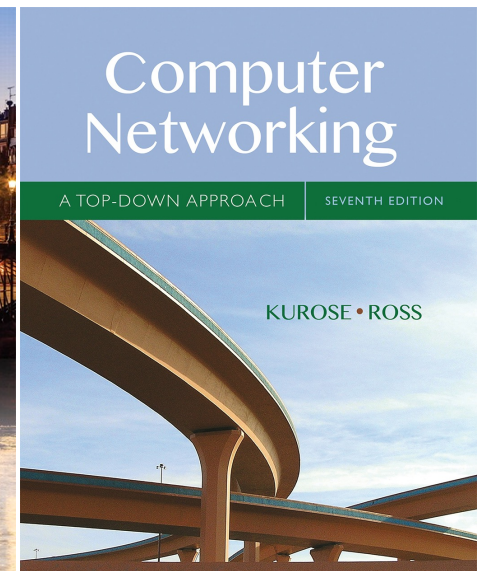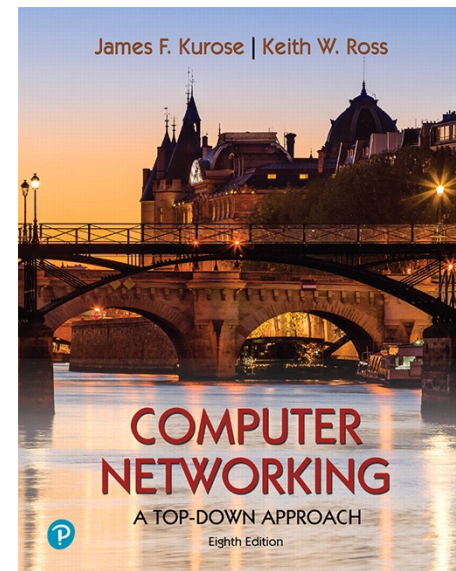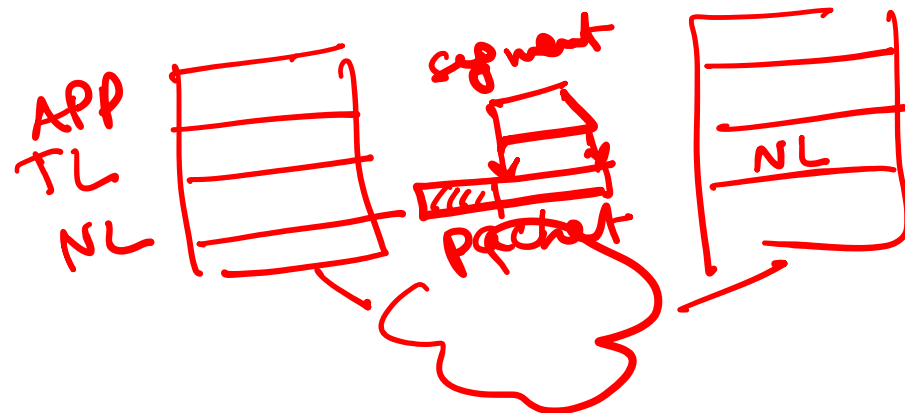# CS 655
Computer Networks

Abraham Matta
Computer Science
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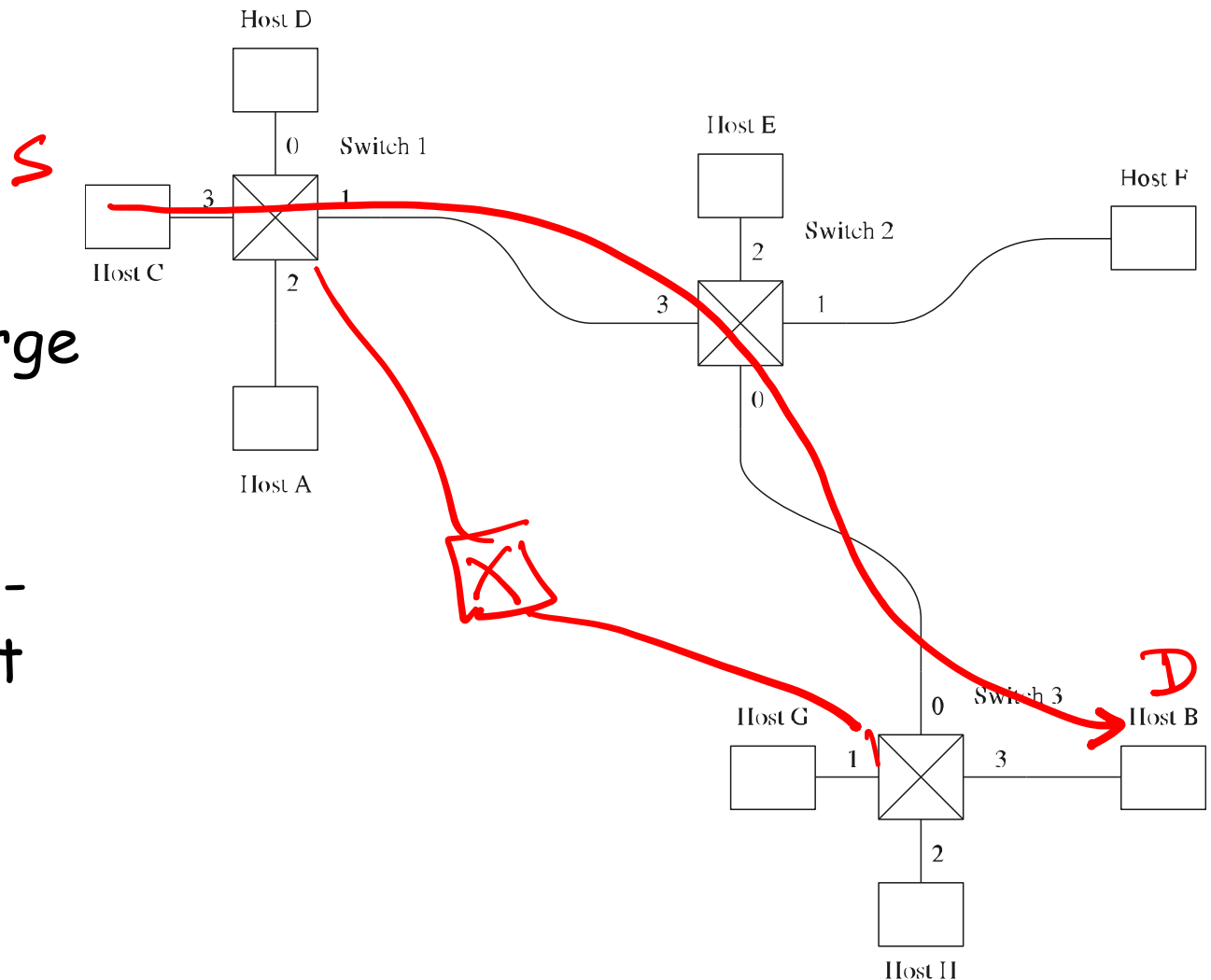# Chapters 4 & 5
Routing Services

Computer Networking: A Top-Down Approach, 8th edition. Jim Kurose, Keith Ross. Pearson. 7th edition is OK too!

Wide Area Networks

- A WAN covers large geographic area
- Switches are connected by long-haul point-to-point links
- Hosts connect to switches
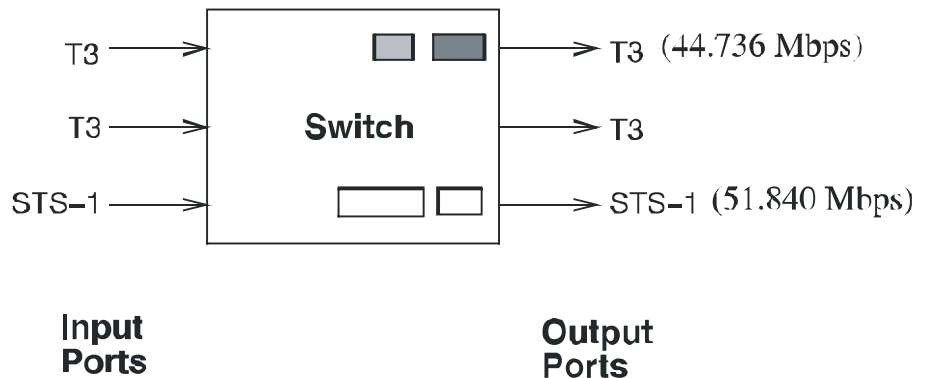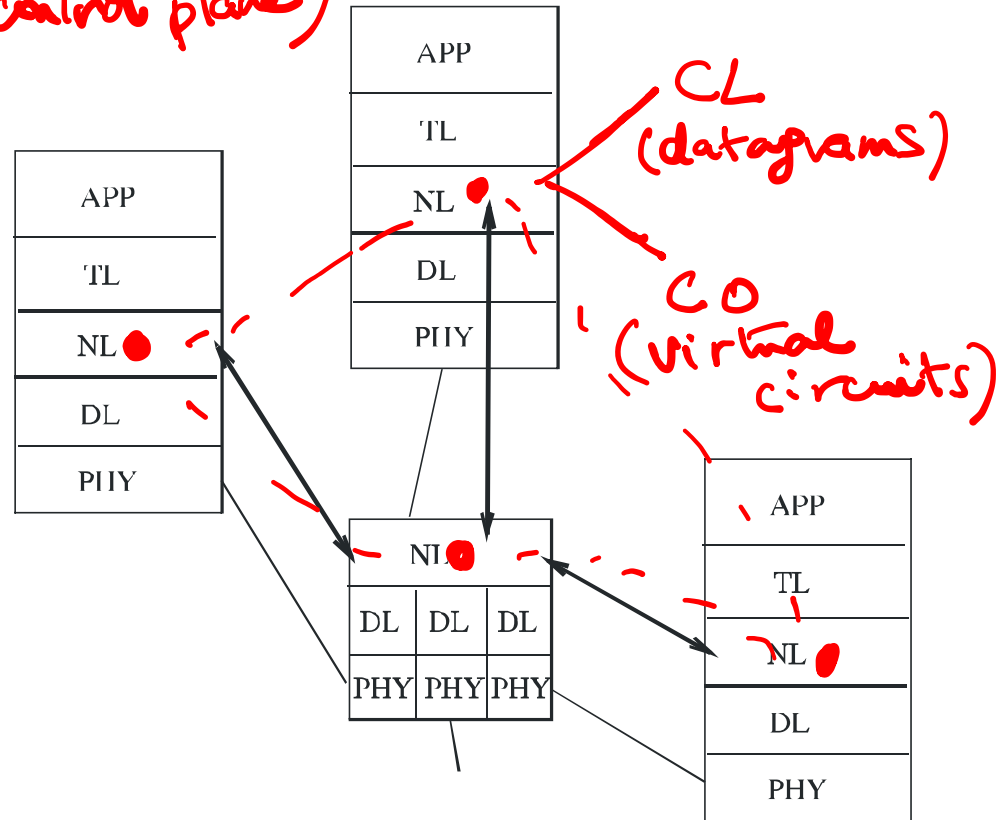
WANs

NL — routing ("control plane")
forwarding ("data plane")

CL (datagrams)

CO (virtual circuits)

❑ Network layer deals with packet routing: the process of selecting paths/routes (path = sequence of switches and links) for the packets to take to reach their destination

❑ A WAN has a maximum packet size to bound packet delays; may need fragmentation/reassembly at the higher layer

APP
TL
NL
DL
PHY

APP
TL
NL
DL
PHY

NL		
DL	DL	DL
PHY	PHY	PHY

APP
TL
NL
DL
PHY

T3 →
T3 →
STS–1 →

Switch

→ T3 (44.736 Mbps)
→ T3
→ STS–1 (51.840 Mbps)

Input Ports

Output Ports

Datagrams

S

Host D
Host C
Host A

Switch 1   next-hop

Host E
Host F
Switch 2
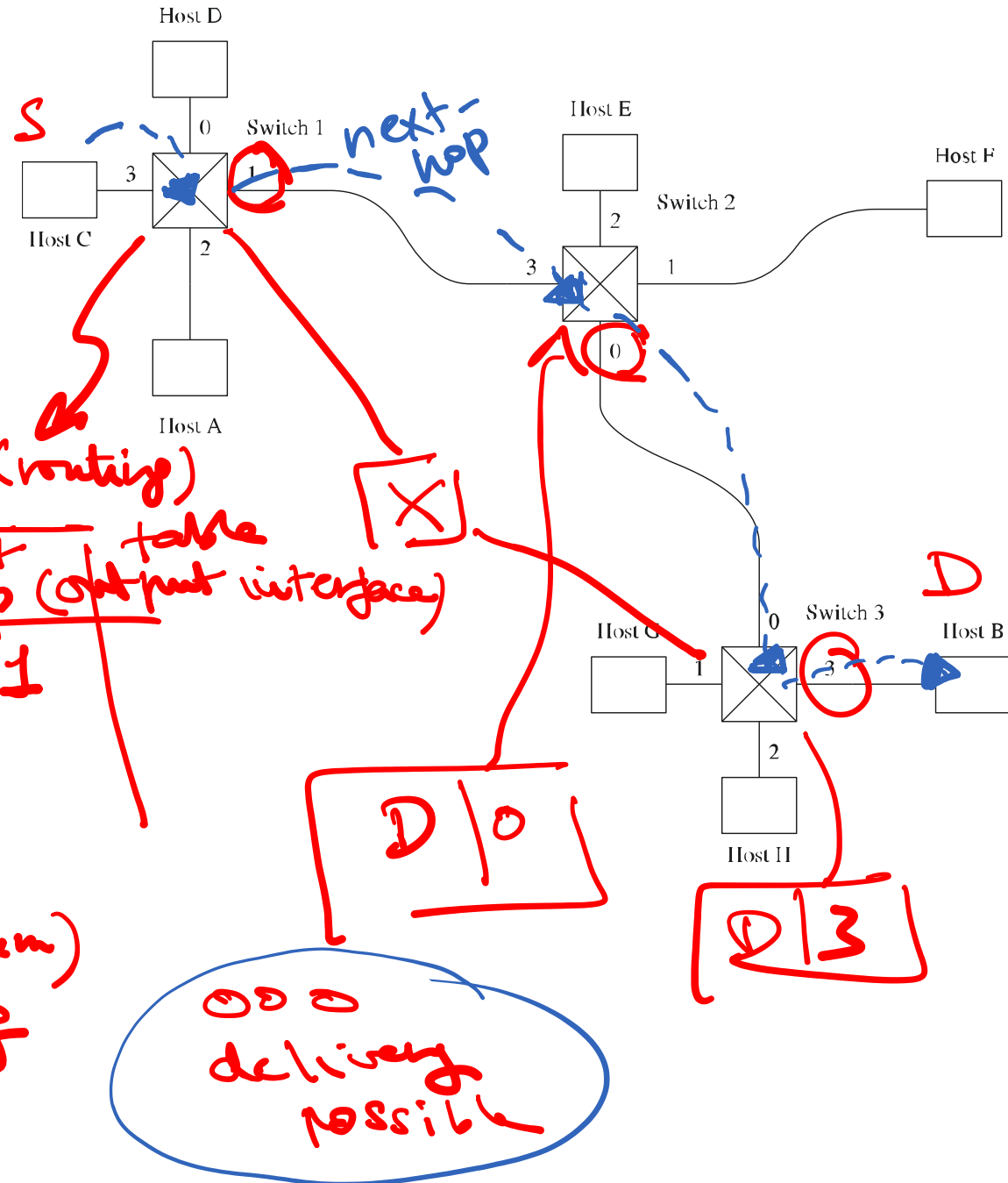
Host G
Switch 3
Host B
Host H

D

segment

packet (datagram)

dest address

forwarding (routing)

Dest address	next hop (output interface)
D	1

next-hop (datagram) routing

X

D | 0

D | 3

delivery possible

Datagrams

- No connection setup phase
- Each packet forwarded independently based on destination address
- Each packet in ``connection'' may follow different path
- Analogy: postal system
- Sometimes called *connectionless* model (*or* next-hop routing)
- Each switch maintains a forwarding (routing) table: {destination address, output port (or next-hop)}

Host D

Host E

Host F

0 Switch 1

3 Switch 1 1

Host C

2

Switch 2

2

3

1

0

Host A

Switch 3

Host G 0

Host B

1 3

2

Host H