

INF3190 Group lecture

Lecture #5

Jan Anders Bremer

UiO - IFI

15.02.2013

Contact information

Phone: 91125994

Mail: janabr@ifi.uio.no

IRC: [janabr at irc.ifi.uio.no](irc://irc.ifi.uio.no) (currently in [#ping.uio.no](irc://irc.ifi.uio.no) and [#cyb](irc://irc.ifi.uio.no), but you can always `/msg me`)

Feel free to send questions, suggestions and feedback.

- CRC, FEC
- Ethernet
- CSMA/CD

CRC - Cyclic redundancy check

- Common sizes: 9, 17, 33 and 65 bits
- Designed to find accidental bit-flips and other mistakes - not intentional tampering
- Demonstration!

FEC - Forward error correction

- This is a group of error correction algorithms, not a specific one
- Ideal for noisy environments as it adds redundancy
- Longer transmit times
- Not very efficient
- May use parity, may be simpler

Flow control on the link layer

- Message the sender in order to have him slow down
- Refuse to ack packets - sender slows down
- Certain protocols allow setting control bits to slow down sending rate

Stop-and-wait

- Stop-and-wait (SAW) is very inefficient - breaks down with long transmission times or small packet-sizes
- Calculations available - see bandwidth.ods in repository
- SAW is rarely the answer to any transmission-problem, most other protocols will outperform SAW in most cases
- In a high-bandwidth, noisy, delayed environment, SAW will have a hard time getting any proper throughput
 - Increase packet size, higher risk of packet being corrupted - less throughput
 - Decrease packet size - less or more throughput - depends

Sliding window

- Two protocols, minor differences: Sliding window, Go-back-N, Selective repeat
- Sliding window in general: cannot advance sender-window until the first/some packet in the window is ack'ed
- All: re-transmit after a certain amount of time, multiple packets in sender-window
- Go-back-N : receiver can only receive the next packet in the window
- Selective repeat: receiver can receive out-of-order packets (and buffer them!), sender can remove packet $n+1$ from the window, even if packet n is still in the window

- Xerox - 1973/1974
- Inspired by ALOHAnet (wireless)
- In the beginning: generally used as a shared medium - everyone broadcasted across the same cable - required CSMA/CD
- Evolved later with hubs and switches using separate cables for each machine
- Used coaxial cable - different variants, later exchanged with the twisted pair cables we know.

ISO CSMA/CD vs ethernet

- Overlap between ethernet type-field and CSMA/CD length-field (both 16 bit)
- CSMA/CD is limited to 1500 bytes in length, ethernet must use types with value higher than 1500.
- Many devices have backwards compatibility for CSMA/CD, even though collisions never occur in modern networks

Ethernet limitations

- Maximum payload: 1500 bytes (bigger frames exist, see jumbo frames)
- Must have a header of a certain structure
- 12 bits for addressing (destination and source MAC)
- Traditionally, one could receive all the frames (which were delivered successfully) from the medium, but since this is now long gone, only packets which you are supposed to route or receive can be received by your adapter.

Ethernet speed increase

- Preferably use the same old mediums - interference, limitations?
- Use of fiber
- Timing-problems (smaller packets!)

- Exponential back-off, persistency
- 51.2 microsec waiting period - allow other to send
- $2^n \times 51.2$ microsec - random n