Panel 1

Last Time:

Data link layer protocols:

- simplex utopian
- simplex stop+ wait
- pos ackn. + retransmission (simplex)
- sliding window protocol

1

Panel 2

The Network Layer

2

Panel 3

The Network Layer

Source to destination delivery of packets accross networks. (vs. data link - sends frames between 2 nodes)

Responsibilities:

→ Addressing (logical)

→ Routing: determine the path accross the network of packets.

3

Panel 4

Network layer has 2 competing ideas

unreliable, connection-less service: packets are routed individually and may/may not arrive

Internet, 30 years of experience

work is moved to host (decentral)

reliable, connection-oriented service: first establish a connection, exchange parameters, then send data without loss

phone company, 100 years experience

work is done in the network (subnet) host uses elaborate services (centralized)

unreliable + connection-oriented

reliable + connection-less

} not used

4

Panel 5

Primary job of Network Layer: Routing

Routing should be:

simple

robust: adjust to changes in topology

stable: algorithm should establish routes that don't change if network parameters don't change

fair: all routes are treated equal

optimal: highest possible performance.

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Panel 6

2 Types of Algorithms

Static: routes are computed once, then don't change

easy

Adaptive: routes change if parameters of subnet change

desirable

Quiz on Monday

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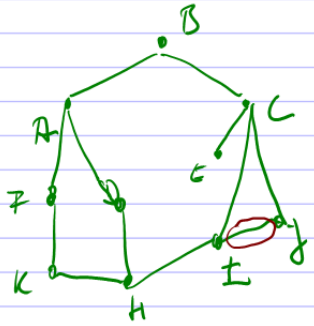
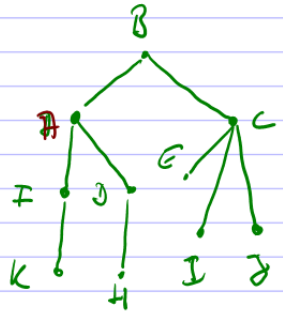
Panel 7

Optimality Principle

If router J is on the optimal path from router I to K then the optimal path from J to K falls along the same route.





sink tree for B

A, B, ... J are routers

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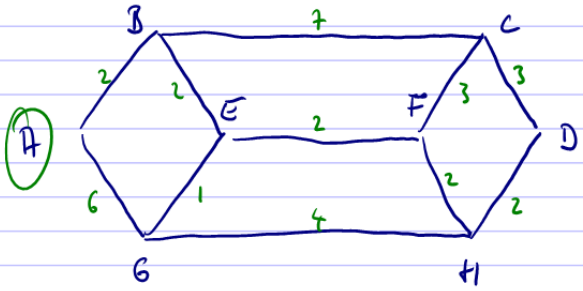
Panel 8

Shortest Path Routing (Dijkstra 1959)



small is better

"Distance":
length of path
mean delay
hops

1.) Each node gets a label indicating distance from source and best connection. Initially, all are $(\infty, -)$
2.) Start at A, make that label permanent
3.) Find all adjacent nodes + add tentative labels
4.) Pick overall smallest, make it permanent, and continue from there!

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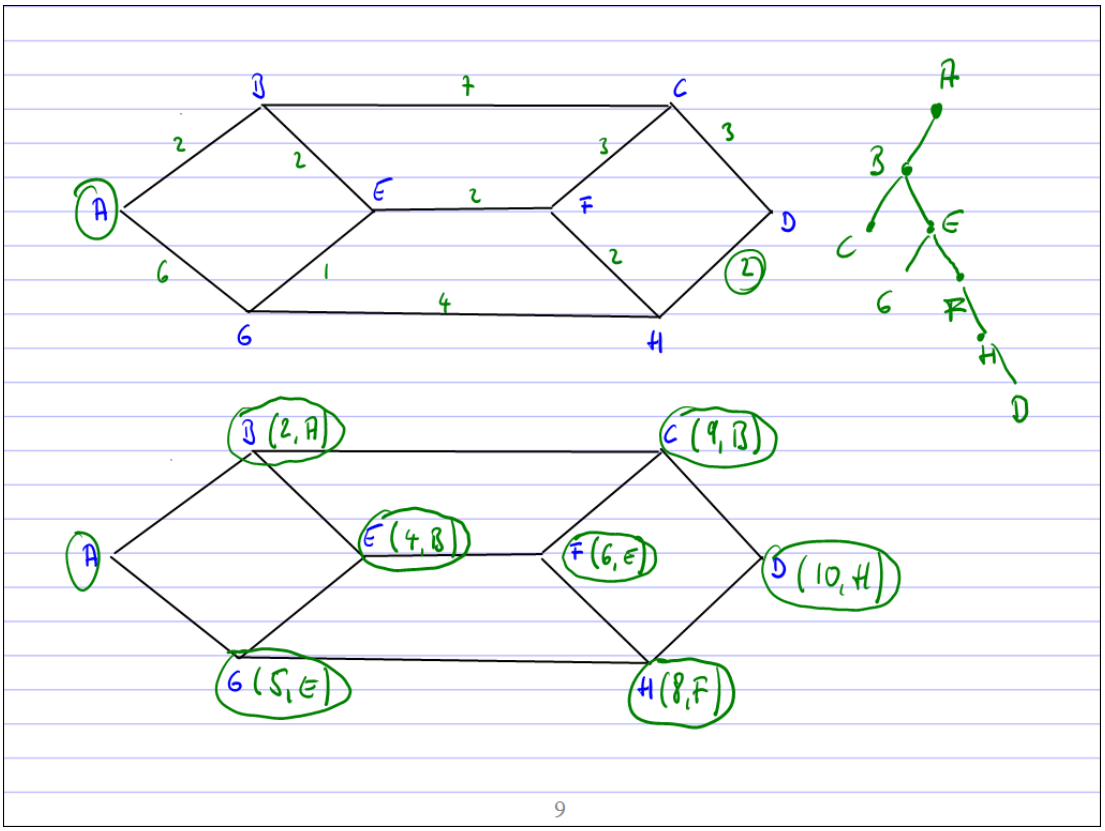
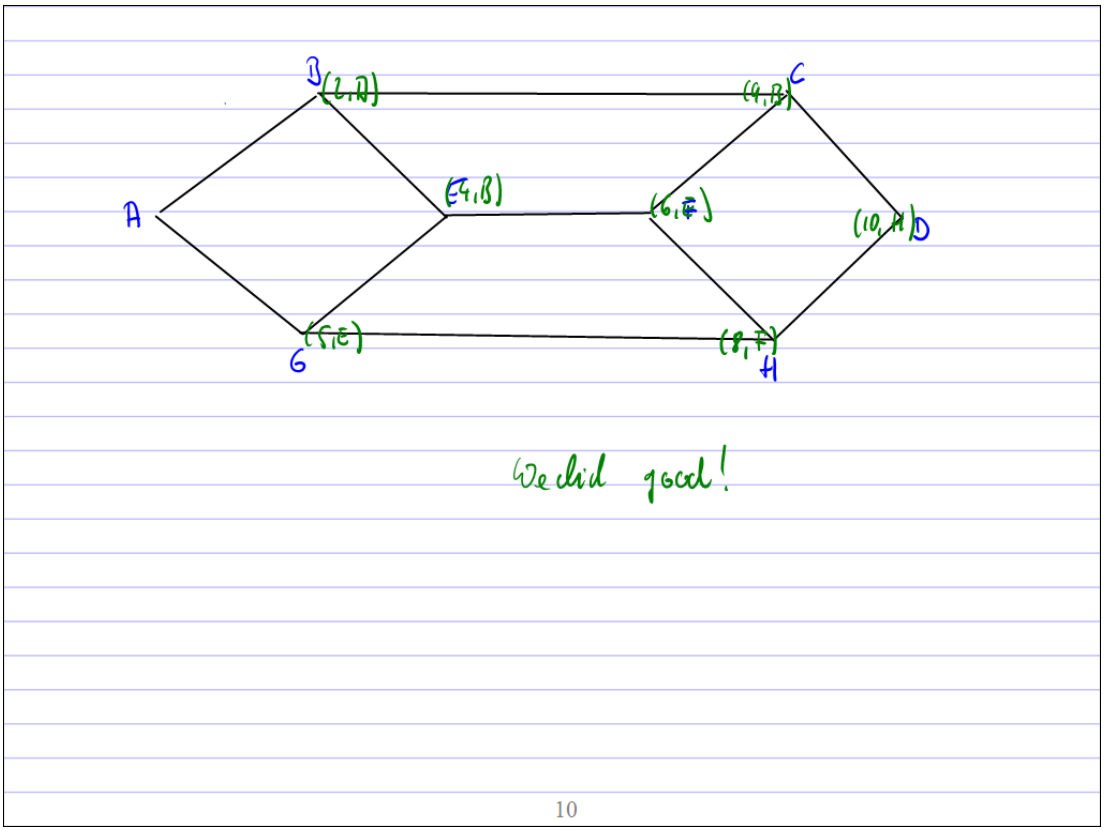
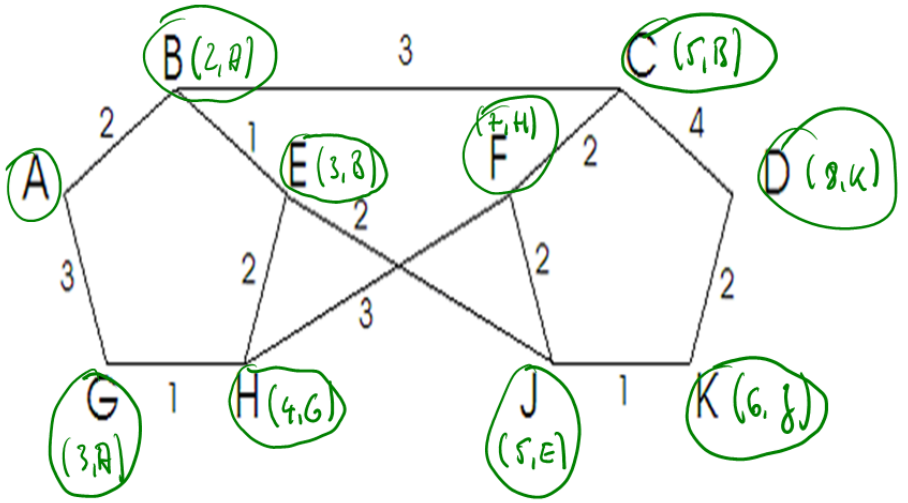
Panel 9



Panel 10



Panel 11



HW: Sink tree for A, also for D

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Panel 12

Simple yet effective: Flooding

Every incoming packet is sent to every outgoing lines except the one it came on.

Add "hop counter" that decrements each time and discard when zero.

=> finds best path because it finds all paths

→ Useful for

measurements against other algorithm

Used for military because its very robust

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Panel 13

Adaptive Routing: Distance Vector Routing

next time on Friday

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