26. INTEGRATED SERVICE DIGITAL NETWORK (ISDN)

26.1 INTRODUCTION

ISDN has been most important development to emerge in the field of computer communications. ISDN is a well-conceived and planned area of development in the field of telecommunication.ISDN –An integrated digital network in which the same digital switches and digital paths are used to establish different services for e.g. telephony, data.

Six conceptual concepts on which ISDN standards laid are:

1. ISDN will evolve from telephony IDN by incorporating additional functions and network feature including other dedicated network to provide for existing and new services.

2. New services should be compatible with 64kbps switched digital connections.

3. The transition from existing network to comprehensive ISDN may require one or two decades.

4. Arrangement must be made for internetworking of services and services on other networks during transition period.

5. ISDN contains the intelligent of providing service features,maintenance and network management functions.

6. Various access arrangements to ISDN require layered functional set of protocols.

So ISDN can be defined as an ISDN is network evolving from telephony IDN that provides end to end digital connectivity to support wide range of services including voice and non-voice services, to which users have access by a limited set of standard multipurpose user network interface.

26.2 NEW SERVICES:

ISDN will support variety of services including the existing voice and data services and host of new services. Short lists of some important new services are:

1. Videotext
2. Electronic Mail
3. Digital Facsimile
4. Teletext
5. Database access
6. Electronic Fund Transfer
7. Image and graphics exchange
8. Document storage and transfer

9. Automatic alarm services, e.g., smoke,fire,police,medical
10. Audio and video conferencing

VIDEOTEX

Videotex is a generic term for systems that provide easy to use, low cost computer based services via communication facilities. Three forms of videotext exist:

1. View data
2. Teletext
3. Open Channel teletext

View data is fully interactive videotex. This means that request for information and service from a user are actually sent to, received by, and acted on by a centralized computer.

Teletex is broadcast or pseudo-interactive videotext service. Teletext users may select the information to be seen, the pace at which the information to be displayed and, often sequence of display. The information cast in the form of frames and set of frames which is called a magazine is recycled continuously. Teletext is a one way communication system and there is no real interaction between the user and the computer.

Open channel teletext is totally non-interactive one way videotext. With this form of videotext, the user receives pre-selected information in predetermined order. There is no interaction either real or apparent. The user has no control over the pace or sequence of display. Open channel text may classify into three categories according to the way of preselected information displayed and the way of display channel is used:

1. Dedicated open channel
2. Open captioning
3. Closed captioning

In dedicated open channel text, a separate transmission channel is dedicated for the display of preselected information. Open captioning shares a normal display channel and teletext display appears at fixed intervals along with other programs of channel.

ELECTRONIC MAIL

Electronic Mail is popularly known as email, may be defined as the communication of textual messages via electronics means. Even the telex communication is electronic in nature but the differences are telex communication is terminal to terminal, electronic mail communication is user-to-user. In telex message destined to no. of users are sent to the same terminal form where it is distributed by an operator or messenger. On the other hand electronic mail delivered to the mail boxes of individuals. Telex works on a circuit switched mode, where electronic mail is store and forward(S&F) services. Electronic mail is computer based message system where telex is

generally not.Advantage of Electronic mail is first of all security then its ability to reduce the consumption of paper in the office. Being a computer based messaging system, files are prepared like automation packages like word, spreadsheet etc. easily interchanged as electronic mail. This facility improves efficiency for office work.

Early electronic mail systems were organized around the single time sharing or multiuser computer system,where electronic mail was exchanged among the user of the system.The typical configuration of electronic mail is given below which was established in 1970s.
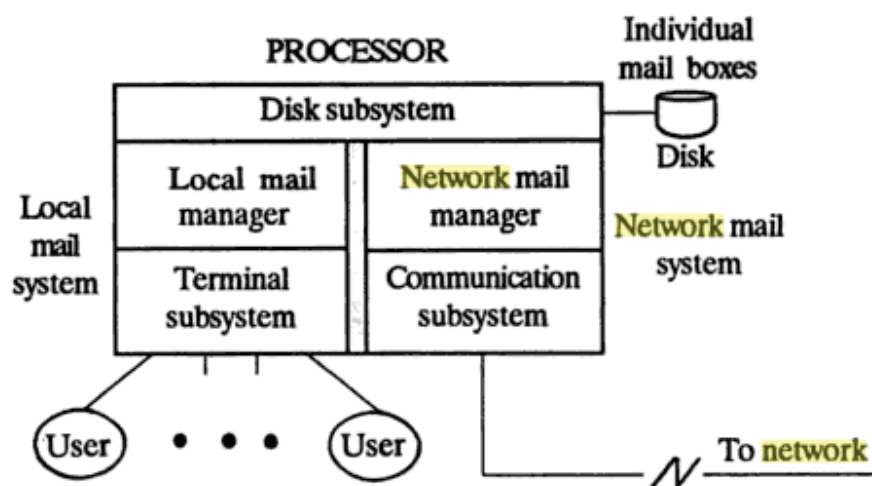

Figure.50: A typical configuration of electronic mail system [1]

Component of the system are: one to handle within the system another to handle mail over the network. Both share common disk storage where mail boxes are maintained. Thus, real time exchanges of messages are possible in an electronic mail system, if the two concerned parties are logged onto the same machine at the same time. Electronic mail being S&F on a network, real time exchange may not possible. Some are the well-knownnetwork who is providing the electronic mail services are UUNET,BITNET,CSNET, and JANET.

In the context of Open System Interconnection (OSI) networks, electronic mail is considered as an application process running on the seventh layer. Standard electronic mail service components have been defined and approved by 1984 CCITT Plenary Assembly. These are known as X.400 family of standards of message handling systems (MHS).List of X.400 family is given below.

Number	Subject dealt with
X.400	System model — service elements
X.401	Basic service elements and optional user facilities
X.408	Encoded information-type conversion rules
X.409	Presentation transfer syntax and notation
X.410	Remote operations and reliable transfer server
X.411	Message transfer layer
X.420	Interpersonal messaging — user agent layer
X.430	Access protocols for teletex terminals

The MHS model as defined in X.400 has two types of entities.

User agent entity (UAE)

Message transfer agent entity (MATE)

The figure of X.400 model is given below. User agent performs functions relating the preparation, submission and delivery of messages.
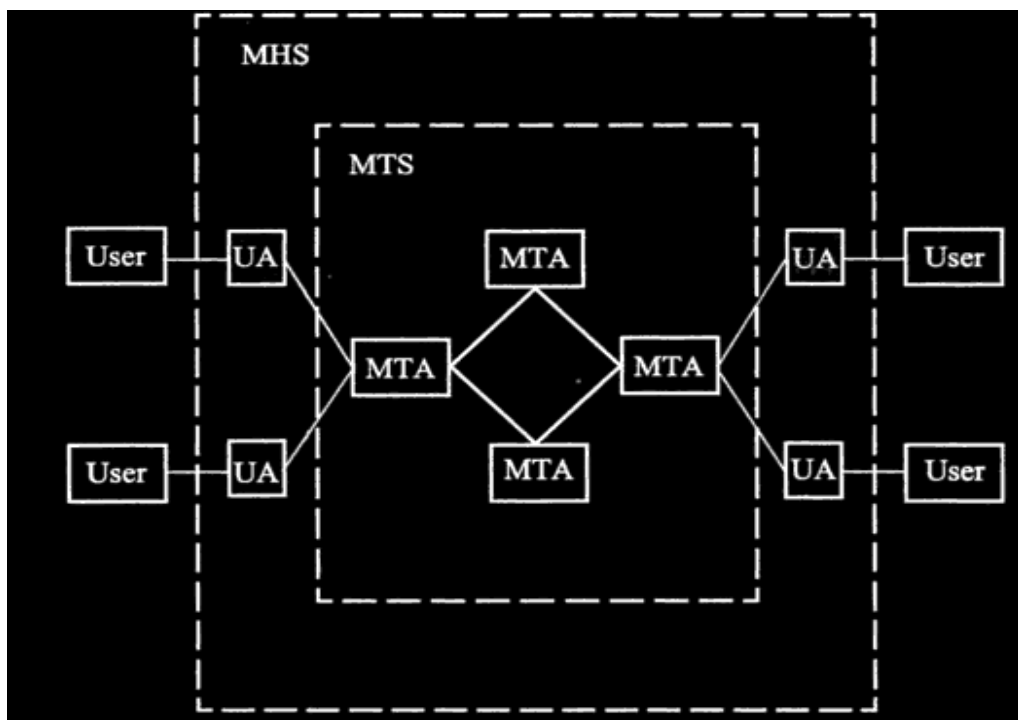
MHS-message handling system   MTA-message transfer agent

MTS – message transfer system   UA-user agent

Fig.51: X.400 message handling system model [1]

It also assists user in other message function such as filing,replying, retrieving and forwarding. Message transfer agent is concerned with transfer of message across of network and functions in an environment designated as message transfer system (MTS). It obtains the message from the source UA and deliveries the same to the destination UA. On accepting message the MTA performs either a delivery function or a routing function. If the destination UA is in the same as the MTA or is attached with MTA directly, then the MTA performs the delivery function, otherwise it performs a routing function.Depending upon the physical location of the MTA and UAs, a no. of different physical realization of emails systems are possible which are listed below.
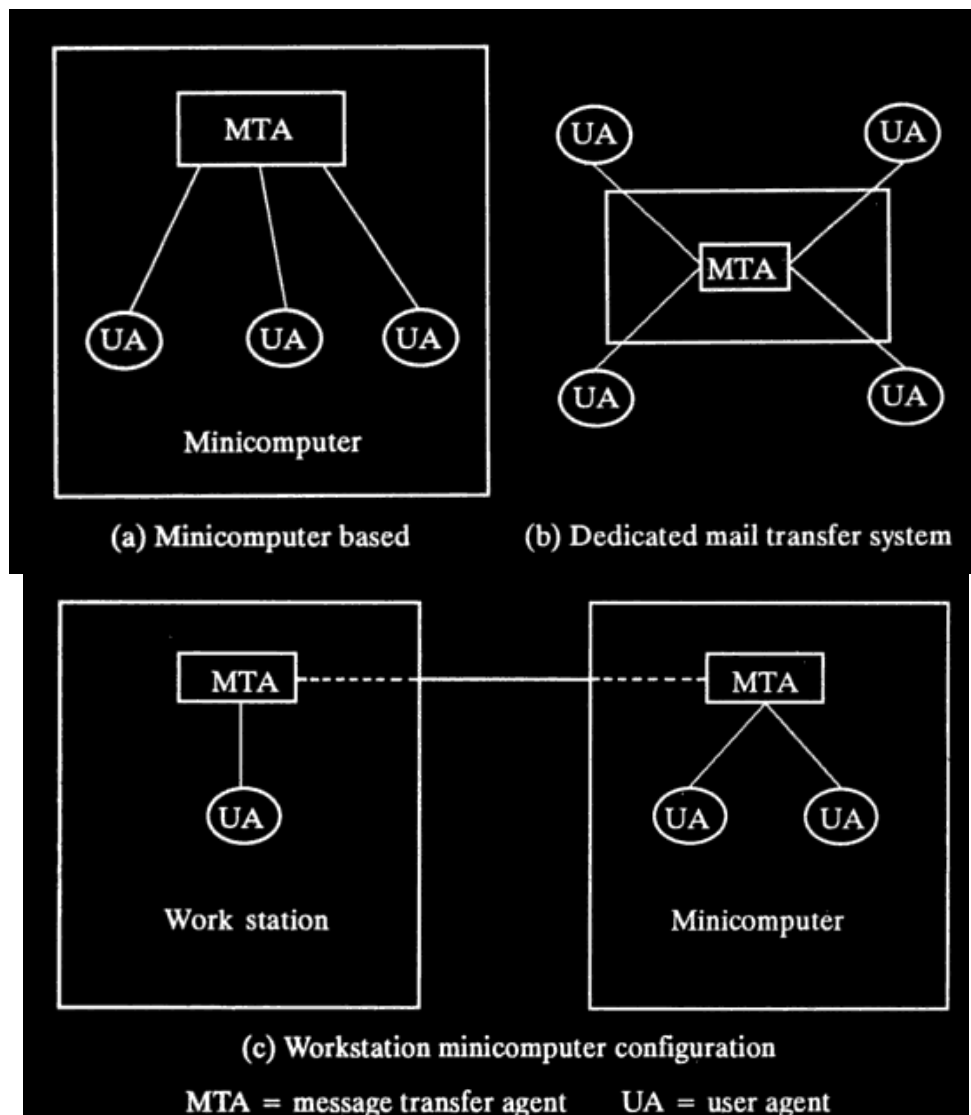

Fig.52: Email system configuration [1]

In the context of OSI reference model, X.400 MHS is part of the application layer. The UA and MTA functions are treated as sub layers as shown in figure below. In systems where only the UA function is implemented, the message transfer sub layer comprises a submission and delivery entity (SDE). The entity acts the interface between a local UA and remote MTA. In the sense, SDE implements a remote procedure call protocol. In the intermediate system, only the message transfer agent entity (MTAE) plays a role acts as a relay. Zero or most intermediate system may be involved in transferring a message from the source MTAE to the destination MTAE. A message may be destined to one or more UAs & its responsibility of message transfer sub layer to deliver the message to all intended recipients.
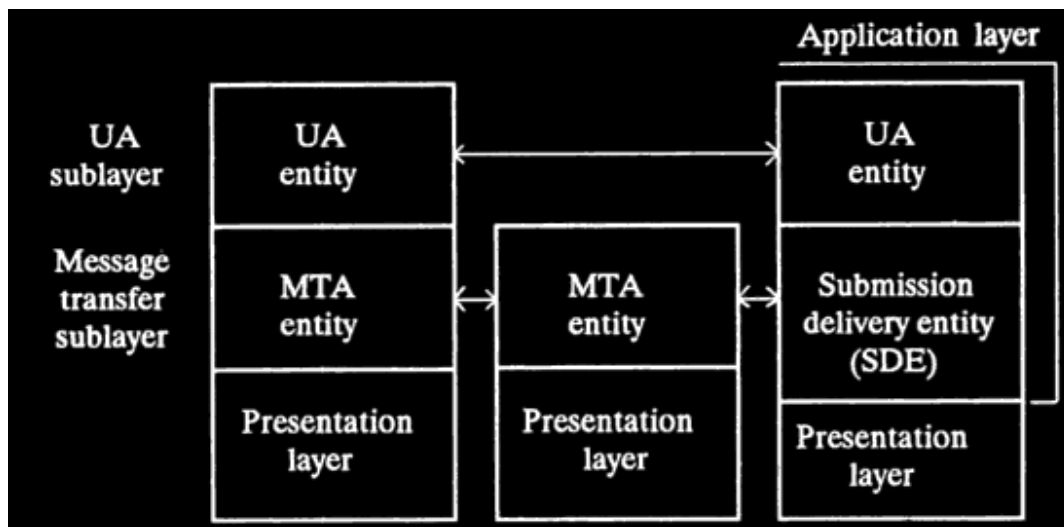

Fig.53: X.400 in the context of OSI model [1]

The services provided by UAEs are known as interpersonal messaging services. Two types of service are supported:

➔ Send/receive user message
➔ Send / receive status report

Corresponding to two types services two types of protocol data units (PDU) are used. The PDU structure is shown in below.
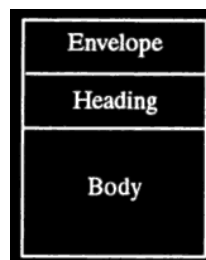

Fig.54: X.400 user message format [1]

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The message consisting of three parts the body of the message is the actual user information, which may considered as user data unit in the OSI parlance

DIGITAL FACSIMILE

Digital Facsimile which is process that digitally encoded the picture signal, i.e. encodes the baseband signal resulting from scanning the object. The facsimile equipment output may be either analog, as defined by CCITT group 3 protocol, or digital defined by CCITT group 4 , STANAG 5000 type I and STANAG 5000 Type II protocols.

Two types of facsimile systems are exists:

➔ Photographic facsimile
➔ Document facsimile

In photographic facsimile, the gray level information is transmitted and printed in addition to black and whitei.e. Typically 8 or 16 gray levels that can be recognized by the system.Document facsimile system handles only black and white levels, i.e. only two gray levels. Document facsimile system is more popular than the photographic system. The receiver / transmitter functions are applicable to both type of facsimile systems are shown in the figure below
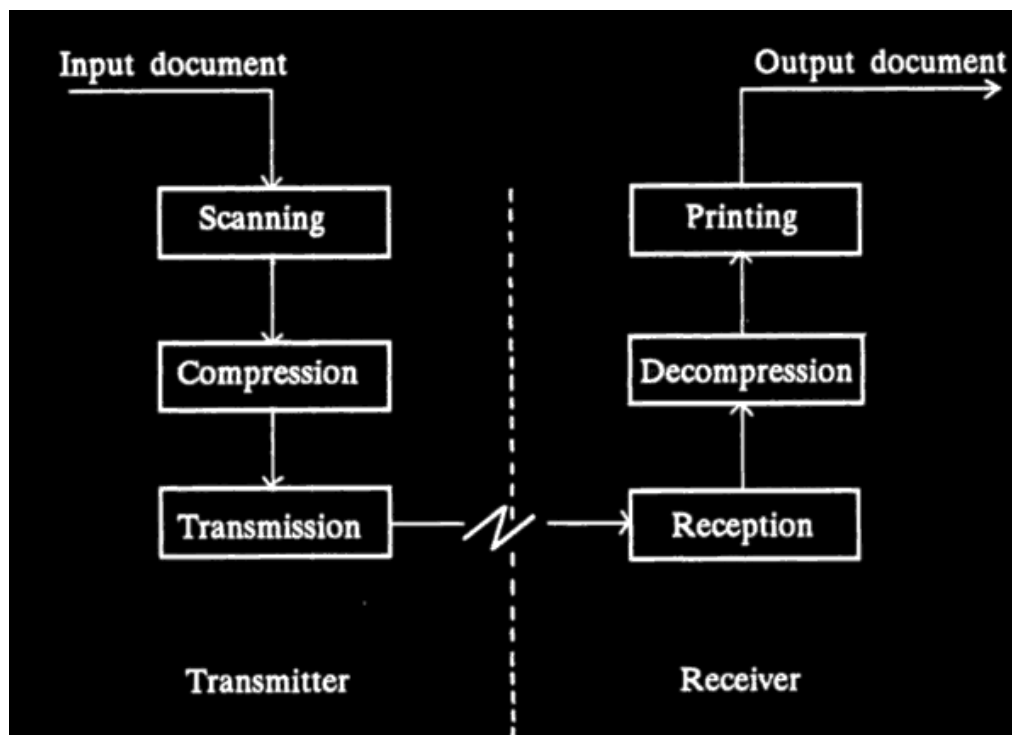

Fig.55: Function of facsimile system [1]

Facsimile inputs or scanned data are required to compress before it transmitting. This is the second step in facsimile transmission. There are two types of compression techniques

➔ Information preserving techniques
➔ Approximate techniques

CCITT has standardized on two compression techniques, both belong to first category. These techniques reproduce an exact replica of scanned images, whereas the techniques belonging to the second category approximate original in the output. The two techniques standardized by CCITT are:

➔**Modified Hoffman Technique (MH)**

➔**Modified READ (MR) Technique**

Before applying Huffman or relative element address designate (READ) technique, the scanned information is coded using a basic technique known as run-length coding. Huffman coding is based on principle that are more efficient coding technique that can be evolved by using short code words for frequently occurring symbols and long code words for sparingly occurring symbols, instead of using a uniform size for all symbols. Huffman code is modified to view the run lengths into two parts and code them independently, taking into account of their probability of occurrence. The two parts of the run length are known as **made up codepart (<64 letters)** and **terminating code part(> 64 letters)**.

Relative element address designate (READ) code is based on the principle that further code efficiency may be gained by coding the relative position of changing elements. There is a strong correlation between black-white patterns two adjacent scanned lines in a document. This fact is exploited in modified READ (MR) coding. A changing element is coded in terms of distance in preceding changing element on the same or on the previous line.

TELETEX

Teletex is an upgrade to the conventional telex service. The terminal to terminal communication service of telex will be turned into office-to office document transmission system by teletex. Teletex envisages direct communication between electronic typewriters, word processor and personal computers. In teletex system the transmission and reception of messages should proceed in the background without affecting the work which is the user may carrying out the foreground with the equipment.

How to access data from the database host?
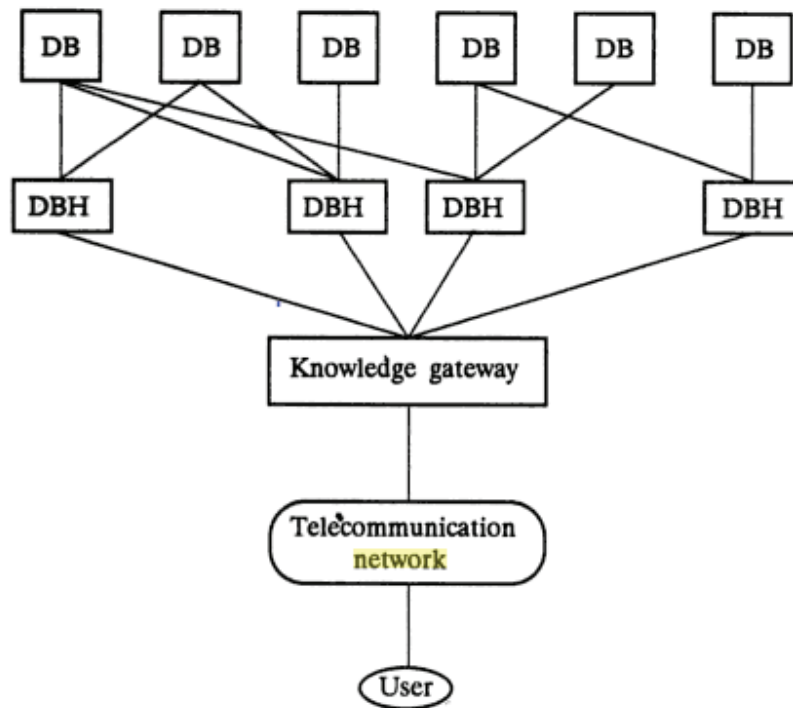
DB-database   DBH- Database host

Fig.56: Electronic access of information [1]

Considering the database access will emerge as a major application in the 1990s, ISO has initiated standardization efforts for **search and retrieval (SR)** of databases. The SR service modeled as pair of application processes. Within each application process, there are two types of functions i.e. local processing functions and OSI related functions.

There are six service elements defined in SR application.

INTIALISE- Initializes communication with a database provider for subsequent program.

SEARCH-permits a database user to search a database at a remote site; outcome is a result set.

PRESENT- permits a database user to retrieve records from a result set.

DELETE- permits a database user to delete records set at result set.

SR-RELEASE- permits a database user to orderly terminate an association.

SR-ABORT- permits a database user or database provider to request abrupt termination of the association.