

CS 640 Introduction to Computer Networks

Lecture 7

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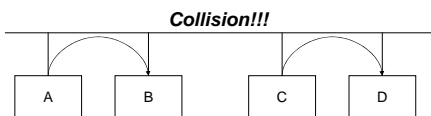
Today's lecture

- Ethernet bridging
 - The learning bridge
 - Spanning tree algorithm for bridges

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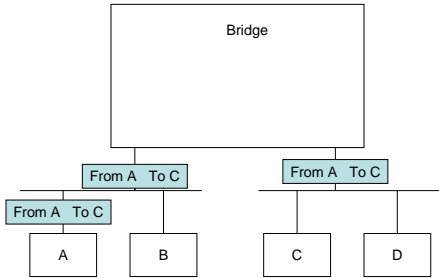
Why use Ethernet bridges?

- Larger networks
- More concurrent communication
- Extend Ethernet without changing computers



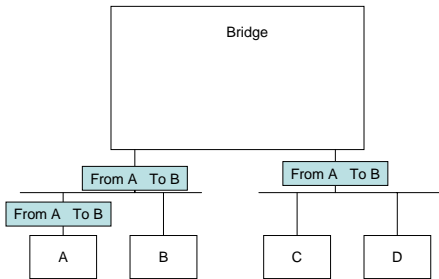
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Basic transparent bridge



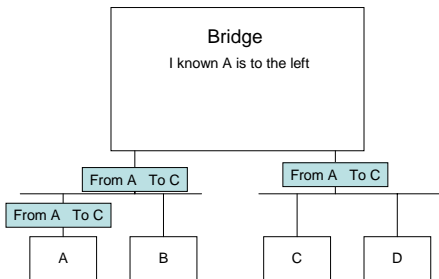
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Basic transparent bridge



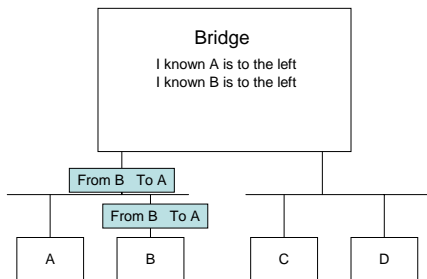
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Learning bridge



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Learning bridge



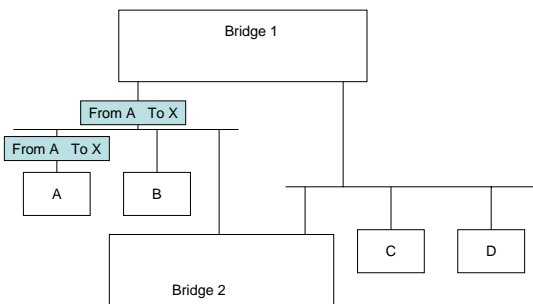
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Learning bridges

- Initially forward frames onto all ports
- Learn where hosts are based on **source** address
- For known addresses only forward to right port
- Multicast/broadcast go to all ports
- Terminology
 - For twisted pair based Ethernet
 - Repeaters are called hubs
 - Bridges are called switches
 - A segment or collision domain has wires and hubs
 - LAN vs. extended LAN

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What happens with cycles



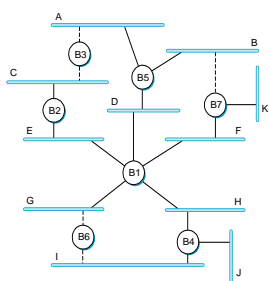
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Solution: eliminate cycles

- On power up Ethernet bridges run a distributed spanning tree algorithm
 - Node with lowest ID is root
 - Spanning tree is the tree of shortest paths to root
 - Break ties based on bridge IDs
- Ports that are not part of the spanning tree are turned off to data traffic
 - All cycles eliminated

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Spanning tree algorithm details



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- Message format: (root, distance, bridgeID)
- Each bridge stores best message for each port
- Each bridge picks port closest to root
- Best message is flooded with distance incremented
- Each segment “elects” a designated bridge
- The root repeats message
- Messages are timed out

Ethernet today

- Limits to growth of bridged LANs
 - Traffic due to broadcast/multicast frames still goes to all segments
 - Throughput at root switch becomes bottleneck
 - Can have faster switches towards the middle
- Bonus for switched Ethernet: better security
 - Hosts cannot snoop on others’ traffic
 - Today switches have advanced features (VLANs)

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