

## Data Link Layer, Part 4 Bridges

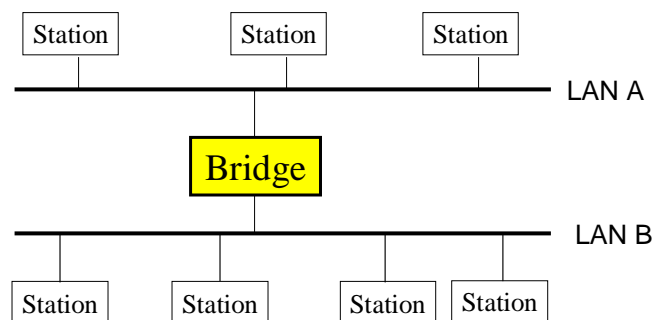
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## Introduction

- ❑ A bridge is a layer-2 device that connects LANs that may or may not be based on the same technology.
- ❑ A simple configuration:



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## Bridge Functions

- ❑ Broadcast on LAN B everything it receives from LAN A.
- ❑ Broadcast on LAN A everything it receives from LAN B
- ❑ As a result, the network appears to all machines as a single LAN.

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## Reasons for Bridges

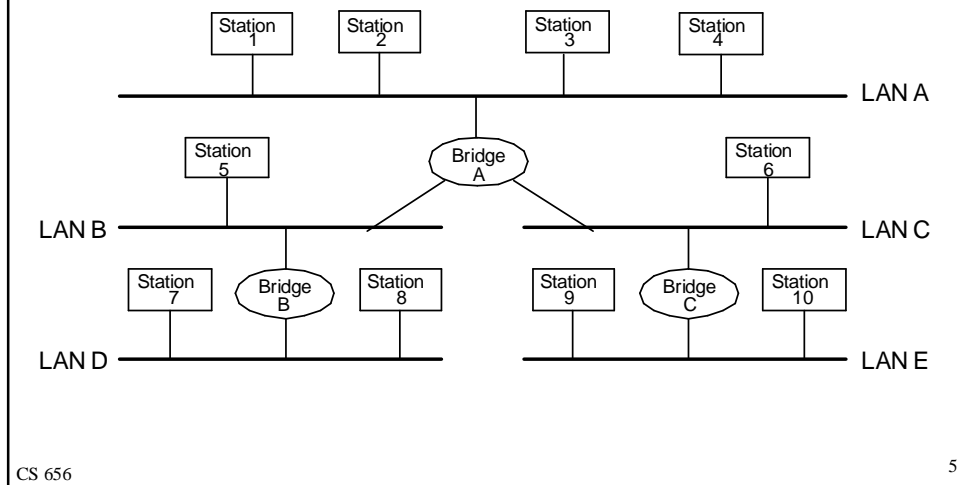
- ❑ overcomes the distance limitations of LANs
- ❑ connects LANs that use different technologies
- ❑ connects LANs built by different organizations

Nowadays we use Internet technologies to achieve these goals.

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## A More Sophisticated Configuration



## Bridge Routing

- ❑ A sophisticated bridge can perform routing
  - decide whether or not to forward frame
  - if attached to more than two networks, must also decide which LAN, if any, to forward it on
- ❑ Methods:
  - fixed routing
  - **self learning**
  - source routing (not covered)

## Self-Learning (Transparent) Bridges

- ❑ Bridges listens “promiscuously.”
- ❑ For each packet received, the bridge
  - stores the source address in a cache along with the port the packet arrives on
  - ➔ – If the destination address is broadcast (all 1’s), forward the packet via all interfaces except the one from which the frame was received.

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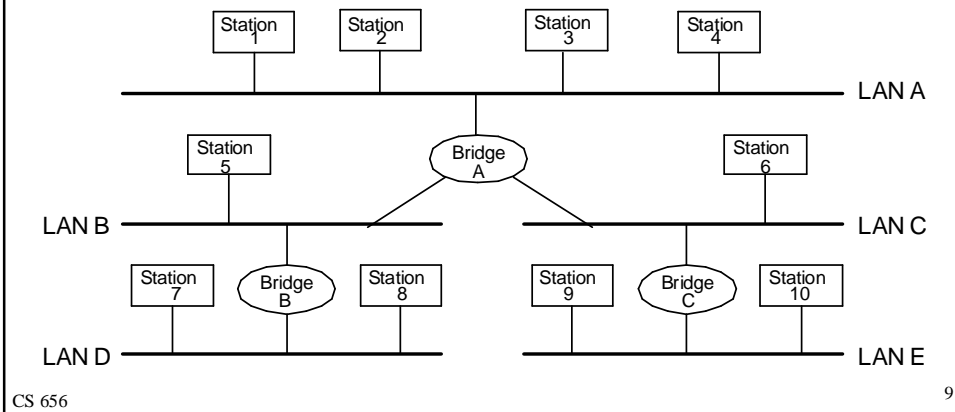
- ❑ For a regular dest address, looks for the destination in its cache
  - if not found, forward the packet via all interfaces except the one from which the frame was received
  - if found, forward the packet via the port indicated by the cache entry (if the port is the one via which the frame arrived, the frame is dropped)

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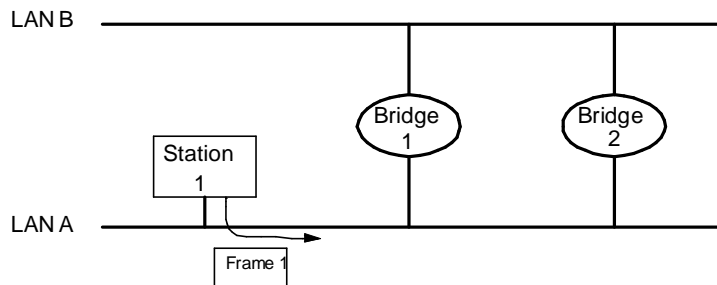
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## Example

- Starting with empty caches at all switches, show the cache of Bridge A after Station 1 sends a frame to Station 4, Station 2 to Station 10, and Station 5 to Station 2.



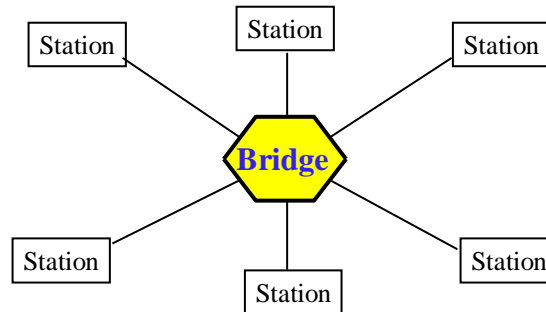
## Problems with Parallel Bridges



- In general, this problem arises with any topology containing loops.
- Solution?
  - avoid loops
  - construct a spanning tree

## Switched Ethernet

- ❑ Recall that the 10/100Base-T Ethernet standards use a star topology.



- ❑ Replace the hub by a bridge and we get ourselves a switched network, with dedicated bandwidth to each station.

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## Discussion

- ❑ Each switch-to-station segment forms an independent collision domain.
- ❑ Moreover, one line is used in each direction.
  - As such, there will be no collisions at all.
- ❑ Is this still Ethernet ?
  - **Yes**, in the sense that legacy Ethernet software and interface cards can still be used.
  - **No**, because the resultant network is based on switching, as opposed to broadcast and CSMA/CD.

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