COMPUTER NETWORKS
- Review

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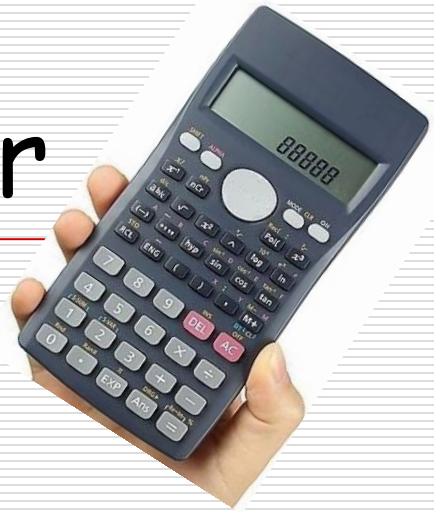
Chapter 1 Introduction

- What is computer network?
- Network category
- Reference model
  - TCP/IP VS. OSI
  - Benefits of layered structure
  - PDU names
- Service VS. Protocol

Chapter 2 Physical Layer



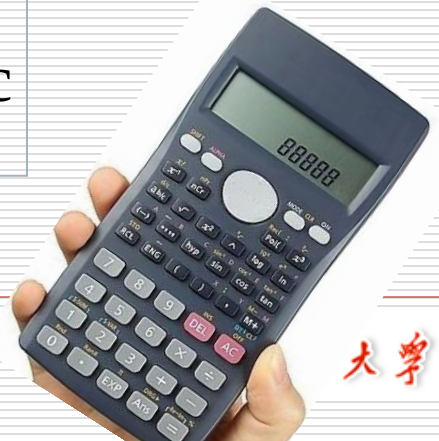
- **Bandwidth – Fourier Series**
  - **Hz and bps**
- **Nyquist theorem**

$$MaxDataRate = 2H \log_2 V \ \ bits/\sec$$

- **Shannon theory**

$$SNR_{dB} = 10 \log_{10}(\frac{S}{N}) \text{ dB}$$

$$MaxDataRate = H \log_2 (1 + \frac{S}{N}) \ \ bits/\sec$$



Chapter 2 Physical Layer(cont'd)

- UTP
- Copper wires and Optical fiber
- Understand modem
  - Amplitude modulation(AM)
  - Frequency modulation(FM)
  - Phase modulation(PM)
  - Quadrature Phrase shift keying (QPSK)

Chapter 2 Physical Layer(cont'd)

- **Master trunk multiplex technology**
  - **Frequency Division Multiplexing**
  - **Time Division Multiplexing**
- **Master circuit-switching ,message switching and packet switching**
- **understand mobile-phone system**
  - **Code division multiple Access (CDMA)**

Chapter 3 data link layer

- **Master framing**
  - **Character count(字符计数法)**
  - **Flag bytes with byte stuffing(带字符填充的首尾界符法)**
  - **Starting and ending flags, with bit stuffing(带位填充的首尾标志法)**
  - **Physical layer coding violations(物理层编码违例法)**

Chapter 3 data link layer(cont'd)

- **Master error detection and correction**
  - **Haimming distance (definition)**
  - **Error correction: hamming code**
    - **Correct one bit error:** $m + r + 1 \leq 2^r$
  - **Error detection:CRC**
- **The error-detecting and error-correcting properties of a code depend on its Hamming distance.**
  - **In order to *detect* d errors, we need a distance of d+1.**
  - **In order to *correct* d errors, we need a distance of 2d+1**

Error correcting and detecting

- **Hamming code**
- **CRC**

Chapter 3 data link layer(cont'd)

- **Master 6 dll's basic protocol**
  - **Utopia**
  - **Stop and wait**
  - **PAR (positive acknowledgement with retransmission) or ARQ (automatic repeat request)**
  - **One-bit sliding window**
  - **Go back n**
  - **Selective repeat**
  - **Max window sizes!**

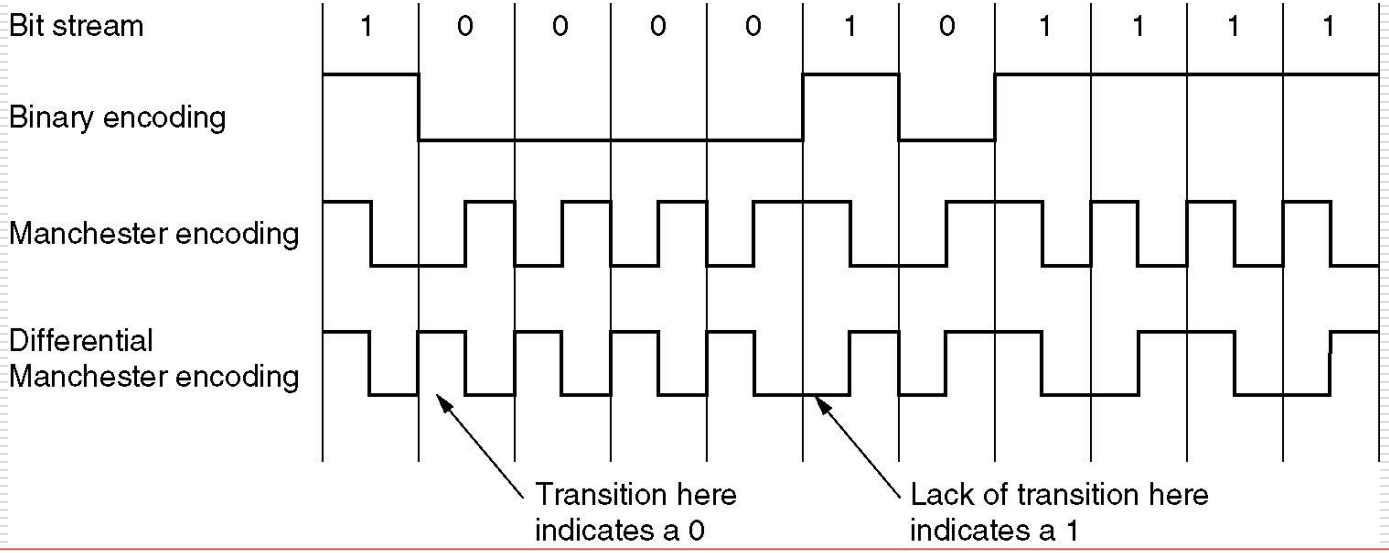
Chapter 4 MAC sublayer(cont'd)

- Multiple Access Protocols
  - ALOHA
    - Pure ALOHA
    - Slotted ALOHA
  - Carrier Sense Multiple Access Protocols
    - 1-persistent CSMA
    - Non-persistent CSMA
    - p-persistent CSMA
    - CSMA/CD (CSMA with Collision Detection)("先听后发、边发边听")
  - Ethernet and IEEE802.3
  - Min frame length!

Chapter 4 MAC sublayer(cont'd)

Bit stream encoding methods

- Manchester Encoding
- Differential Manchester Encoding
- Question - Bit stream is 1001101001, sketch three waves:



MAC sublayer

- MAC address
- Ethernet & IEEE802.3

Working principle of switching

- **Flooding**
- **Backward learning**

Chapter 5 network layer

- Routing Protocol
  - IGP
    - DV:RIP
    - LS:OSPF
- Routed Protocol
  - IPv4
  - IPv6
- BGP

Routing algorithm

- **Routing algorithm**
  - **Static routing algorithm**
    - **Dijkstra**
    - **flooding**
  - **Dynamic routing algorithms**
    - **DV**
    - **LS**
    - **Comparisons**

IPv4

- Main function of router
- Learn IP
  - IP packet format
  - IP address and it's classification
- Reserved IPv4 address

Other protocol and technology

- **Subnet and subnetting**
- **The idea of CIDR**
- **The principle of NAT/PAT**

Sup. :IPv6

- **Advantage of IPv6**
- **Differences with IPv4**

Chapter 6 transport layer

- UDP (segment)
- TCP (segment)

Comparation

- Pseudo header. (why?)
- Socket
- Transport layer and network layer (why?)

Chapter 7 Application layer

- **DNS**
  - **Working principle**
  - **Using UDP(why?)**

Lab sessions

- Router operations
- Networking
- Socket

- **THANKS!**
- **BEST of LUCK!**

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