Ethernet Switching

Repeater/Hub versus Bridge/Switch versus Router

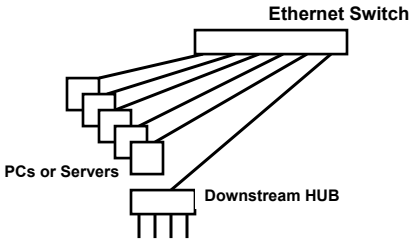
- Hub/Repeater
  - Improved distance
  - End stations see one physical LAN
  - Single broadcast domain, single collision domain
- Switch/Ethernet Switch/Bridge
  - End stations see one logical LAN
  - Protocol insensitive
  - Single broadcast domain, multiple collision domains
- Router/L3 Switch
  - Protocol sensitive (at layer 3)
  - Traffic isolation
  - Multiple broadcast domains, multiple collision domains
  - End stations see multiple networks and of course, multiple LANs

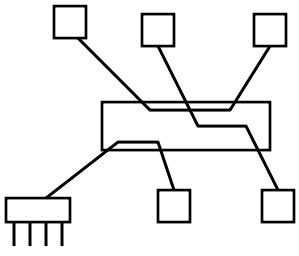
Ethernet Switch Functionality

The first ethernet switches were called ethernet bridges and they had two ports. The large bridges years ago had eight ports. Switches today can have 100s of ports.

- Implements frame filtering and forwarding
- Can also implement the Spanning Tree Protocol. We do not study STP in this course.
- Implements Network Control and Management

Ethernet Switch Topology



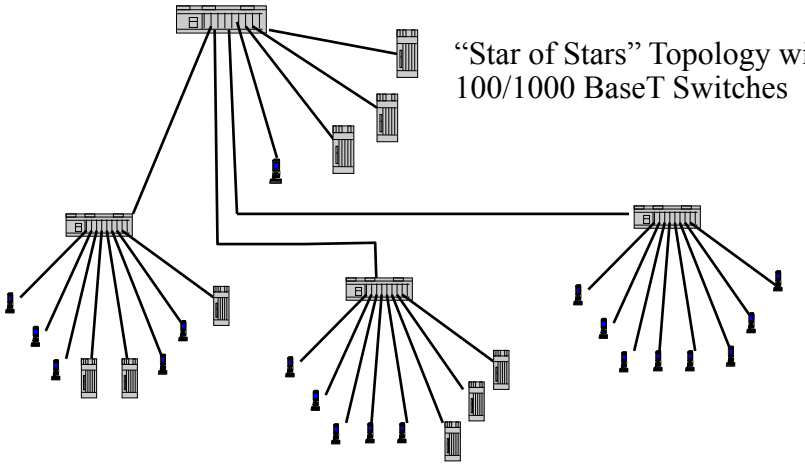


A switch uses the same wiring approach as a hub

BUT

Multiple parallel paths are provided by the switch.

Typical Ethernet Switch Topology

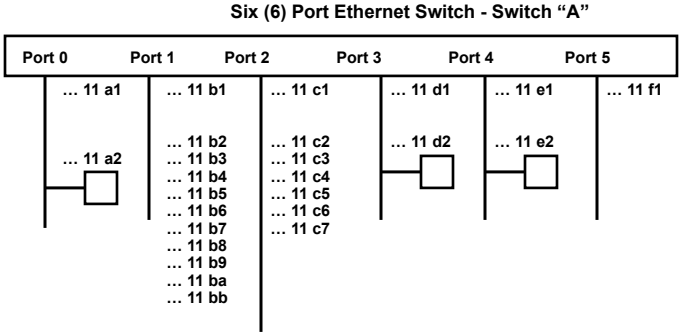


"Star of Stars" Topology with 100/1000 BaseT Switches

Switch Filtering and Forwarding

- Receive a frame on a port
- Discard frame if bad checksum
- Learn (or re-learn) that the station with the source MAC address of the frame is located "off that port." Update table of address and port information.
- Look at destination MAC address and if it is a broadcast, forward frame out all ports (except the port it arrived on.)
- Look at destination MAC address and if not in table, forward frame out all ports (except the port it arrived on.)
- Look at destination MAC address, find it in the table and then forward the frame out the specified port (unless it is the port it arrived on.)

Ethernet Switch Configuration - Switch A



Each ethernet device has a unique MAC address

Ethernet Switch Table - Switch "A"

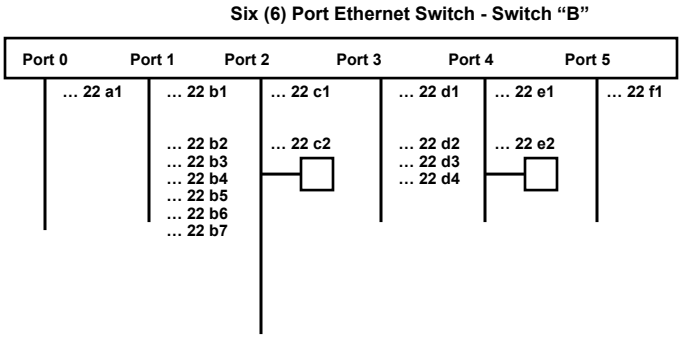
Ethernet address	Switch Port #	Time-Stamp	Etc.,	Etc.,

Ethernet Switch Table - Switch "A"

Ethernet address	Switch Port #	Time-Stamp	Etc.,	Etc.,
… 11 a2	0			
… 11 b2	1			
… 11 b3	1			
… 11 b4	1			
… 11 c2	2			
… 11 c3	2			
… 11 c5	2			
… 11 d2	3			
… 11 e2	4			

* Ethernet addresses are checked and entered as the stations send frames

Ethernet Switch Configuration - Switch B



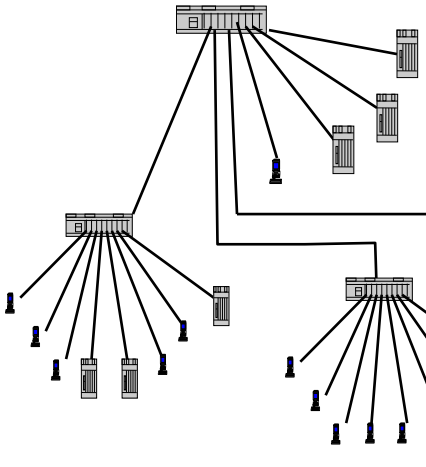
Each ethernet device has a unique MAC address

Ethernet Switch Table - Switch "B"

Ethernet address	Switch Port #	Time-Stamp	Etc.,	Etc.,

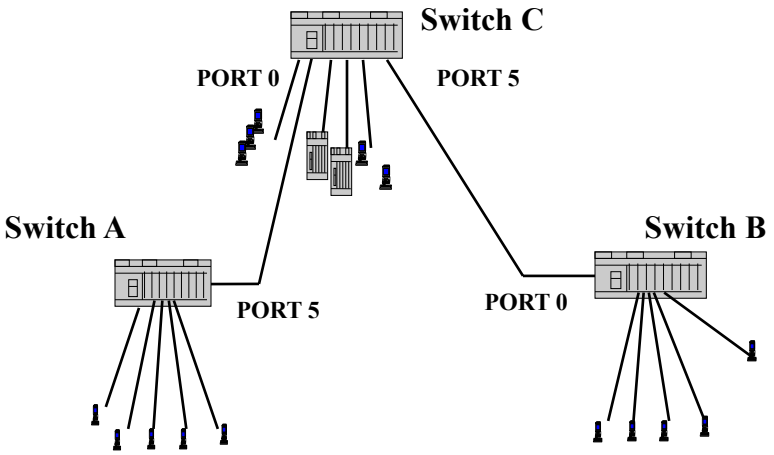
* Ethernet addresses are checked and entered as the stations send frames

Typical Ethernet Switch Topology

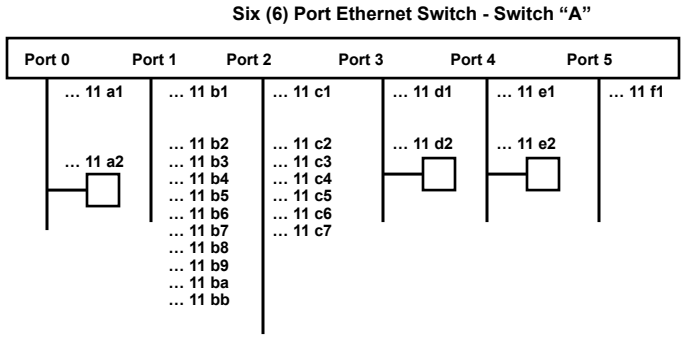


"Star of Stars" Topology with 100/1000 BaseT Switches

Interconnected Ethernet Switches



Ethernet Switch Configuration - Switch A



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… 11 b4	1			
… 11 c2	2			
… 11 c3	2			
… 11 c5	2			
… 11 d2	3			
… 11 e2	4			

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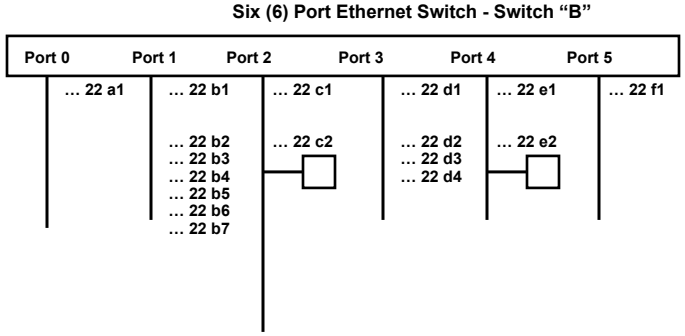
Ethernet Switch Configuration - Switch B



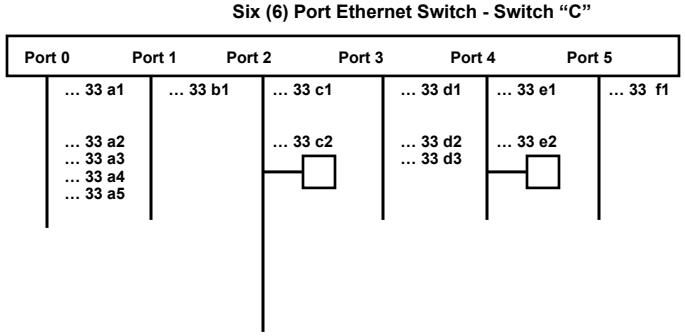
Each ethernet device has a unique MAC address

Ethernet Switch Table - Switch "B"

Ethernet address	Switch Port #	Time-Stamp	Etc.,	Etc.,

* Ethernet addresses are checked and entered as the stations send frames

Ethernet Switch Configuration - Switch C

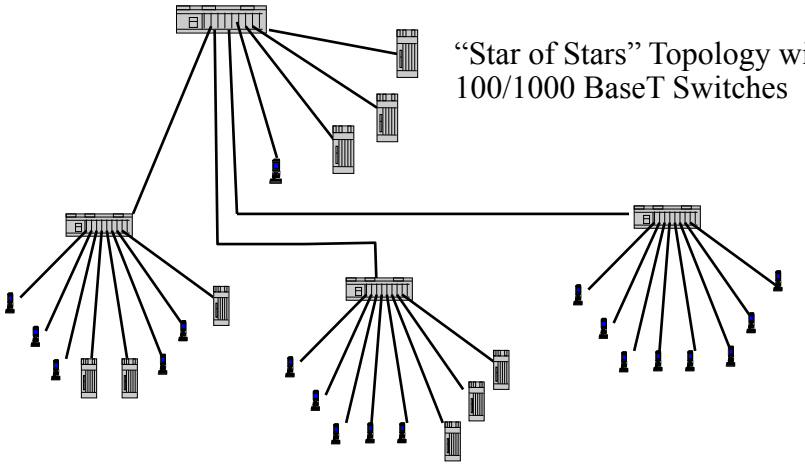


Ethernet Switch Table - Switch "C"

Ethernet address	Switch Port #	Time-Stamp	Etc.,	Etc.,

* Ethernet addresses are checked and entered as the stations send frames

Typical Ethernet Switch Topology



"Star of Stars" Topology with
100/1000 BaseT Switches