ARPANET, INTERNET & PRIVATE NETWORKS

By
Nidhi Jindal
Assistant Professor
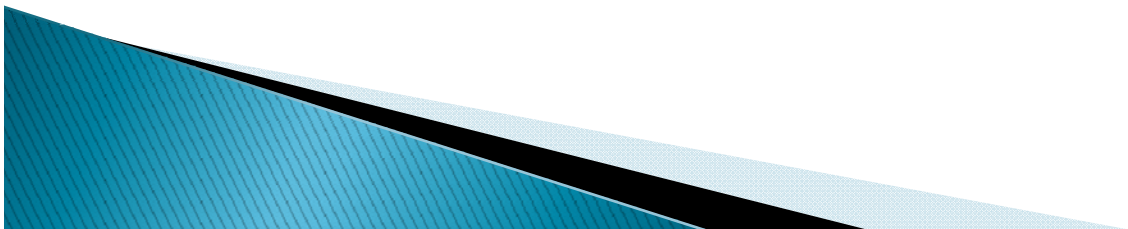Department of Information Technology
Mail ID: nidhi.jindal@ggnindia.dronacharya.info

INTRODUCTION

- What is ARPANET?
- *ARPANET* was the first Internet.

- The precursor to the Internet, *ARPANET* was a large wide-area network created by the United States Defence Advanced Research Project Agency (**DARPA**), sometimes called as **ARPA** also.

History of ARPANET

- The DoD wanted a command- and-control network that could survive a nuclear war. At that time, all military communications used the public telephone network, which was considered vulnerable
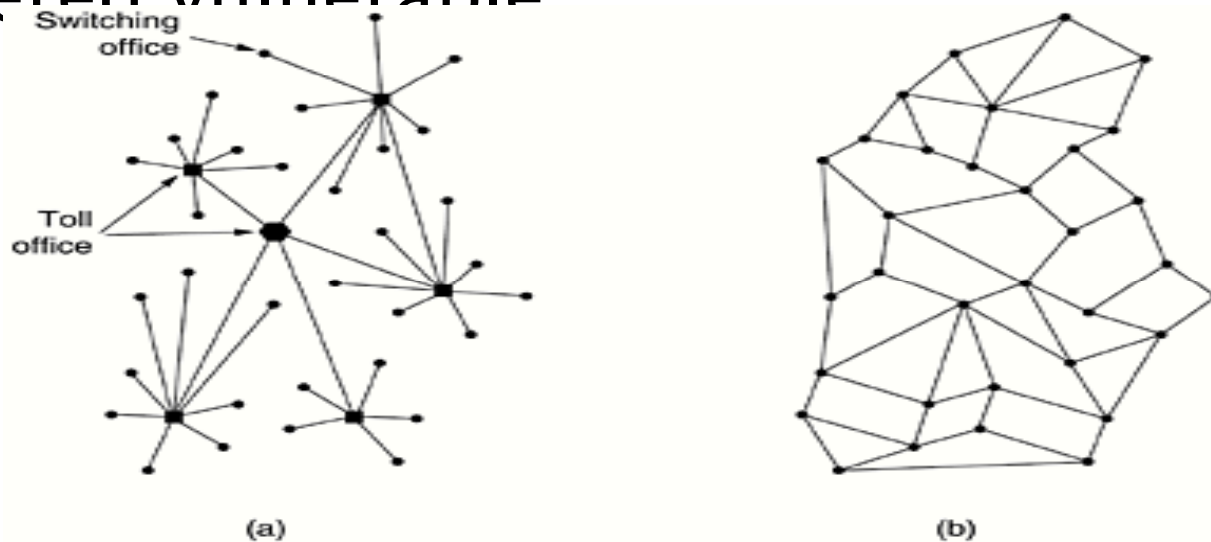

Figure - (a) Structure of the telephone system. (b) Baran's proposed distributed switching system.

ARPANET

- Here the black dots represent telephone switching offices, each of which was connected to thousands of telephones.
- These switching offices were, in turn, connected to higher-level switching offices (toll offices), to form a national hierarchy with only a small amount of redundancy.
- The vulnerability of the system was that the destruction of a few key toll offices could fragment the system into many isolated islands.
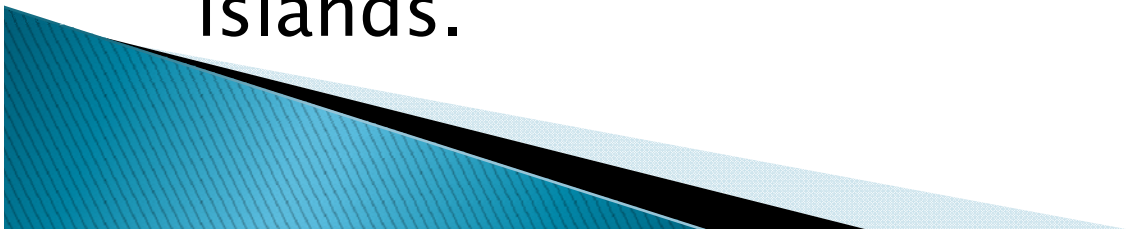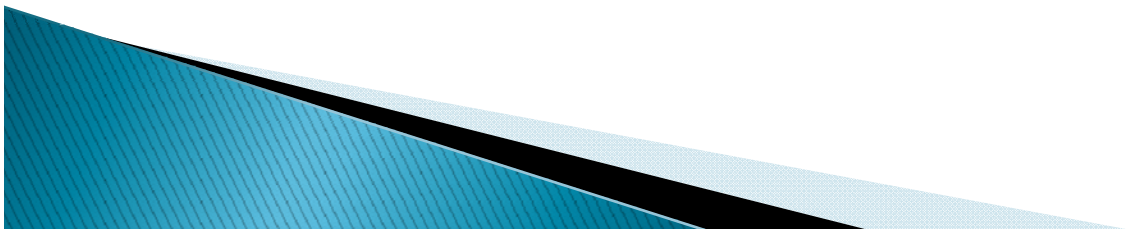
ARPA??

- ARPA the Advanced Research Projects Agency . It did its work by issuing grants and contracts to universities and companies whose ideas looked promising to it.

- For the first few years, ARPA tried to figure out what its mission should be, but in 1967, the attention of ARPA's then director, **Larry Roberts**, turned to **networking.** He contacted various experts to decide what to do. One of them, **Wesley Clark**, suggested building a **packet switched subnet**, giving each host its own router.

Structure of ARPANET

- The subnet would consist of minicomputers called **IMP** s (**Interface Message Processors** connected by **56-kbps transmission lines.**
- For high reliability, each IMP would be connected to **at least two other IMPs.**
- The subnet was to be a **datagram subnet**, so if some lines and IMPs were destroyed, messages could be automatically rerouted along alternative paths.
- Each node of the network was to consist of an IMP and a host, in the same room, connected by a short wire.

Structure of ARPANET

- A host could send messages of up to 8063 bits to its IMP, which would then break these up into packets of at most 1008 bits and forward them independently toward the destination.

- Each packet was received in its entirety before being forwarded, so the subnet was the first electronic store–and–forward packet–switching network.

Contract for Subnet software given to BBN

- ARPA then put out a tender for building the subnet. Twelve companies bid for it.
- After evaluating all the proposals, ARPA selected BBN, a consulting firm in Cambridge, Massachusetts, and in December 1968, awarded it a contract to build the subnet and write the subnet software.
- BBN chose to use specially modified Honeywell DDP-316 minicomputers with 12K 16-bit words of core memory as the IMPs.
- The IMPs did not have disks, since moving parts were considered unreliable.
- The IMPs were interconnected by 56-kbps lines leased from telephone companies.

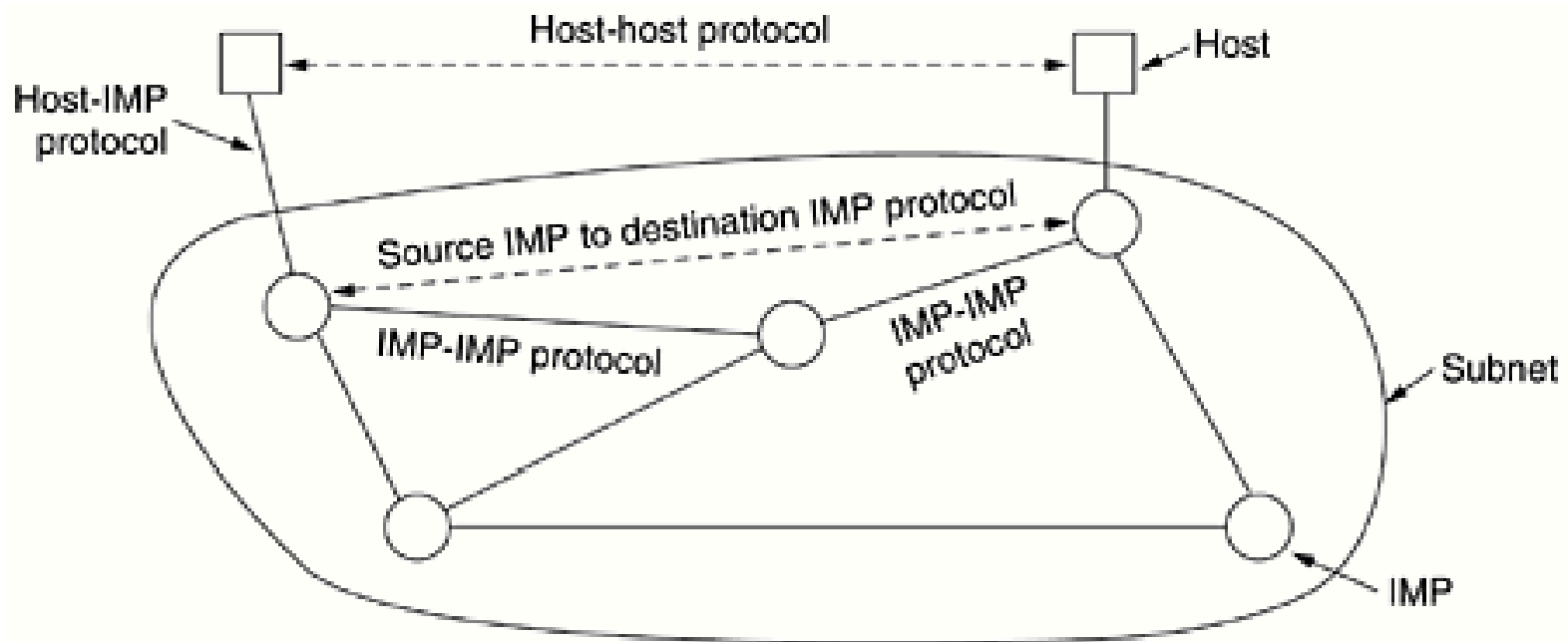# ARPANET Design

- The original ARPANET design is shown in fig.

Figure - The original ARPANET design.

More on ARPANET

- An experimental network went on the air in December 1969 with four nodes: at UCLA, UCSB, SRI, and the University of Utah.
- These four were chosen because all had a large number of ARPA contracts, and all had different and completely incompatible host computers (just to make it more fun).
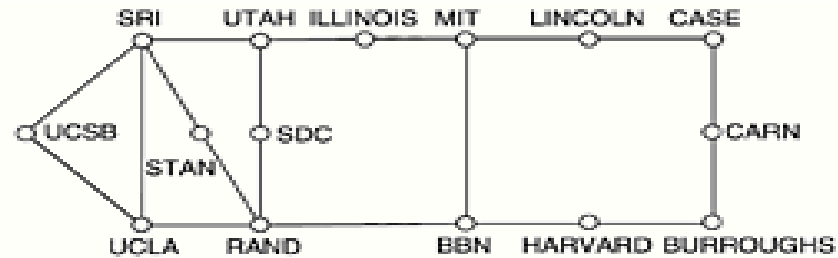- The network grew quickly as more IMPs were delivered and installed; it soon spanned the United States.

Figure – Growth of the ARPANET. (a) December 1969. (b) July 1970. (c) March 1971. (d) April 1972. (e) September 1972.
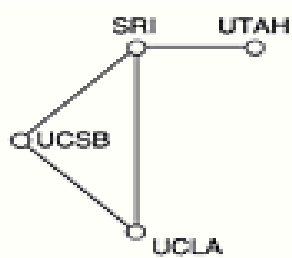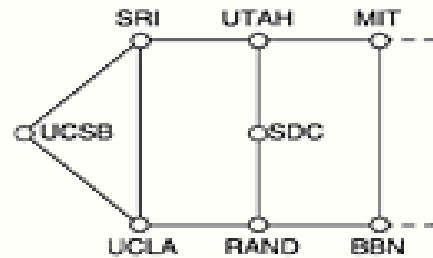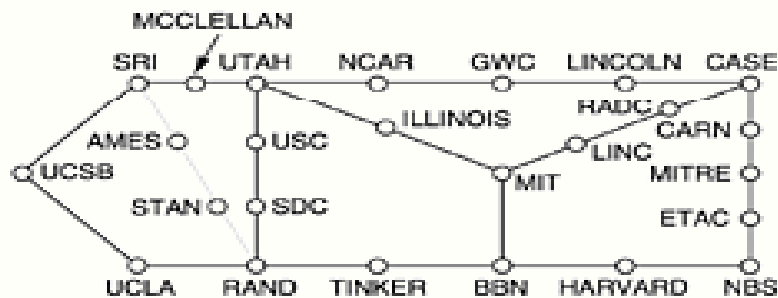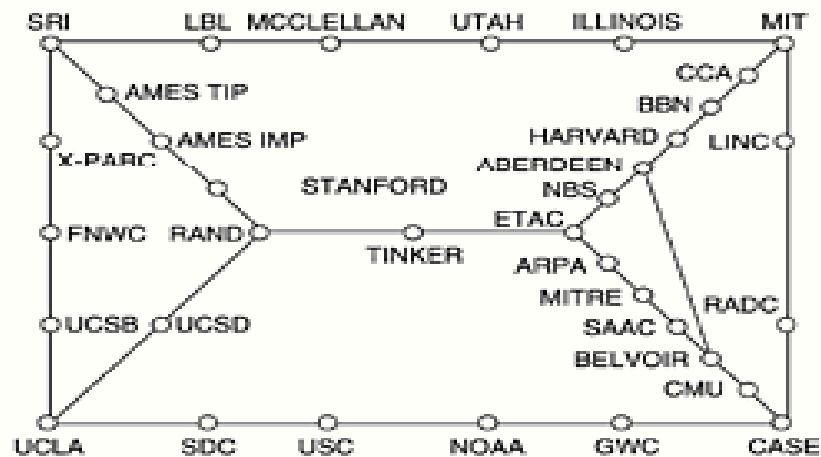
More on ARPANET

- This experiment also demonstrated that the existing ARPANET protocols were not suitable for running over multiple networks. This observation led to more research on protocols, culminating with the invention of the TCP/IP model and protocols (Cerf and Kahn, 1974).

- TCP/IP was specifically designed to handle communication over internetworks, something becoming increasingly important as more and more networks were being hooked up to the ARPANET.
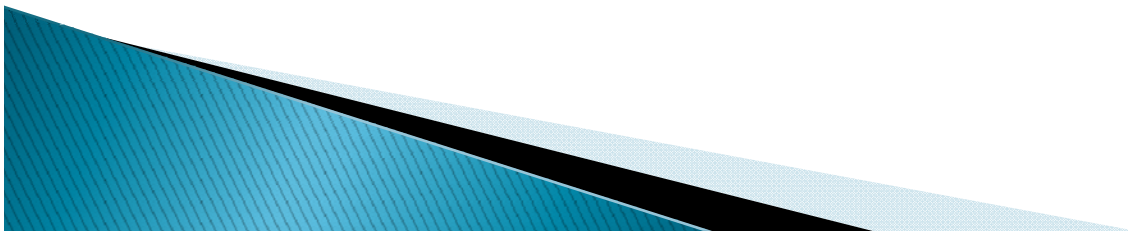
INTERNET

▸ The number of networks, machines, and users connected to the ARPANET grew rapidly after TCP/IP became the only official protocol on January 1, 1983. When NSFNET and the ARPANET were interconnected, the growth became exponential. Many regional networks joined up, and connections were made to networks in Canada, Europe, and the Pacific.

▸ Sometime in the mid-1980s, people began viewing the collection of networks as an internet.
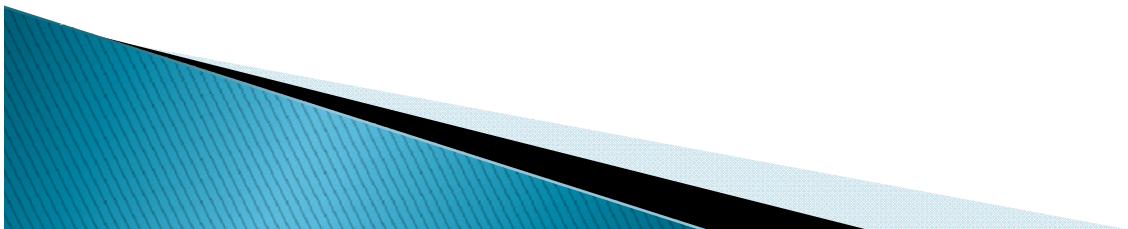
The glue that holds the Internet together is

INTERNET

- What does it actually mean to be on the Internet?
- Our definition is that a machine is on the Internet if it runs the TCP/IP protocol stack, has an IP address, and can send IP packets to all the other machines on the Internet.

Private Networks???

- In your college LAB?
- Any organization's intranet?
- Other examples?

APPLICATION

- **ARPANET** was first packet switching network which gave path to other researchers to invent what today is called **INTERNET**.
- **INTERNET** has numerous applications, some of these are:
  ◦ WWW, Email, messengers, video conferencing, Remote processing, Distributed Processing and lot more……
- Private Networks are mainly used for:
  ◦ File sharing, Resource Sharing and Distributed Processing
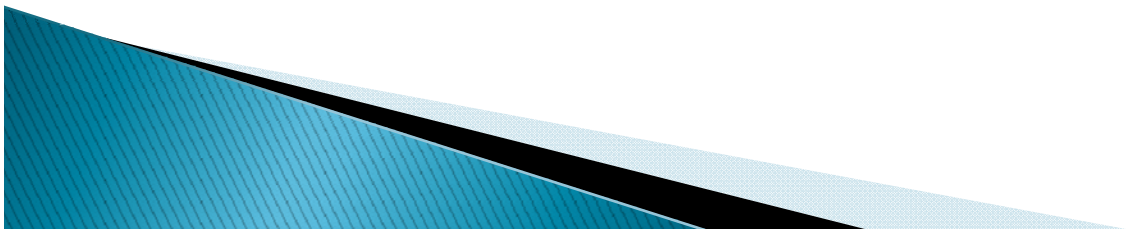
Scope of Research

- Better switching Networks than circuit or Packet Switching.
- Wireless Networks
- Mobile Computing
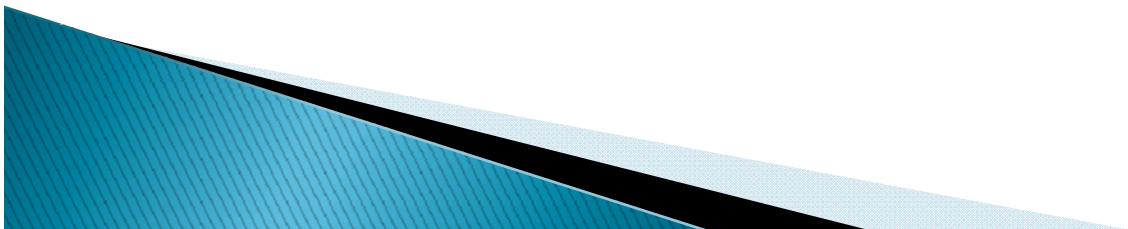
Assignment 4

- What are circuit switched Networks?
- How packet switched networks are different from Circuit switched Networks?