Unit 12
Other Technological Reviews

Contents

- PSTN
- ISDN and its types
- Frame Relay
- DSL and ADSL
- VoIP
- Bluetooth
- Wi-Fi and Wi-Max
- GSM
- 3G and 4G
- NFC

PSTN

- Public Switched Telephone Network also known as “Plain Old Telephone Service”
- A circuit switched network, i.e. phone call is switched through numerous switches like local ,regional , national, etc.
- Circuit
  - Connection ultimately established by among phones through switching
- Prior to 1960s, phone calls were analog and manual , hence required operator’s assistance

PSTN

- Dialing techniques
  - Pulse dialing / Rotary Dialing
  - Touch Tone Dialing
- Bandwidth link of PSTN
  - 64 Kbps
- Dial-up Modem utilizes upto 56 kbps for data

ISDN

- Integrated Services Digital Network
- Set of standards for digital transmission over telephone copper wire and other media.
- Requires ISDN adapters at both ends
- Broadband ISDN is intended for fiber optics supporting bandwidth up to 622.08Mbps
- Two types of Channels of ISDN
  - B (bearer) channel
    - 64kbps channel used for general purpose
  - D (delta) channel
    - 16 or 64kbps channel for signaling between ISDN network and ISDN equipment

ISDN

- Types / Levels of ISDN service:
  - Basic Rate Interface (BRI)
    - Used for home users and small enterprises
    - Also known as “2B+D” channel
    - 2B means 2 different B channels each of 64 kbps and D means one D channel of 16kbps
    - Total data rate of BRI is hence 144Kbps
  - Primary Rate Interface (PRI)
    - Intended for large organizations with intensive communication needs
    - Also known as 23B+D channel
    - 23 64kbps B channel and one 64 kbps D channel exists
    - Standard for Europe : 30B+D and North America: 23B+D

Frame Relay

- High performance and simplified WAN protocol based on the principle of packet switching
- Routes frames of data to different destinations based on the header information
- Switches and routes data frames much faster but does not guarantee data integrity at all
- Cares about speed, not the integrity
- Operates at data link layer and physical layer

Frame Relay

- Frame relay provides connection oriented data link layer communication, by using virtual circuit
- Two types of Virtual Circuit are used
  - Switched VCs (SVCs)
    - VC is established only when data needs to be transmitted and closed when transfer completed
    - Temporary in nature
  - Permanent VCs (PVCs)
    - Permanently established virtual circuits whether or not the transmission is currently active or not
    - Useful for frequent and consistent data transfer

DSL

- Digital Subscriber Line
- Assumes that digital data requires no conversion into analog
- Technology that brings high bandwidth information to homes and small business over copper telephone lines
- DSL line can carry both data and voice signals at the same time

DSL

- Upstream and downstream lines exist
- Protocols used
  - DHCP (for IP address details provision to equipments)
  - PPP(Point-to-point protocol)
    - For user authentication
  - PPPOE(Point to Point Protocol Over Ethernet) and PPPOA(Point to Point Protocol Over ATM)
    - To provide Network Details

Variations of DSL

- ADSL
  - Assymetric Digital Subscriber Line
- HDSL
  - High bit-rate DSL
- RADSL
  - Rate Adaptive DSL
- VDSL
  - Very high data rate DSL

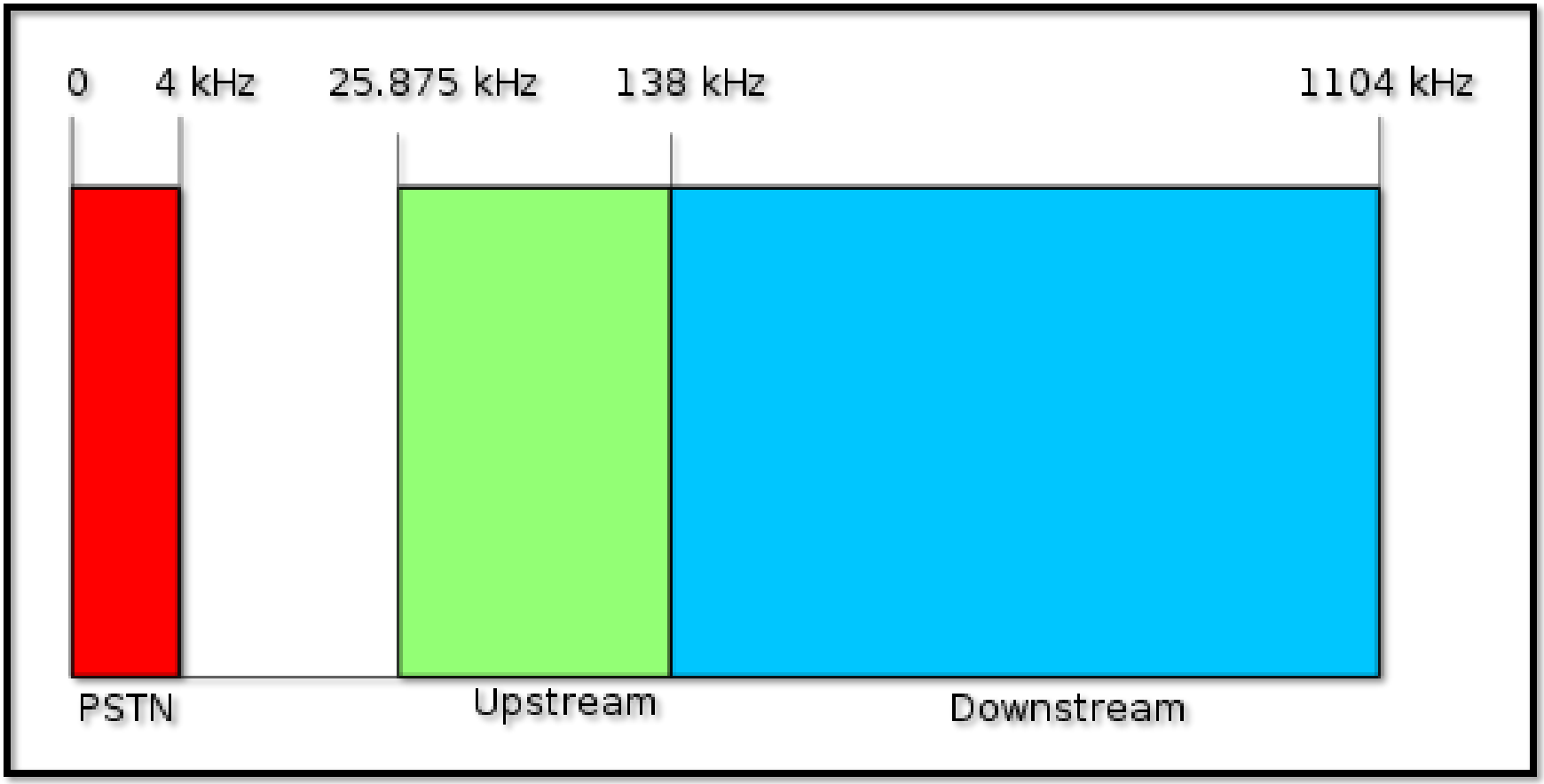
ADSL

- Asymetric variety of DSL in which most of the bandwidth is devoted towards downstream
- Small portion of data bandwidth allocated for upstream and user interaction
- Downstream upto 6.1Mbps while upstream upto 640Kbps

ADSL Operation

- Frequency of 1100kHz, i.e. 1.1 MHz is divided into 256 channels each channel being of 4312.5 Hz , typically 4kHz
- Uses a frequency splitter device to perform the above operation
- Channels
  - Channel 0 : 0-4312Hz used for PSTN
  - Channel 1-5 : 4312Hz to 25875 Hz for guard band
  - 25kHz – 138 kHz for upstream
  - 138-1100kHz for Downstream

ADSL frequency partition



VOIP

- Voice Over Internet Protocol
- Allowing to make phone calls over an internet connection, instead of conventional telephone technologies like GSM, CDMA , PSTN, etc
- Call is made through the internet and the voice is packetized
- Audio of the voice is sampled and converted to digital format using the VOIP codec
- Communication needs to happen in real time and for that, RTP (real time protocol) is used

VOIP

- UDP is used in VOIP because it requires faster transmission more than quality transmission and retransmission

- VOIP signaling protocols must be compatible with the traditional telephone signaling protocol , i.e. SS7

- Components required for IP telephone system
  - IP telephone
  - Media gateway controller
  - Media gateway (audio translation : IP and PSTN)
  - Signaling gateway (signaling operations : IP and PSTN)

Bluetooth

- Short range radio technology used for Personal Area Network
- Aims to replace wired communication for short distances
- Transmission of signals over short distances 1m-100m typically. Radius based coverage area and varies from Class of service
  - Class 1, 2 and 3: 100m, 10m and 1m respectively
- Mainly for data and voice communication
- Operates on unlicensed band of 2.4 – 2.485Ghz frequency
- Data rate in Version 2.0 : 2.1-3Mbps
  - V3 and V4 : 25Mbps
  - V5 : 50Mbps
- Topologies used
  - Piconet
  - Scatternet

GSM

- Global System for Mobile communication
- Globally accepted standard for digital cellular communication
- Operates at radio frequency 900MHz and is a narrowband based technology
- Three major systems comprise of GSM
    a. Switching System
    b. Base Station System
    c. Operation and Support System

a. Switching system

- Responsible for call processing and subscriber related functions
- Functional units of switching system
  - Home location register
    - Maintains profile of subscribers in a database
  - Mobile service switching centre
    - Performs telephone switching and controlling of calls
  - Visitor Location register
    - Contains temporary information about subscribers required by MSC to service the visiting subscriber

a. Switching system

- Functional units of switching system
  - Authentication Centre (AUC)
    - Authentication and encryption parameters that verify user's identity and confidentiality of each call
    - Detecting valid users and protecting the calls in progress
  - Equipment Identity Register (EIR)
    - Database used to identify valid and invalid mobile equipment
    - Helps to prevent calls from stolen and unauthorized equipments

b. Base Station System

- Station related and radio related tasks are handled
- Components
  - Base Station Controllers
    - Control functions like handover, cell configuration data, controlling radio frequency power, etc
  - Base Transceiver Stations
    - Radio equipments and antennas needed to service each cell in the network. These are mounted on top of houses
    - Collectively controlled by the BSCs

c. Operation and Support System

- Functional entity from which the network operator monitors and controls the system
- Offers support for operations and maintenance activities required for a GSM network
- Must be connected to all equipment in the switching system and BSC

3G

- 3G stands for third generation
- 1800 - 2100MHz frequency, hence shorter coverage than GSM (2G)
- Ability to properly transfer voice and non voice data over the same network due to improved bandwidth
- Deliver broadband capacity and more customers can be accomodated
- Standards
  - Wideband CDMA
  - EVDO (evolution data optimized)
- Data rate of 2Mbps
- More secure encryption than 2G

4G

- Fourth Generation
- Successor of 3G
- 2 – 8GHZ frequency range
- High speed data rates : 20Mbps – 100Mbps
  - Suitable for multimedia related functions like video streaming, TV broadcast, Video Calls, Mobile gaming, etc
- LTE
  - Long Term Evolution
  - 100Mbps downlink and 50Mbps uplink