

CAP275: Data Communication and Networking

Lecture Zero

Dr. Manmohan Sharma

School of Computer Applications

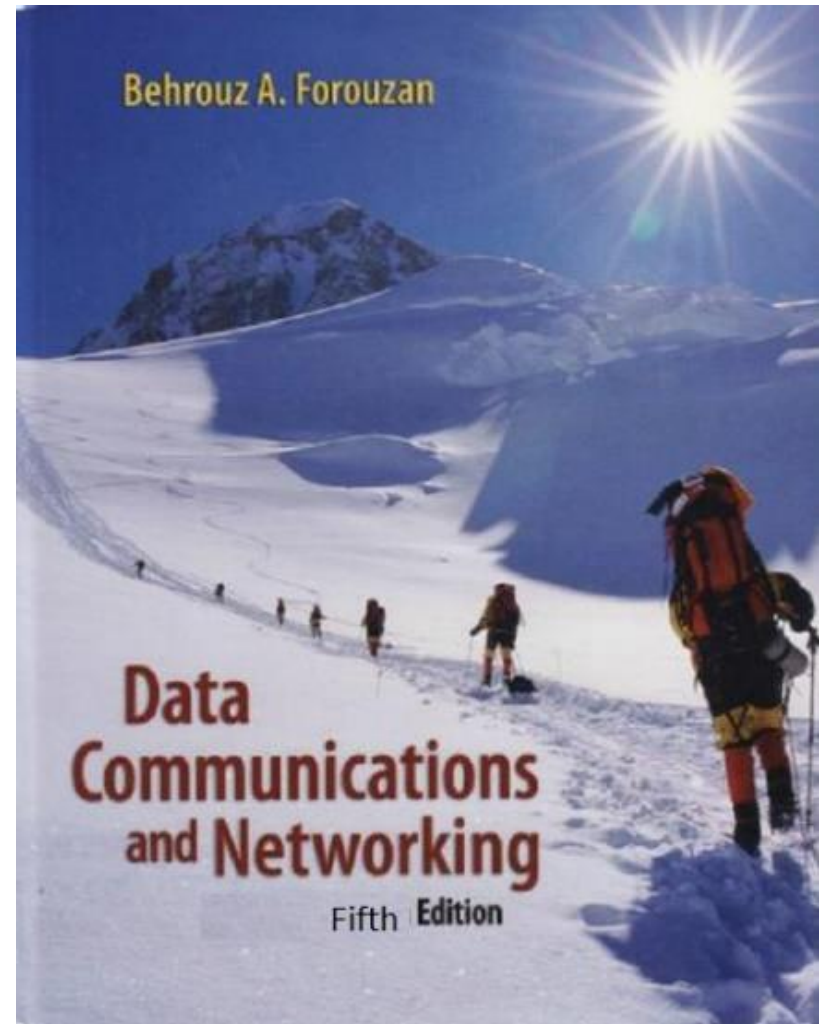
Lovely Professional University

About the Course

- This is an introductory course in data communication and computer networks.
- This course provides an introduction to the data communication systems and other fundamental concepts of data communication.
- This course also discuss about the computer networks, with a special focus on the Internet architecture and protocols.
- Topics include layered network architectures, OSI reference model and TCP/IP network architecture models, addressing, naming, forwarding, routing, communication reliability, the client-server model, web and email protocols.
- The implementation principles and design issues at each layer of these models will be discussed later in the course following a bottom up approach of study.
- At the end of the course there will be a discussion on various security protocols and techniques used in the computer networks.

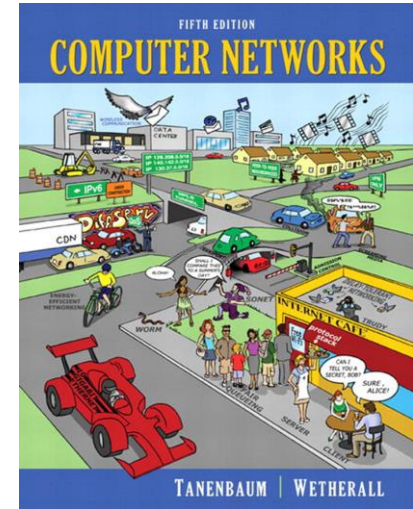
Text Book

- DATA COMMUNICATION AND NETWORKING by B.A. FOROUZAN
- MCGRAW HILL EDUCATION



Reference Books

- COMPUTER NETWORKS by ANDREW S. TANENBAUM, DAVID J. WETHERALL,
- PEARSON



- DATA AND COMPUTER COMMUNICATIONS by WILLIAM STALLINGS
- PEARSON EDUCATION INDIA



Course Organization

- L T P of the course is 3 0 0 i.e 3 hours of lecture per week for 14 weeks.
- Examinations:
 - 3 Continuous Assessments in form of Online assignments will be held in 3rd, 9th, and 12th week of the term.
 - Mid Term Exam will be held after week 7.
 - End Term Exam will be held after week 14.
- Exam Category for this course is 13
 - Mid Term Exam: All MCQ
 - End Term Exam: MCQ + Subjective

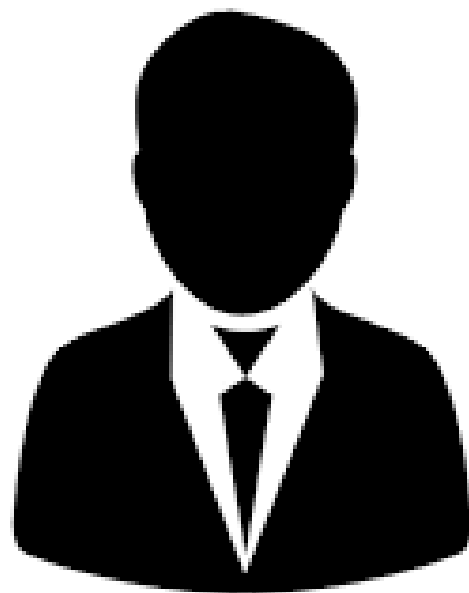
Course Assessment Model

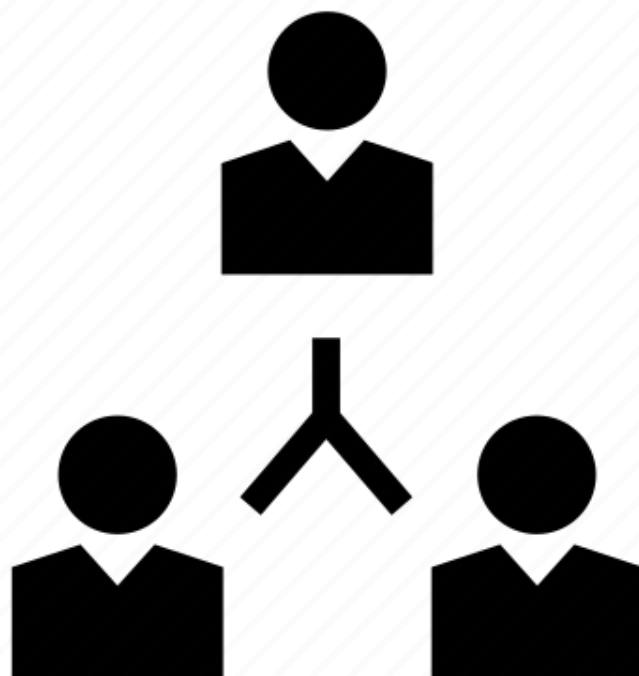
| Assessment Criteria | Weightage |
|------------------------|-------------|
| Attendance | 05% |
| Continuous Assessments | 25% |
| Mid Term Exam | 20% |
| End Term Exam | 50% |
| Total | 100% |

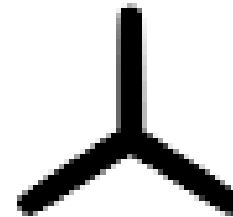
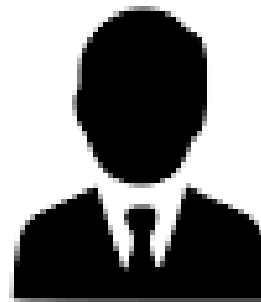
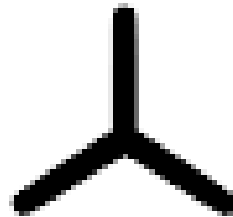
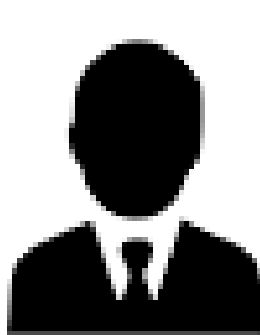
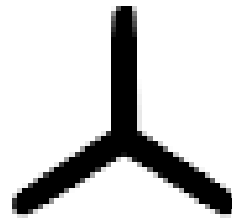
Course Outcomes

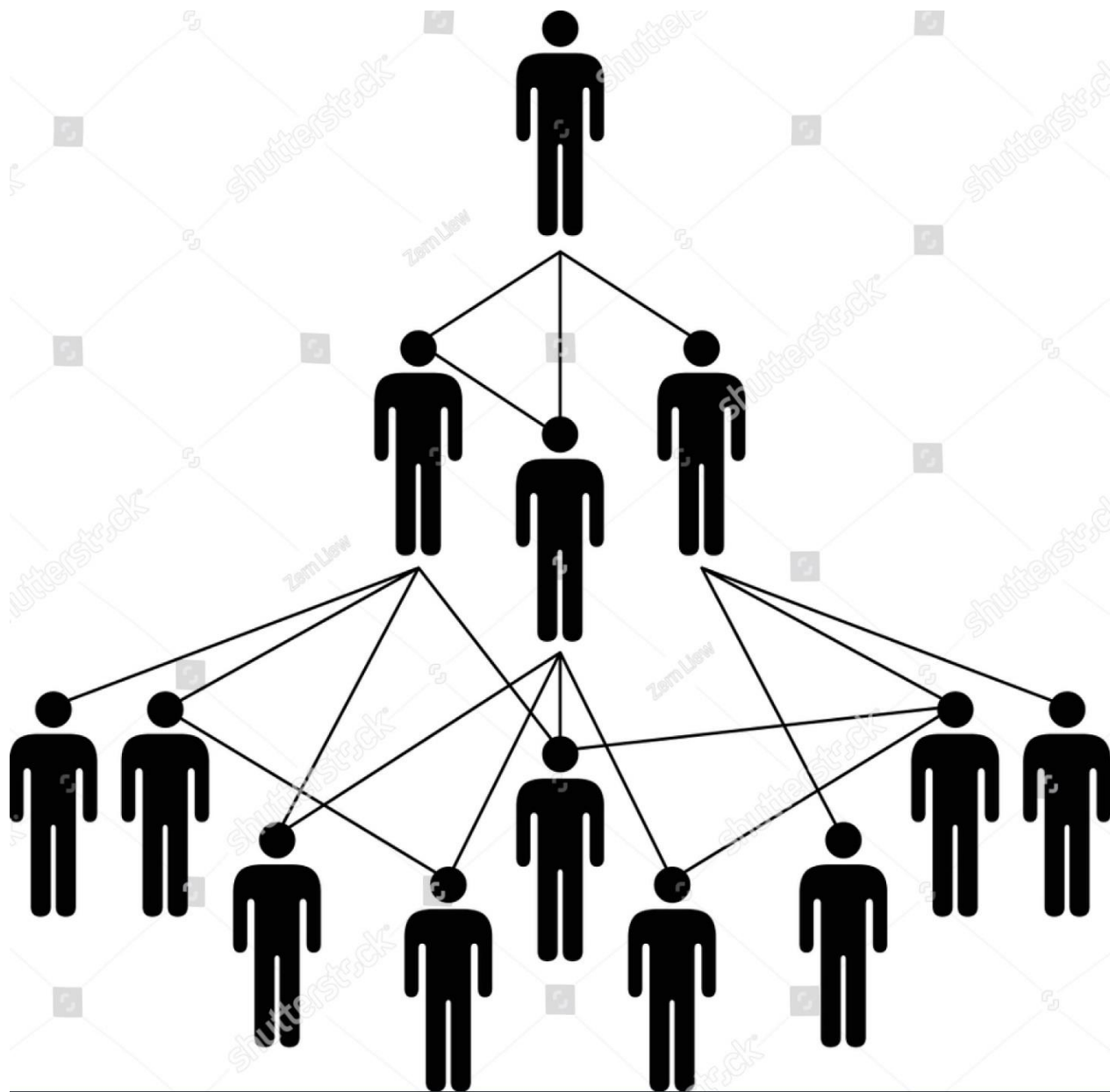
- CO1::** Recognize the basics of data communication, networking, internet and their importance.
- CO2::** Understand the concepts of data communication, layered model, protocols and interworking between computer networks and switching components.
- CO3::** Determine the various networks using the logical addressing and by applying subnetting and routing concepts.
- CO4::** Analyze the working of transport and application layer protocols in an IP based networking infrastructure.

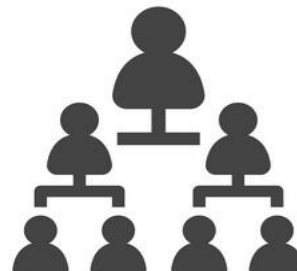
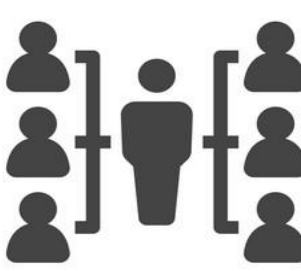
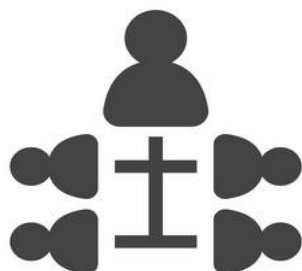
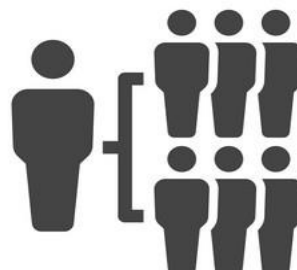
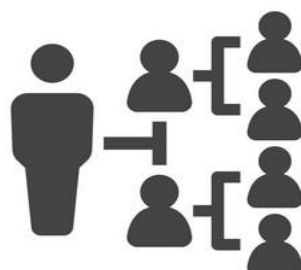
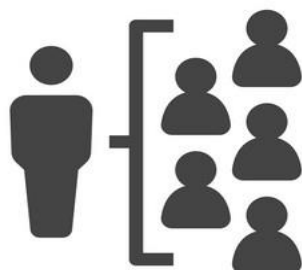
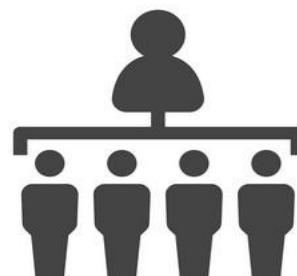
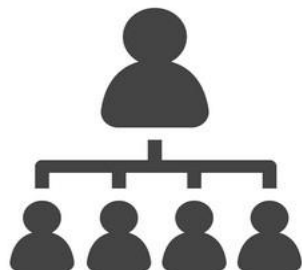
Networks







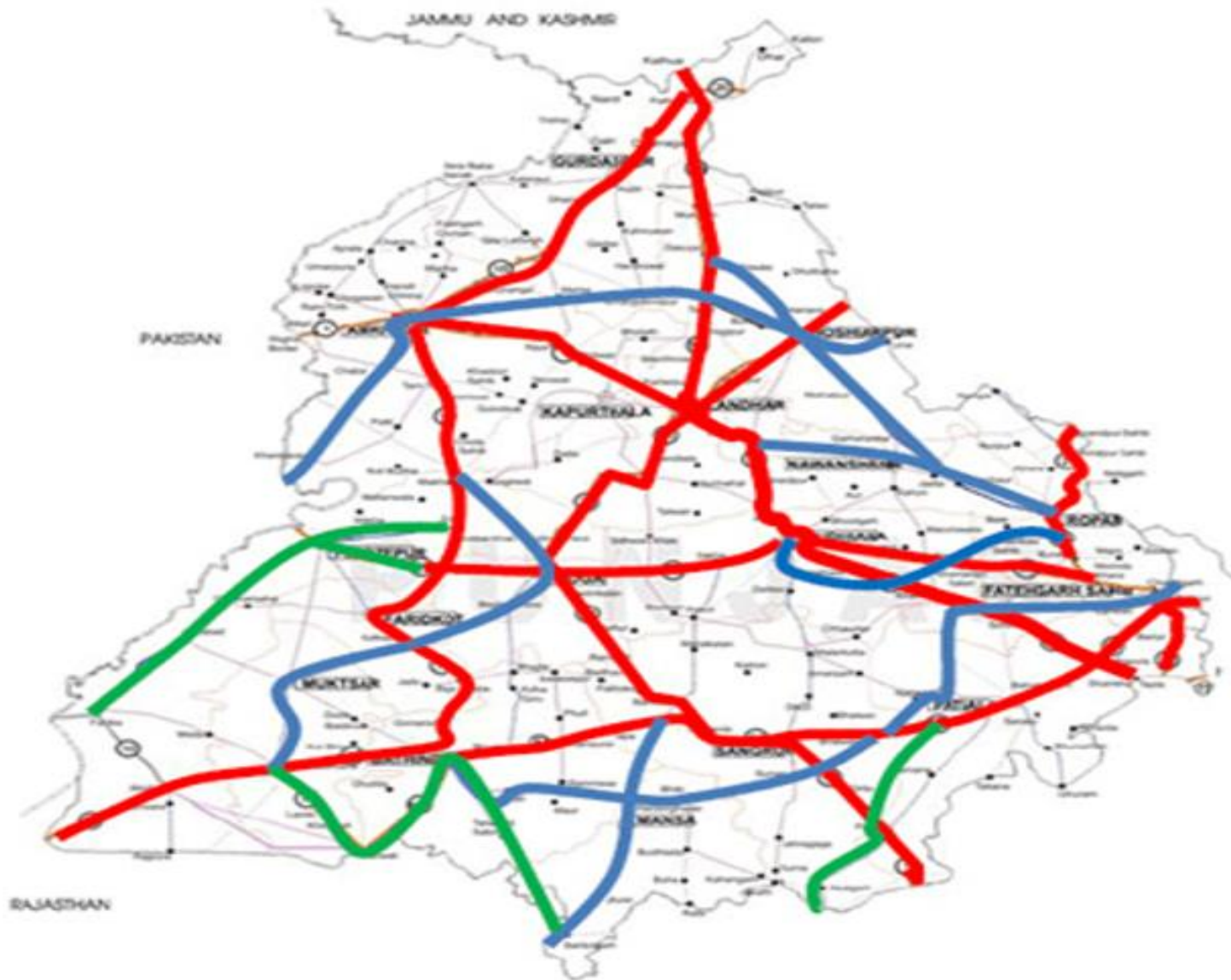




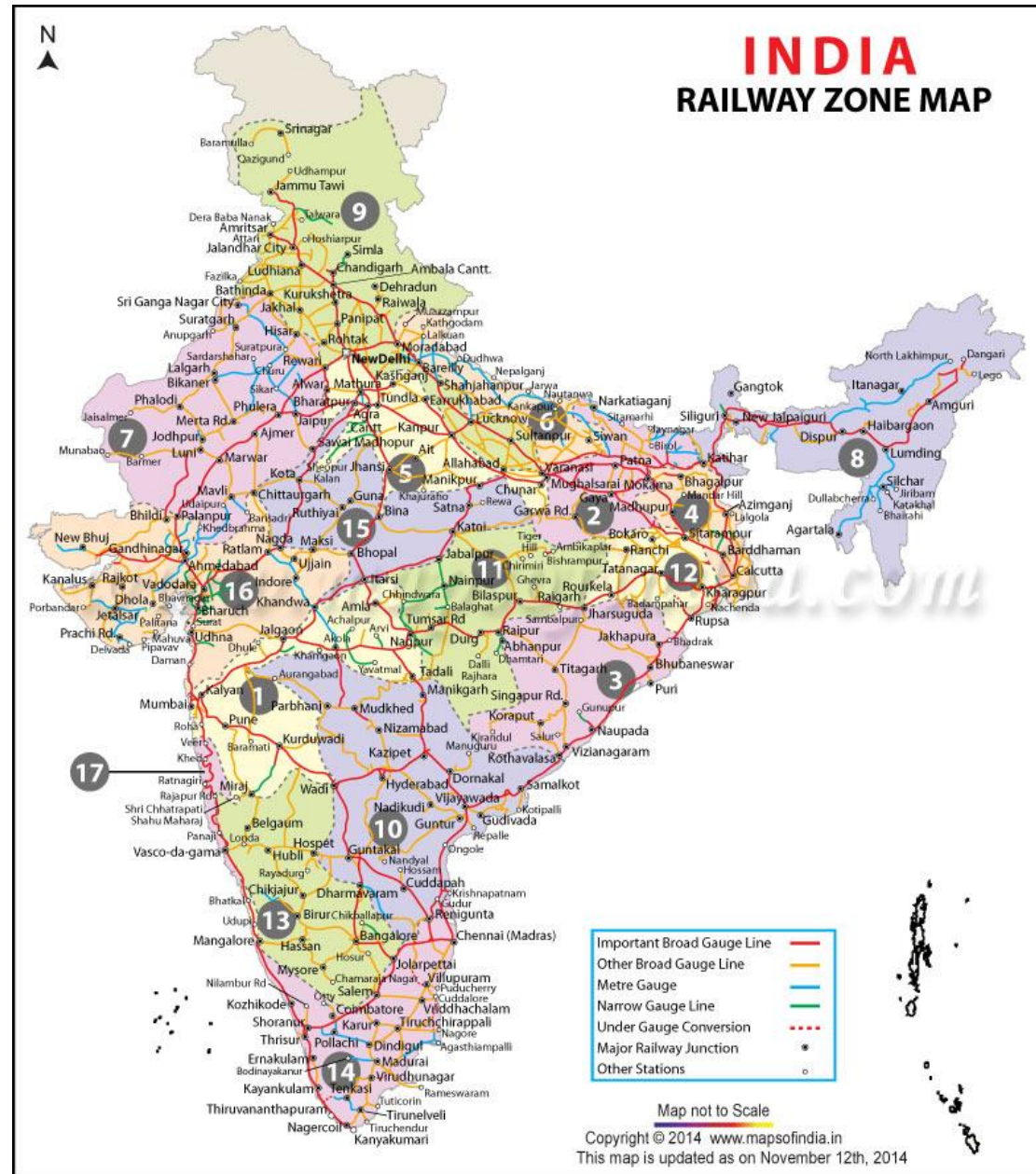
Social Network



Road Networks



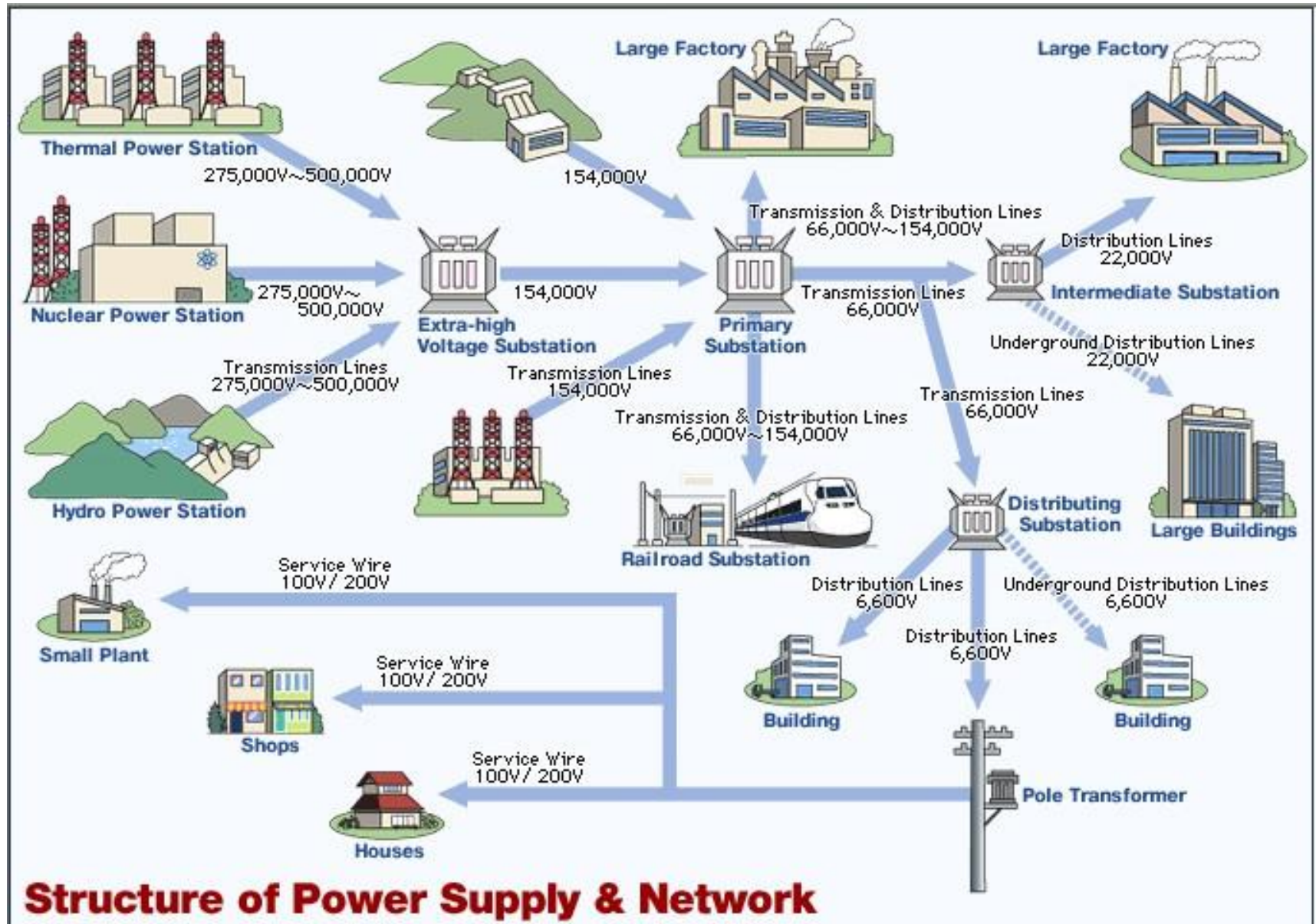
Railways Networks



Air Transport Networks



Power Distribution Network



ONLINE BANKING

FUND MANAGEMENT
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TRANSFER BETWEEN OWN ACCOUNTS
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PAYMENT SERVICES & CREDIT
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ACCOUNT SECURITY

TRANSFER BETWEEN BANKS
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CUMULATION
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MONEY MARKET
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Features of Networks

- Nodes
- Connectivity (Link/Relationships)
- Transfer of data and knowledge (Sharing)
- Scalability
- Reliability
- Security
- Rules

Communication or Telephone Networks

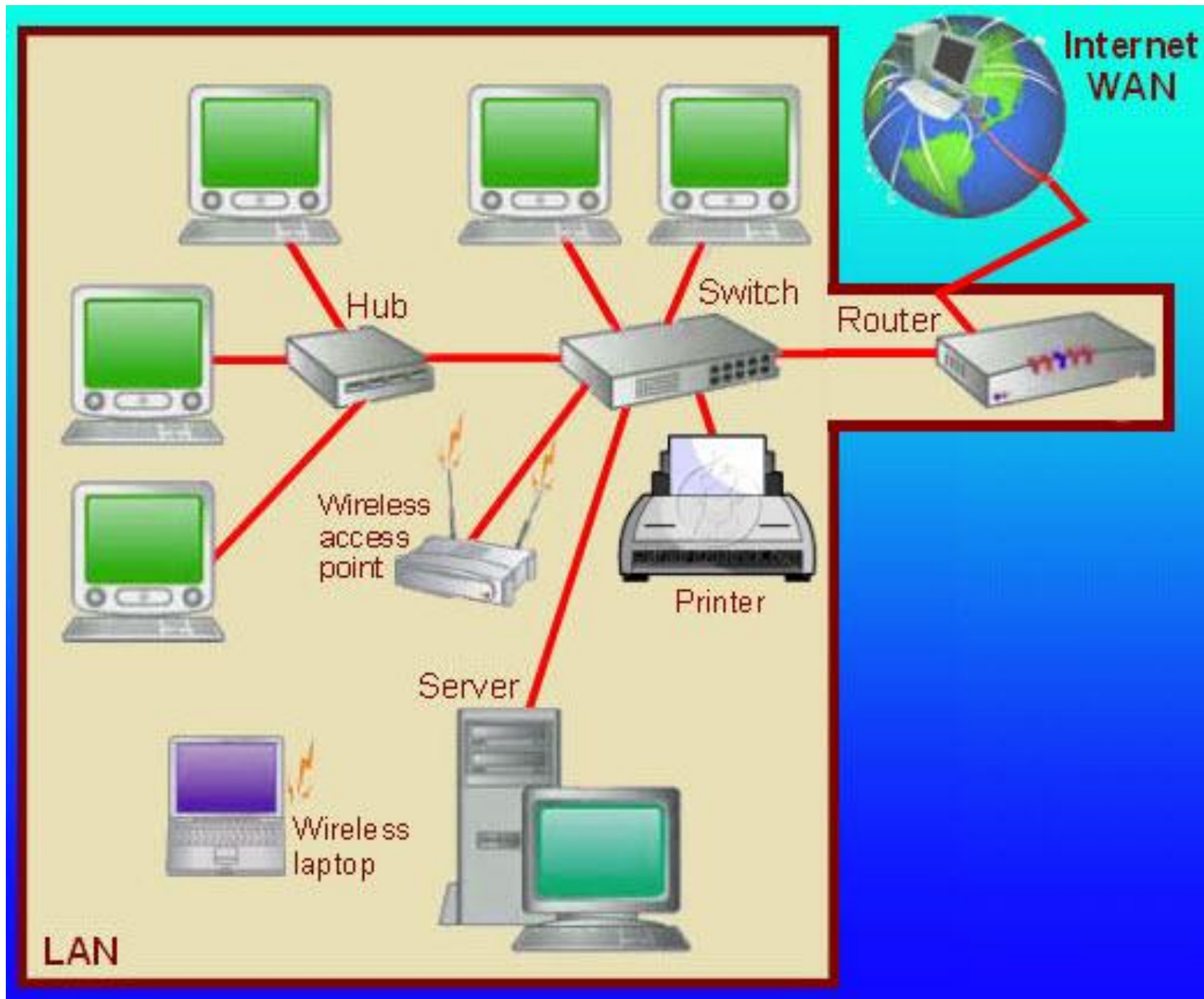
Public Switched Telephone Network



Computer Networks

A **computer network**, often simply referred to as a network, is a collection of autonomous computers and devices interconnected by communications channels.

These communication channels facilitate communication and allows sharing of resources and exchange of information among interconnected devices.



What is the need of Computer Networks?

- **Information** and **communication** are two of the most important strategic issues for the success of every enterprise.
- Today nearly every organization uses a substantial number of computers and communication tools
- While managers today are able to use applications like word processors or spreadsheets, not very many of them use computer-based tools to communicate with other departments or information retrieval programs.
- To overcome these obstacles in an effective usage of information technology, computer networks are necessary.

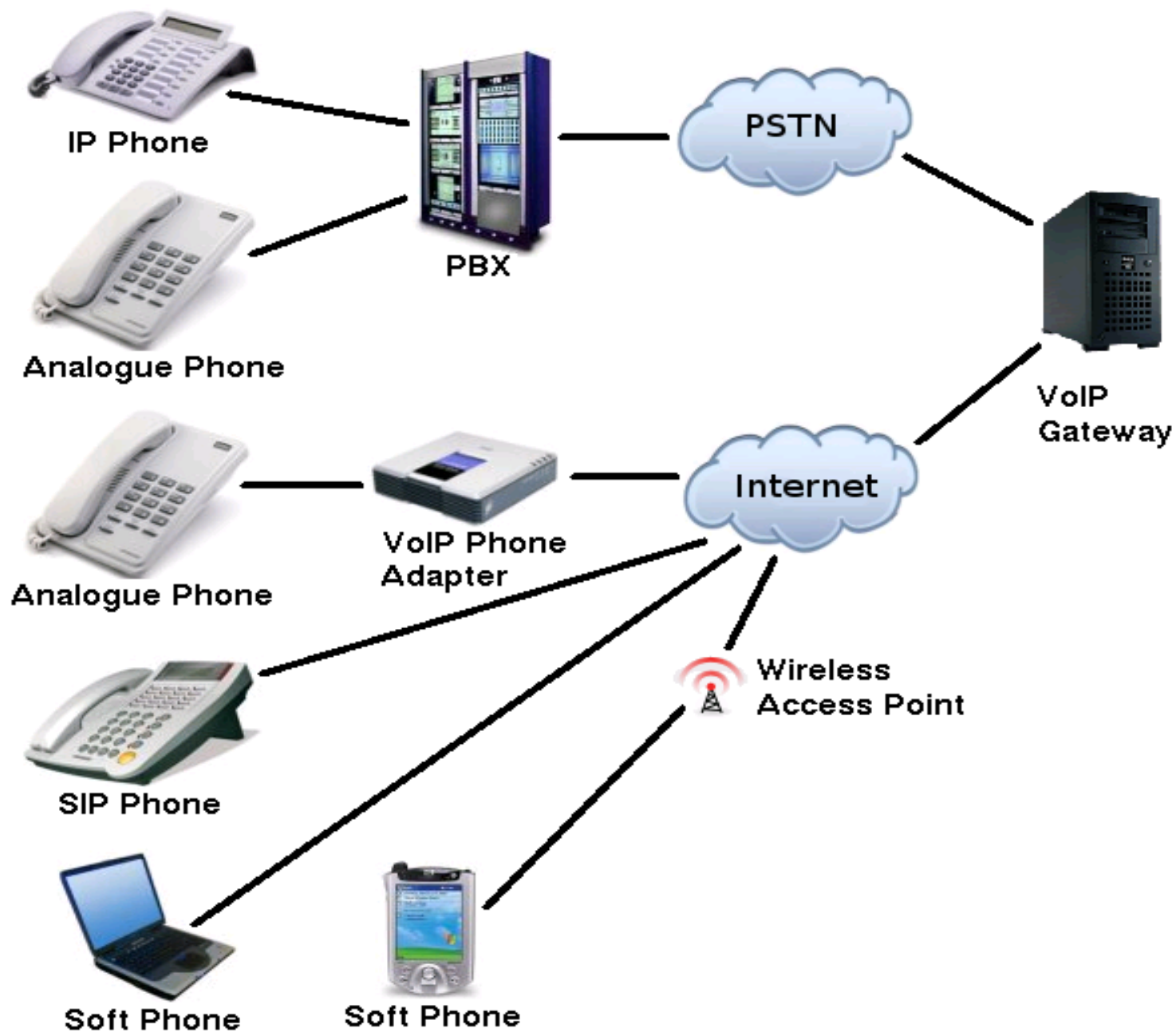
- At the same time they are the means to converge between two areas; the unnecessary distinction between tools to process and store information and tools to collect and transport information can disappear.
- Computer networks can manage to put down the barriers between information stored on several (not only computer) systems.
- Computer networks can built borderless communication and information sharing environment.
- Computer networks allow the user to access remote programs and remote databases either of the same organization or from other enterprises or public sources.

- Computer networks provide communication possibilities faster than other facilities. Because of these optimal information and communication possibilities, computer networks may increase the organizational learning rate.
- Besides this major reason why any organization should not fail to have a computer network, there are other reasons as well:
 - cost reduction by sharing hard- and software resources
 - high reliability by having multiple sources of supply
 - cost reduction by downsizing to microcomputer-based networks instead of using mainframes
 - greater flexibility because of possibility to connect devices from various vendors

Internet

The **Internet** is the biggest world-wide communication network of computers. The **Internet** has millions of smaller domestic, academic, business, and government networks, which together carry many different kinds of information.





Services and Uses of Internet

- Surf website
- Information access
- e-mail
- e-commerce
- Social networks (WhatsApp, Facebook, etc.)
- Education
- Banking Services (Online banking, CBS, ATM)
- Entertainment (Netflix, Amazon Prime, Hotstar, Voot etc.)
- Healthcare (Health monitoring system)
- Research
- Online Gaming

Syllabus

Unit I

- **Data communications** : characteristics, components, data representation, data flow
- **Networks** : distributed processing, network criteria, types of connections, types of topologies, categories of networks, protocols, standards, standards organizations, internet standards
- **Network models** : the OSI model, layered architecture, layers in the OSI model, TCP/IP protocol suite, addressing mechanisms in layers

Unit II

- **Physical layer** : analog and digital, analog signals, digital signals, analog versus digital, data rate limit, transmission impairments, line coding, block coding, sampling, transmission mode, modulation of digital data, telephone modems, modulation of analog signal, FDM, WDM, TDM, guided media, unguided media, switching, networking devices

Unit III

- **Data link layer** : error detection and correction, types of errors, error detection and correction techniques, data link control and protocols, flow and error control, stop-and-wait ARQ, go-back-n ARQ, selective repeat ARQ, HDLC, point-to-point access, point-to-point protocol (PPP), PPP stack, multiple access, random access, controlled access, channelization

Unit IV

- **Network layer** : classful addressing, logical addressing, IPv4, IPv4 frame format and functions, subnets, FLSM, VLSM, classless inter domain routing (CIDR), public and private addresses, network address translation (NAT), IPv6, basic routing (or forwarding) mechanism, unicast routing protocols, distance vector routing, RIP, link state routing, OSPF, path vector routing, BGP, overview of multicast routing

Unit V

- **Transport layer** : process-to-process delivery, port addresses, socket address, user datagram protocol (UDP), transmission control protocol (TCP), 3-way handshaking, SCTP, data traffic, traffic descriptors, congestion control, quality of service, techniques to improve QoS

Unit VI

- **Application layer** : domain name system (DNS), Dynamic Host Configuration Protocol (DHCP), remote logging, TELNET, electronic mail, file transfer, WWW, HTTP, network management system, simple network management protocol (SNMP)
- **Network security** : cryptography, symmetric key cryptography, public key cryptography, security services, IPSec, VPN, firewalls