- Internet standards are developed by the Internet Engineering Task Force (IETF).
- IETF standard documents are called request for comments (RFCs).
  - RFCs started out as general request for comments to resolve network and protocol design problem that faced the precursor to the Internet.
  - RFCs tend to be quite technical and detailed.
  - They define protocols such as TCP, IP, HTTP (for web) and SMTP (for e-mail)

SERVICE DESCRIPTION:

- Internet - An infrastructure that provides service to applications.

- These applications include e-mail, web surfing, social nws, instant messaging, Voice-over-IP (VoIP), video streaming, distributed games, peer-to-peer (P2P) file sharing, television over Internet, remote login.
- The applications are said to be distributed applications, since they involve multiple end systems that exchange data with each other.

- Internet applications run on the end systems (not in switches)

↓
but it facilitates the exchange of data among end systems

eg: Develop Distributed Internet application (may be written in Java, C, python)

⇓ has to run on different end s/ms

Need to send data to each other

How does one program running on one end s/m instruct the Internet to deliver data to another program running on another end s/m?

Each systems attached to the Internet provide an Application Programming Interface (API) that specifies how a program running on one end system asks the Internet infrastructure to deliver data to a specific destination program running on another end system.

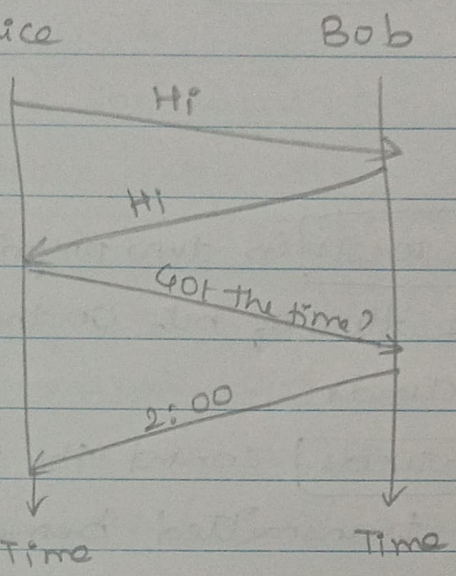
Internet API is a set of rules that the sending program must follow so that the Internet can deliver data to the destination program.

eg: Alice - Bob Postal service.

⇓ have to follow certain rules

PROTOCOL:

Analogy



Ask time

Reply Yes

No response to a question

If people runs different protocol

* has manners but others does not
* One may not understand the concept of time.

⇓

* Protocol does not interopeate
* No useful work can be accomplished.

True in n/wing

Two (or) more Communicating entities running the same protocol in order to accomplish a task.

Network Protocols:

- Here entities exchanging messages and taking actions are hardware (or) software components of some devices.

- All activity in Internet that involves two or more communicating remote entities is governed by a protocol.

For example:

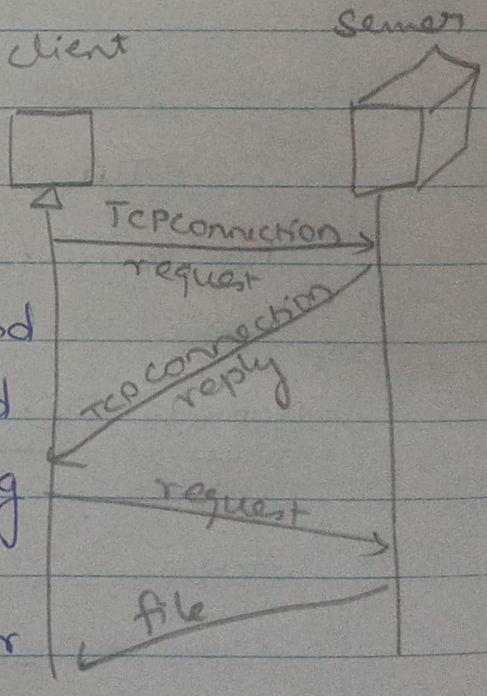
(i) H/w implemented protocols in two physically connected computers control the flow of bits on the "wire" between the 2 n/w interface cards.

(ii) Congestion control protocols control the rate at which packets are transmitted between sender and receiver.

(iii) Protocols in routers determine a packet's path from source to destination.

eg.

Request to web server



Ans A protocol defines the format and the order of messages exchanged between two or more communicating entities as well as the actions taken on the transmission and/or

receipt of a message or other event.

The Network Edge:

- The computers and other ~~end~~ devices connected to Internet are often refered to as **end-systems**.
- **They are refered to as end systems** because they sit at the edge of the Internet.
- Internet's end systems include
  - ★ Desktop computers (eg: desktop PCs, Macs & Linux boxes)
  - ★ Servers (web and e-mail servers) and
  - ★ Mobile computers (eg: Laptop, smartphones and tablets)
- Furthermore, an increase number of non-traditional devices are being attached to Internet.
- **Each ~~sys~~ are also refered to as hosts** because they host application programs such as a web browser program, a web server program, an e-mail client program or e-mail server program.

Hosts are divided into two categories:

- ★ clients and → Desktop, mobile PCs, Smart phone
- ★ servers (powerful m/c that store & distribute web pages, stream video, relay, e-mail)

- Most of the servers from which search results are

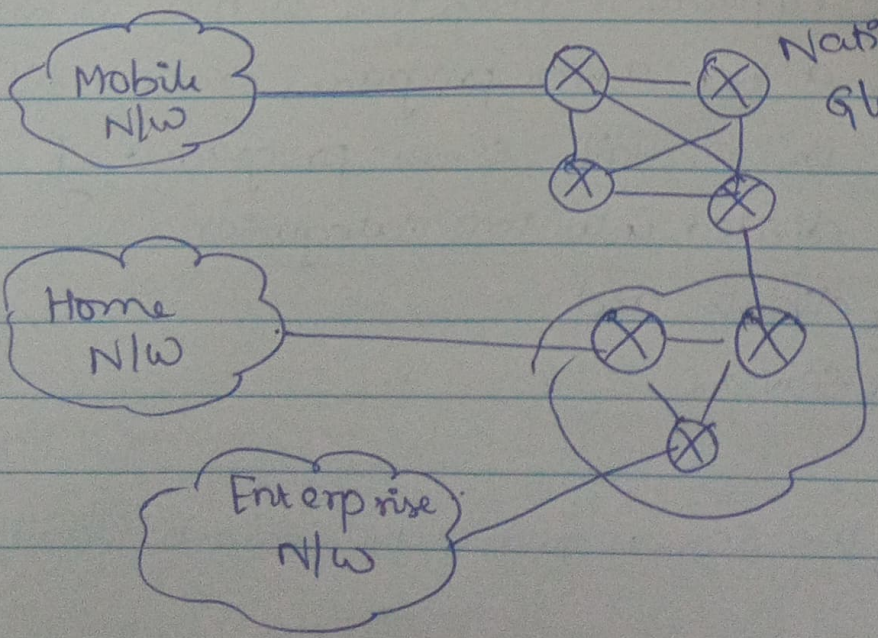
received: e-mail, web-pages & videos reside in large data centers.

- For eg: Google has 30-50 data centers, with many having more than one hundred thousand servers.

Access Networks

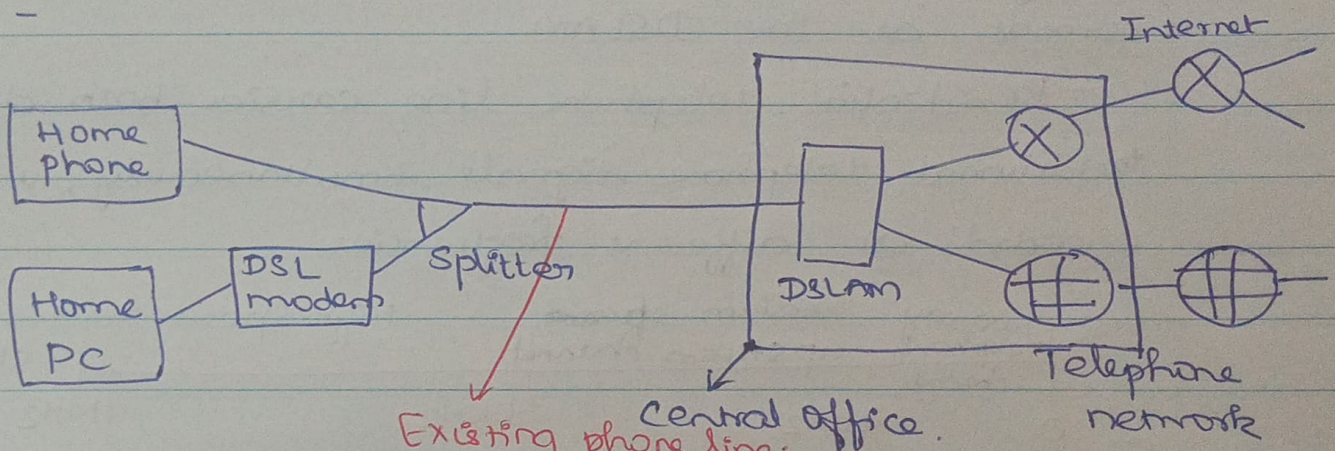
- Applications & end systems are at the "edge of the network"
- Access Network:

The network that physically connects an end system to the first router (edge router) on a path from the end system to any other distant end system.



Home Access: DSL, cable, FTTH, Dial-up and satellite

DSL - Digital Subscriber Line
- Most prevalent types of broadband residential access.
-



- A residence typically obtains DSL Internet access from the same local telephone company (teleco) that provides its wired local phone access.
- When DSL is used, a customer's teleco is also its ISP.
- Each customer's DSL modem uses the existing telephone line (twisted pair copper wire) to exchange data with a Digital Subscriber Link Access Multiplexer (DSLAM) located in the teleco's local

- Home's DSL modem takes digital data and translates it to high frequency tones for transmission over telephone wires to the CO; the analog signals from many such houses are translated back into digital format at the DSLAM

- Residential telephone line carries both data and toaditional telephone signals simultaneously, which are encoded at different frequencies.