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VIDEO OVER INTERNET PROTOCOL (IP)

What is Internet Protocol

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Conversion and Transmission

Methods for Video over IP

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Connection Speeds

Options for Securing Bandwidth

Considerations

IP

Internet Protocol (IP), layer 3) is a protocol used to deliver data sent from a device with an address to another device with an address through a network. The data is divided into little packets and each packet is sent separately to the destination address. IP provides a connectionless packet delivery service. Each packet that makes up a particular message (data string) is sent separately and may even traverse different networks on the way to the destination. The TCP protocol is responsible for re-assembling the packets in the correct order.

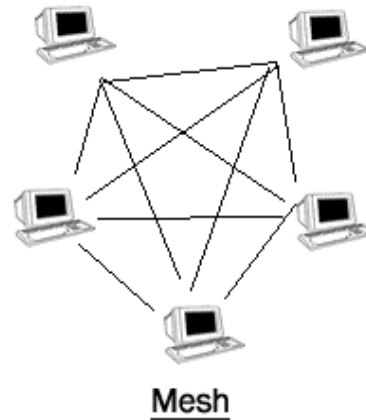
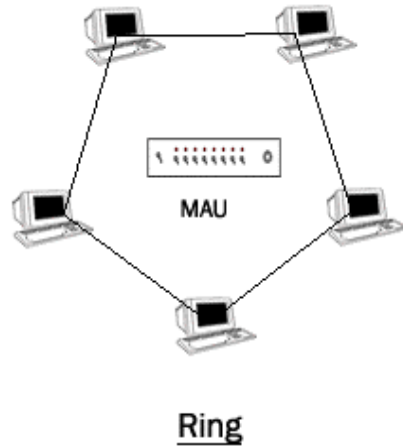
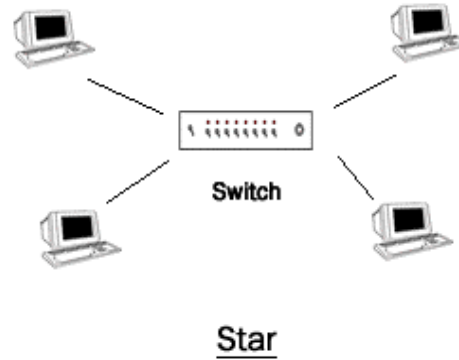
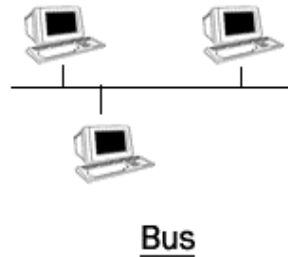
TCP/IP

Transmission Control Protocol/Internet Protocol TCP/IP This is the suite of protocols that defines the Internet. Originally designed for the UNIX operating system, TCP/IP software is now available for every major kind of computer operating system. To be truly on the Internet, your computer must have TCP/IP software.

Connection-oriented **TCP** (Transmission Control Protocol) reassembles packets in the correct order at the destination. IP was originally developed by the US Department of Defense (DoD) for internetworking computers and networks running different and/or proprietary protocols. As such, IP has an open architecture and easily interoperates with other protocols.

What is a network?

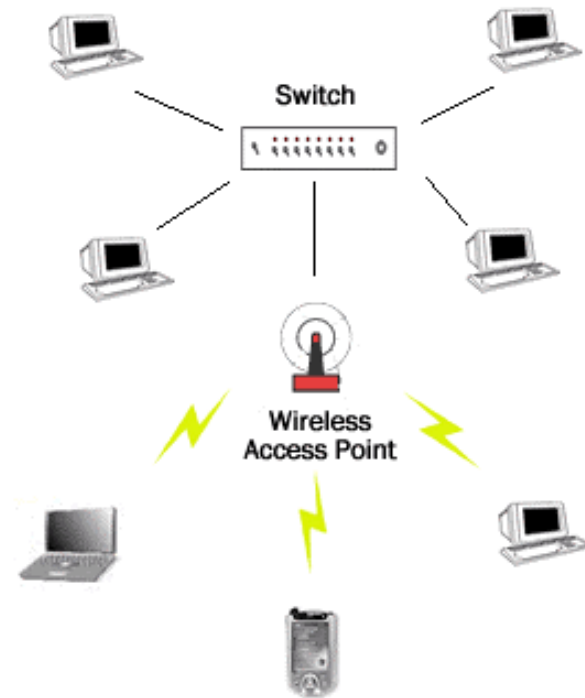
Network Topologies



Wireless

Wireless networking has opened the door to many new applications where getting a wired network was difficult, impossible or too expensive. Wireless connections are slower and less secure than wired alternatives. Signal interference is also a concern especially as wireless connectivity becomes more wide spread.

- 802.11a – 5.15-5.8 GHz, 54Mbps - Shorter Range
- 802.11b – 2.4 GHz, 11Mbps – Longer Range
- 802.11g – 2.4 GHz, 54Mbps – Longer Range

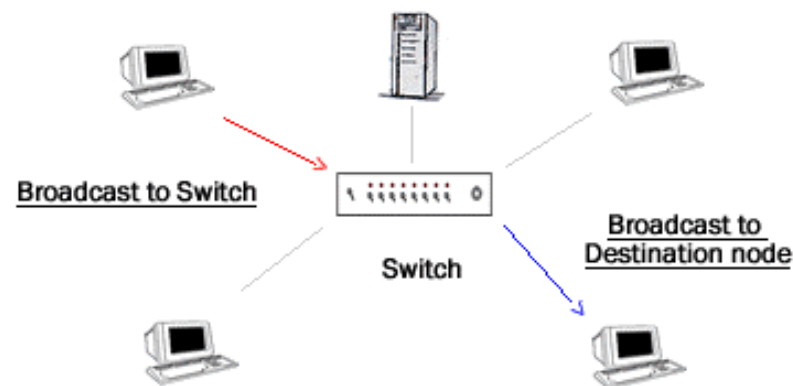


Hub

A hub forwards data packets out every port resulting in large amounts of network traffic. The receiving network card must determine if data is for it or should be ignored. This often results in no available bandwidth for other communications.

Switch

A switch forwards data packets only to the destination port thus reducing network traffic. Switches are also capable of full-duplex mode sending and receiving data simultaneously.



Network Models

Peer to Peer

A peer to peer network is a decentralized model incorporating shares on devices to share data and resources

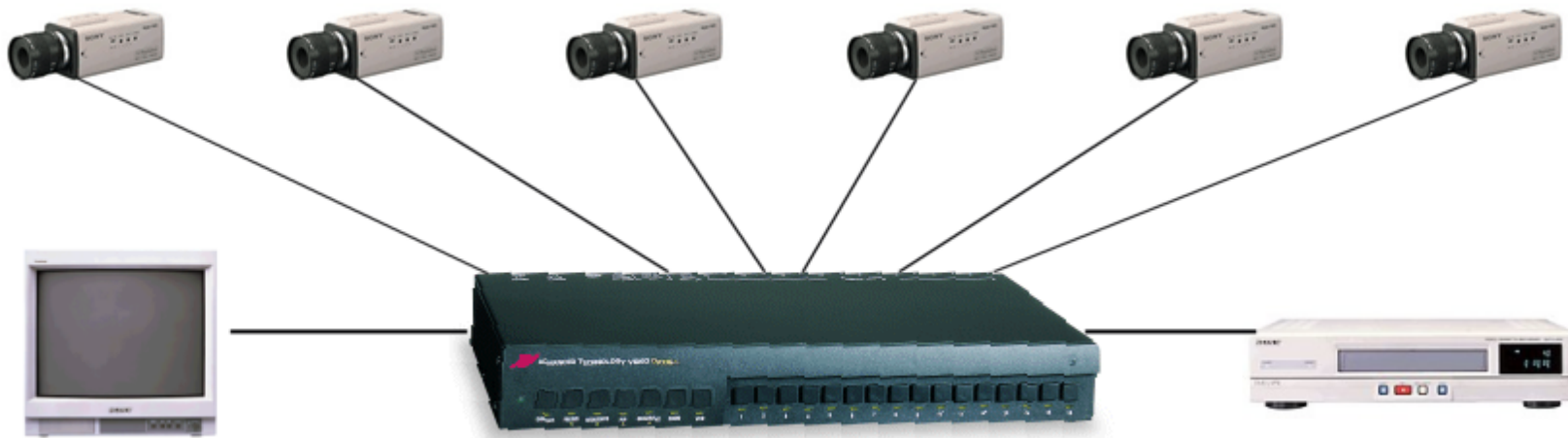
Client Server

Most widely implemented network model. Allows centralized management of network services users, security, backups and more. This model uses a central server/s for control of the network.

How do we get video transmitted over IP?

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Standard Analog Video System





How much bandwidth is going to be used by video over IP?

- Video consumes bandwidth (lots!)
- A dedicated network is preferred
- Dedicated IP addresses may be required
- How much bandwidth is available?

How do I determine the amount of bandwidth I need?

Estimating the required bandwidth is much easier than actually getting it!

1. Find the average image size (usually given in Kilobytes) produced by your transmission method. Image size is comprised of:
 - a. Compression type (JPEG, MPEG4, etc...)
 - b. Resolution 352X240(1CIF), 704X480 (4CIF), 1280X1024 (16CIF)
 - c. Percent of motion
2. Multiply by 8 to get bits
3. Multiply by the desired number of images per second (30 ips is real time)

For example, if our image size is 8KB and we are interested in 30 ips...

$$8 \times 8 \times 30 = 1,920\text{Kbps} \quad (1.9\text{Mbps})$$

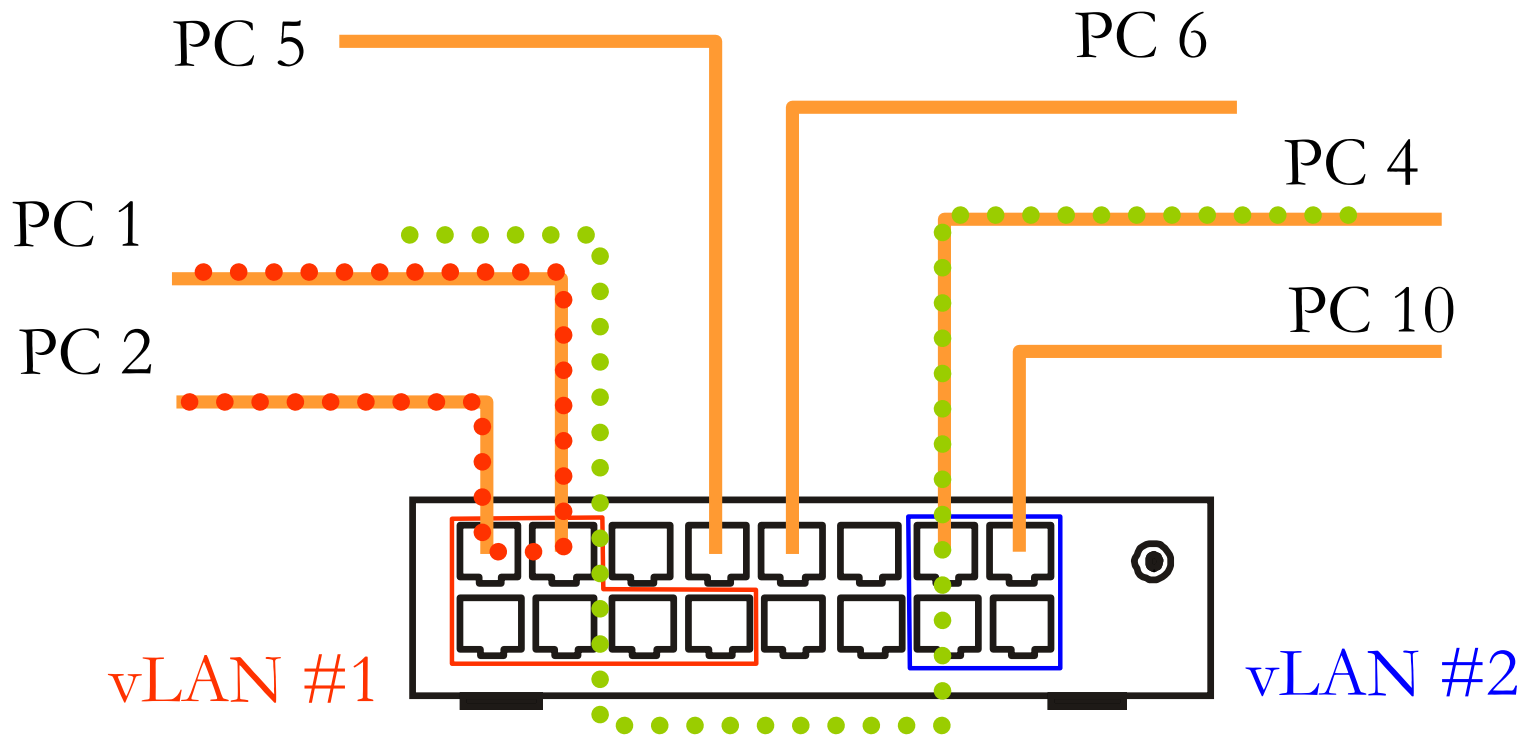
$$8 \times 8 \times 15 = 960\text{Kbps}$$

$$8 \times 8 \times 7 = 448\text{Kbps}$$

Remember this is PER CAMERA PER SECOND.

ADSL	Upstream speeds range from 64Kbps-1Mbps. 768Kbps to 6.1 Mbps downstream.
Cable Modem	256 Kbps – 1.5 Mbps (theoretical 5 Mbps)
SDSL	Up to 2.3Mbps both ways.
Frame Relay	56 Kbps - 1.544 Mbps
VPN	56 Kbps - 1.544 Mbps
Fractional T-1	128 Kbps - 1.544 Mbps
T-1	1.544 Mbps
Fractional T-3	3 Mbps - 44.736 Mbps
10/100 Switch	10 Mbps – 100 Mbps
T-3	44.736 Mbps
OC-3	155.52 Mbps (Optical Carrier Fiber)
OC-12	622.08 Mbps
OC-48	2.488 Gbps (Gigabytes per second)

Dedicated Network Virtual Lan



Analog Video:

- Power Failure
- Cabling Cut
- Camera Failure
- Controller Failure

IP Video

- Power Failure
- Cabling Cut
- Camera Failure
- Controller Failure
- Network Switch Failure
- Virus
- Denial of Service
- Bandwidth
- Video Quality
- Video Latency
- Camera Control Latency
- Operator Interface