Tech Moment

Hooking Up

By Tom Thorpe

Ethernet network devices are connected with:

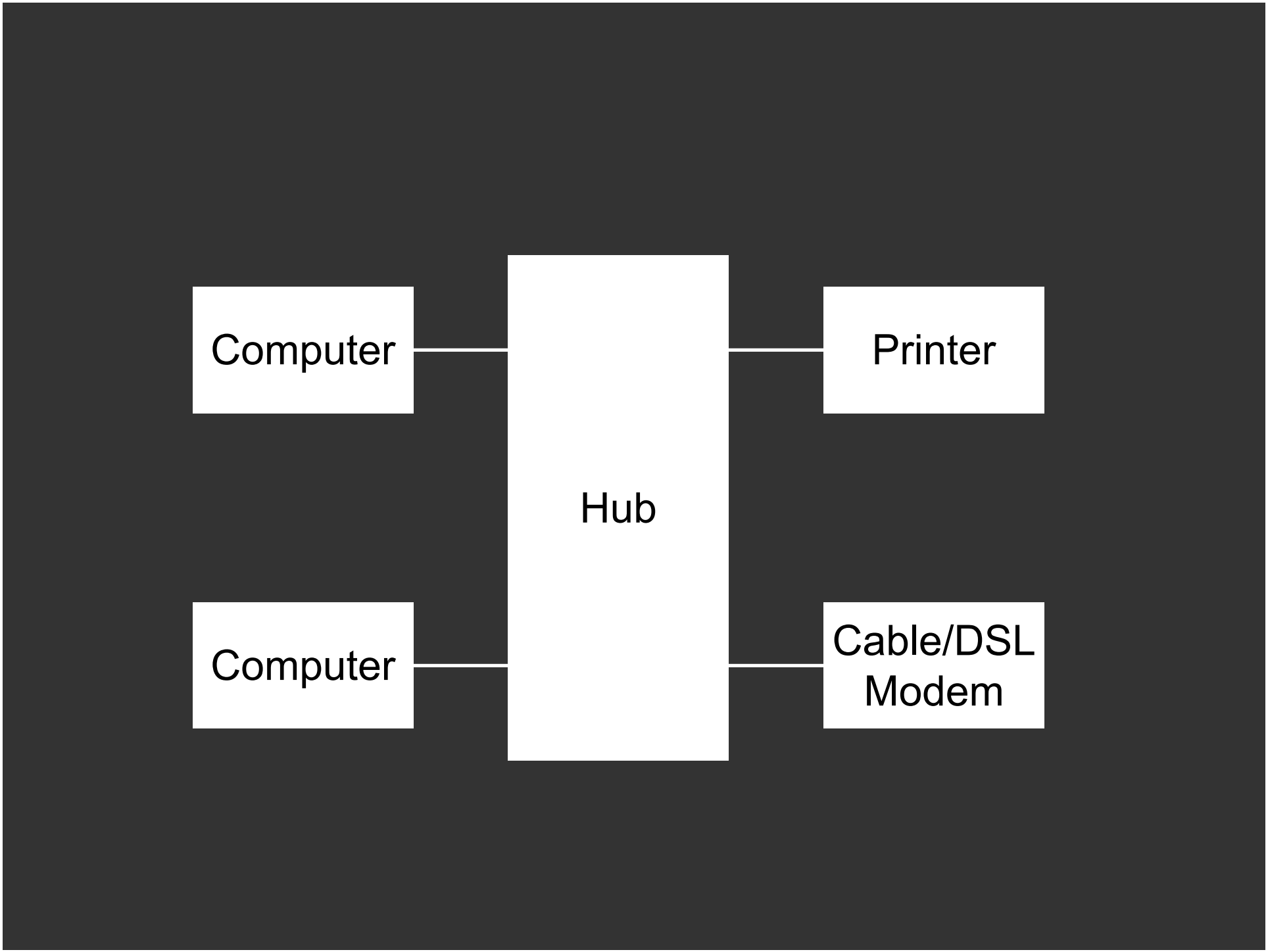
- Hub
- Switch
- Router
- Gateway

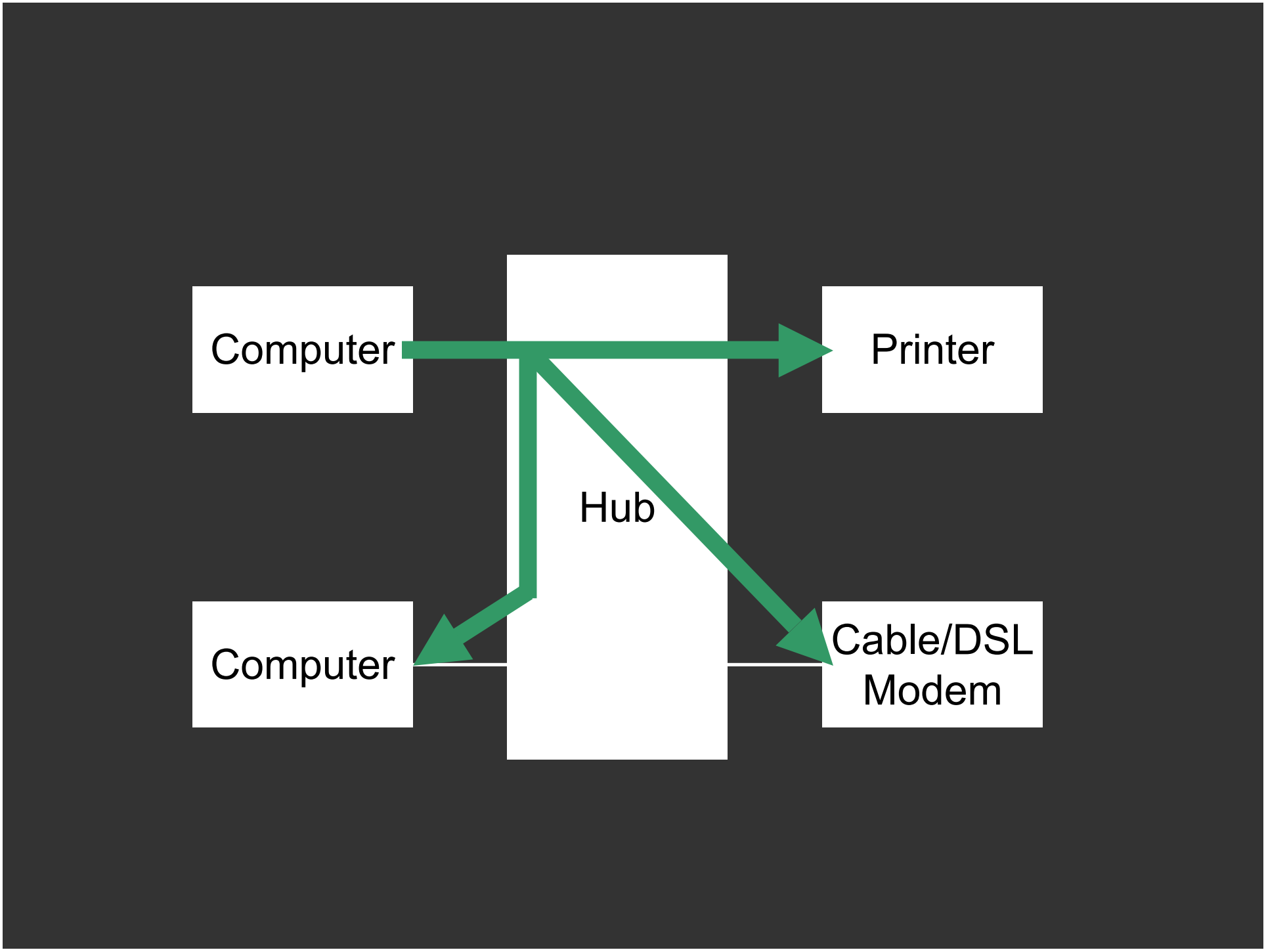
All have multiple connection points called ports

- Ethernet cables have two pairs of wires
  - One for receive data, one for transmitted data
- Some, typically older devices
  - Fixed bit rate (10Mbps, or 100 Mbps)
  - You have to match up the receive/transmit pairs
    - Crossover cables are required
- Most newer devices
  - Ports can auto-negotiate the bit rate
  - Ports can automatically crossover the Rx/Tx lines if needed
- Each port has a unique MAC address

Hub

- Most elementary way of connecting network devices
- Forget auto-anything
- One set of ports
- Dumb device - just buffers
- Repeats all network traffic to all ports
- If more than one person creates traffic at the same time then collisions occur
  - Both parties loose
  - There is a protocol to recover from a collision


Computer
Computer
Hub
Printer
Cable/DSL
Modem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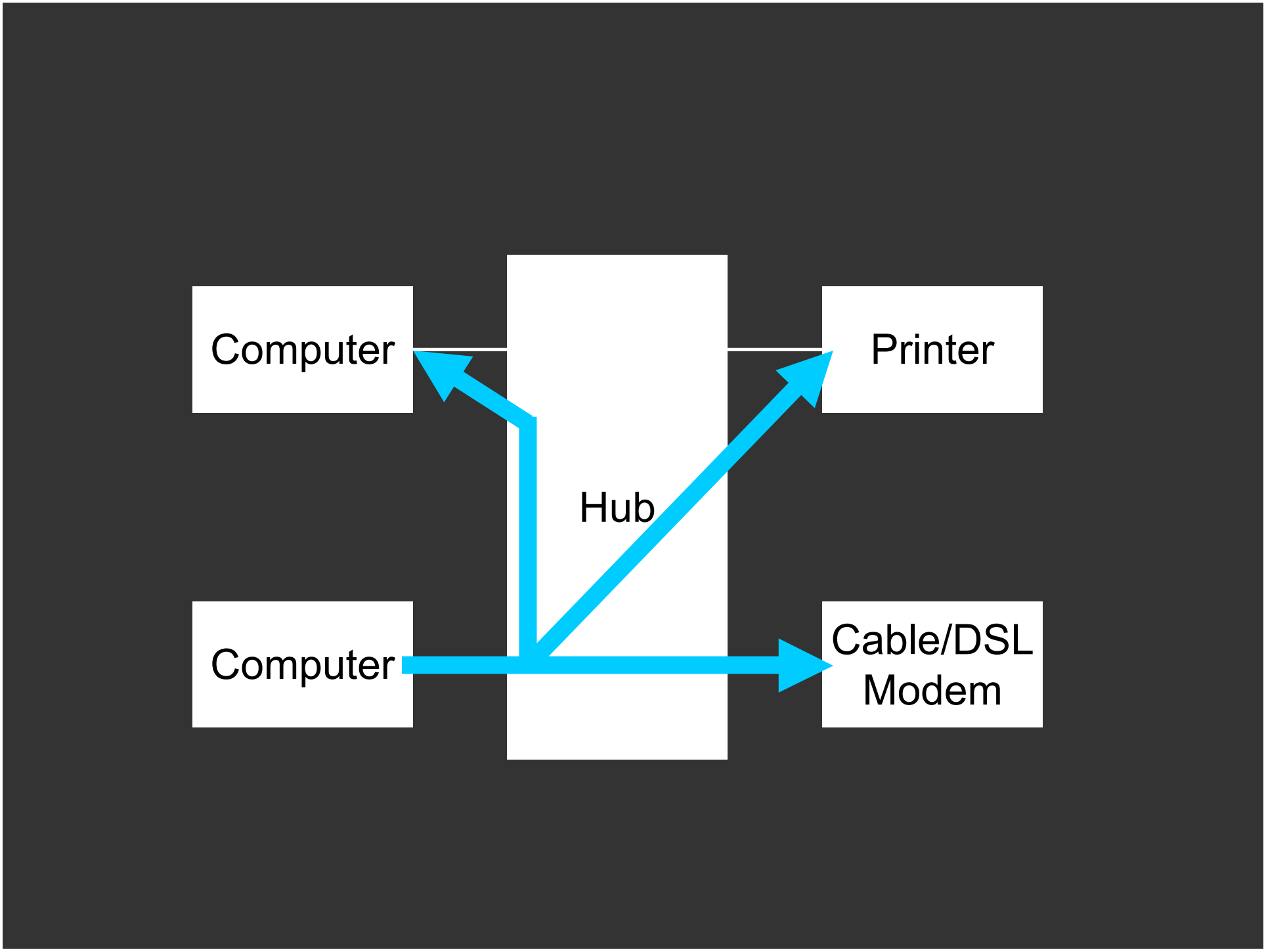
Computer
Printer
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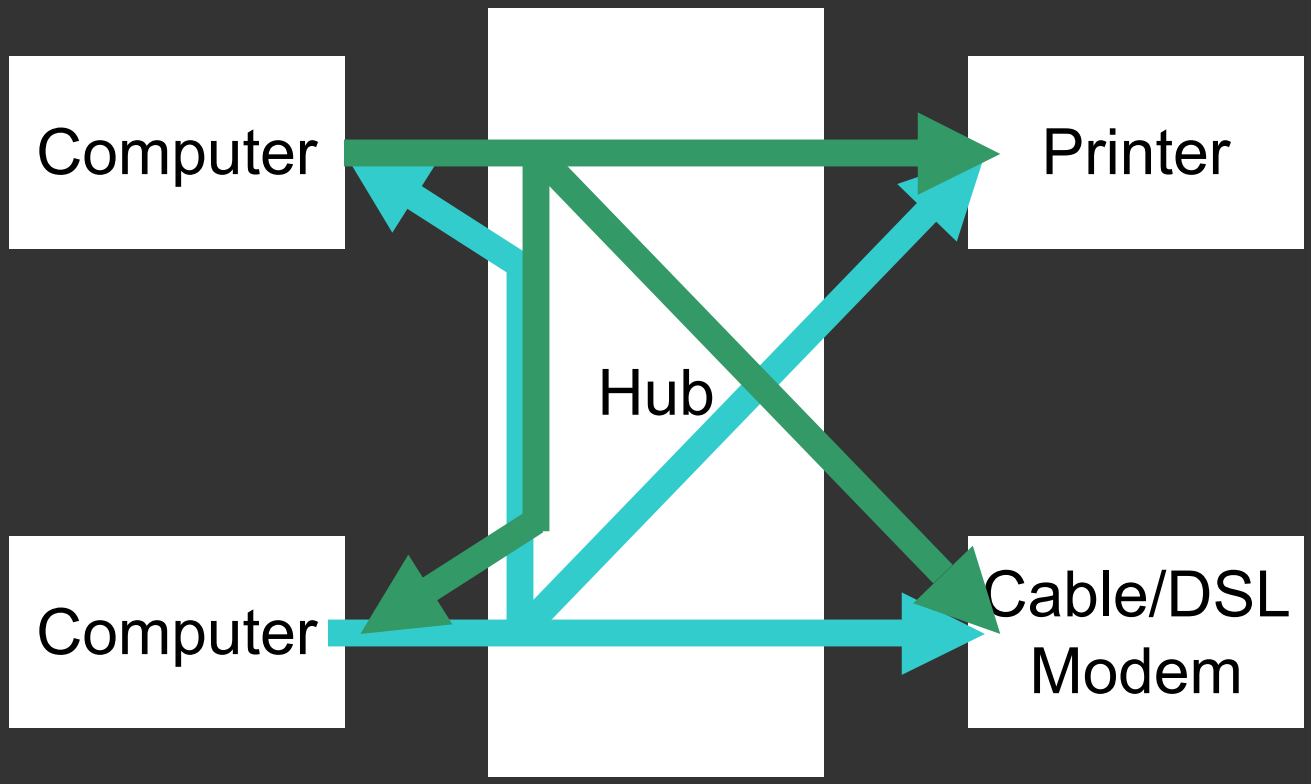
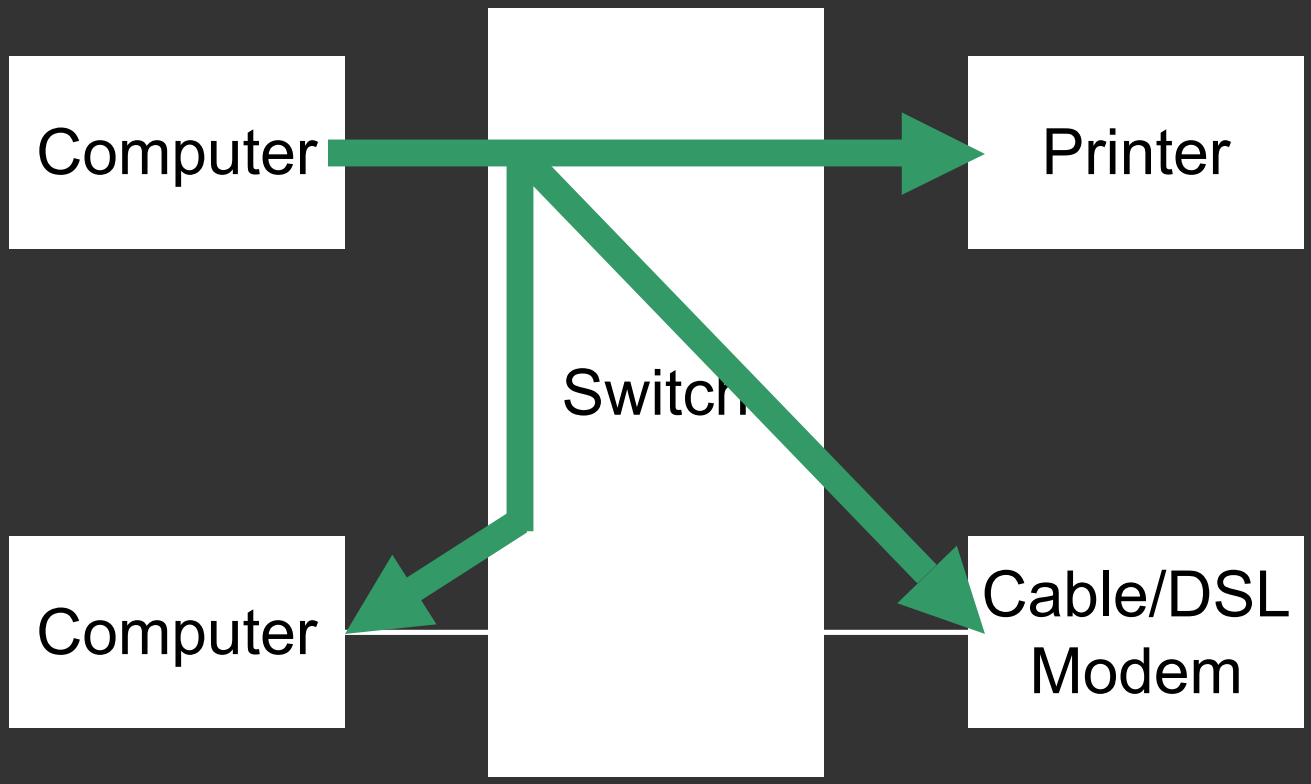
NO!



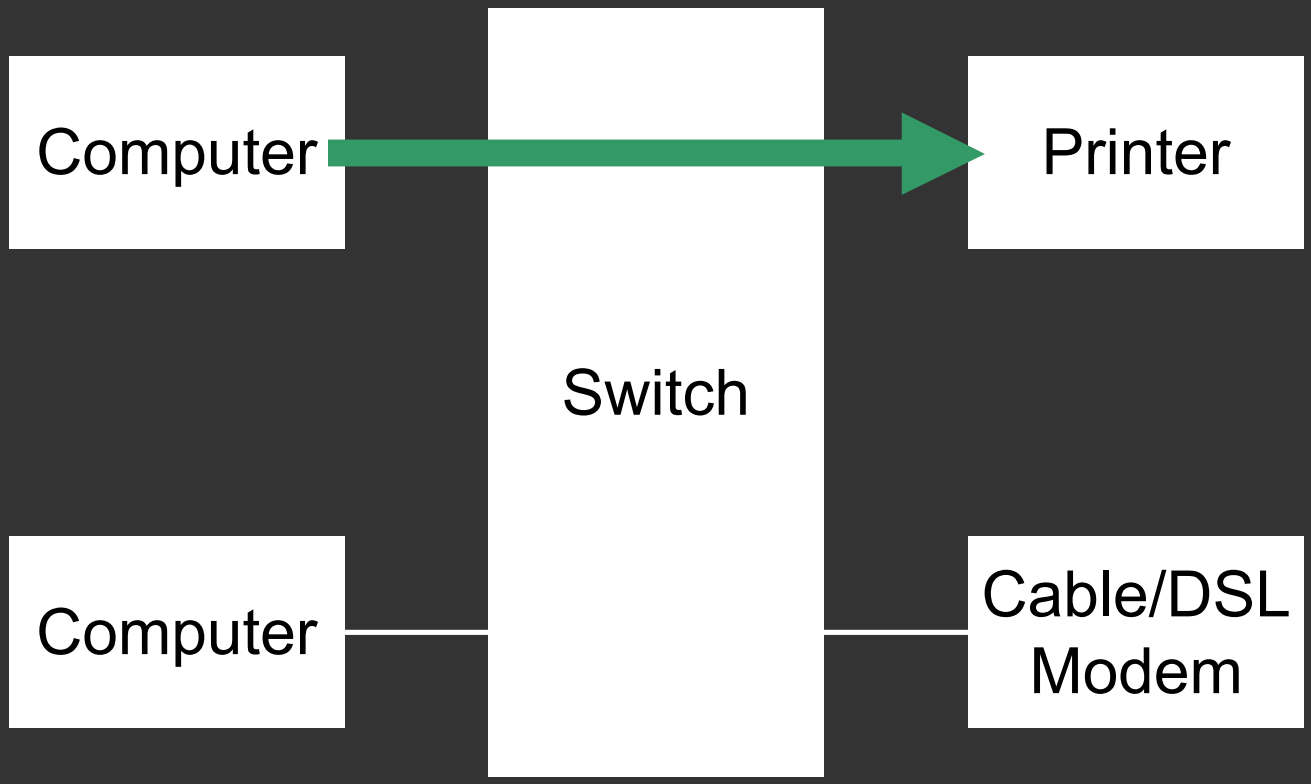
Switch

- One set of ports
- Smarter device
- Starts like a hub by repeating traffic to all ports
- Remembers who answers on which ports and then sends traffic between only the affected ports
- Collisions are minimized
- Can receive and transmit at different bit rates

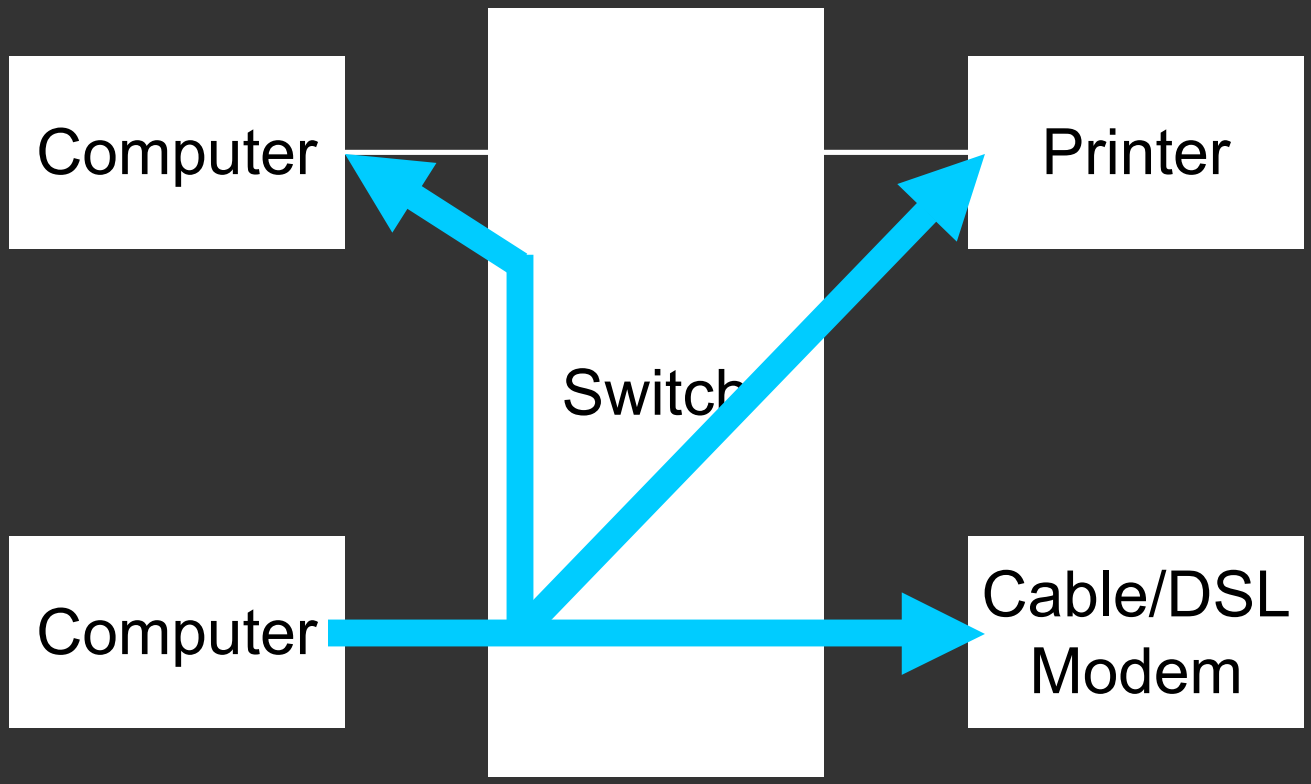
First time



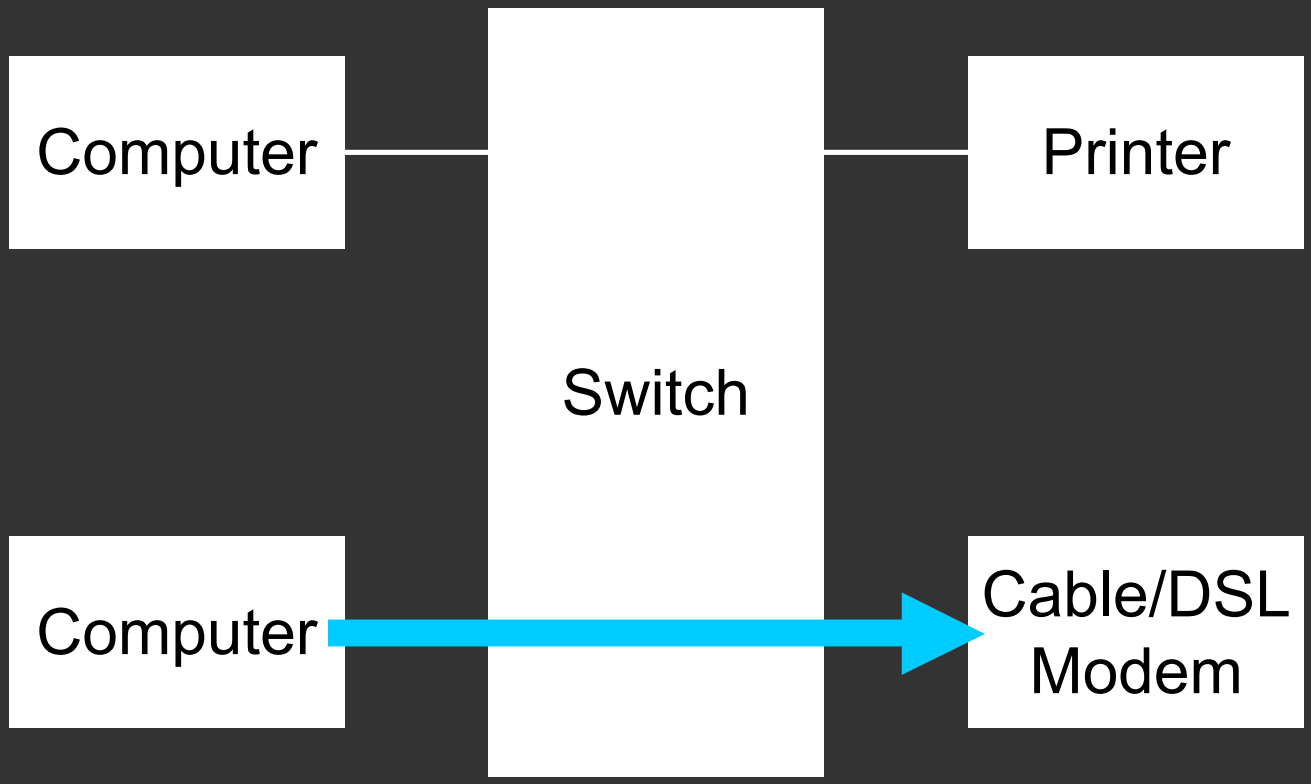
Subsequent times



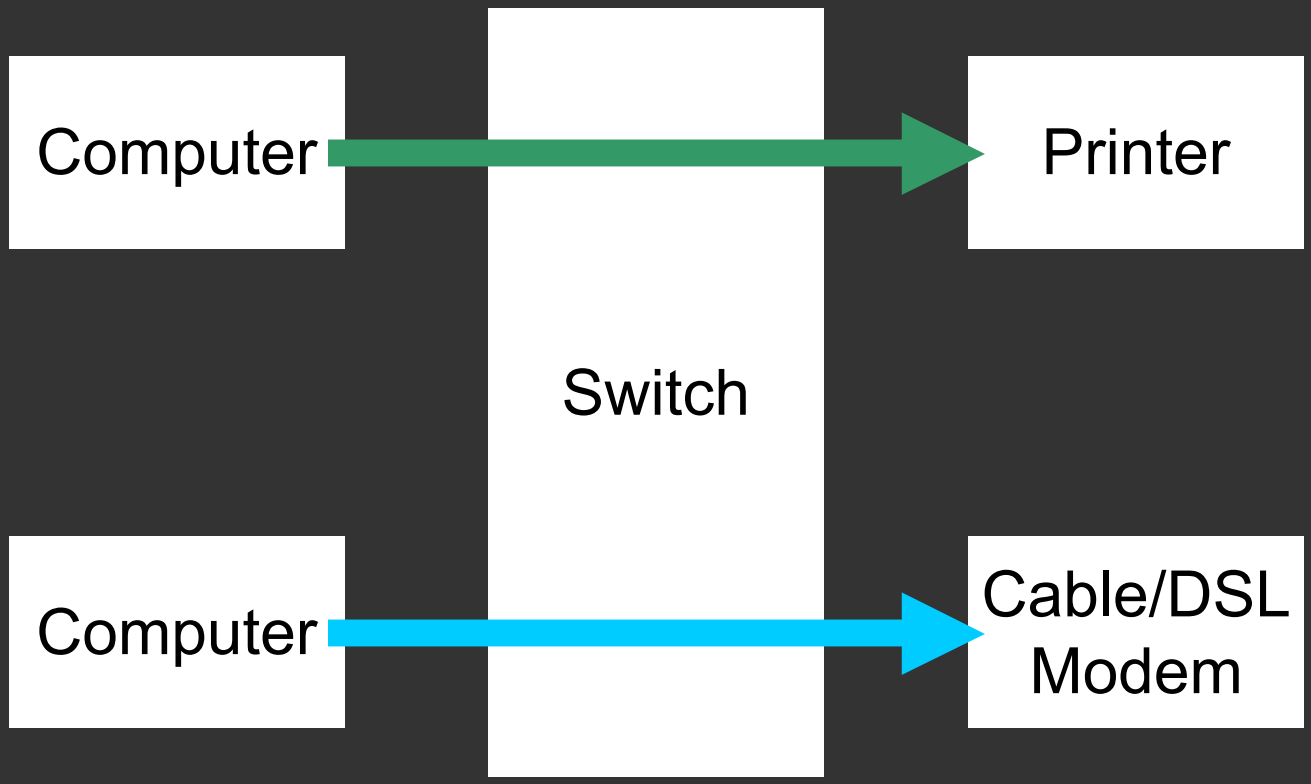
First time



Subsequent times



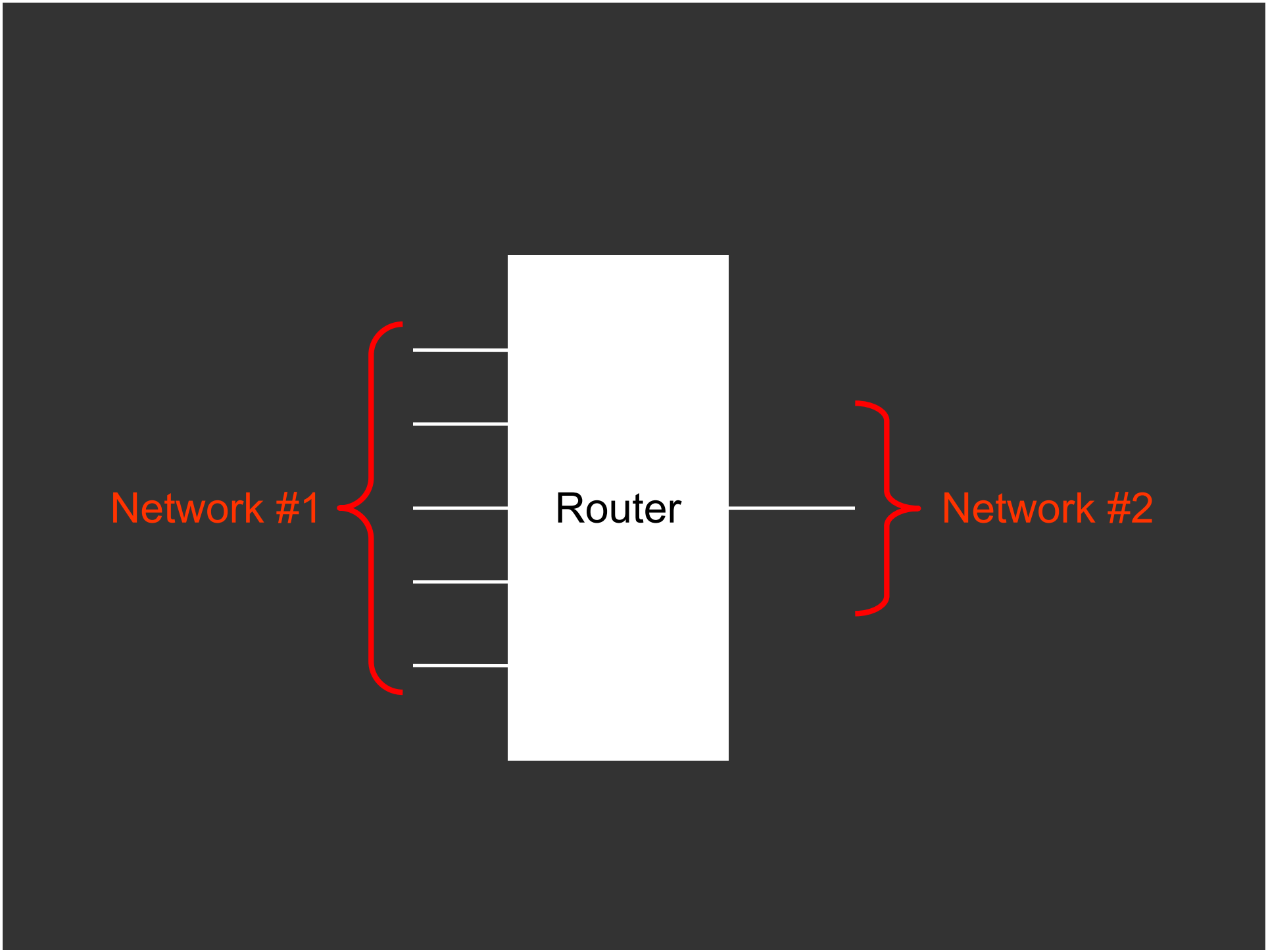
Yes!



Router

- Works like a switch but smarter
- Routers regulate traffic between similar networks
- Two sets of ports
  - Usually one is labeled "WAN", "INTERNET", or the like
  - The rest are for the local network
- The router has its own IP address
  - You assign it and configure the router via a web browser
  - Lots of options

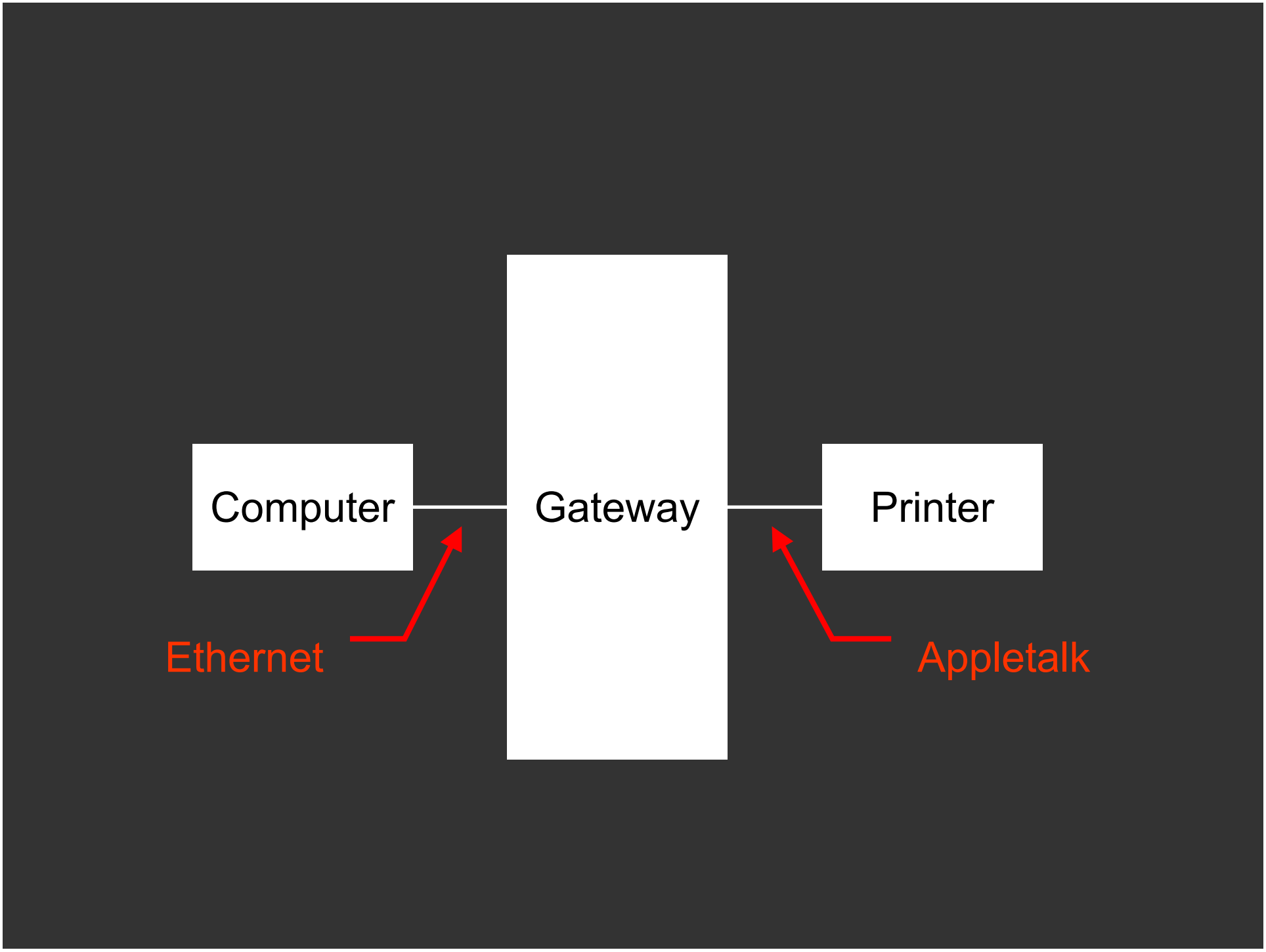
    e.g. limiting certain types of network traffic, logs, etc
- Routers remember the shortest path between computers in a routing table which contains a list of IP addresses that a router can connect to


Network #1
Router
Network #2

Gateway

- Like a router but much smarter
- Gateways connect two dissimilar networks that use different protocols

  e.g. Ethernet ⇔ AppleTalk
- Either a physical box or a computer program


Computer
Gateway
Printer
Ethernet
Appletalk

Summary

- Hubs are the dumbest
- Switches are the network workhorses
- Use a router for getting between two networks
- Vary rarely will you need a gateway