

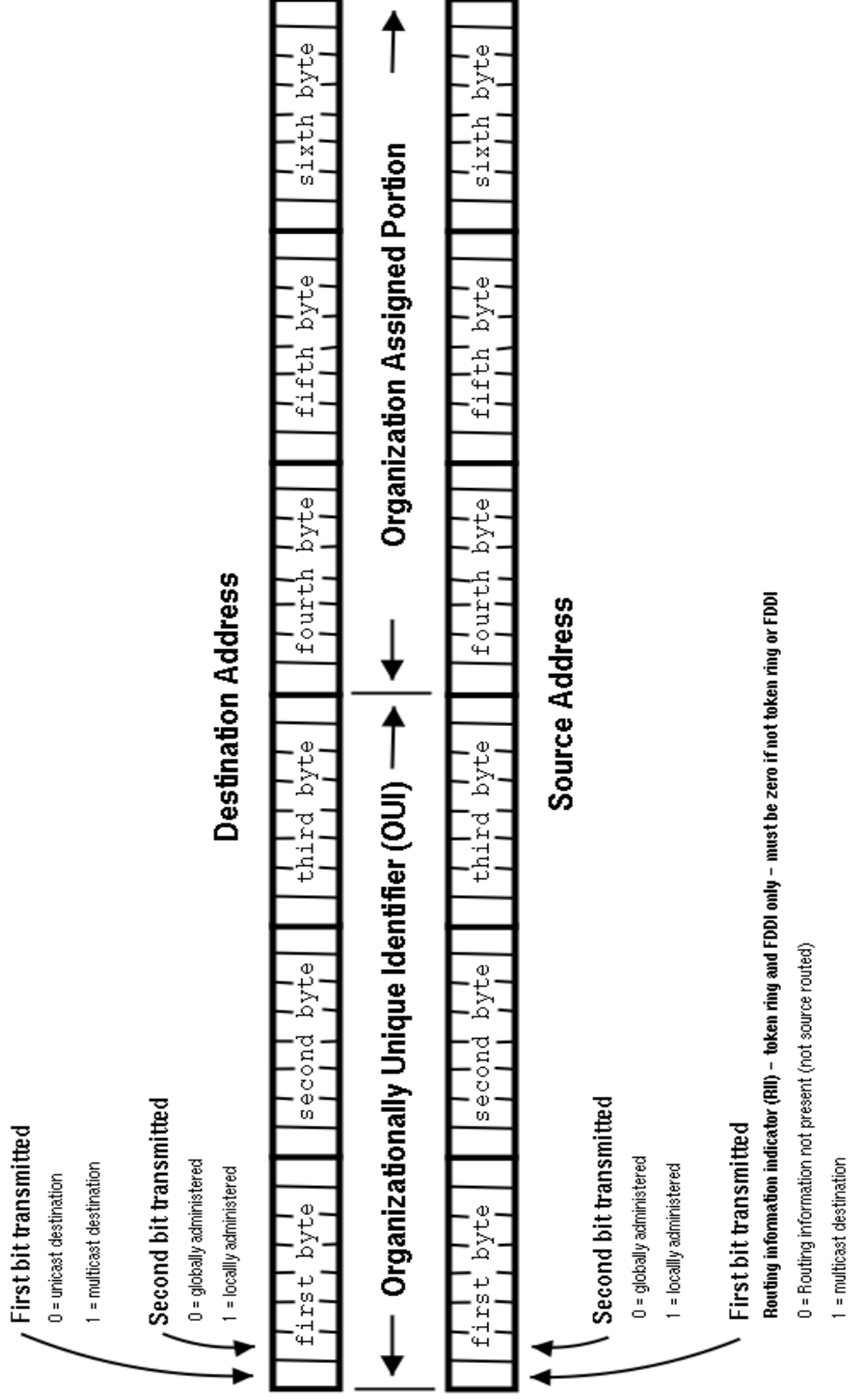
# Interconnection Technologies

## *Bridging I*

# Data link addressing

- IEEE standard LAN address is 48–bits long
- Written as sequence of 12 hex digits
  - 6 bytes/octets
  - Often separated by colons or dashes
  - aa–bb–cc–dd–ee–ff or aa:bb:cc:dd:ee:ff
- Sometimes referred to as:
  - Hardware, MAC or layer 2 addresses

# Data link addressing illustrated



# Data link unicast addressing

- Identifies a single device or interface
- Source addresses are always unicast
- May be locally or globally assigned
  - Universally administered address (UAA)
    - IEEE assigns organizationally unique identifier (OUI)
  - Locally administered address (LAA)

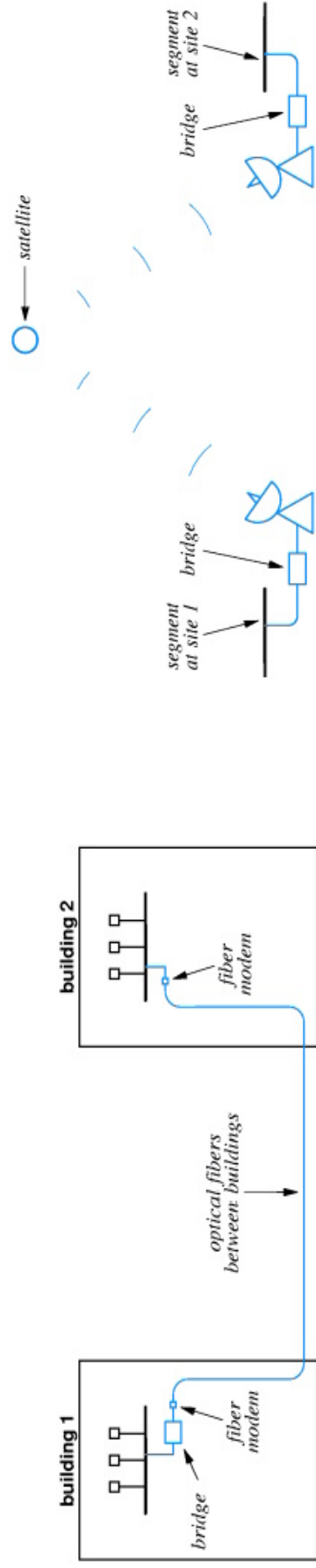
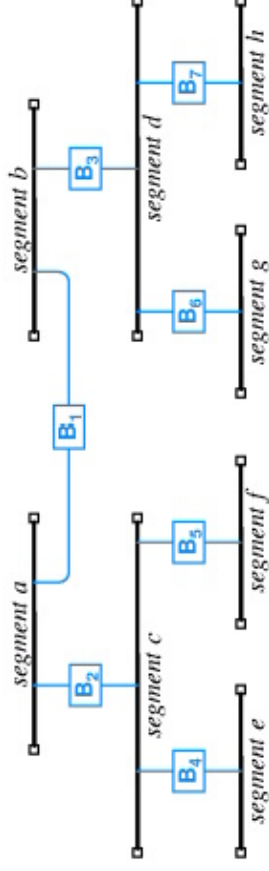
# Data link multicast addressing

- Identifies a group of devices or interfaces
- Broadcast address is the set of all hosts
- Also called group addresses

# Why bridge?

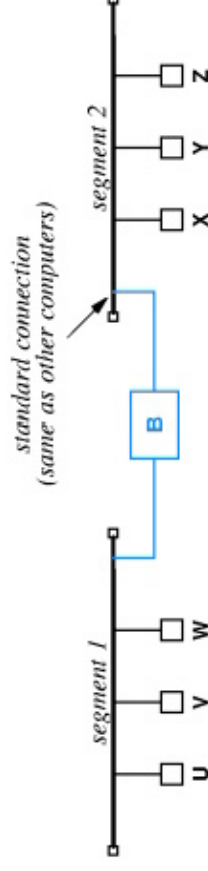
- LANs may have physical distance limitations
- Limitations on the number of hosts per LAN
- Allocate more LAN capacity per station
- Contain local traffic to local segments
- Accommodate hosts with no layer 3 protocol
- Support any layer 3 protocol
- Connect dispersed LANs together

# Bridging illustrated



# Transparent bridging overview

- Listen to each interface promiscuously
- Inspect layer 2 information
- Output to other interface(s) if necessary

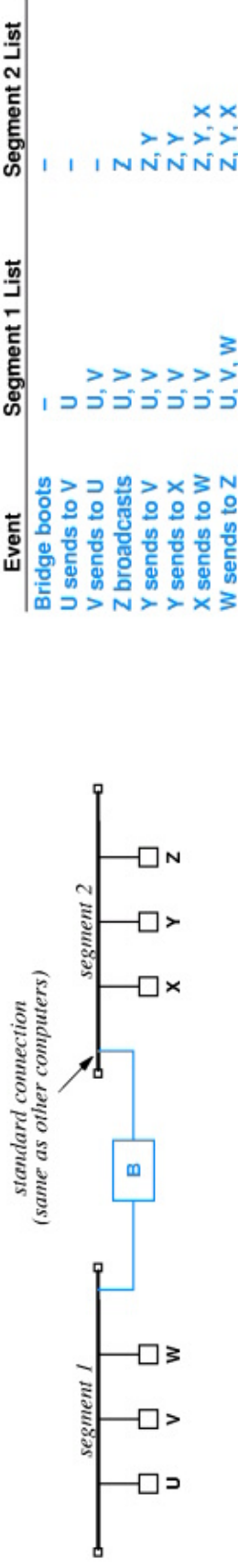


# Bridge forwarding and filtering

- Receive frame on an ingress interface
- Inspect destination address
- If multicast/broadcast
  - Output to all except incoming interface
- Query address table (cache) for destination
  - If found, send to appropriate egress interface...
    - Except when ingress = egress, then filter it
  - If not found, flood to all except ingress interface

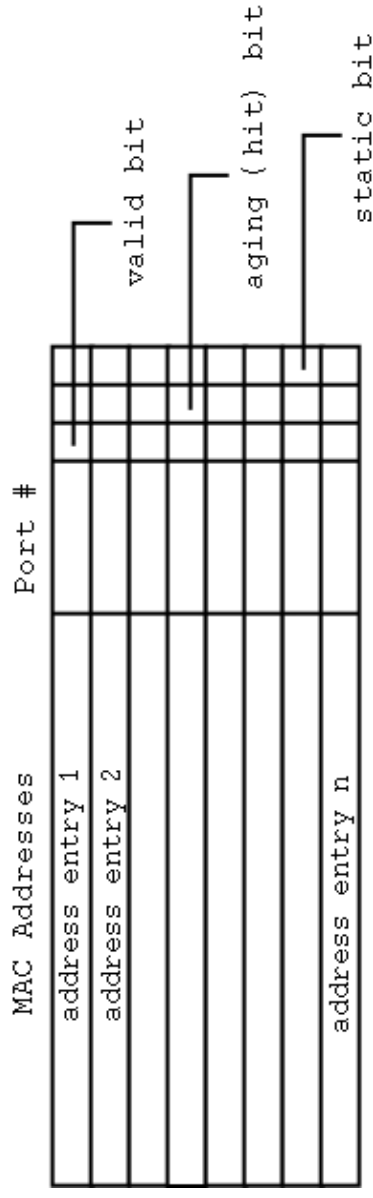
# Source address learning

- Bridge listens promiscuously on all ports
- Store source address and associated ingress bridge port in address table (cache)



# Bridge table (cache) entry aging

- Low priority or non-time critical operation
- Allows station mobility and small table size
- Aging process periodically clears H bit
- If H bit is clear, clear V bit
- If H and V bit is clear, remove table entry



## A transparent bridge...

- Must participate in MAC on each interface
- May introduce *transit delay* in forwarding
- Must not alter the frame
  - \*interesting token ring AR/FC bits aside
- Is *transparent* to end stations
- May drop frames in periods of congestion
- Requires globally unique LAN addresses throughout the entire bridged *catenet*

# IEEE 802.1D standard

- Comprises a number of bridging standards
- Describes bridges, address tables, forwarding, filtering, etc.
- Describes various operating parameters
- Requires bridges to validate FCS field
- Specifies limited multicast addresses

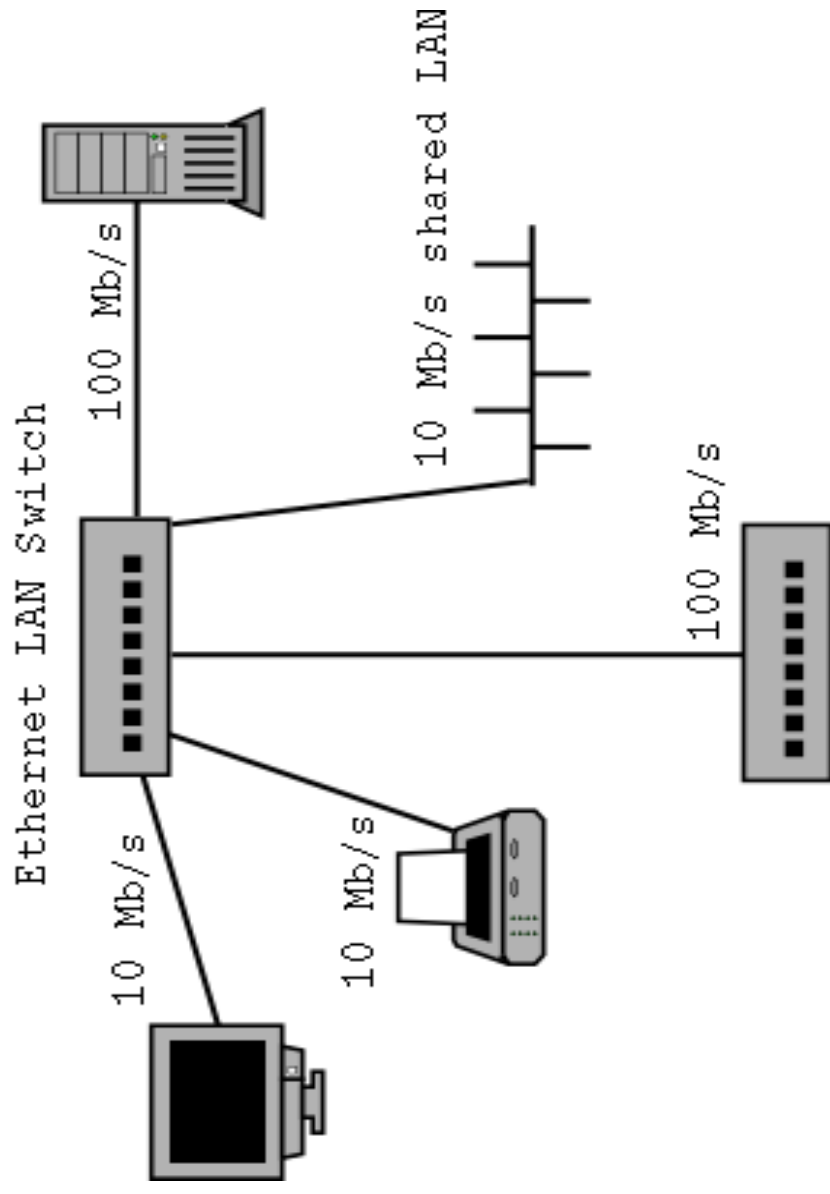
# LAN switches

- LAN switches = LAN bridges
- Switches imply newer, faster, better, bigger
- Switching is a successful marketing term
- Being used to further segment shared LANs
- Switch port per device becoming the norm
- LAN switches are relatively cheap

# Why switch?

- Reduce/remove shared medium contention
- Maximize aggregate capacity
- Extended distance limitations
- Data rate flexibility

# Switching illustrated



# Store and forward switching

- Completely receive frame on input port
- Check frame check sequence for validity
- Perform address learning and lookup
- Forward or filter frame as appropriate

# Cut-through switching

- Begin address lookup as soon as destination address of an incoming frame is received
- Begin forwarding/filtering immediately
  - Before the end of the frame even
- Goal is to improve switch transit latency

# Cut-through switching fallacies

- Latency only improves if output port is free
  - Latency improvements when you don't need it
- Switch latency is the least of your problems
- Multicast/broadcast cut-through is rare
- Input/output ports must be the same rate
- Propogates errors
  - But who cares, error rates are pretty insignificant
- Marketing mumbo jumbo that means nada

# LAN switch configurations

- Bounded
- Stackable
- Chassis

