Network Architecture & Topology

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For the sake of this course, the only one that matters is the "Star" topology. 99% of networks you will encounter are Star-topology networks.

Key device terms to be used in this course

Bridge Interconnects multiple devices, enabling them to communicate directly with one another on a common network.

Router "A router is used to route data packets between two networks."[2]

Firewall "Firewalls are mainly used as a means to protect an organization's internal network from those on the outside (internet)." "Firewalls are also used to limit the access of individuals on the internal network to services on the internet along with keeping track of what is done through the firewall."[1]

Device Terminology (cont.)

Key device terms to be used in this course

Server A device installed on the network which is providing resources to users with access to that network

Gateway "A gateway can translate information between different network data formats or network architectures"[2]

Endpoint Used to describe a computer, typically a PC, on the network which is regularly connecting a user to the network, and possibly the Internet.

Two most commonly used network models

OSI Model Seven layer architecture, each layer is considered to be responsible for a different part of the communications.[3]

1. Physical Layer
2. Data Link Layer
3. Network Layer
4. Transport Layer
5. Session Layer
6. Presentation Layer
7. Application Layer

Two most commonly used network models

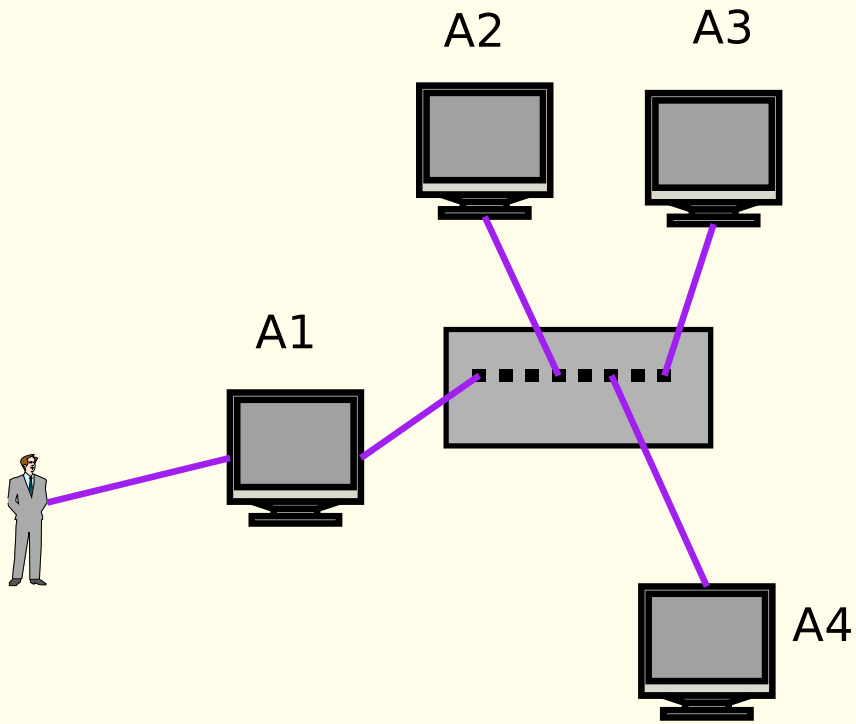
DOD Model Four layer architecture, originally designed for the Dept. of Defense.[3] We will sometimes use this as a short-hand model for describing TCP/IP networks.

1. Link Layer
2. Network Layer
3. Transport Layer
4. Application Layer

Switched networks

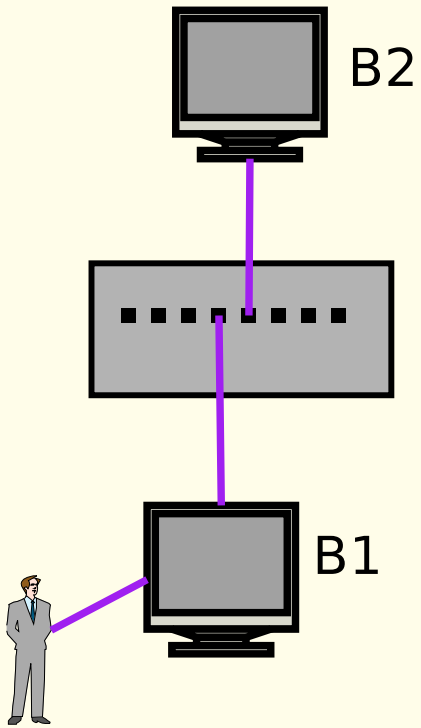
- In a switched network, everyone connected to the same switch (a bridge) can identify everyone else connected to it, but only the two endpoints of a coversation may observe the content of that traffic.
- The switch will negotiate with each device physically connected to the switch to determine what host addresses are accessible on the connected port, and the switch will retain a record of these. This enables multiple switches to maintain internal pictures of the network, when interconnected.

A "primary" corporate network. A1 can talk to A3, without A2 or A4 being able to see the content.



Simple, 4 user network "A"

A "remote", secondary corporate network. B2 can talk to B1 directly.



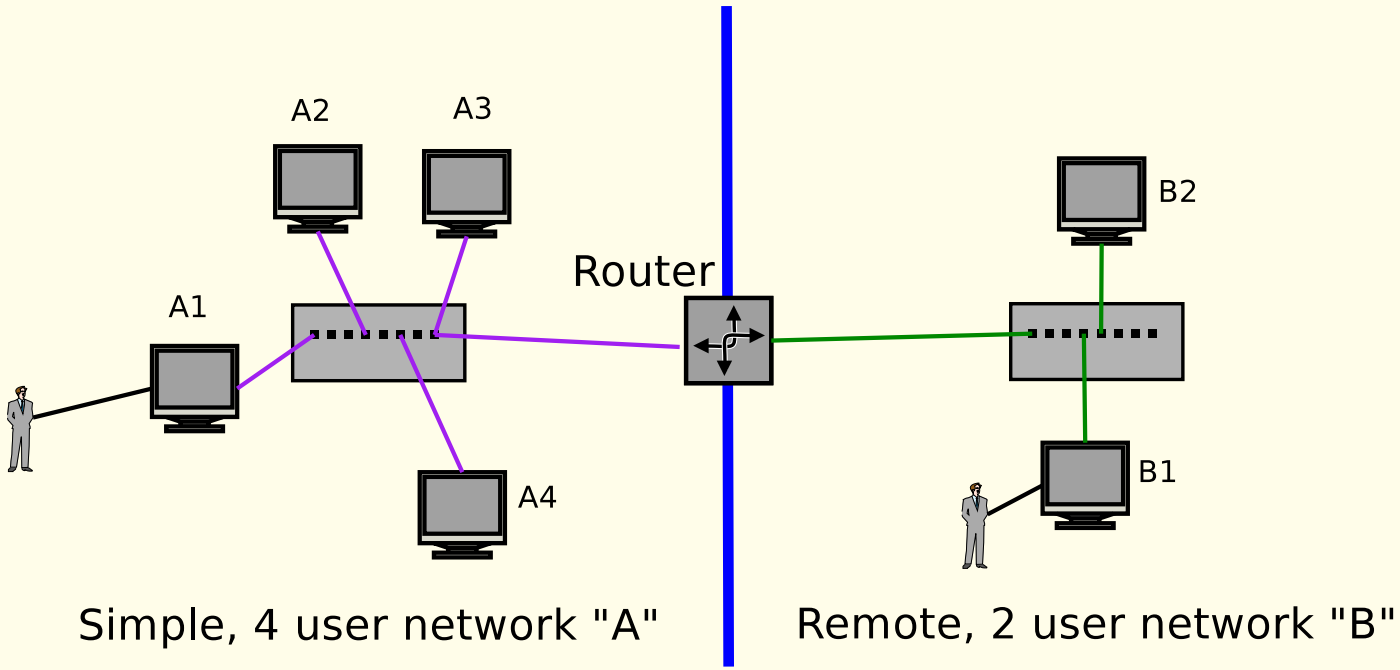
Remote, 2 user network "B"

Routing between the two

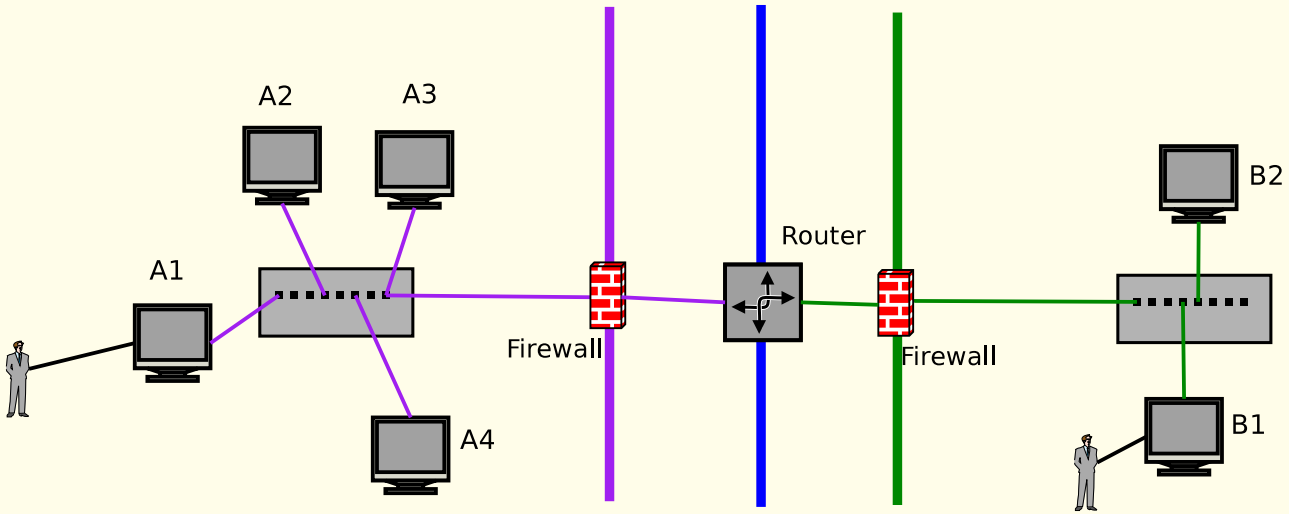
Join the two networks via a Router

- Router can observe all traffic from any host in one network communicating with any host in another network
- Architectural "choke point" & partitioning tool
- Architectural "visibility" enforcement tool
- While a firewall is a separate concept, modern routers typicall incorporate firewalls within the same box

Join example "A" to "B" so that users on each network may communicate with one another. Still two partitioned networks, but we've added functionality to "route" certain traffic types to each one.



Firewalls can perform traffic inspection to determine if certain traffic should even be routed to the remote network, and vice-versa.
There are now **4 partitions** to the network, after the addition of the two firewalling points.



Simple, 4 user network "A" Remote, 2 user network "B"

This course is intended as a broad overview, with some advanced proficiency in networking expected. Further research on the details of Internet technology, networking data structures, and general networking topics:

- `http://www.freesoft.org/CIE/Topics/index.htm`
- `http://www.comptechdoc.org/independent/networking/guide/`

[1] Mark Allen. The ctdp networking guide, firewalls section.

http://www.comptechdoc.org/independent/networking/guide/netfirewall.html.

[2] Mark Allen. The ctdp networking guide, network devices section.

http://www.comptechdoc.org/independent/networking/guide/netdevices.html.

[3] Mark Allen. The ctdp networking guide, network protocol levels section.

http://www.comptechdoc.org/independent/networking/guide/netstandards.html.