

# INF3190 - Data Communication

## Summary (part 2)

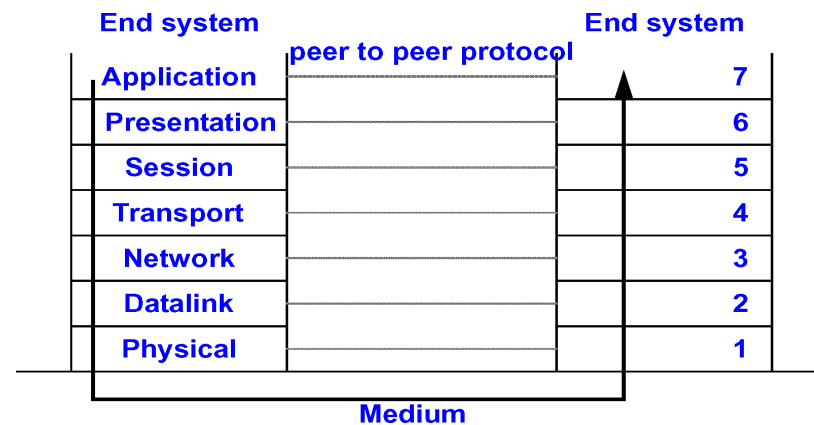
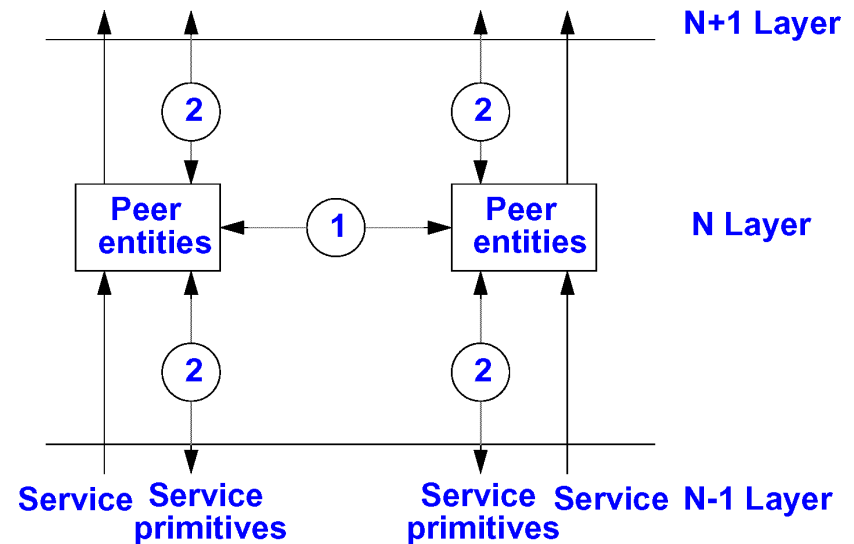
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# Basics

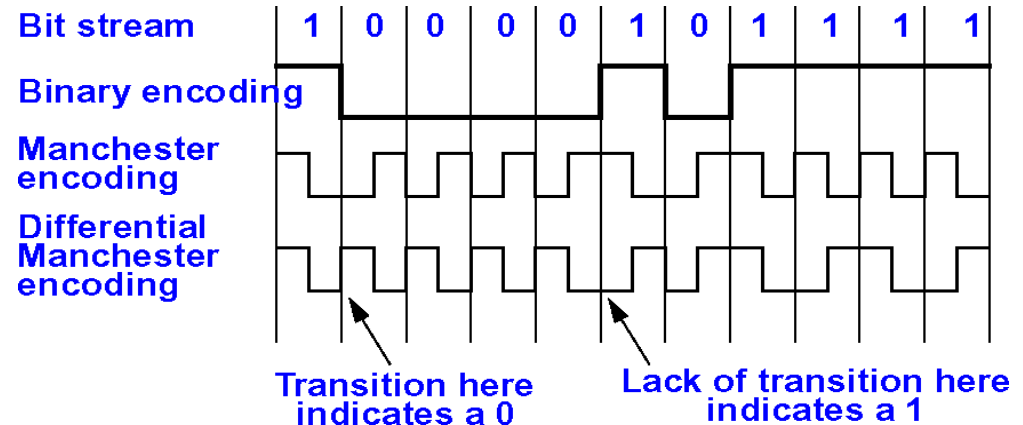
- Recap protocol terminology
  - several OSI terms are not introduced by Tanenbaum
  
- Remember the functions of the OSI model
  - very brief in the book
  - but terminology persists and is used in unexpected contexts



# Physical layer

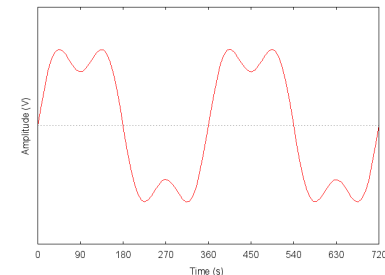
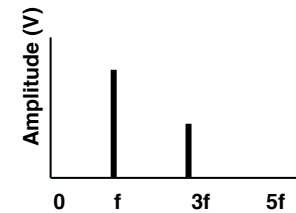
Baseband transmission schemes (very brief in Tanenbaum pp. 145)

- presented
  - binary encoding / NRZ (non-return-to-zero)
  - NRZI
  - Manchester
  - Differential Manchester



Passband transmission (Tanenbaum pp. 110)

- approximating digital signals
- bits vs. bauds
  - amplitude, phase, frequency
- bitrate of a perfect channel (Nyquist's theorem)
- capacity of a noisy channel (Shannon's theorem)
  - quite short in Tanenbaum
  - reasons for noise



# Data Link Layer

Framing (Tanenbaum pp. 217)

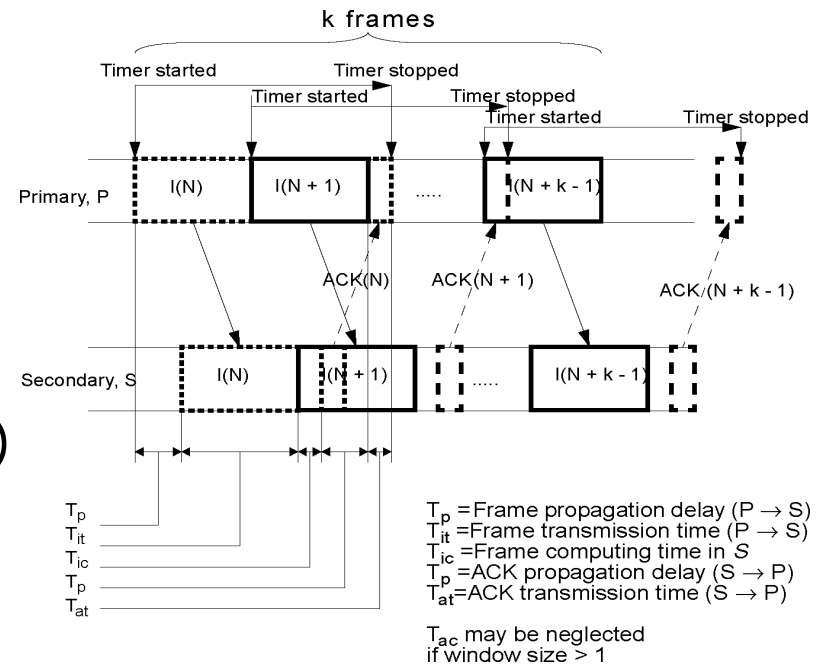
- What are the options?

Error correcting codes (Tanenbaum pp. 224)

- Hamming distance
- CRC – How does it work? What can it detect?

Flow control (Tanenbaum pp. 235)

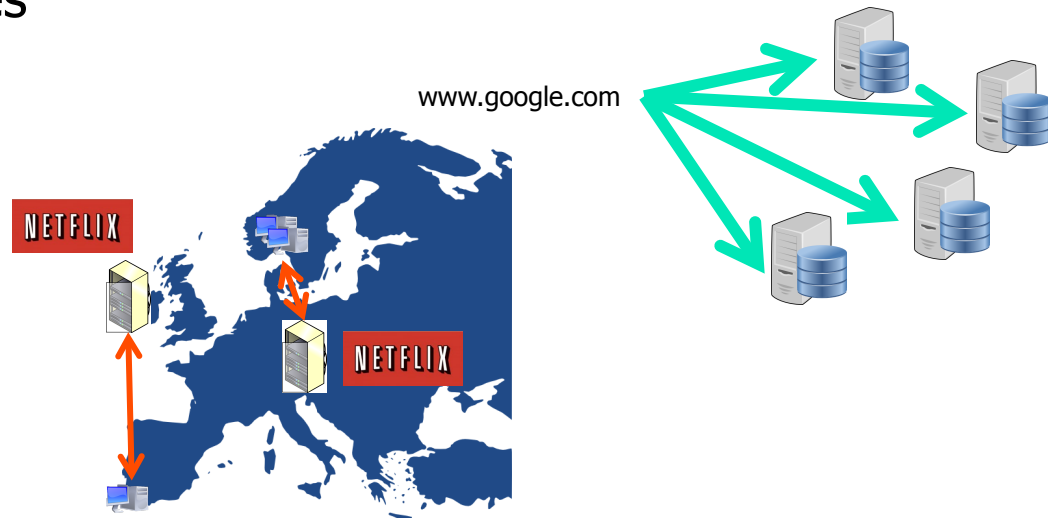
- Protocol examples
  - stop-and-wait, go-back-n, selective repeat
- Sequence number ranges
- Propagation delay and maximum link utilization (very brief in Tanenbaum)



# Application layer

DNS (Tanenbaum pp. 629)

- recursive and iterative queries
- not in Tanenbaum
  - caching
  - aliasing
  - zoning and load balancing



HTTP (Tanenbaum pp. 664)

Email / SMTP (Tanenbaum pp. 641)

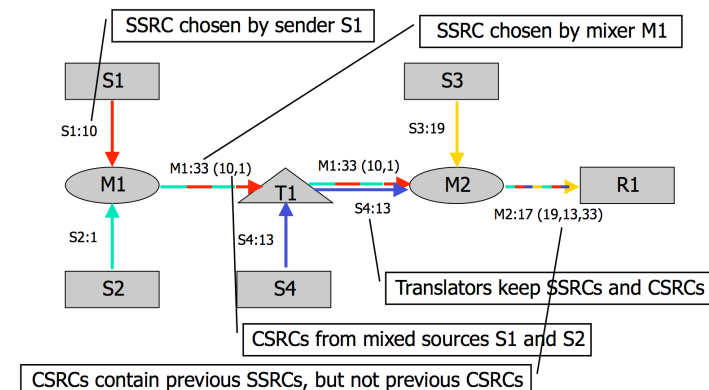
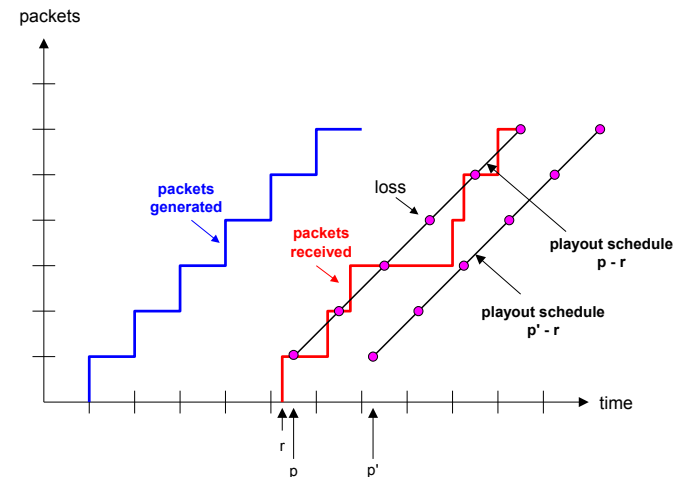
# Application layer

Multimedia (not in Tanenbaum)

- classes and characteristics of continuous media
- UDP or TCP?
- basic challenges
  - delay, loss, jitter
  - jitter compensation
  - loss compensation

RTP (Tanenbaum pp. 564)

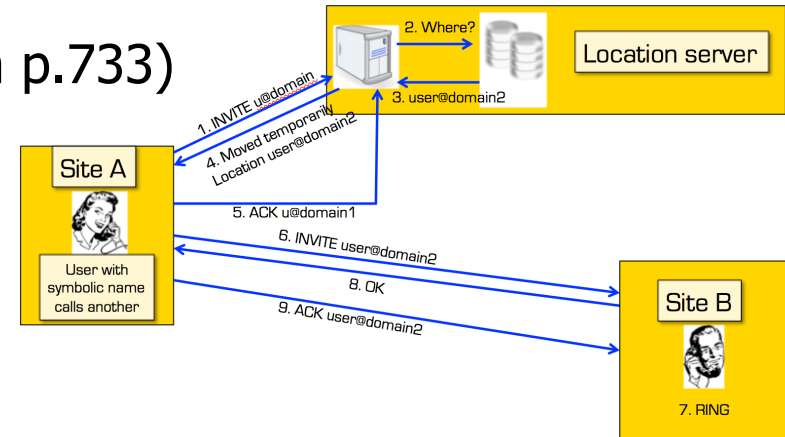
- *wrong section! not a transport protocol!*
- relation between RTP and Application layer framing / Integrated layer processing
- role of RTCP
- mixers and translators (not in Tanenbaum)



# Application layer

## Signaling protocols

- RTSP (briefly mentioned in Tanenbaum p.733)
- SIP (Tanenbaum pp.749)
  - proxy mode and redirect mode

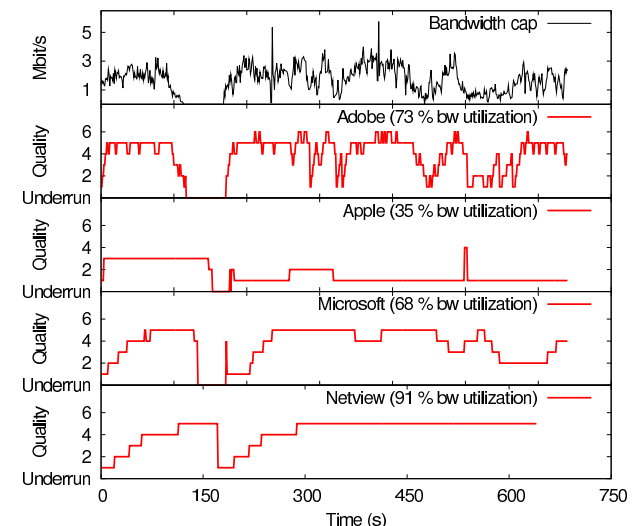


## Quality adaptation (not in Tanenbaum)

- Loss-Delay Adjustment Algorithm
- Blurriness, noise and motion flicker

## HTTP Adaptive Streaming (not in Tanenbaum)

- comparison to RTP streaming
- handling of bandwidth fluctuations



# Application layer

Content Delivery Networks (Tanenbaum pp. 761)

Modeling popularity (not in Tanenbaum)

- use and misuse of the the Zipf distribution

Peer-to-peer networks (briefly discussed in Tanenbaum pp. 766)

- BitTorrent
- DHTs
- Chord

