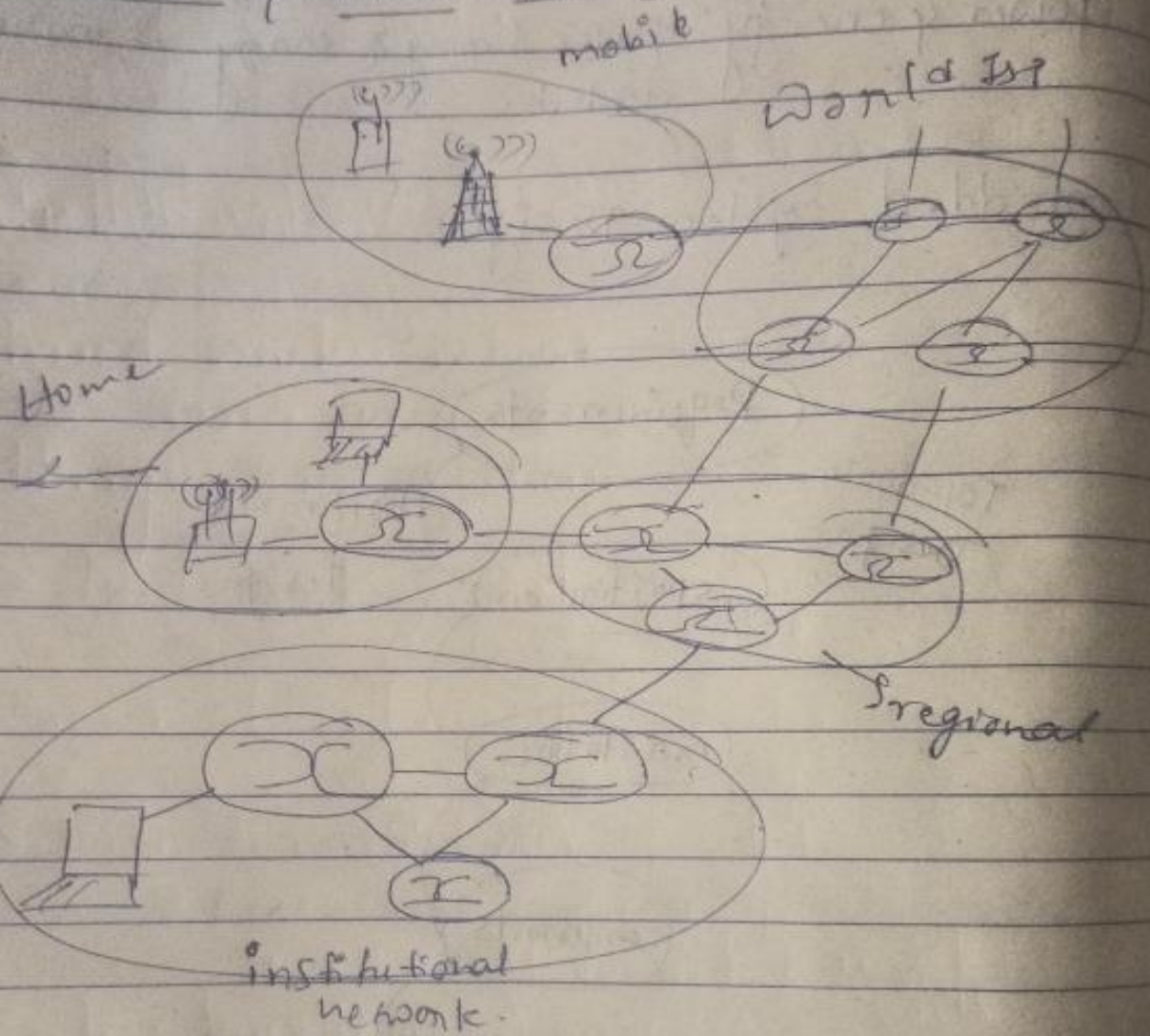
Computer Networks

What is the Internet?
→ The global network that connects worldwide computers across the world.

Nuts & Bolts View



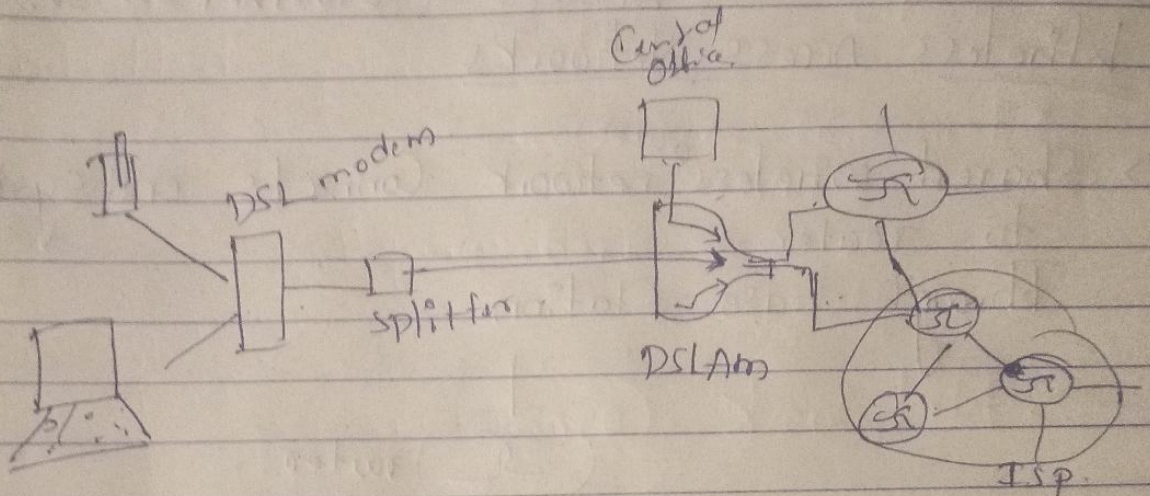
~~Access net~~

Network Edge
End systems (hosts)

In residential access nets
→ use Dial-up modem
* home directly connected to Central office

Digital Subscriber Line (DSL)

→ uses existing telephone infrastructure,
→ upto 1mbps upstream
→ upto 8mbps downstream
→ dedicated physical line to telephone central office



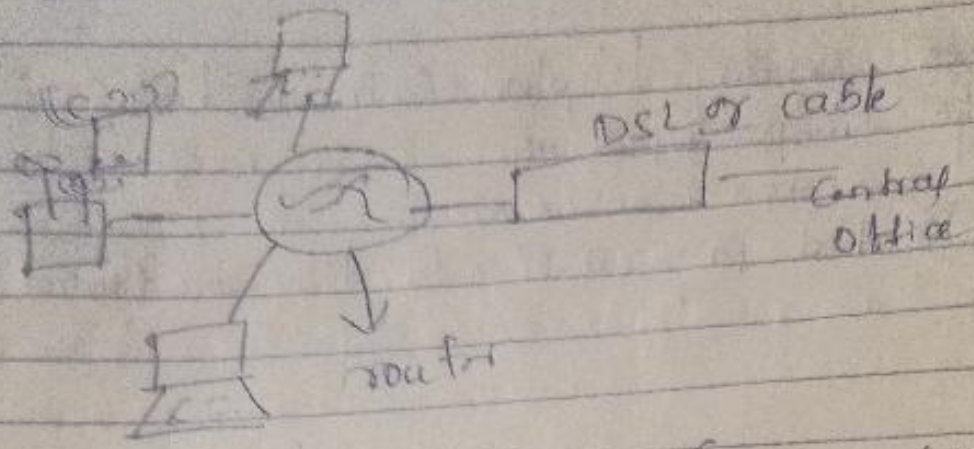
Cable network (coax)

→ Same diagram with in middle Systems and (CMTS) → Cable modem Termination system

HFC: Hybrid fiber Coax
: asymmetric: up to 30 Mbps downstream
2 mbsps upstream.

* uses cable of Tv infrastructure.

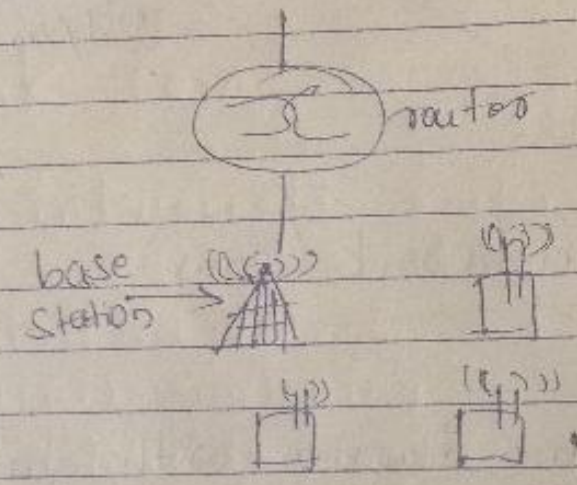
Home network :-



→ In Ethernet access Network (Ethernet switch)

Wireless Access Networks

→ Shared wireless access network connects end system to router
Through base station



→ Wireless ~~lans~~ LANs:
within building (100 ft)
802.11b/g (wifi) 54 mbps transmission rate.

→ Wide-area wireless access.
→ provided by Telephone Company Operator.
→ 1 mbps over cellular system
to
10 mbps
→ 3G, 4G, LTE

Host: Sends packets of data

→ host sending message
→ breaks into smaller chunks known as packets of length (L) bits
→ transmit packets into access network at transmission rate (R)

$$\text{Packet transmission delay} = \frac{L\text{-bits}}{R(\text{bits/sec})}$$

Physical media.

bit :- ~~Transm~~ propagates between transmitter/reciver pairs.

Physical link :- what lies between transmitter & Reciever

Twisted pair (TP) -> Ethernet wires
100mbps ↓
write about wires.

Coaxial cable :- * Two Concentric Copper Conductors
* bidirectional
* multiple Channels / single Channel

Fiber optical cable :- glass fiber carrying light pulses.
each pulse a bit.
* high speed.
* low error rate

Physical media: radio

* Radio channels carry signals in the electromagnetic spectrum
* Can penetrate walls
* Connectivity to mobile web
* Carry signal to long distance
* No physical wire
* Bidirectional

→ Radio link types

* terrestrial microwave
  * LANs
  * wide-area
* Satellite

→ Network Core

→ mesh of interconnected routers

→ Data transferred through
  * Circuit switching
    * dedicated circuit per call: telephone net
  * packet switching
    * data sent through net in discrete "chunks"

Circuit switching

Delay - queuing

Lost → and retransmitted

Throughput :- rate at which bits transmitted between Sendr/Receiver.

layering → Easy maintenance & modulation
↓ transparent to other devices

Internet protocol Stack

Application	→ FTP, HTTP
transport	→ Tcp, UDP
network	→ Ip
link	→ Ethernet 802.11(Wifi)
physical	→ bits

Iso/OSI reference model

Application	
Presentation	→ encryption, Comprehension
Session	→ Checkpointing, recovery data
transport	
network	
link	
physical	

Note about Encapsulation

Network Security

- How Bad guys attack Computers
- How to defend Bad guys
- How to build architecture to avoid attacking

- Bad guys put malware into hosts via Internet
  virus; Worm or Trojan horse
- Bad guys attack Servers
  bogus traffic
- Bad guys can Sniff packets
- Ip spoofing :- Sending to other Addresses
- Record and playback