

INTEGRATED SERVICE DIGITAL NETWORK (ISDN)

Integrated Services Digital Network (ISDN) is a network that provides end-to-end digital connectivity to support a wide range of services including voice and data services. ISDN allows multiple digital channels to operate simultaneously through the same regular phone wiring used for analog lines, but ISDN transmits a digital signal rather than analog. Latency is much lower on an ISDN line than on an analog line.

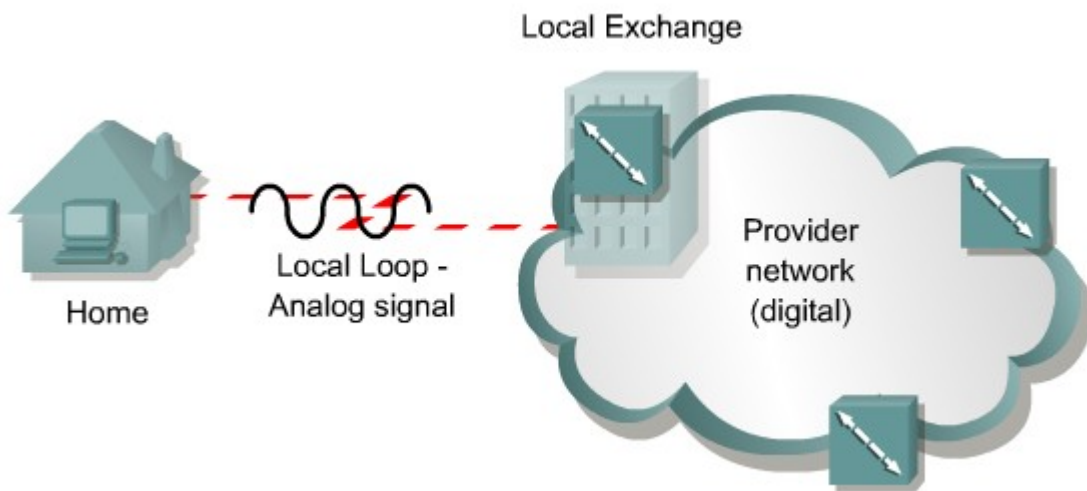


fig1: Analog Communication without ISDN

The traditional PSTN was based on an analog connection between the customer premises and the local exchange, also called the local loop. Fig 1 The analog circuits introduce limitations on the bandwidth that can be obtained on the local loop. Circuit restrictions do not permit analog bandwidths greater than approximately 3000 Hz. ISDN technology permits the use of digital data on the local loop, providing better access speeds for the remote users fig2.

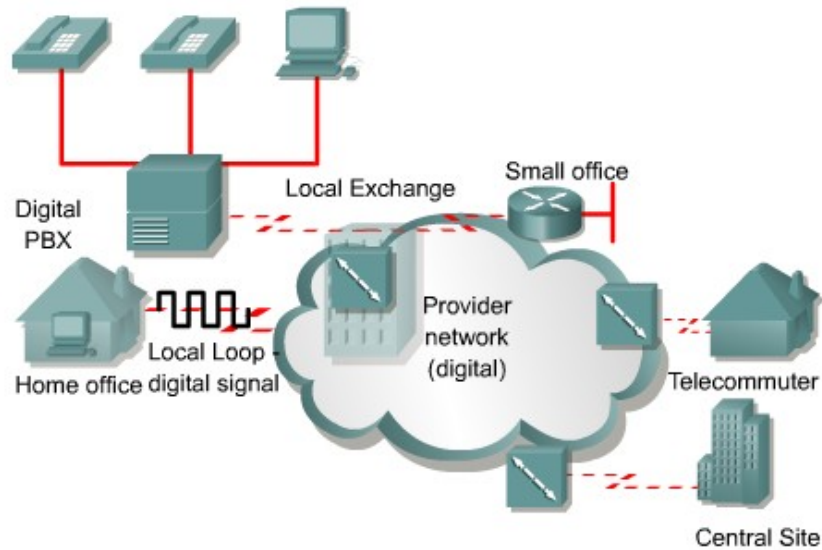
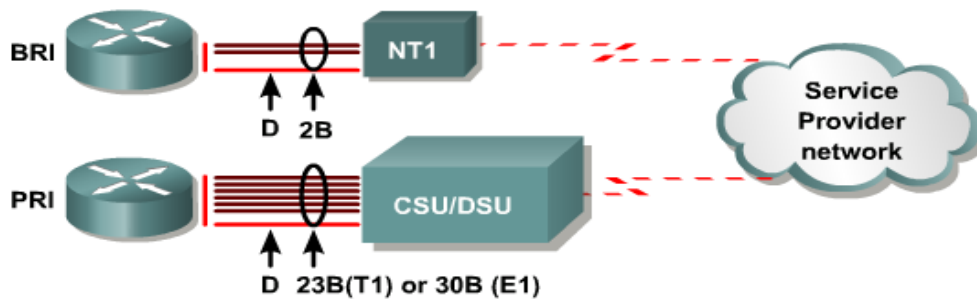


Fig2: Digital Communication with ISDN

ISDN standards define two main channel types, each with a different transmission rate.

The bearer channel, or B channel, is defined as a clear digital path of 64 kbps for voice or up to 64 Kbps of data. It is said to be clear because it can be used to transmit any type of digitized data in full-duplex mode. For example, a digitized voice call can be transmitted on a single B channel.

The second channel type is called a **delta channel, or D channel.** The D channel carries signaling messages, such as call setup and teardown, to control calls on B channels. Traffic over the D channel employs the Link Access Procedure on the D Channel (LAPD) protocol. LAPD is a data link layer protocol based on HDLC. There can either be 16 kbps for the **Basic Rate Interface (BRI)** or 64 kbps for the **Primary Rate Interface (PRI)**. The D channel is used to carry control information for the B channel.

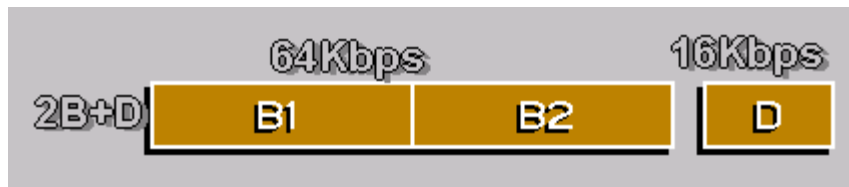


Channel	Capacity	Mostly Used for
B	64 kbps	Circuit-switched data (HDLC, PPP)
D	16/64 kbps	Signaling information (LAPD)

ISDN specifies two standard access methods, BRI and PRI. A single BRI or PRI interface provides a multiplexed bundle of B and D channels.

Basic Rate Interface (BRI):

The ISDN BRI structure consists of two B-channels at 64Kbps and one D-channel for control at 16Kbps. The B-channel can carry either voice or data while the D-channel is used for signaling and can be used for packet data.



The capacity of the BRI is therefore:

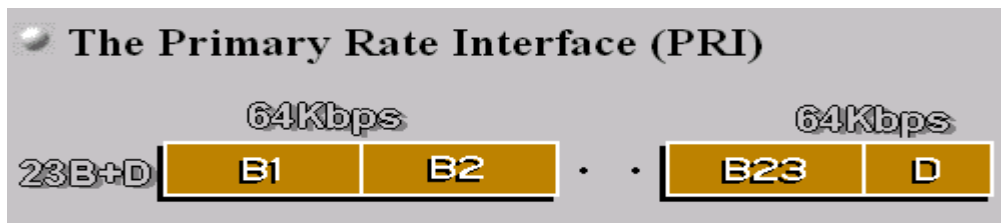
- two voice, two high-speed data or
- one voice and one high-speed data plus 16kbps packet data

BRI can carry a wide and flexible range of communications. A single BRI, for example, can carry two simultaneous voice or data conversations (to the same or different locations).

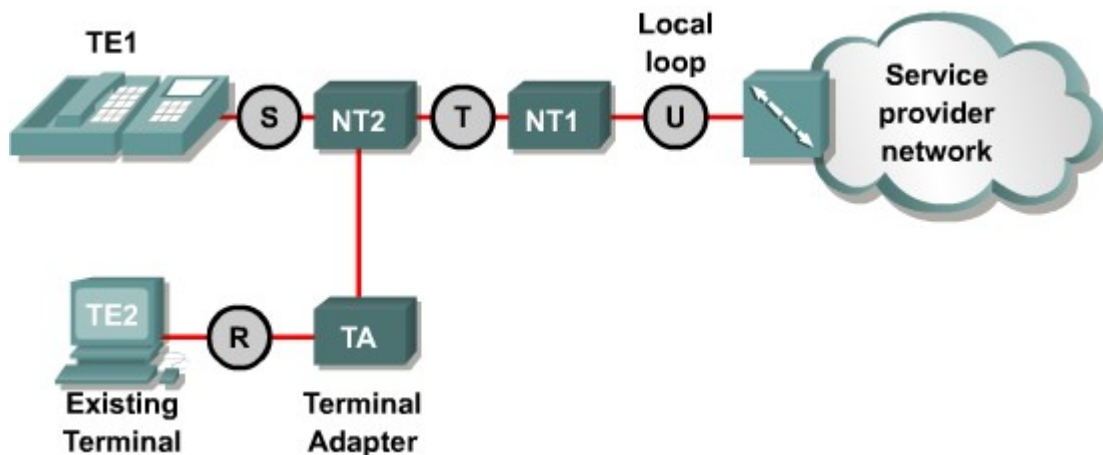
The D-channel can also be used for packet communications to a third location, also simultaneously.

PRI (Primary Rate Interface):

In North America and Japan, PRI offers twenty-three 64 kbps B channels and one 64 kbps D channel. A PRI offers the same service as a T1 or DS1 connection. In Europe and much of the rest of the world, PRI offers 30 B channels and one D channel in order to offer the same level of service as an E1 circuit. PRI uses a Data Service Unit/Channel Service Unit (DSU/CSU) for T1/E1 connections.



ISDN Reference Points:



- **R** — References the connection between a non-ISDN compatible device Terminal Equipment type 2 (TE2) and a Terminal Adapter (TA), for example an RS-232 serial interface.
- **S** — References the points that connect into the customer switching device Network Termination type 2 (NT2) and enables calls between the various types of customer premises equipment.
- **T** — Electrically identical to the S interface, it references the outbound connection from the NT2 to the ISDN network or Network Termination type 1 (NT1).
- **U** — References the connection between the NT1 and the ISDN network owned by the telephone company.

Device	Device Type	Device Function
TE1	Terminal Equipment 1	Designates a device with a native ISDN interface, such as an ISDN router or ISDN telephone.
TE2	Terminal Equipment 2	Designates a non-ISDN device, such as a workstation or router, that requires a TA to connect to an ISDN service provider.
TA	Terminal Adapter	Converts EIA/TIA-232, V.35, and other signals into BRI signals.
NT2	Network Termination 2	The point at which all ISDN lines at a customer site are aggregated and switched using a customer switching device.
NT1	Network Termination 1	Controls the physical and electrical termination of the ISDN at the customer's premises. Converts the four-wire BRI signals into two-wire signals used by the ISDN digital line.

Source : <http://dayaramb.files.wordpress.com/2011/03/computer-network-notes-pu.pdf>