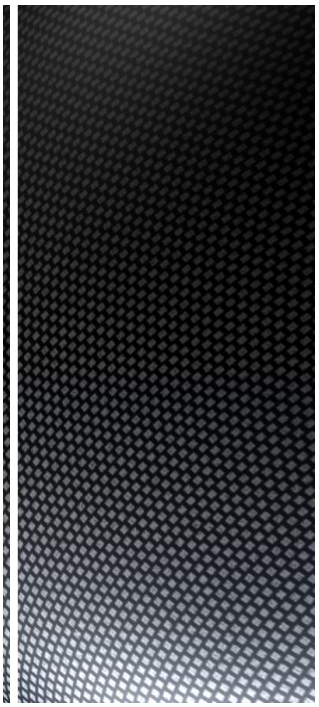
CIS (21-774)
Computer Information Systems
in
Industrial Engineering

Department of Industrial Engineering
Sharif University of Technology

Session# 11



Course Description *(Continued..)*

- *Contents:*
  - *The role of managers in Information Technology (IT)* *(3 sessions)*
  - *Organizational Issues* *(3 sessions)*
  - *Information Technology* *(9 sessions)*
  - *Operational and enterprises systems* *(4 sessions)*
  - *Exciting directions in systems* *(3 sessions)*
  - *E-Business and E-Commerce* *(3 sessions)*
  - *Issues for senior management* *(2 sessions)*

Course Description *(Continued..)*

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  - *Information Technology* *(9 sessions)*
    - *Fundamentals*
      - *The components of a personal computer*
    - *Software*
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      - *The Contribution of Higher-Level languages*
      - *The Web Browser and Internet standards*
      - *The operating system*
    - *Database management*
      - *File elements*
      - *Enter database management software*
      - *Database in systems design*
      - *Data Warehouses, Data Marts, and Data Centers*
      - *Enterprise Content Management*

Course Description *(Continued..)*

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  - *Information Technology (Continued …)* *(9 sessions)*
    - *Communications*
      - *Communications between computers*
      - *Networks*
    - *Information Technology architecture*
      - *Hardware & software architecture*
    - *System alternatives and acquisition*
      - *To buy or not: major applications*
      - *The services industry*
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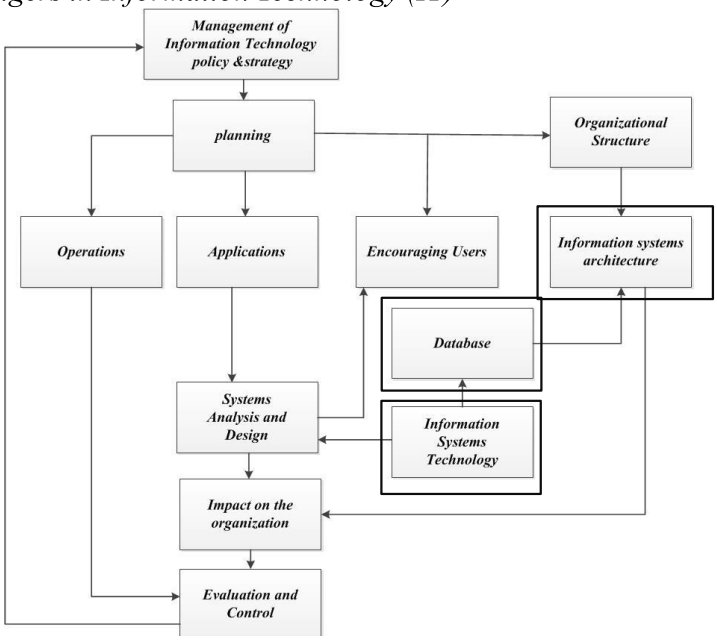
      - *Systems design life cycle*
      - *Data collection for analysis and design*

The role of managers in Information Technology (IT)



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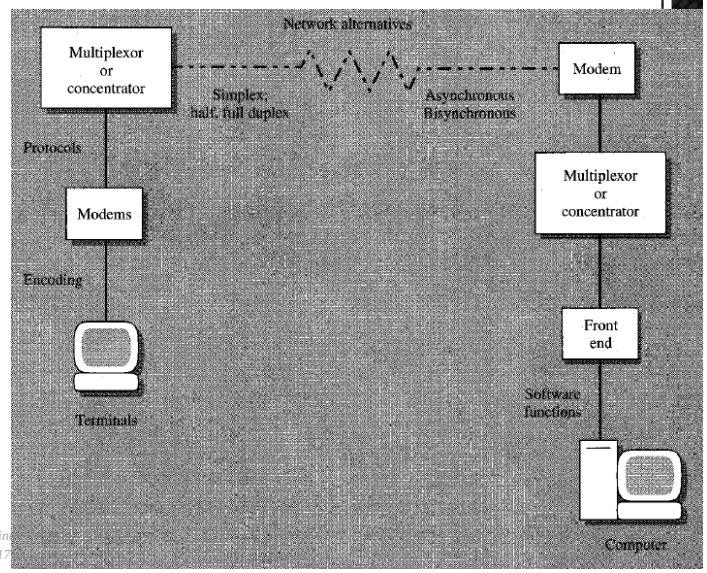
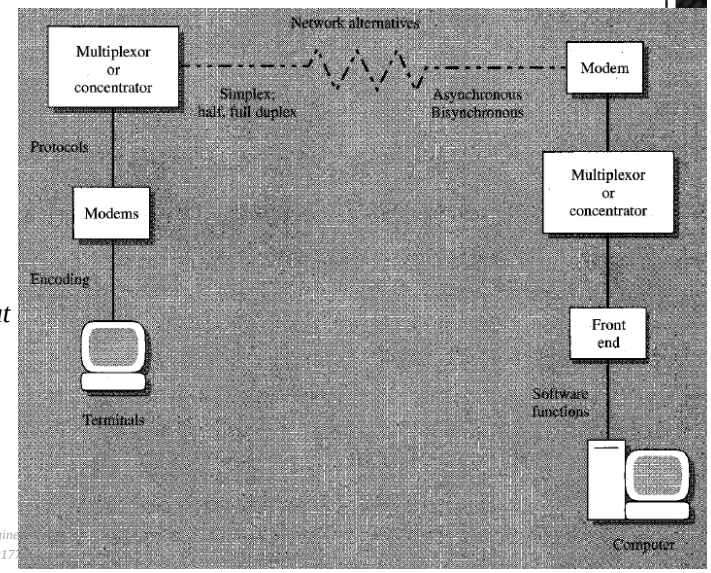
Information Technology

- *Networks*
  - *A network connects a variety of computers and other devices.*
  - *The largest computer network is the Internet*
  - *The largest general-purpose network in the world is the **public switched network** used to carry most voice traffic around the world*



Information Technology

- *Networks*
  - *In addition to telephone, there are special private network services also providing switched connections.*
  - *Such a network covers a huge distance and would be considered a **wide area network (WAN)**.*
  - *Some organizations want a network that is local to a given area, and they might configure it using private lines.*
  - *This kind of network is known as a metropolitan area network (MAN).*



Information Technology

- *Networks*

TYPES OF NETWORKS AND EXAMPLES

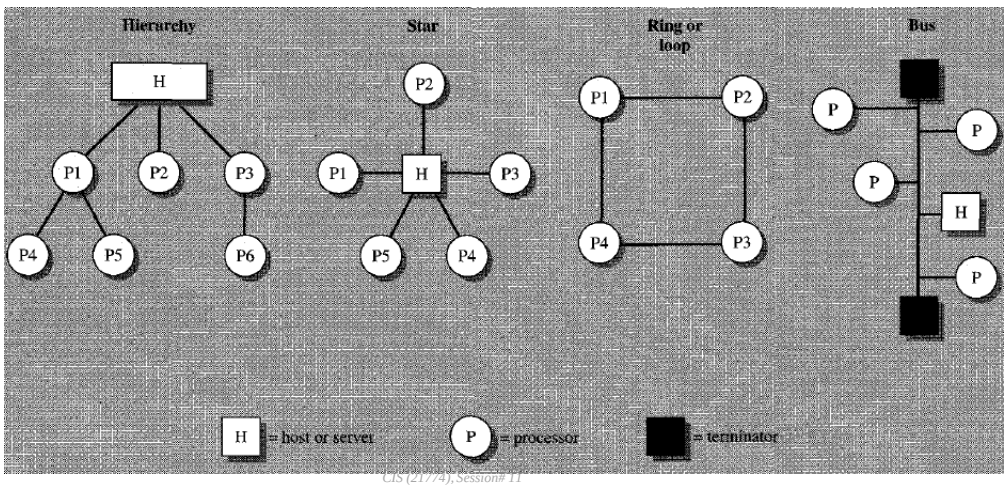
Type of network	Example
Network of networks	The Internet
Public switched network	Voice telephony
Wide area network (WAN)	The phone system
Metropolitan area network (MAN)	A campus network
Local area network (LAN)	PC network within a building

Information Technology

- *Networks*
  - *In place of a switched network, you could make a simple direct connection between a computer and a terminal using twisted-pair cables running directly between the two devices.*
  - *You can generally wire directly for a mile or two before the loss of signal (attenuation) becomes too great and modems are needed.*
  - *One way to reduce line costs is to have several terminals connected to a device called a multiplexer. The multiplexer combines the signals from various low-speed terminals and sends them over a higher-speed line.*
  - *A concentrator is a hardware device that collects messages from terminals and stores them if necessary. The concentrator sends the messages over a higher-speed line to the computer.*

Information Technology

- *Network configuration*



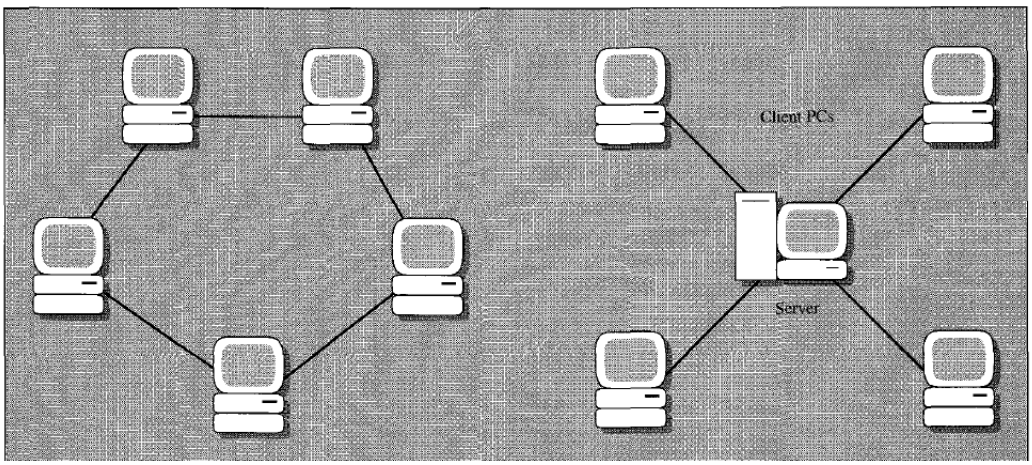
Information Technology

- *Local Area Connection (LAN)*
  - *The local area network is an approach for connecting various devices that need to communicate with each other and that are grouped closely together, as in a single building.*
  - *There are two major architectures for LANs.*
    - *The first is a peer-to-peer network in which all PCs are connected to each other. Data on the network are passed from one PC to the next. As a user, you must devote some of the resources of your workstation to accepting and passing data on the network. Each computer on the LAN incurs this type of overhead.*
    - *The second type of LAN is more popular and employs a file server. The server is a computer that responds to requests from its clients or user PCs.*

Information Technology

- *Local Area Connection (LAN)*

(a) Peer-to-peer LAN. (b) Client-server LAN.

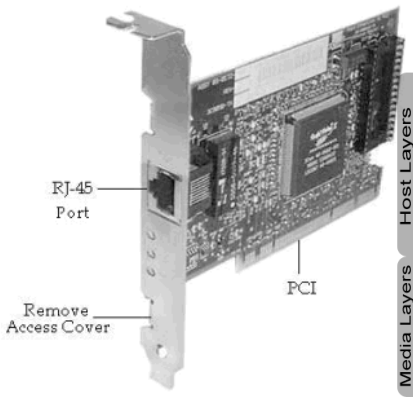


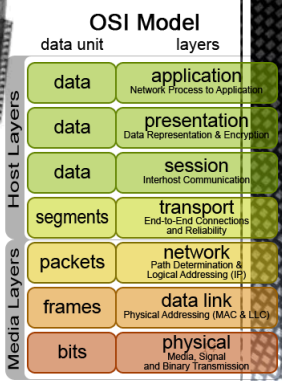
Information Technology

- *Local Area Connection (LAN)*
  - *The LAN is generally installed for a group of users who need to share something-a database, computer equipment, and/or software.*
  - *This LAN is more complex than the peer-to-peer network and is usually more expensive.*
  - *It does free the client workstation from performing any LAN functions for other users.*

Information Technology

- *Local Area Connection (LAN)*
  - *Ethernet*
  - *The most popular local area network protocol today is Ethernet.*
  - *In contrast to the peer-to-peer LAN, a computer connected to an Ethernet LAN must have a network interface card (NIC), usually called an Ethernet card.*
  - *The fastest version of Ethernet, called gigabit Ethernet, promises speeds from 200 Mbits/second to the full 1 Gbits/second.*



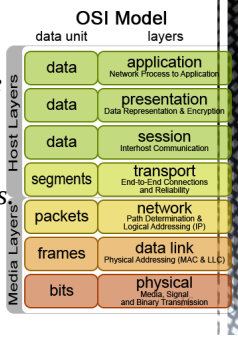


Information Technology

- *Local Area Connection (LAN)*
  - *Sometimes the LANs use different standards:*
    - *One might use Appletalk and serve Macintosh computers while another features an IBM PC standard called token ring architecture*
  - *Sooner or later, users on these networks want to be connected to each other.*
  - *The solution is to use a bridge or a router.*
    - *A bridge has very little logic; it connects similar networks.*
    - *A router contains logic and serves as the interface between two or more networks and possibly a wide area network.*
  - *A multiprotocol router is able to process messages from networks that follow different protocols.*

Information Technology

- *TCP/IP: A Network Protocol*
  - *One of the best known protocols is Transmission Control Protocol (TCP)Internet Protocol (IP)*
  - *It was developed by a Department of Defense research project to connect various kinds of networks.*
  - *The IP part of the protocol is responsible for moving packets of data from node to node in a network.*
  - *IP forwards each packet based on a four-byte destination number or IP address.*



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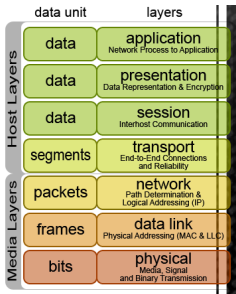


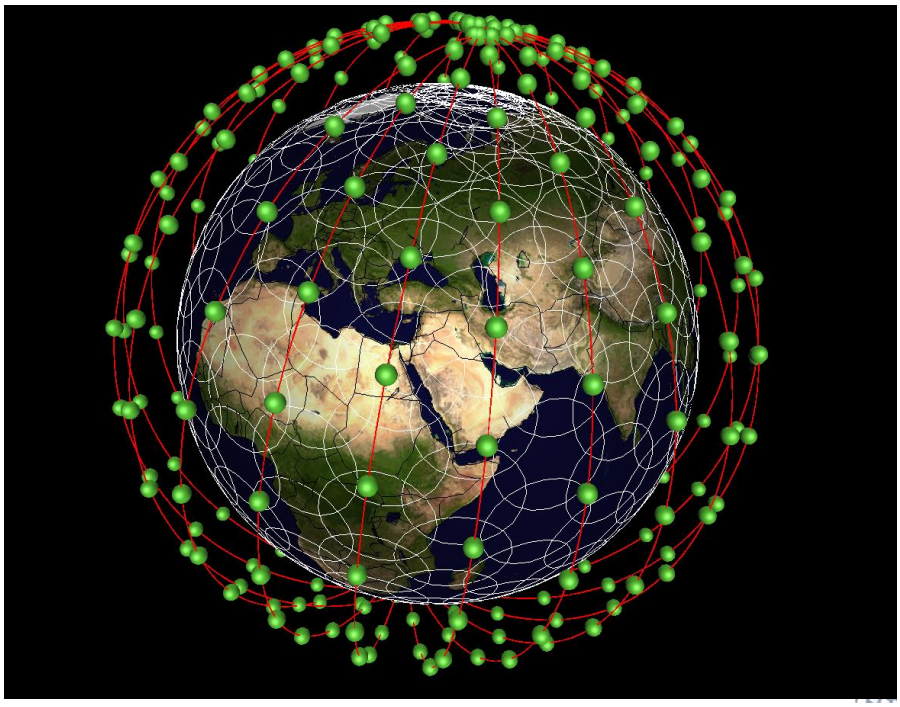
- *TCP/IP: A Network Protocol*
  - *Gateways and servers move data among departments and around the world.*
  - *IP operates on these computers. TCP is responsible for verifying the correct delivery of data from a client computer to a server and must see that data are not lost someplace on a network.*
  - *TCP adds support to detect errors or missing data and to generate a retransmission until all the data have been correctly received.*
  - *Because the Internet is a packet-switched network, when you connect to an Internet service provider (ISP), the communications software must use the TCP/IP protocol.*

Information Technology

- *Wireless*
  - *Setting up a network with cables and wires is not always desirable or feasible.*
  - *Wireless technology uses some kind of broadcast to eliminate the need for cabling.*
  - *The most obvious wireless option for wide area communications is the cellular phone network. Cellular digital packet data (CDPD).*
  - *For transmitting graphics and video. Another option is to use a system of low-orbit satellites like Iridium or Teledesic.*
  - *These two systems employ large numbers of satellites (66 or more) in a low orbit. The sending station sends data to a satellite that forwards it through other satellites until it reaches the receiving station.*

Information Technology

- *Wireless*



Information Technology

- *Wireless*

Harvesting by Satellite

The idyllic view of the American farmer using a tractor and plow to produce a bountiful harvest is not quite complete. Farmers on the leading edge use Geographical Position System (GPS) satellite navigation to map and analyze fields, telling the farmers where to apply the proper amounts of seeds, fertilizer, and herbicides.

One equipment dealer indicated that he had sold 14 combines in a year, and 11 of them were equipped with GPS receivers. He is also retrofitting older combines as the technology spreads, though only about 5 percent of American farmers now use it. GPS units and their associated computer monitors start at about $6500.

In the past farmers managed their business on a per-field basis; now they can micromanage. One Illinois farmer found that parts of his fields did not need any fertilizer at all after monitoring the soil. Less fertilizer lowers costs and reduces pollution from the runoff of water from the fields. A typical application is to use geographic fixes from the GPS and a computerized counter to record how much grain is being harvested each second from each meter of the field. Then the farmer downloads this information into a personal computer, which produces a contour map that shows variations of, say, more than 60 bushels an acre. Cross-referencing this information to other variables, like characteristics of the soil, allows the farmer to analyze why some land is less productive. The farmer combines these data with GPS navigational fixes to precisely apply herbicides or fertilizer only where it is really needed.

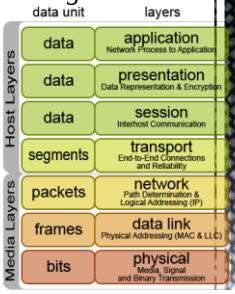
Innovators constantly take advantage of new opportunities provided by technology. In this instance, equipment manufacturers are combining a navigational system first developed for the U.S. Navy with information technology to improve productivity in agriculture.

Information Technology

- *Worries about Network Security*
  - *There have been many network security problems; networks are a tempting target for mischief and fraud*
  - *A firm must identify users before they are granted access to a corporate network and that access should be appropriate for the given user.*
  - *Almost all networks require some kind of logon, including user name and password.*
  - *A "fire wall," a computer that sits between an internal network and the Internet.*
    - *The fire wall allows access to internal data from specified incoming sites but tries to detect unauthorized access attempts and prevent them from occurring.*
    - *For highly secure communications, a sender can encrypt data, that is, encode the data so that someone without the "key" to decode them cannot read the message.*

Information Technology

- *The contribution of communications*
  - *Firms take advantage of the opportunities provided by telecommunications and networks in a number of ways.*
    - *Electronic mail (e-mail) and*
    - *Electronic Data Interchange (EDI).*
  - *Computer users with appropriate software and communications links can send messages and documents to other computer users.*
  - *Most companies with large e-mail systems also have large networks.*



Information Technology

- *The contribution of communications*
  - *The firm must be connected electronically with customers and suppliers.*
  - *One rapidly growing technique for this type of interconnection is EDI.*
    - *Detroit auto manufacturers were among the first companies to encourage suppliers to accept orders electronically.*
  - *Because each firm has its own formats for each of the paper documents used prior to EDI, there are problems of compatibility.*
    - *The American National Standards Institute (ANSI) has developed a standard known as ANSI X.12 to specify common document formats for the transactions involved in ordering, receiving, and paying for merchandise*

Information Technology

- *The contribution of communications*

1 Order Series (ORD)
2 Materials Handling Series (MAT)
3 Tax Services Series (TAX)
4 Warehousing Series (WAR)
5 Financial Series (FIN)
6 Government Series (GOV)
7 Manufacturing Series (MAN)
8 Delivery Series (DEL)
9 Engineering Management & Contract Series (ENG)
10 Insurance/Health Series (INS)
11 Miscellaneous ANSI X12 Transactions Series (MIS)
12 Mortgage Series (MOR)
13 Product Services Series (PSS)
14 Quality and Safety Series (QSS)
15 Student Information Series (STU)
16 Transportation
- 16.1 Air and Motor Series (TAM)
- 16.2 Ocean Series (TOS)
- 16.3 Rail Series (TRS)
- 16.4 Automotive Series (TAS)

Information Technology

- *The contribution of communications*
  - *Manufacturing Series (MAN)*
    - *196 Contractor Cost Data Reporting*
    - *830 Planning Schedule with Release Capability*
    - *844 Product Transfer Account Adjustment*
    - *846 Inventory Inquiry/Advice*
    - *849 Response to Product Transfer Account Adjustment*
    - *852 Product Activity Data*
    - *861 Receiving Advice/Acceptance Certificate*
    - *866 Production Sequence*
    - *867 Product Transfer and Resale Report*
    - *869 Order Status Inquiry*
    - *870 Order Status Report*
    - *894 Delivery/Return Base Record*
    - *895 Delivery/Return Acknowledgment or Adjustment*

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