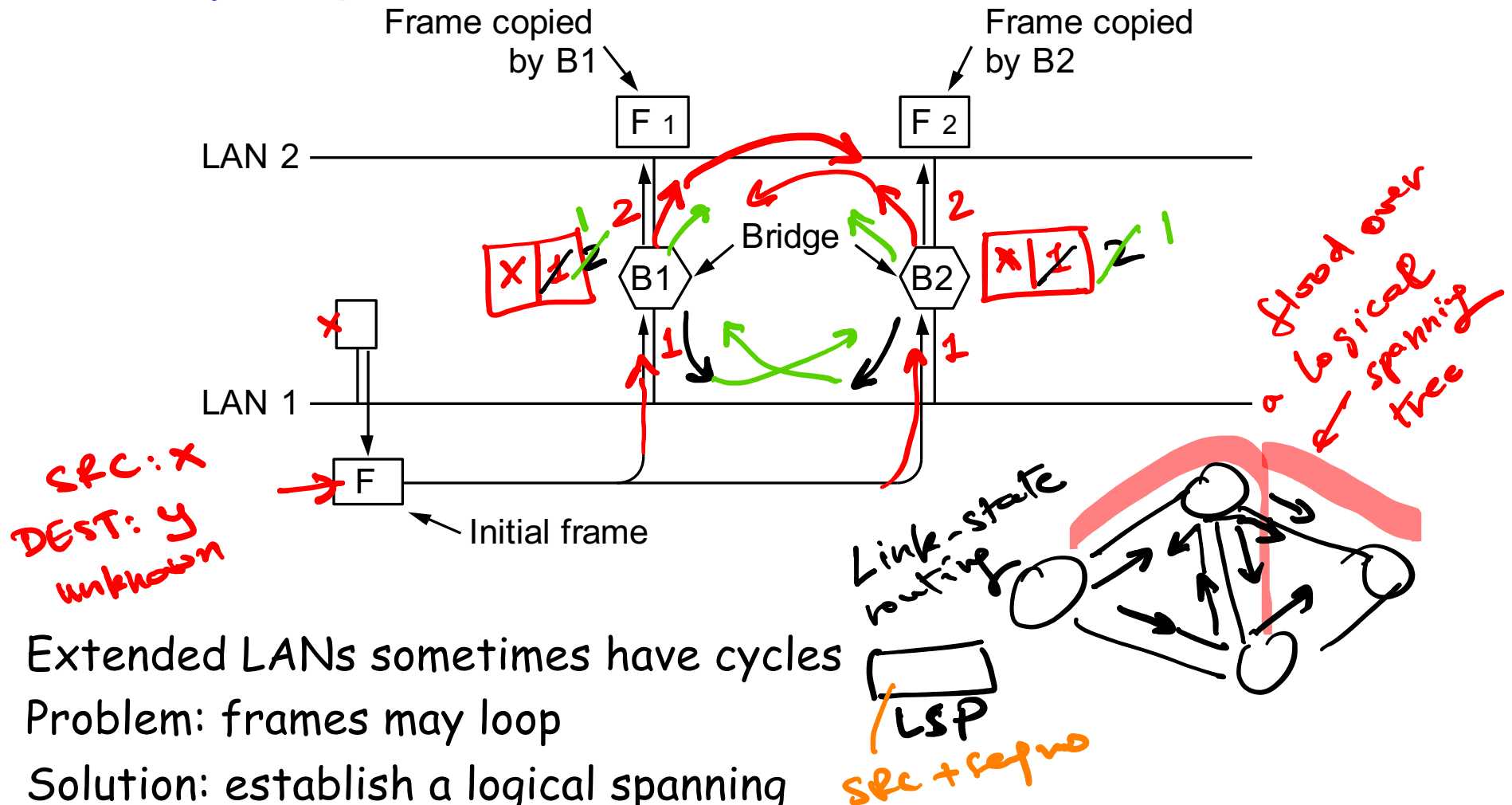
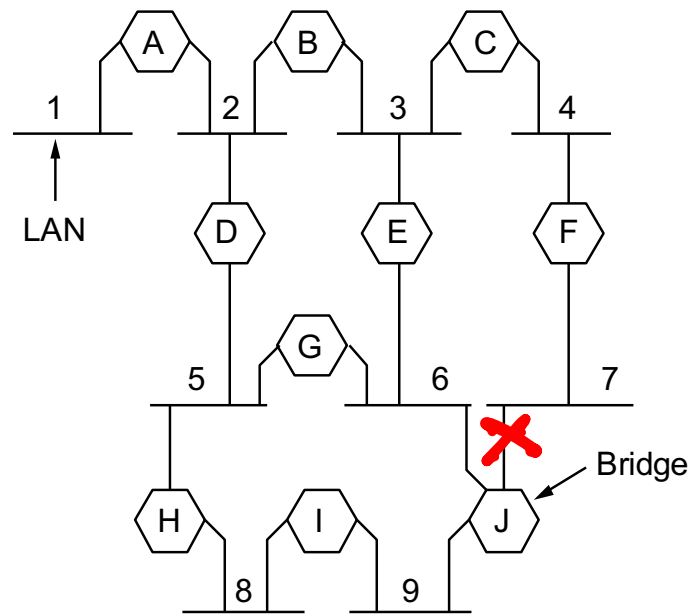


Looping Problem

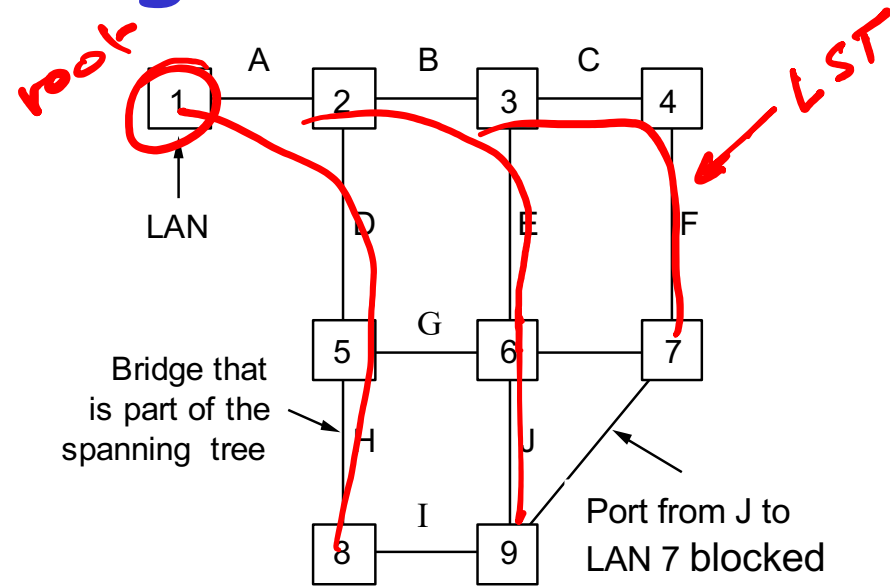


- Extended LANs sometimes have cycles
- Problem: frames may loop
- Solution: establish a logical spanning tree over the physical topology (i.e. some bridges/ports are not used)

Spanning Tree Algorithm



(a)



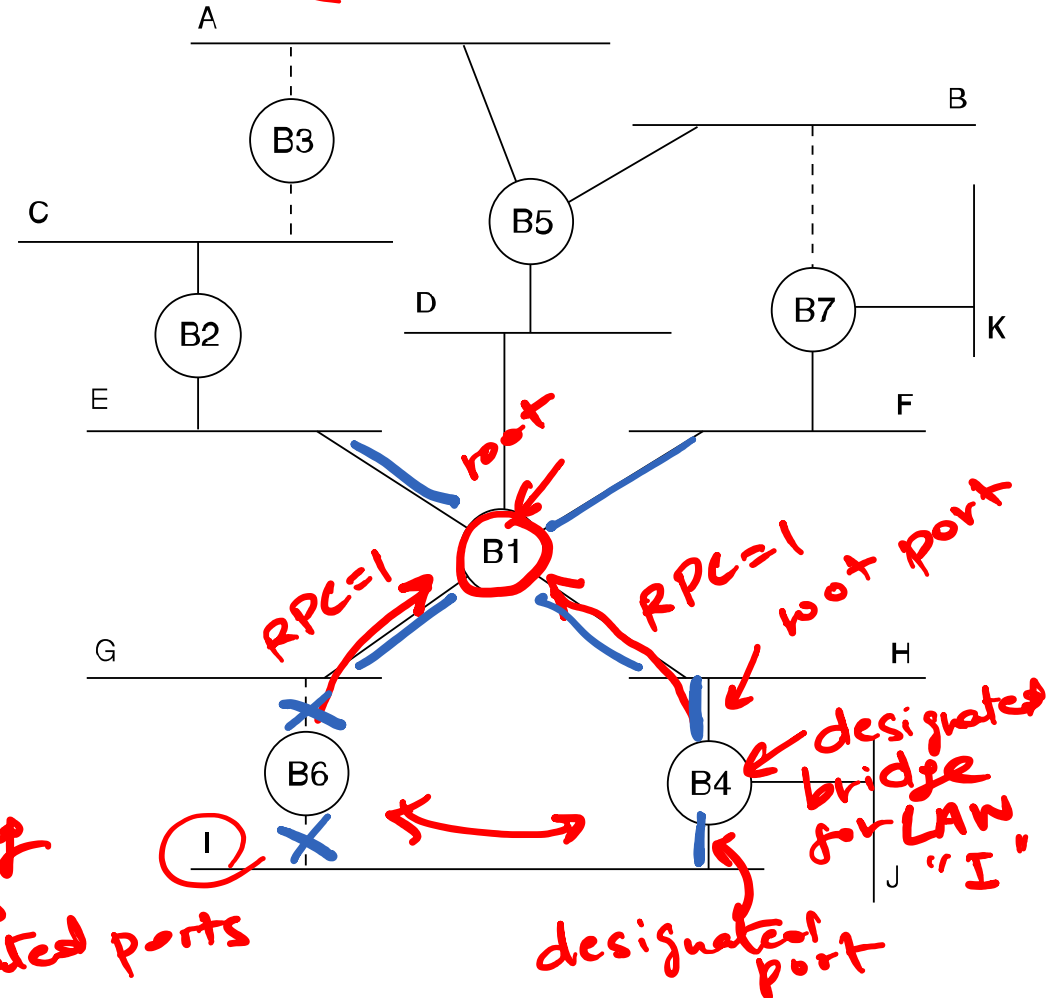
(b)

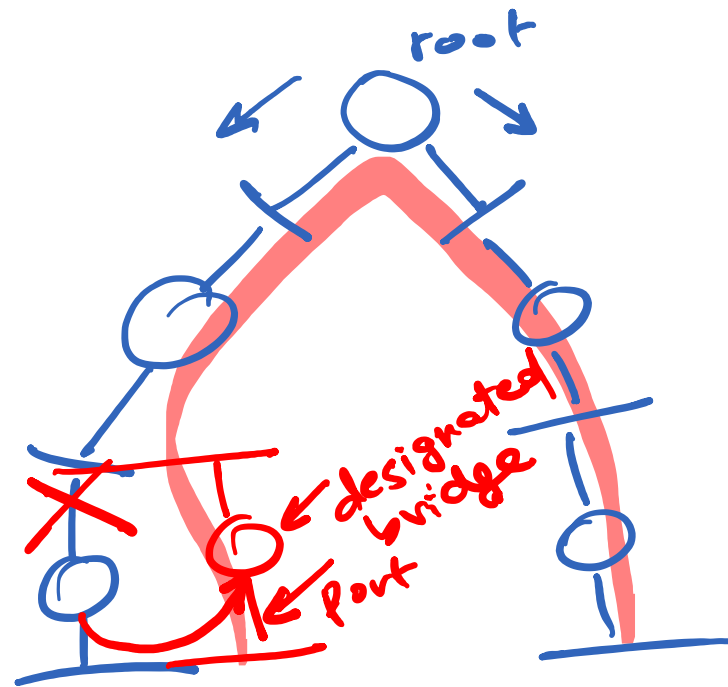
- ❑ Only one path is active (in use) between any two LANs
- ❑ Bridges run a distributed spanning tree algorithm

Algorithm Overview

- ❑ Each bridge has a unique id (e.g., B1, B2, B3)
- ❑ Select bridge with smallest id as root
- ❑ Select bridge on each LAN that is closest to the root as that LAN's designated bridge (use id to break ties)
- ❑ Each bridge forwards frames over each LAN for which it is the designated bridge

configuration message:
(sender ID, root ID, distance to root)





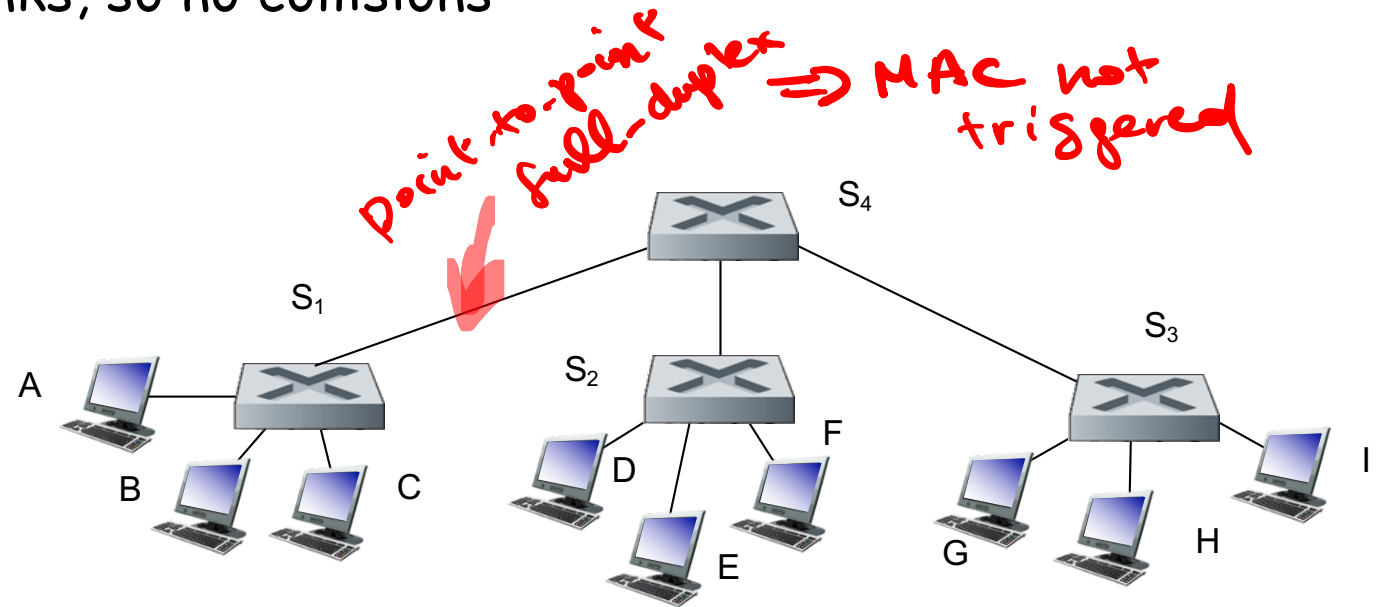
Spanning Tree Algorithm Detail

- ❑ Bridges exchange configuration messages (using group MAC address for all bridges)
 - ❑ id for bridge sending the message
 - ❑ id for what the sending bridge believes to be root bridge
 - ❑ distance (hops) from sending bridge to root bridge
- ❑ Each bridge records current best configuration message for each port
- ❑ Initially, each bridge believes it is the root
- ❑ When learn not root, stop generating configuration message
 - ❑ in steady state, only root generates configuration messages
- ❑ When learn not designated bridge, stop forwarding configuration msgs
 - ❑ in steady state, only designated bridges forward configuration msgs
- ❑ Root bridge continues to send configuration messages periodically
- ❑ If any given bridge does not receive configuration message after a period of time, starts generating configuration messages claiming to be the root

Final Words on Bridges (Layer-2 Switches)

❑ Common configuration today:

- Computers and switches connected by point-to-point (full-duplex) links, so no collisions



❑ Do not scale

- spanning tree algorithm does not scale