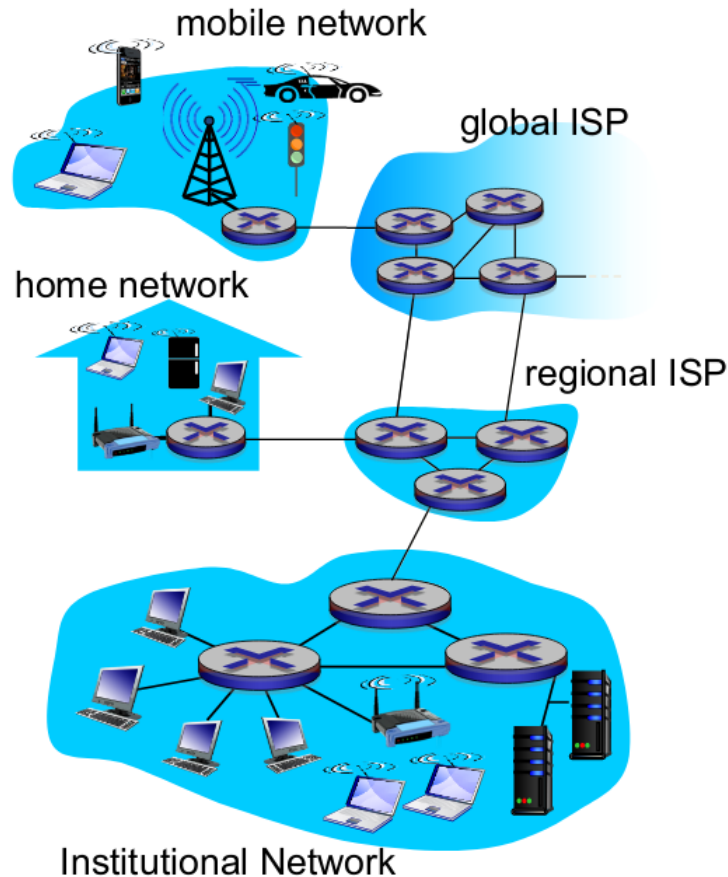


Introduction

Computer Network - A group of devices that are connected to one another in order to exchange information or share resources

1 Overview



Hosts - End systems

Communication links - Fiber, copper, radio, satellite

Bandwidth - Transmission rate

Packet switches - Forward packets (routers and switches)

Internet - A network of networks

Protocols - Control sending, receiving of messages

Internet standards:

- RFC: Request for comments
- IETF: Internet Engineering Task Force

2 What's a protocol

Protocols define the format and order of messages sent and received among network entities, and actions taken on message transmission and receipt

3 Access Network

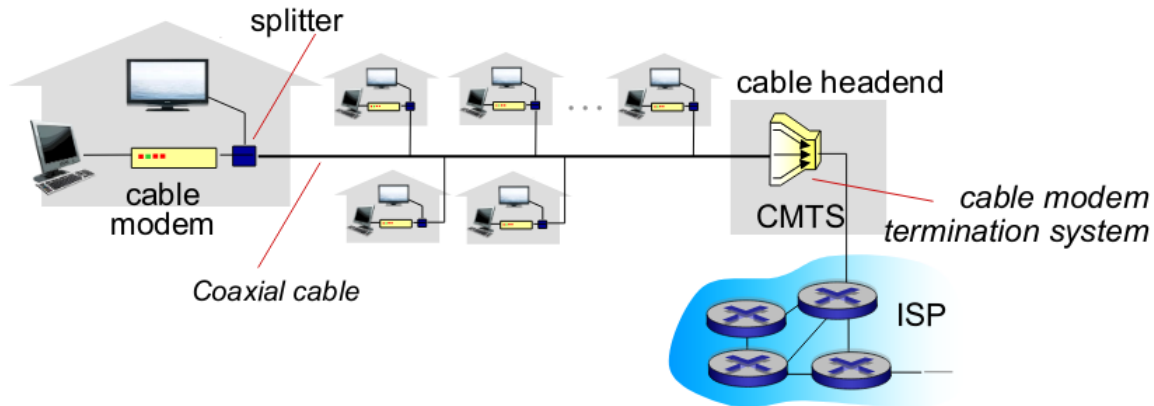
3.1 DSL

Use existing telephone line to central office DSLAM

- data over DSL phone line goes to internet
- voice over DSL phone line goes to telephone net

Asymmetric so much faster download than upload

3.2 Cable network



HFC - hybrid fiber coax

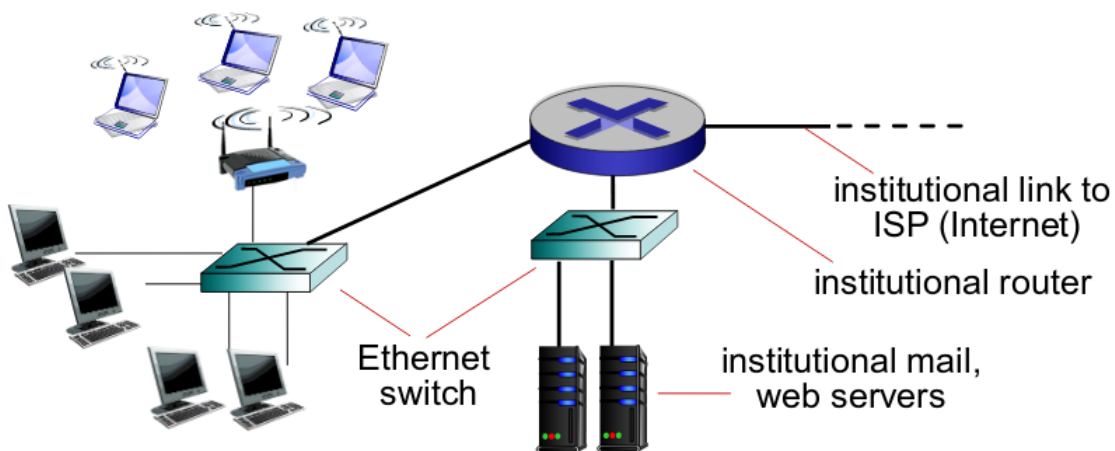
Network of cable, fiber attaches homes to ISP router

- Homes share access network to cable headend
- Unlike DSL, which has dedicated access to central office

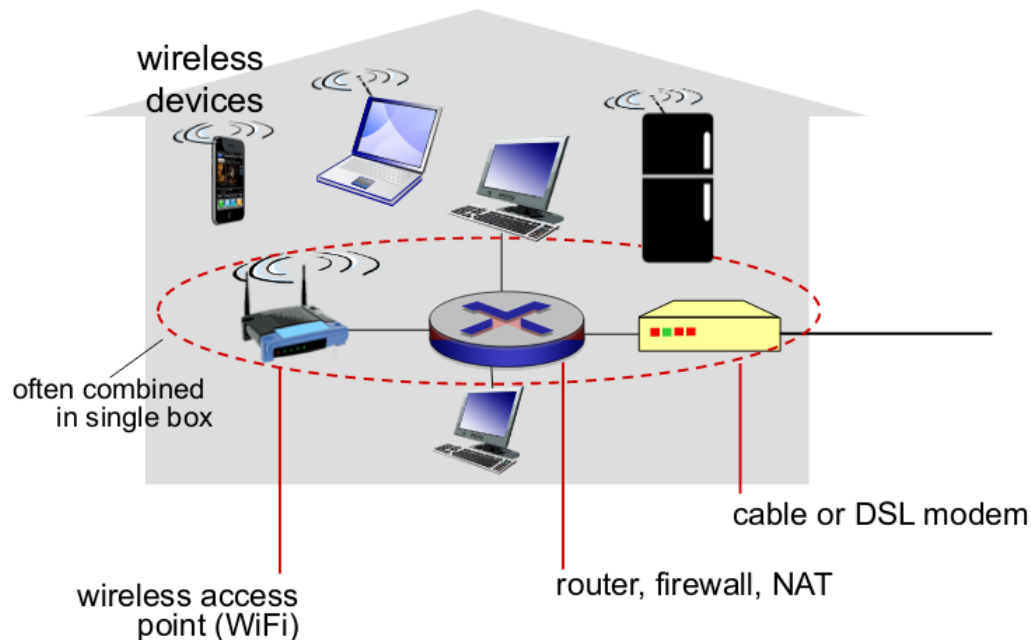
Shared line between a group of users

CMTS translates signal between the coaxial cable and the ISP

3.3 Ethernet (Enterprise access networks)



3.4 Home network



4 Wireless Access Networks

Shared wireless access networks connects end system to router via base station, aka "access point"

Wireless LANs(802.11): - Within Building (54-1300 Mbps)

Wide-area wireless access - 10s of km (1-10 Mbps)

5 Physical media

Bit: Propagates between transmitter/reciever pairs

Physical link: What lies between the transmitter and reciever

Guided media: Signals propagate in solid media (usually cables or fibers)

Unguided media: Signals propagate freely (radio etc)

5.1 Coax, Fiber

Twisted Pair:

- Two insulated copper wires
- Cat5: 10Mbps, 1Gbps
- Cat6: 10Gbps

Coaxial cable:

- Two concentric copper conductors
- Can achieve high data transmission rates

Fiber optic cable

- Glass fibre carrying light pulses representing bits
- High speed operation
- Low error rate

5.2 Radio

- Signal carried in electromagnetic spectrum
- No physical wire
- Carry a signal for long distances
- Propagation environment effects
 - Reflection
 - Obstruction by objects
 - Interference

Classified into three groups

- Very short distance
- LAN
- Wide area

6 Network Security

Network Security

- How bad actors can attack computer networks
- How to defend networks against attacks
- How to design architectures resistant to attacks

Internet originally designed with little security

- Original vision: "a group of mutually trusting users attached to a transparent network"
- Internet protocol designers playing "catch up"
- Security considerations in all layers

Bad actors can "sniff" packets

- Broadcast media
- "Promiscuous" network interface reads/records all packets