. Transmission Media

1. twisted pair
  - a. UTP Cat 5e,6,7

----- **Final Material Begins Here !!** -----

- b. Dial up connections
  - c. ADSL, VDSL
  - d. Hub topology (10BASET)
2. Coaxial cable
  - a. baseband
    - i. 10BASE2
    - ii. 10BASE5
  - b. broadband {CATV}
    - i. HFC
3. Optical Fiber
  - a. three types of fiber
  - b. three different wavelengths
  - c. FTTH
    - i. FiOS

## V. Local Area Networks

- A. "The Channel Allocation Problem"
  1. assumptions
- B. LAN Performance Notation
  1. relative propagation time - **a**
  2. S, I, and G {throughput, input load, offered load}
- C. ALOHA
- D. Slotted ALOHA
- E. CSMA
  1. non-persistent
  2. 1-persistent
  3. p-persistent
- D. CSMA/CD
- E. Ethernet
  1. binary exponential backoff
  2. Ethernet evolution (10Base5, 10Base2, 1Base5, 10BaseT)
- F. Switched Ethernet
  1. backward learning

## VI. More LAN Topics

- A. Bridges
  1. backward learning
  2. collision domains
  3. loops
    - a. transparent bridges (spanning trees)
    - b. source routing bridges
- B. Token Ring

## VII. Wireless LANs

- A. Classification
  - 1. Infrastructure
  - 2. Ad Hoc
  - 3. MANET
- B. 802.11 Protocols
  - 1. infrared
  - 2. FHSS
  - 3. DHSS
    - a. 11-bit chipping Barker sequence
    - b. CDMA
  - 4. 802.11a
    - a. OFDM
  - 5. 802.11b
    - a. HR-DHSS
  - 6. 802.11g
  - 7. 802.11n
    - a. MIMO
- C. Management Functions
  - 1. Channel Selection and Power Management
  - 2. Authentication, Association, Beacon Management
  - 3. Passive and Active Scanning
- D. MAC Sublayer
  - 1. Hidden Terminal Problem
  - 2. Exposed Station Problem
  - 3. DCF
    - a. CSMA/CA
      - i. MACA
      - ii. RTS/CTS
      - ii. MACAW with Virtual channel sensing
      - iv. 1-persistent physical carrier sensing
      - v. timer countdown
      - vi. SIFS, DIFS
  - 4. 802.11 frame addresses
  - 5. Frame fragmentation
  - 6. PCF
    - a. beacon frame
  - 7. Implementation Details
    - a. Dynamic Rate Adaptation
- VIII. Wireless Measurement
  - A. "Characterization of 802.11 Wireless Networks in the Home"**
  - B. "Performance Anomaly of 802.11b"**
- IX. Cellular and Mobile Networks
  - A. Cellular Architecture
    - 1. Base Station and MSC
    - 2. combined FDM/TDM
    - 3. CDMA

- 4. GSM
  - B. 2G {voice}
    - 1. BSS, BTC, BSC
  - C. 2.5G {voice and data}
    - 1. GPRS, EDGE, CDMA-2000
    - 2. SGSN, GGSN (parallel data network)
  - D. 3G {voice/data}
    - 1. UTMS, CDMA-2000, EVDO
  - E. 4G LTE
    - 1. PRB
  - E. Mobile Networks
    - 1. home network, agents, correspondent, visited network
    - 2. permanent address, care-of-address (COA), registration
    - 3. Indirect Routing
    - 4. Direct Routing
      - a. anchor foreign agent
- X. Wireless Sensor Networks
  - A. Berkeley Mote Revolution
    - 1. Trends, Low Power
    - 2. Periodic versus Triggered events
    - 3. Zigbee Radio
  - B. Details
    - 1. Network Lifetime
    - 2. Energy wastes:
      - a. Idle listening, collisions, overhearing, control overhead, overmitting
    - 3. Communication patterns
      - a. Broadcast, multicast, convergecast, local gossip
    - 4. Lower Duty Cycle
      - a. TDMA
      - b. Scheduling
      - c. LPL
  - C. WSN Types
    - 1. Tiered
    - 2. Cluster-based
  - D. Power-Aware MAC protocols
    - 1. S-MAC
    - 2. T-MAC
    - 3. LPL
    - 4. SCP-MAC
- XI. Introduction to TinyOS and nesC
  - A. nesC
    - 1. Components and interfaces
  - B. Component Model
    - 1. Commands and Events
    - 2. User and Provider
    - 3. Call and signal

4. Event Handlers and tasks
  5. Modules
    - a. Provide interfaces
    - b. Signature/implementation
  6. Configurations
    - a. Wiring and callbacks
  - C. Syntax/ constructs in nesC
    1. 'as'
    2. Generic Interfaces – types
    3. Module variables (private)
    4. Generic Components 'new'
  - D. Split-phase Interfaces
    1. Read
    2. Send
- XII. TinyOS Applications
- A. LEDS, Timer, Boot
  - B. Light Sensing
  - C. Active Messages (AM)
  - D. Platform independent types and structs
  - E. AMSend, packet payloads
  - F. SplitControl
  - G. Receive

**{Only top level topics from this point forward !!}**

- XIII. High Speed LANs
- A. FDDI
    1. differences from 802.5 token ring
    2. 4B/5B encoding
    3. dual ring
    4. TTRT
  - B. Fast Ethernet
    1. 100 Base T4
      - a. four twisted pairs
      - b. 8B/6T encoding
      - c. 33-1/3 Mbps per pair
    2. 100 Base TX
    3. 100 Base FX
  - C. Gigabit Ethernet
    1. Fiber Channel technology
    2. 8B/10B encoding
    3. 1000 Base SX
    4. 1000 Base LX
    5. 1000 Base CX
    6. 1000 Base T
    7. carrier extension
    8. frame bursting
    9. buffered distributor

- 10. 10 and 100 Gigabit Ethernet
- XIV. SONET
  - A. optical fiber standard
    - 1. common master clock
    - 2. byte interleaved TDM
  - B. SONET architecture
    - 1. ADM - add/drop multiplexor
    - 2. REG - regenerator for optical signals
    - 3. section/line/path overhead
  - C. SONET frame
    - 1. SPE Synchronous Payload Envelope
    - 2. Overhead
  - D. Multiplexing hierarchy
    - 1. up to STS-3 and beyond
    - 2. down to virtual tributaries
- XV. ATM {Asynchronous Transfer Mode}
  - A. Basics
    - 1. 53 byte cell-switching technology
    - 2. virtual circuits
  - B. Conceptual Model Assumptions
  - C. Header Details
    - 1. UNI versus NNI
    - 2. VPI/VCI
  - D. Architecture
    - 1. variety of traffic types
      - a. original four types
      - b. revised traffic types
    - 2. AALs
      - a. AAL1
      - b. AAL3/4
      - c. AAL5
    - 3. CS and SAR sublayers
  - E. Cell Switching Issues
    - 1. cells not reordered
    - 2. non-blocking switches
    - 3. PVCs versus SVCs

----- *Final Covers up to Here* -----

- XV. Firewalls and Intrusion Detection Systems (IDS)
  - A. Stateless Packet Filtering
  - B. Stateful Packet Filtering
  - C. Application Gateways
  - D. IDS
- XVI. Distributed Denial of Service (DDoS) {not covered}
  - A. Flood-based DDoS Attack
  - B. Direct Attack

- 1. TCP-SYN Flooding
- C. Reflector Attack
  - 1. Smurf Attack
  - 2. SYN-ACK Attack