DETAILED CONCEPT OF INTEGRATED SERVICES DIGITAL NETWORK

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ABSTRACT

Integrated Services for Digital Network (ISDN) is a set of communication standards for simultaneous digital transmission of data, voice, video, and other network services over the traditional circuits of the Public Switched Telephone Network (PSTN). It was first defined in 1988 in the CCITT red book. Before ISDN, the telephone system was viewed as a way to transport voice and some special services available for data. The main feature of ISDN is that it integrates speech and data on the same lines thus adding features that were not available in the classic telephone system. There are various kinds of access interfaces to ISDN defined as Basic Rate Interface (BRI), Primary Rate Interface (PRI), Narrowband ISDN (N-ISDN), and Broadband ISDN (B-ISDN). In a broad sense ISDN can be considered a suite of digital services existing on the layers 1, 2, and 3 of the OSI model. ISDN is designed to provide access to voice and data services simultaneously.

**Keywords:-** _Integrated Services Digital Network(ISDN),_ CCITT, _IDN, Basic Rate Interface (BRI), Primary Rate Interface (PRI)_

1.   INTRODUCTION

Integrated Services for Digital Network (ISDN) is a set of communication standards for simultaneous digital transmission of data, voice, video, and other network services over the traditional circuits of the public switched telephone network. For the first time it was defined in 1988 in the CCITT red book. Earlier, the telephone system was viewed as a way to transport voice having special services available for data. The important feature of ISDN is that it integrates speech and data on the same line, adding features that were not available in the telephone system. Several access interfaces to ISDN are defined as Basic Rate Interface (BRI), Primary Rate Interface (PRI), Narrowband ISDN (N-ISDN), and Broadband ISDN (B-ISDN). ISDN is a circuit-switched telephone network system, that provides access to packet switched networks which are designed to allow digital transmission of voice and data over ordinary telephone copper wires, providing potentially better voice quality than an analog phone provide. It offers circuit-switched connections (for both voice and data), and packet-switched connections (for data only), in increments of 64 Kilobit/s. A major application in market for ISDN in some countries is Internet access, where ISDN provides a maximum of 128 Kbit/s in both upstream and downstream directions. It should not be mistaken for its use with a specific protocol, such as Q.931 where ISDN is employed as the network, data-link

and physical layers in the context of the OSI model. In a wide sense it can be considered a suite of digital services existing on layers 1, 2, and 3 of the OSI model designed to provide access to voice and data services simultaneously. However, common use reduced ISDN to be limited to Q.931 and the related protocols, which are a set of protocols for establishing and breaking circuit switching connection, and also for advanced calling features for the user. They were introduced in 1986. ISDN provides simultaneous text, voice, and video, transmission between individual desktop videoconferencing systems and group (room) videoconferencing systems in a videoconference.

2. EVOLUTION OF ISDN

ISDN will be based on the concept of telephone IDNs. IDN was developed for and evolved within existing telephone network. The telephone networks have the dominant role in ISDN (not PSN sat.).Transition to ISDN would take time of one or more decades. The introduction of ISDN services is done in the context of existing digital facilities and existing services. The use of existing networks is also made for its evolution. The interface to packet-switched services is X.25. With the introduction of fast PS and VC control, new interface will be needed. Some Interim user-network arrangements may be needed to be adopted for early penetration of digital service capabilities. An evolving ISDN may also include switched connections at bit rates higher and lower than 64 Kbit/s.

2.1   ISDN PRINCIPLES

- It supports a wide range of voice and non-voice applications using a limited set of standardized facilities that defines the purpose of ISDN and the means of achieving it.

- It supports a large number of switched and non-switched applications. Switched connections in ISDN include both circuit-switched and packet-switched connections.

- ISDN should be compatible with 64-kbps switched digital connections.

- A layered protocol structure should be used for the specification of the access to an ISDN.

- ISDNs may be implemented in a variety of configurations according to specific national situations.

2.2   OBJECTIVES

i. Standardization

- To provide universal access to the network.

- Movable ISDN-standard equipment and use of layered protocol.

- To allow users to select equipment from multiple suppliers.

ii. Transparency

- Digital transmission service is independent of the contents of data.

- New applications and protocols can be developed by users.

- Encryption methods provided by users can be employed simply.

iii. Separation of competitive functions

- ISDN does not preclude competitive functions from basic ones.

- Some countries desire certain enhanced services be offered competitively (e.g., videotex, electronic mail).

iv. Leased and switched services

- ISDN should provide both switched and leased services .

- To allow users to optimize on the basis of cost and performance.

v. Cost-related tariff

- One type of service does not subsidize others.

- Price distinctions related to the cost of providing specific performance and functional characteristics of a service.

vi. Smooth migration

- ISDN evolution must coexist with existing equipment and services.

- Specific capabilities required: Requirement of pre-ISDN terminals to interface to ISDN, inter-network protocols, and protocol converters.

vii. Multiplexed support

1. Accommodating user-owned PBX and LAN equipment.

2.3   ISDN SERVICES

There are two kinds of services :

1. Network Services

• Network Services define how the user and the network interact with each other in order to manage calls.

• The user can use Network Services to request the network to perform functions such as making and clearing calls, transferring calls and so on.

• This activity is known as signaling.

2. Bearer Services

• Bearer services carry the call activity that the user is performing at any given moment.

• This includes voice calls, modem and fax calls, and connections to the Internet.

• Broadly speaking, there are two forms of bearer service.

Structured Data - the information passing over the bearer service is in a format that is understood by the network. Voice is an example of this type. As the network knows the connection carrying voice, it can convert the data into an analogue signal in the event that the call is connected to an ordinary analogue phone.

Unstructured Data - the format of the information is not understood by the network, but is understood by the two users at either end of the service.

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3. ISDN ARCHITECTURE

ISDN supports a new physical connector for users, a digital subscriber line, and a variety of transmission services. Physical interface provides a standardized means of attaching to the network. The interface supports a basic service consisting of three time- multiplexed channels, two at 64 kbps and one at 16 kbps.There is a primary service that provides multiple 64- kbps channels. For both basic and primary service, an interface is defined between the customer's equipment (TE) and a device on the customer's premises (NT).Physical interface provides a standardized means of attaching to the network. The interface supports a basic service consisting of three time-multiplexed channels, two at 64 kbps and one at 16 kbps. In addition, there is a primary service that provides multiple 64-kbps channels. An interface can be defined between the customer's terminal equipment (TE) and a device on the customer's premises, which is known as a network termination (NT). The subscriber loop is the physical path from the subscriber's NT to the ISDN central office. Must support full-duplex digital transmission for both basic and primary data rates.
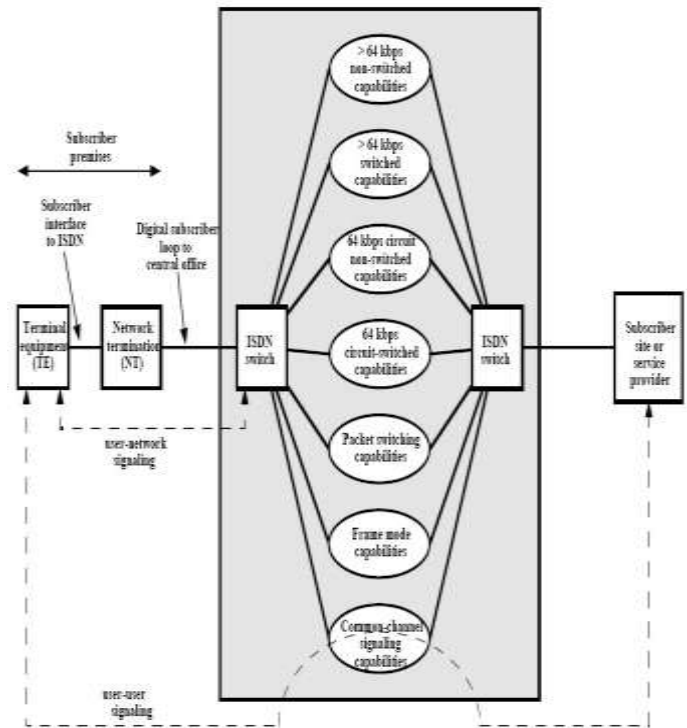

Figure 5.5 ISDN Architecture

3.1 ISDN DEVICES

The various ISDN devices are:

- **TE1 (Terminal Equipment)** — A device compatible with an ISDN network and that connects to NT type 1 or 2 devices. TE1 devices comprises of ISDN routers, modems, and ISDN phones.
- **TE2 (Terminal Equipment)** — A device not compatible with an ISDN network and that requires a terminal adapter to connect, such as a regular telephone's old-time terminal and other non-ISDN devices.
- **Terminal adapter (TA)** — Converts non-ISDN signaling to ISDN signaling.
- **NT1 (network termination)** — connects four-wire ISDN subscriber line wiring to the conventional two-wire local loop facility. It is common

to find an NT1 at a user's location inside of a networking device (router or modem) in North America. In Europe and Asia, NT1 is not part of the ISDN device at the user's location because it belongs to the LEC.

- **NT2 (network termination)** — Directs traffic from different subscriber devices and from the NT1. The device performs switching and concentrating, and similar to NT1, it converts wiring within the telephone carrier (four-wire) network to the (two-wire) local loop. The NT2 adds data link layer and network layer functionality to NT1, and it is usually used with connecting private branch exchange (PBX) devices. CPE can be considered as an NT2 device.

- **Local Exchange (LE)** — it includes Local Termination (LT) and Exchange Termination (ET) on the provider's site.

3.2 ISDN SERVICES

The two different types of ISDN services are :

1. ISDN BRI Service

The ISDN Basic Rate Interface (BRI) service offers two B channels and one D channel (2B+D). BRI B-channel service operates at 64 kbps and is meant to carry user data; BRI D-channel service operates at 16 kbps and is meant to carry control and signaling information, although it can support user data transmission under certain circumstances. The D channel signaling protocol comprises Layers 1 through 3 of the OSI reference model. It also provides for framing control and other overhead, so the total bit rate comes around 192 kbps.

2. ISDN PRI Service

ISDN Primary Rate Interface (PRI) service offers 23 B channels and 1 D channel in North America and Japan, yielding a total bit rate of 1.544 Mbps (the PRI D channel runs at 64 kbps). ISDN PRI in Europe, Australia, and also other parts of the world provides 30 B channels plus one 64-kbps D channel and also an interface rate of 2.048 Mbps.

4. CONCLUSION

The basic advantage of ISDN is to facilitate the user with multiple digital channels which can operate concurrently through the same one copper wire pair. It provides high data rate because of digital scheme which is 56kbps. ISDN network lines are able to switch manifold devices on the single line such as computers, faxes, cash registers, credit cards readers, and many other devices and these all devices can work together and directly be connected to a single line. It takes only 2 seconds to launch a connection while other modems take 30 to 60 second for establishment. The disadvantage of ISDN lines is that it is very costly than the other typical telephone system. It requires specialized digital devices just like Telephone Company. It has high speed image applications that are used to transfer data between two or more

users. It also has a high speed data transfer as the bit transfer rate through ISDN is very high. It also has very good voice service. It is also used in the video conferencing in which we have used the various devices like TV, camera, microphone, speakers etc.

For carrying out communications with various users for formal purposes. It also provides Additional telephone lines in the homes etc.

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