Computer Networking Past Paper

Computer Networking

0. Network and Architecture

Switching

- y2019p5q6 (a)
    - multiplexing in five layers
- y2016p5q6 (a)
- y2018p5q5 (a)
    - Packet switching and Circuit switching
- y2019p5q5 (a)
    - marshalling taking up transmission time vs propagation delay
    - TDM
- y2017p5q4 (b)
    - queueing, $\propto$ contention, $B = 2T \times C$
    - processing, unusual packets, ≈ 0
    - transmission, the capacity of the link, $size(pkg)$/Exception
    - propagation, $\propto$ distance, WAN

Architecture

- y2017p5q4 (a)
    - hop-by-hop vs end-to-end, encryption

1. Physical Layer

- y2014p5q5 (b)
    - Queueing
- y2013p5q4 (a)
    - Coding
- y2019p5q5 (b,c)
    - Coding, multilevel encoding
    - Error Correction, redundancy and FEC
    - CDMA, chipping / gold code

2. Data Link Layer

- y2013p5q4 (b)
    - CSMA/CD, CSMA/CA
- y2021p5q6 (b)

- CDMA, CSMA/CA, VLAN

Switches

- y2021p5q4
  - Topology, Forwarding table, Troubleshooting
- y2020p5q4
- y2023p5q3 (a)(i,ii)
  - Spanning Tree

3. Network Layer

- y2020p5q5
  - fault finding
- y2020p5q6
  - DHCP, ARP
- y2021p5q5
  - ICMP, topology, ping, trace-route, whole-system debugging
- y2018p5q5 (c)
  - subnet
- y2021p5q6 (a)
  - IPv6
- y2023p5q3 (b)
  - IP Troubleshooting
- y2017p5q5 (b ii,iii)
  - Fault finding, Classless Inter-Domain Routing, trace-route

Routers

- y2018p5q6 (a,b)
  - a switch vs router
  - distance-vector
- y2017p5q5 (a)
  - Router Control vs Data Panel (line-card)
- y2022p5q1
  - shortest path in a satellite network
- y2023p5q3 (a)(iii,iv)
- y2018p5q5 (b)
  - Link-state vs Distance Vector protocol

4. Transport Layer

Reliable Data Transfer

- y2011p5q5
    - FSM

UDP(QUIC), TCP

- y2022p5q3 (a,b), y2009p5q7 (a)
    - Flow-control and Congestion-control
- y2019p5q4
    - TCP, ARQ; QUIC
- y2022p5q2
    - TCP; QUIC
- y2016p5q6 (b)
    - TCP retransmission timeout
    - Exponential Average (EWMA filter), Jacobson/Karels Algorithm
- y2018p5q6 (c-e)
    - TCP, Karn-Partridge algorithm
    - Max-min fairness, limitations(cheat)
- y2017p5q5 (b i)
    - Fault finding, TCP

Network buffers

- y2013p5q4 (c)
    - $B = 2T \times C$, assumptions
    - Reference: Buffer Size Rule, Stanford, Note on Buffer size BDP

5. Application Layer

- y2014p5q5 (a)
- y2019p5q6 (b,c)
    - DNS
- y2013p5q5
    - Cache, CDN
- y2022p5q3 (c,d)
    - Cache