

# INTEGRATED SERVICES DIGITAL NETWORK

ETI2506

Monday, 05 December 2016

# COURSE OUTLINE

## **ETI 2506 Telecommunication Systems**

### **Prerequisites**

ETI 2301 Computer Networks

### **Purpose**

The aim of this course is to enable the student to;

1. understand evolution of telephony
2. understand structure of basic transmission systems and network topologies

### **Learning Outcomes**

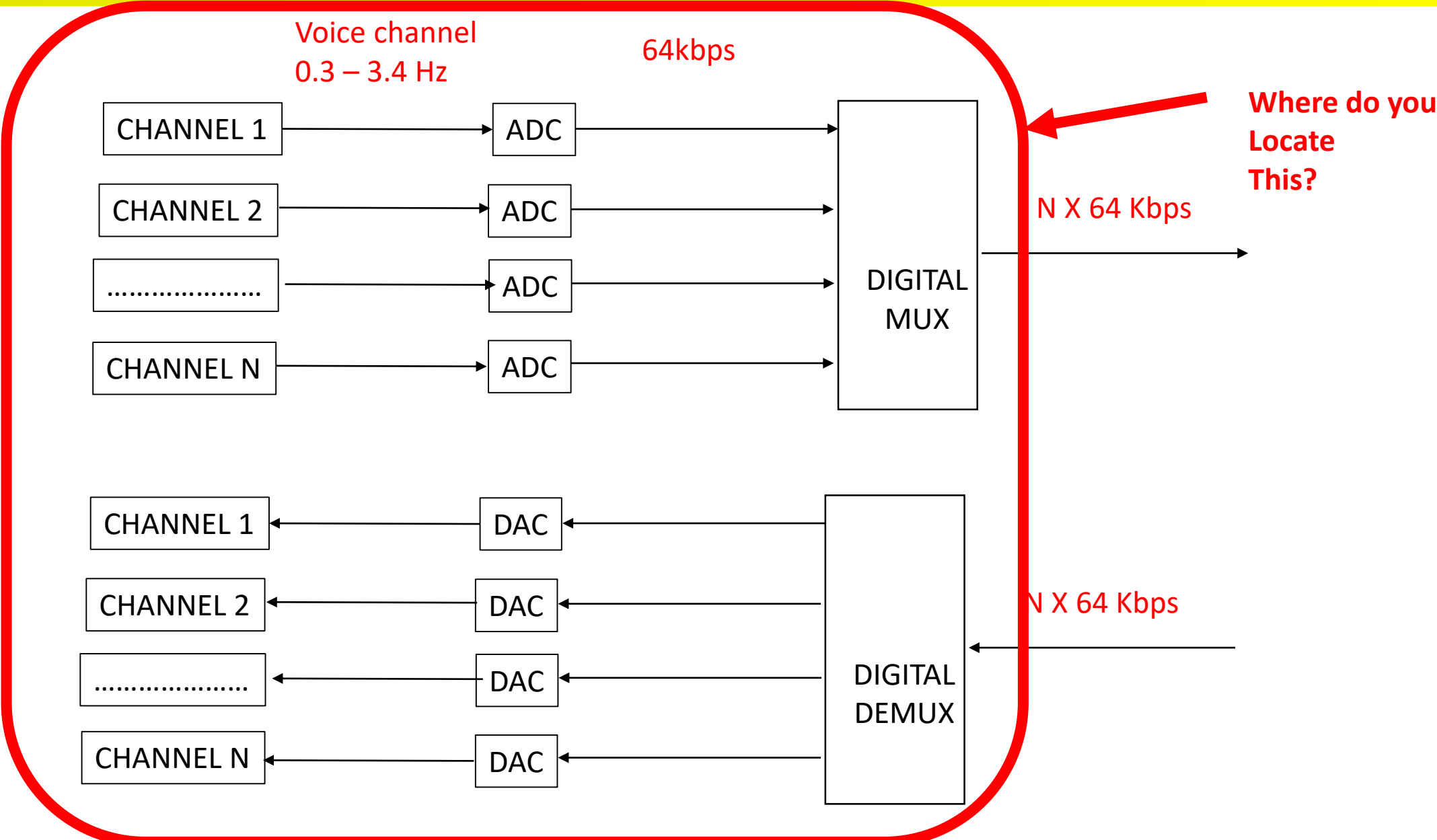
At the end of this course, the student should be able to;

1. apply knowledge of telephony in telecommunication systems

### **Course Description**

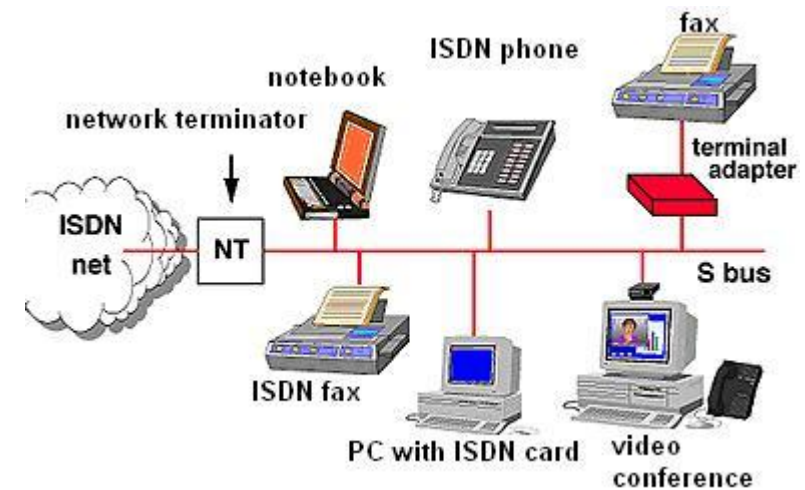
Evolution of the fixed line telephony, analog to digital, relay switched to stored program controlled switching, manual PBX to private automatic branch exchange(PABX), analog to ISDN and DSL, non-cellular mobile phone systems, cordless phones (DECT). System structure: Basic transmission system. Types of switching: circuit switching, message switching and packet. Network topologies, exclusive and multiparty lines; signaling methods; signaling No. 7 protocol. Call types: local, trunk and international, automatic multi-exchange connection and inter-exchange signaling. Terminal Equipment: Telephone set (receiver and transmitter), telex, facsimile, computer. Traffic modeling and dimensioning: queuing theory, Erlang traffic theory. Use of traffic tables in capacity design of telephone network systems.

# MULTIPLEXING DS1 STREAM



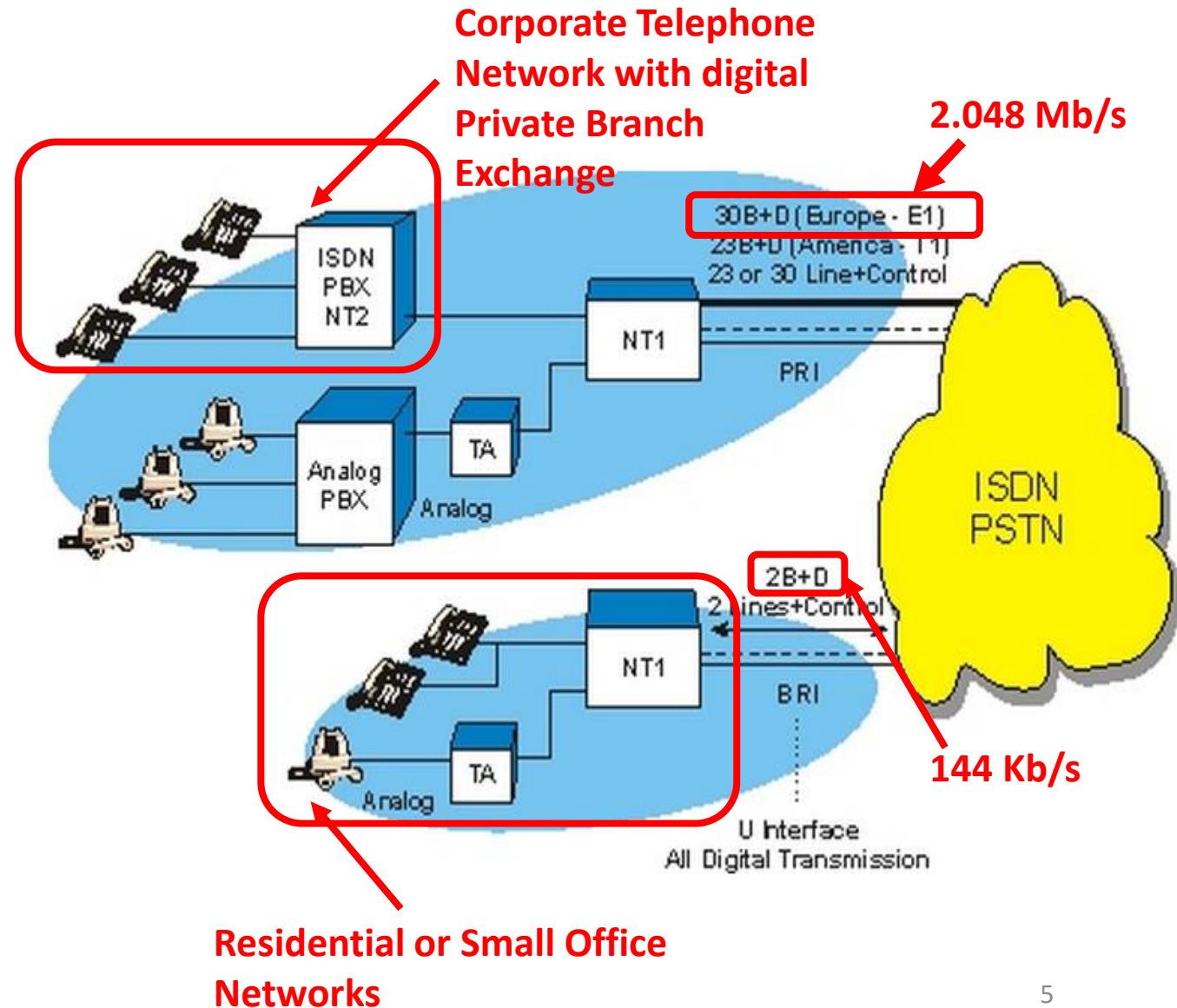
# HISTORY OF INTEGRATED SERVICES DIGITAL NETWORK (ISDN)

- Integrated Services Digital Network (ISDN) specification first proposed in 1984 by the CCITT (now ITU-T).
- Prior to ISDN, the telephone system was viewed as a way to transport only voice, with some special services available for data.
- ISDN was developed to integrate speech and data on the same telecommunication lines while adding features that were not available in the classic telephone system.



# ELEMENTS OF INTEGRATED SERVICES DIGITAL NETWORK

1. An integrated services digital network (ISDN) is a structured all digital telephone network system that was developed to replace/upgrade analog fixed telephone networks.
2. ISDN provides several communication channels to customers via local loop lines through a standardized digital transmission protocol.
3. ISDN standard defines a vendor independent digital interface between user terminals (telephone, fax and computer) and the telecommunication network.
4. ISDN complements the traditional wired telephone by enabling a telephone pair to carry voice and data simultaneously.



## 1972: DEFINITION OF ISDN

- **Integrated Services Digital Network (ISDN)** is an integrated digital network in which the same digital switches and digital paths are used to establish different services, e.g. voice, data or video.

# 1980: CONCEPTIONAL PRINCIPLES ON WHICH ISDN WAS BASED

- a) ISDN shall be based on and will evolve from telephony IDN by progressively incorporating additional functions and network features
- b) New services introduced in ISDN shall be compatible with a DS1 line, i.e 64kbps switched data connection.
- c) The transmission between the then existing networks and ISDN shall require a period ranging from one to two decade, and internetworking between new ISDN services and older services shall be provided
- d) ISDN shall contain intelligence for the purpose of providing maintenance and network management functions
- e) A layered functional set of protocols shall be maintained for the various access arrangements of ISDN.
- f) Customer access to ISDN may vary depending to the services required and status of evolution of ISDN.

# ISDN DEFINITION IN 1980

- Integrated Services Digital Network (ISDN) is network, in general, evolving from telephony IDN, that provides end-to-end digital connectivity to support a wide range of services (voice and non-voice), to which users have access by a limited standard multipurpose user-network interfaces.



# NEW ISDN SERVICES (1980s)

1. Video Text
2. Electronic mail
3. Digital facsimile
4. Teletext
5. Database Access
6. Electronic Fund Transfer
7. Image and graphics transfer
8. Document storage and transfer
9. Automatic alarm services
10. Audio and Video Conferencing

# ISDN DATA RATES

- 1. Basic rate** interface operates at **144 Kb/s** and can carry two telephones and control signals. It is used to serve homes and small offices.
- 2. Primary rate** operates at **2.048 Mb/s (Region 1)** and **1.536 Mb/s (Region 2 and 3)**. It is used to serve to corporate offices or to serve users in a rural area.



# BASIC RATE

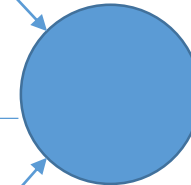


- Speech Sampled at 8kbps
  - Each sample encoded at 8 bits
- Rate = 8,000 x 8 = 64 Kbps**



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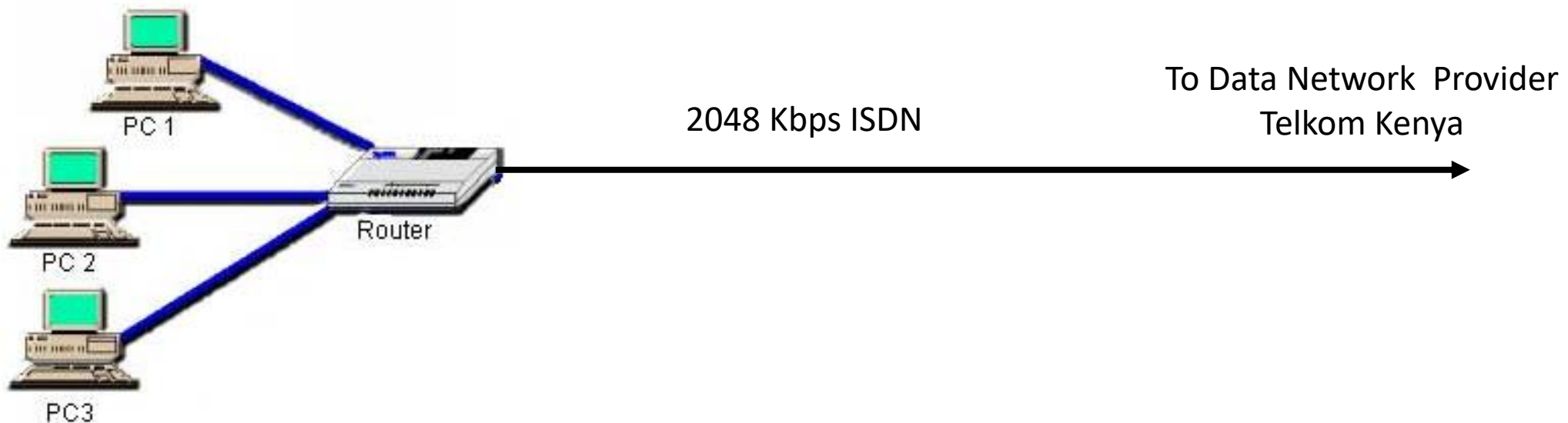
**Data line at 17 Kbps**



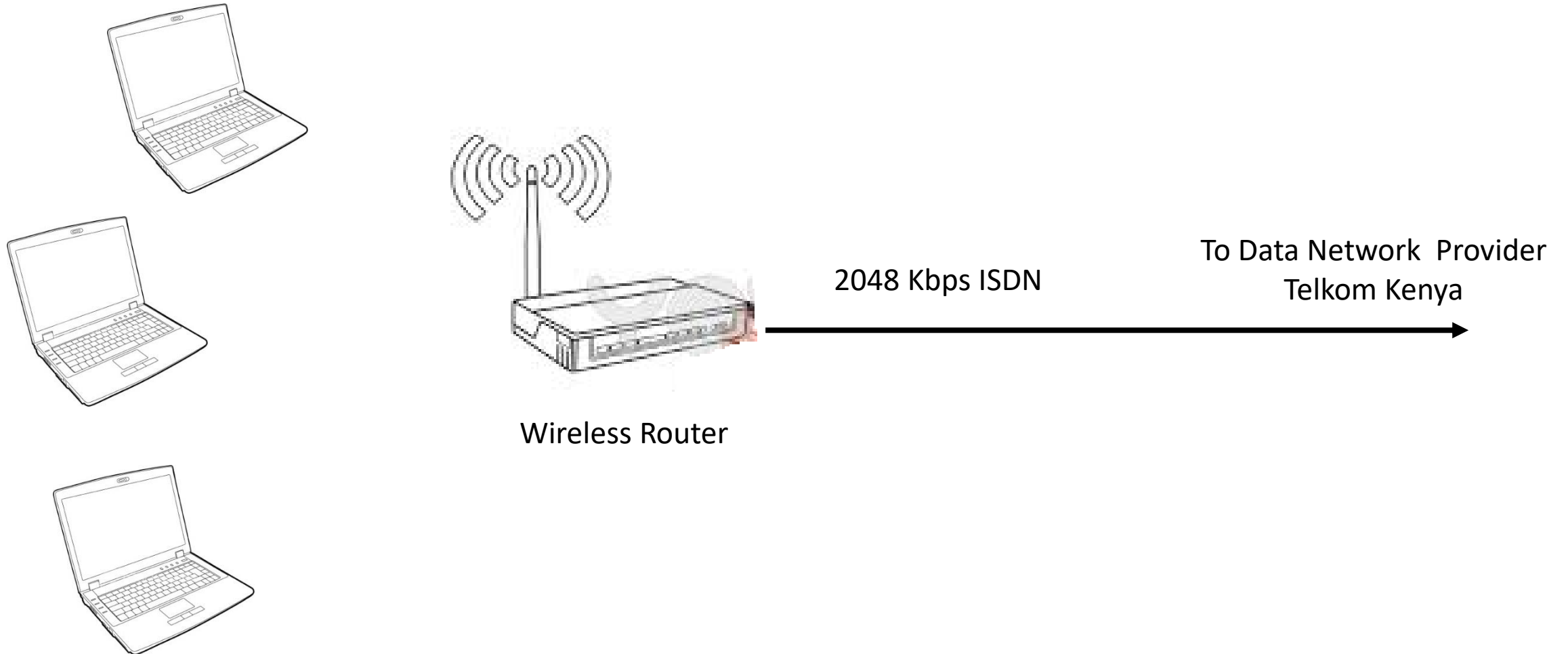
**ISDN Basic data rate  
144 Kbps**

# ISDN PRIMARY RATE (1)

Subscriber uses the ISDN to access the internet or as a link between two corporate offices.

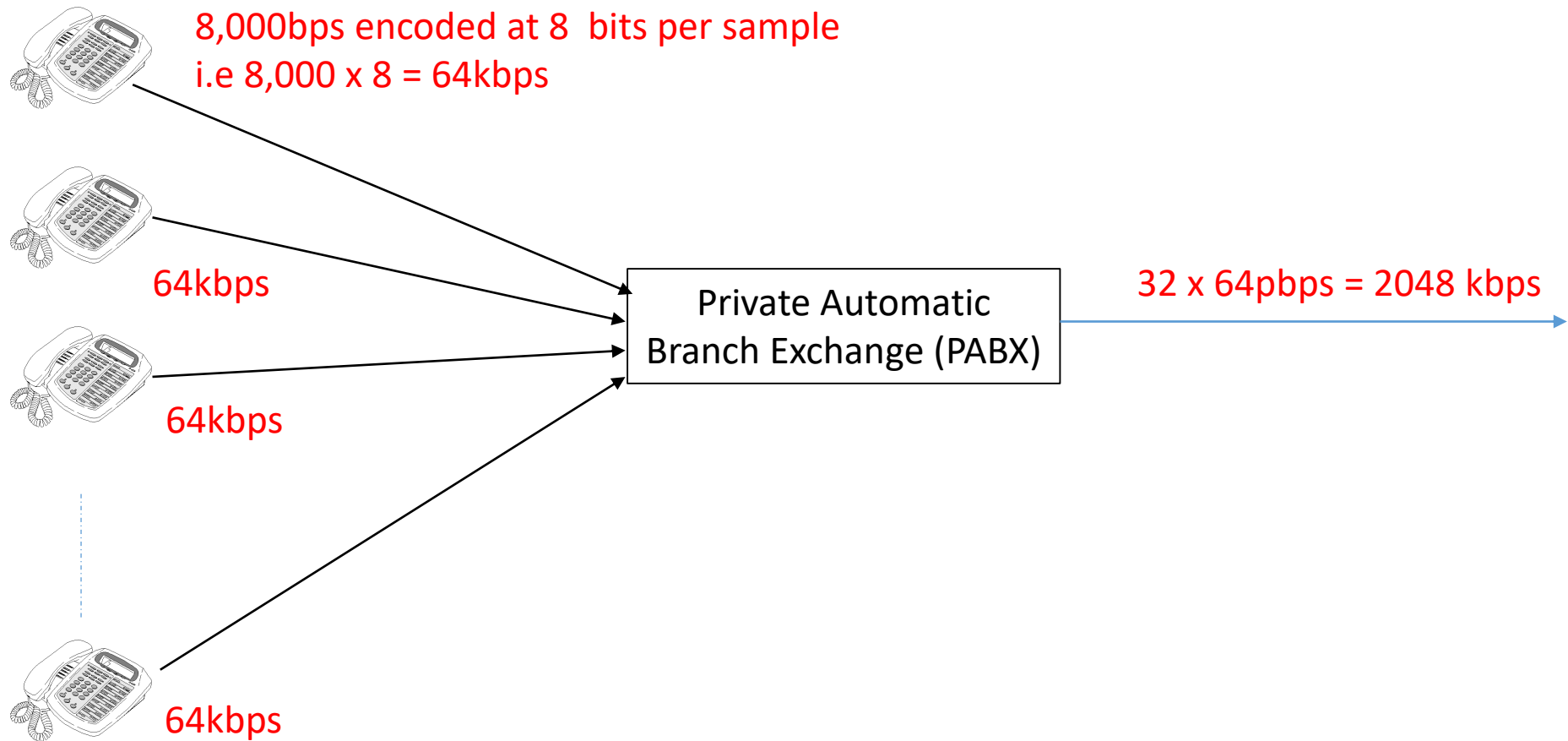


# ISDN PRIMARY RATE (1)



# ISDN PRIMARY RATE (2)

Corporate Telephone Network served by 32 lines from a public telephone exchange



# ISDN SERVICES

There are two kinds of services provided by ISDN.

## 1. Network services

- **Network services carry the interactions between the user and the network**, For example: setting up calls and disconnecting them.

## 2. Bearer services

- **Bearer services carry data between two users**. For example: voice or fax information encoded as a bit stream.

# NETWORK/SIGNALLING SERVICES

1. Network or Signalling Services define how the user and the network interact with each other in order to manage calls.
2. The user can use Network Services to request the network to perform functions such as making and clearing calls, transferring calls to another user, etc.



# BEARER SERVICES

1. Bearer services include voice calls, fax and modem calls, and connections to the Internet.
2. There are two forms of bearer service:

## **(a) Structured Data**

Refers to information passing over the bearer service **is in a format that is understood by the network**. Voice is an example of structured data. Because the network knows that the connection is carrying voice, it can convert the data into an analogue signal in the event that the call is connected to an ordinary analogue phone.

## **(b) 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.

# ISDN ADDRESS STRUCTURE

Transparent to the ISDN network, i.e.  
Only analysed by the destination equipment

