Additional Slides from

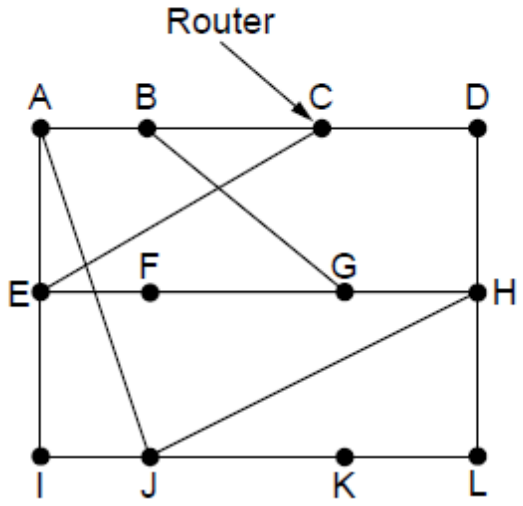
Computer Networks

by Tanenbaum and Wetheral

Flooding (Taşkın)

- Every incoming packet is sent out on every outgoing link except the one it arrived on
- It generates vast number of duplicate packets
- A hop counter is kept at the header of each packet which is decremented at each hop, with the packet being discarded when the counter reaches to zero
- Keeping track of floooding packet could be an alternative technique to avoid sending them out second time
- Selective flooding could be another alternative solution
- It is very robust
- It finds the shortest path

Distance Vector Routing



(a)

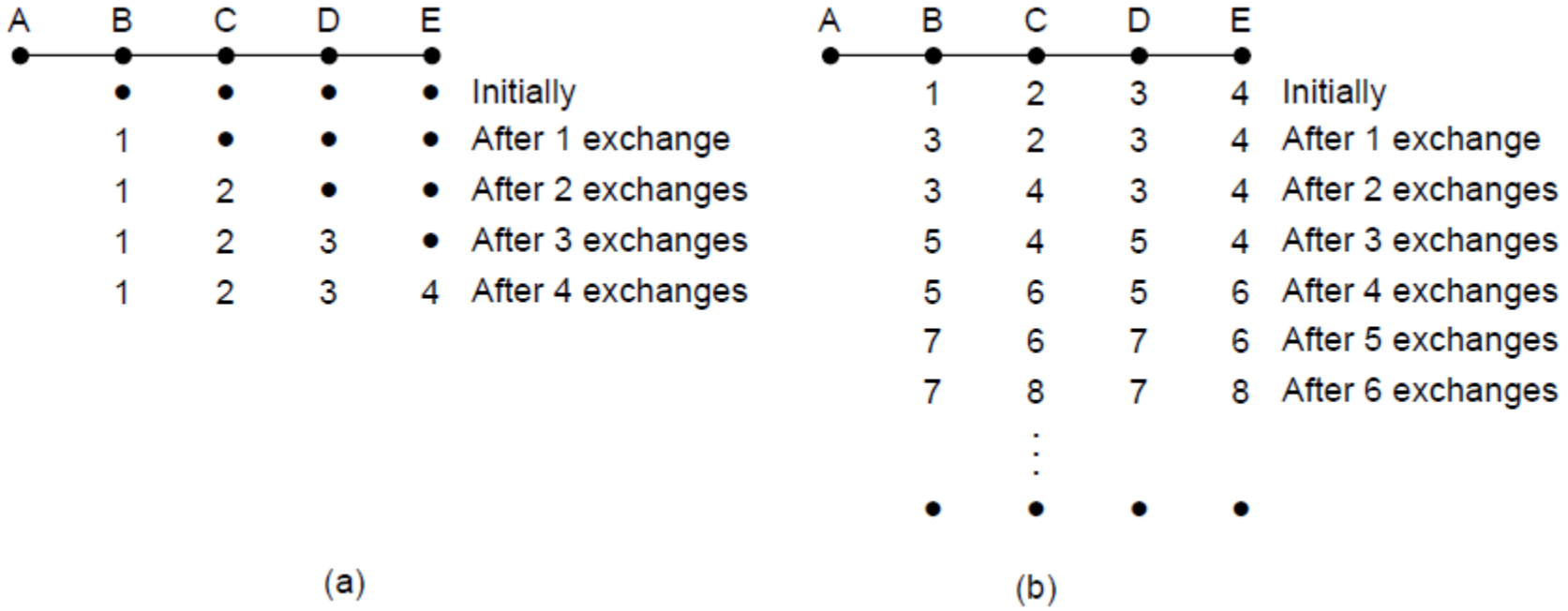
To	A	I	H	K	New estimated delay from J	Line
A	0	24	20	21	8	A
B	12	36	31	28	20	A
C	25	18	19	36	28	I
D	40	27	8	24	20	H
E	14	7	30	22	17	I
F	23	20	19	40	30	I
G	18	31	6	31	18	H
H	17	20	0	19	12	H
I	21	0	14	22	10	I
J	9	11	7	10	0	–
K	24	22	22	0	6	K
L	29	33	9	9	15	K
	JA delay is 8	JI delay is 10	JH delay is 12	JK delay is 6	New routing table for J	

Vectors received from J's four neighbors

(b)

(a) A network.
(b) Input from *A, I, H, K, and the new routing table* for *J.*

The Count-to-Infinity Problem



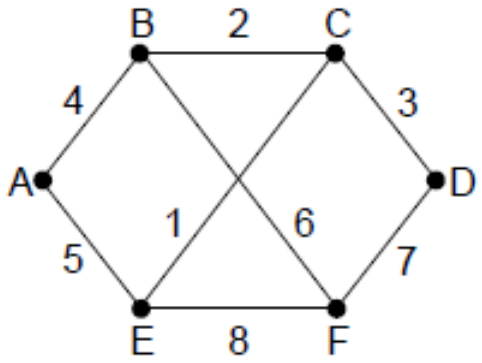
The **core of the problem** is that when X tells Y that it has a path somewhere, Y has no way of knowing whether it itself is on the path.

The count-to-infinity problem

Link State Routing

1. Discover neighbors, learn network addresses.
2. Set distance/cost metric to each neighbor.
3. Construct packet telling all learned.
4. Send packet to, receive packets from other routers.
5. Compute shortest path to every other router.

Building Link State Packets



(a)

Link State Packets

A	B		C		D		E		F	
Seq.	Seq.		Seq.		Seq.		Seq.		Seq.	
Age	Age		Age		Age		Age		Age	
B	4	A	4	B	2	C	3	A	5	B	6
E	5	C	2	D	3	F	7	C	1	D	7
		F	6	E	1			F	8	E	8

(b)

(a) A network. (b) The link state packets for this network.

Possible problems

- Sequence numbers wrap around
- If a router crashes, it will start with seq no 0!
- If a sequence number gets corrupted

Solution: Age field which is decremented once per second while being kept in a router. If it gets zero, the packet will be discarded.

+ Some refinements: holding area and ACK

Distributing the Link State Packets

Source	Seq.	Age	Send flags A	Send flags C	Send flags F	ACK flags A	ACK flags C	ACK flags F	Data
A	21	60	0	1	1	1	0	0	
F	21	60	1	1	0	0	0	1	
E	21	59	0	1	0	1	0	1	
C	20	60	1	0	1	0	1	0	
D	21	59	1	0	0	0	1	1	

The packet buffer for router *B* in previous slide