Networking

Link Layer
Network Layer
End to End Layer

Link Layer
• Reliable communication between the hosts in the network
• Link Layer
• Frame packets
• Checksums

Link Layer
• Physical/logical link layer
• Multiplexing between different network protocols
• frame mark + network protocol + data + checksum...
• MTU
• Example: 802.11b, Ethernet

Network Layer
• We need to route the packets between these hosts
• Network layer
• Routing: design project
• A method for addressing: IP protocol

End to End Layer
• What do we want form our protocol?
• At least once delivery:
• Nonce (unique ID)
• Acknowledgement
• Timers

End to End Layer
• Still we need a protocol that will control how the two end hosts will communicate
• We did do error detection at the link layer but...
• So we need end to end error control
• And checksums
• End to End argument
End to End Layer
- At most once delivery:
- Make use of nonce
- Cache the nonces at the receiver

End to End Layer
- In order delivery
- Make the nonce monotonically increasing.
- Sequence numbers

End to End Layer
- Different MTUs for different links along the path
- Divide up Datagrams and reassemble

End to End Layer
- Efficiency
  - Utilize the available bandwidth
  - Don’t send too much

End to End Layer
- The lock-step
  - One packet per round trip time
- Fixed window
  - N packets per
    (N transmission time + 1 roundtrip time)

End to End Layer
- Sliding window
  - For continuous flow:
    - Window size >= round-trip time * bottleneck data rate
  - Don’t send faster than the receiver can accept
End to End Layer

- Shared resources
- Congestion collapse
- Congestion flag
- Random Early Drop

TCP

- Slow start
- Duplicate Acknowledgement
- Equilibrium: Additive increase, multiplicative decrease
- Restart when Retransmission timer expires

End to End Layer

- Multiplexing/ Demultiplexing between applications
- The Presentation layer
- Ports

End to End Layer

- Also Session Layer
- And Application Layer

Papers

- Ethernet
- Mobile IP
- End to End argument
- Click modular router
- Hands on: trace route, ping