CIS 457 - Data Communications

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Images taken from Kurose and Ross book

Introduction

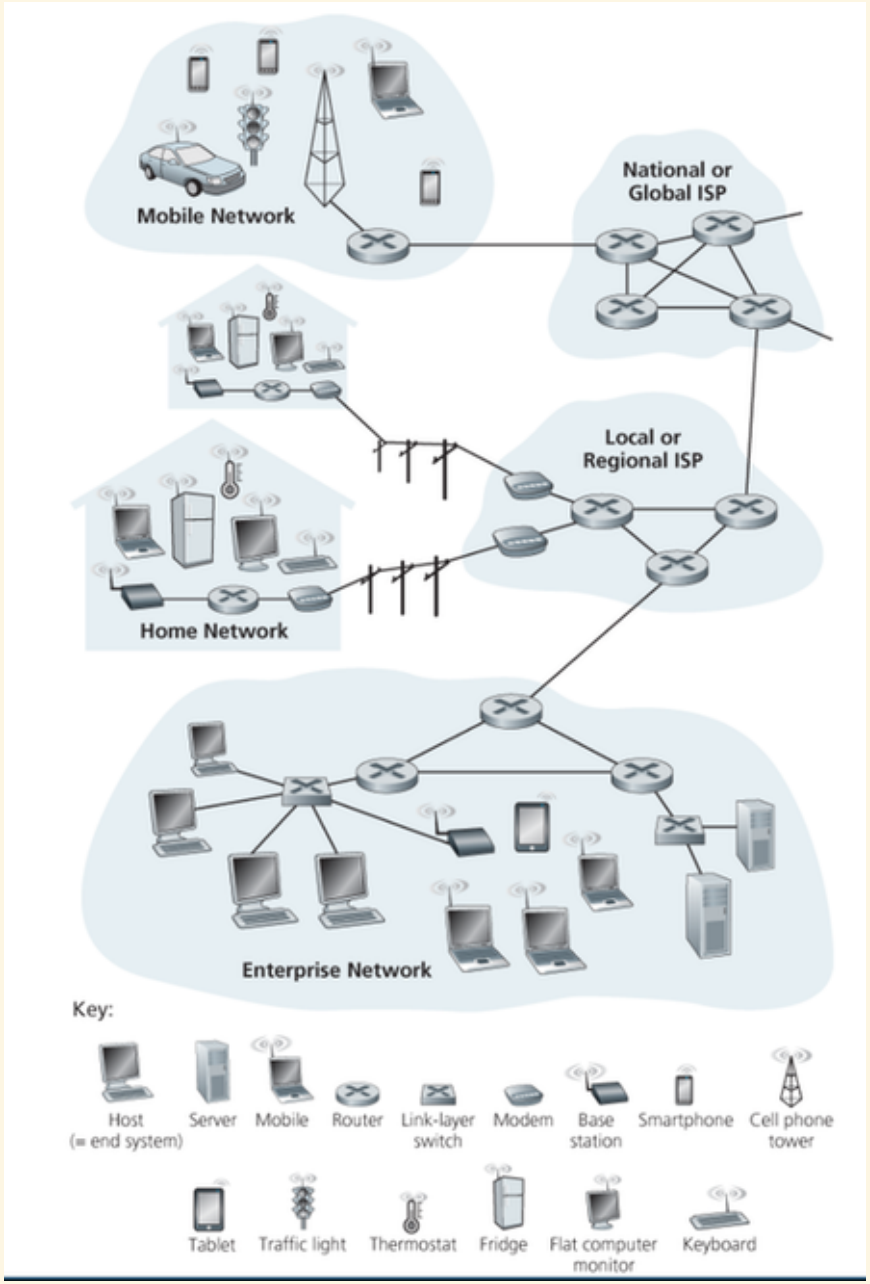
We will go into a lot of detail throughout the semseter of different aspects of networking, but the first few lectures will be a high-level overview of the Internet and some related concepts

We will roughly follow Chapter 1 of your textbook, but in less detail

A computer network is a group of computers (or other digital devices) that communicate with one another

The Internet is a particular network that spans the globe and connects billions of devices

Connected devices are called **hosts** or **end systems**


Mobile Network
National or Global ISP
Local or Regional ISP
Home Network
Enterprise Network
Key:
Host (= end system)
Server
Mobile
Router
Link-layer switch
Modem
Base station
Smartphone
Cell phone tower
Tablet
Traffic light
Thermostat
Fridge
Flat computer monitor
Keyboard

Generally think of hosts as residing at the edge of a network

All useful work is performed at network edge by hosts

Hosts serve up web pages, play games, hold email, etc.

Network itself does not do anything execpt move messages between hosts (though that is a non-trivial task)

To reiterate: the network itself does not provide any kind of application

It simply allows distributed applications to exist by providing a means for hosts to communicate

All storage and work for the applications is performed in the hosts

Network consists of **communication links** and **packet switches**

Communication links are physical media through which information travels, such as coaxial cable, radio spectrum, etc.

When host wants to send a message, it

- breaks the message into smaller parts
- adds header information to each part

These smaller parts are called **packets**

Packets are sent through network of commuication links and packet switches to other hosts and then reassembled to their original form (using header data)

Packet switches receive packets on one communication link and forward them to another communication link

They may use the header information to figure out which link to send a packet out on

Two most common types of packet switches are **routers** and **link-layer switches**, which will be discussed more later

Sequence of communication links and packet switches traversed by packet when moving from one host to another is called **route** or **path**

Internet Service Providers (ISPs) are networks that allow end systems to access the Internet

ISPs must be able to connect with one another for a global Internet to exist

Smaller, regional ISPs generally connect to one another through networks provided by higher-tier ISPs

Various ISPs are managed separately, but they must all run the IP protocol so they can commuincate with one another

In fact, all systems connected to the internet (hosts, packet switches, etc.) must run certain shared protocols that allow them to communicate with one another

Two of the most important are **Transmission Control Protocol (TCP)** and **Internet Protocol (IP)**

The protocols for the internet are generally referred to as TCP/IP protocols, though there are others

Since people will not spontaneously agree on protocols, the protocols need some sort of standardizing body

For the Internet, this is the **Internet Engineering Task Force (IETF)**

Standard documents from the IETF are called **requests for comments (RFCs)**

We have mentioned "protocols" a few times, and they will be central to our study of networks

A protocol is an agreed-upon way for elements of the network to communicate with one another

A human example of a protocol is a knock-knock joke

- I must begin the joke by saying "knock knock", or you won't know I am ready to tell a joke
- You must reply "who's there?". If you decline to respond, or respond with something else, I cannot continue the joke
- I then say a word or phrase of my choice
- You repeat my phrase, followed by "who?"
- I state the punch line
- You are obligated to laugh

If either of the people in the example does not understand the knock-knock protocol, or declines to follow it, the joke cannot proceed

It is the same with computer networks -- all communicating parties must agree upon and follow a protocol

Your textbook's definition:

"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."