INDUSTRY INTERNSHIP REPORT

Submitted to VIT University in partial fulfilment of the

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BACHELOR OF TECHNOLOGY

In

ELECTRONICS AND COMMUNCIATION ENGINERRING

By

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CERTIFICATE

This is to certify that the industry internship under **"BHARAT SANCHAR NIGAM LIMITED"** which is a experimental &/ theoretical &/ Simulation &/ hardware work carried out by ABHISHEK BORRA (15BEC0506) in partial fulfilment for the award of the degree of **Bachelor of Technology** in Department **Electronic & Communication Engineering**, during the year **2017-2018**. The industry internship has been approved as it satisfies the academic requirements.

Evaluation

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ABHISHEK BORRA (15BEC0506)

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INDUSTRY PROFILE

Telecom scenario in India:

Introduction – Evolution:

Indian telecom sector is more than 165 years old. Telecommunications was first introduced in India in 1851 when the first operational land lines were laid by the government near Kolkata (then Calcutta), although telephone services were formally introduced in India much later in 1881. Further, in 1883, telephone services were merged with the postal system. In 1947, after India attained independence, all foreign telecommunication companies were nationalized to form the Posts, Telephone and Telegraph (PTT), a body that was governed by the Ministry of Communication. The Indian telecom sector was entirely under government ownership until 1984, when the private sector was allowed in telecommunication equipment manufacturing only. The government concretized its earlier efforts towards developing R&D in the sector by setting up an autonomous body – Centre for Development of Telematics (C-DOT) in 1984 to develop state-of-the-art telecommunication technology to meet the growing needs of the Indian telecommunication network. The actual evolution of the industry started after the Government separated the Department of Post and Telegraph in 1985 by setting up the Department of Posts and the Department of Telecommunications (DoT).

The entire evolution of the telecom industry can be classified into three distinct phases.

- Phase I- Pre-Liberalization Era (1980-89)
- Phase II- Post Liberalization Era (1990-99)
- Phase III- Post 2000

Until the late 90s the Government of India held a monopoly on all types of communications – as a result of the Telegraph Act of 1885. As mentioned earlier in the chapter, until the industry was liberalized in the early nineties, it was a heavily government-controlled and small-sized market; Government policies have played a key role in shaping the structure and size of the Telecom industry in India. As a result, the Indian telecom market is one of the most liberalized markets in the world with private participation in almost all of its segments. The New Telecom Policy (NTP-

99) provided the much needed impetus to the growth of this industry and set the trend for liberalization in the industry.

Telecommunications in India

Indian telecom industry underwent a high pace of market liberalization and growth since the 1990s and now has become the world's most competitive and one of the fastest growing telecom markets. The Industry has grown over twenty times in just ten years, from under 37 million subscribers in the year 2001 to over 846 million subscribers in the year 2011. India has the world's second-largest mobile phone user base with over 929.37 million users as of May 2013. It has the world's third-largest Internet user-base with over 137 million as of June 2013.

India's telecommunication network is the second largest in the world based on the total number of telephone users (both fixed and mobile phone). It has one of the lowest call tariffs in the world enabled by the mega telephone networks and hyper-competition among them. It has the world's third-largest Internet user-base. According to the Internet and Mobile Association of India (IAMAI), the Internet user base in the country stood at 190 million at the end of June, 2013. Major sectors of the Indian telecommunication industry are telephony, internet and television broadcasting Industry in the country which is in an ongoing process of transforming into next generation network, employs an extensive system of modern network elements such as digital telephone exchanges, mobile switching centers, media gateways and signaling gateways at the core, interconnected by a wide variety of transmission systems using fiber-optics or Microwave radio relay networks. The access network, which connects the subscriber to the core, is highly diversified with different copper-pair, optic-fiber and wireless technologies. DTH, a relatively new broadcasting technology has attained significant popularity in the Television segment. The introduction of private FM has given a fillip to the radio broadcasting in India. Telecommunication in India has greatly been supported by the INSAT system of the country, one of the largest domestic satellite systems in the world. India possesses a diversified communications system, which links all parts of the country by telephone, Internet, radio, television and satellite.

Telecom Regulatory Authority of India (TRAI) Act, 1997

With the entry of private sector in the provision of telecommunication services a need was felt to have an independent regulatory body. The above requirement was indicated in the guidelines issued for entry of private sector in basic telecom service. Accordingly, Telecom Regulatory Authority of India (TRAI) was established in the year 1997 in pursuance of TRAI (Ordinance) 1997, which was later replaced by an Act of Parliament, to regulate the telecommunication services. Some of the major recommendatory, regulatory and tariff setting functions of TRAI are to make recommendations on the need and timing for introduction of new service provider, on the terms and conditions of license to a service provider, ensure compliance of terms and conditions of license, effective management of spectrum, lay down the standards of quality of service to be provided by the service providers and ensure the quality of service and conduct the periodical survey of such service provided by the service providers so as to protect interest of the consumers of telecommunication service, ensure effective compliance of Universal Service Obligations, notify the rates at which telecommunication services within India and outside India shall be provided under this Act etc.

The TRAI (Amendment) Act, 2000 had led to reconstitution of the Authority. It consists of one Chairperson, two full-time members and two part-time members.

COMPANY PROFILE

INTRODUCTION:

Bharat Sanchar Nigam Limited is an Indian State-owned telecommunication company headquartered in New Delhi, India. It was incorporated on 15th September 2000 with ROC in Kerala. It is India's oldest and largest Communication Service Provider (CSP). Currently BSNL has a customer base of 117 million (mobile and basic telephony) as on January 2014. It has footprints throughout India except for metropolitan cities of Mumbai and New Delhi which are managed by MTNL as on 31st March 2009

BSNL commanded a customer base of 33.7 million wire line, 3.6 million CDMA –WLL and 27.5 million GSM mobile subscribers. BSNL's earnings for the financial year ending 31st March 2006 stood at INR 401.8 billion (US $ 9.09billion) with net profit of INR 89.4 billion (US $ 2.02 billion).

BSNL has an authorized share capital of INR 17,500 cores (US $ 3.95 billion) and net worth of INR 63,443 billion (US $ 14.32 billion).

Objectives:

- To be the leading Telecom Service provider by achieving higher rate of growth so as to become a profitable enterprise
- To provide quality and reliable fixed telecom service to our customer and hereby increase customers confidence
- To provide customer friendly mobile telephone service of high-quality and play a leading role as GSM operator in its area of operation.

IMPROVEMENT BEING UNDERTAKEN

- BSNL is introducing new value added services to existing customer as well as potential customers.
- Company is adopting Effective marketing strategies to gain marketing leadership.
- BSNL is forwarding steps in a variety of schemes for both subscribers commercial and residential.
- Technological up gradation of network.

TRANSMISSION

Optical Fiber Communication:

An optical telegraph was built by Claude Chappe in 1790s in France. The information travels from the transmitter to the receiver over the information channel. There are basically two types of information channels: unguided or guided channels. Atmosphere is an unguided type of channel over which waves can propagate. Guided channels are those which guide the electromagnetic waves through them. Two wire lines, coaxial cable, waveguide and optic fibre are the examples of Guided information channels. Guided channels have the advantages of privacy, no weather dependence and the ability to convey messages within, under and around physical structures.

An optical fibre is a thin strand of glass or plastic serving as the transmission medium over which the information passes. The basic fibre–optic system is a link connecting optical transmitter and receiver.

Advantages of Fibers

- **Wide Bandwidth:**

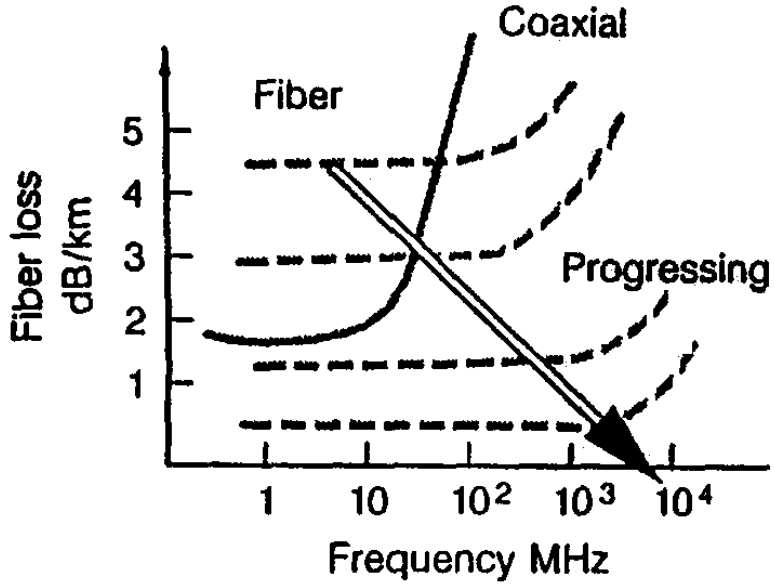
The information carrying capacity which increases with the bandwidth of the transmission medium, is very large in fibres. The bandwidth available on a pair of single mode fibres is in the order of several GHz. Thus, thousands of circuits can be carried on the fibres whether the information is voice, data or video or a combination of these.

- **Low Loss:**

Bandwidth is an effective indication of the rate at which information can be sent. Loss indicates how far the information can be sent. As a signal travel along a transmission path the signal loses strength. This loss of strength is known as attenuation. In a copper cable, attenuation increases with the modulation frequency: the higher the frequency of the information signal, the greater is the loss. In an optical fibre, attenuation is flat: loss is the same at any signalling frequency until a very high frequency. Thus, the problem of loss is much more in a copper cable as information carrying capacity increases.

Figure shows the loss characteristics Vs the channel bandwidth for fibres, and coaxial cable. Loss in coaxial cable increases with frequency, whereas loss in the optical cable remains flat.

Figure. Attenuation versus Frequency (BW)



The loss at very high frequencies in the optical fibre does not result from additional attenuation of the light by the fibre. The loss is caused by loss of information, not by optical power, but due to the variation of the optical power. At very high frequencies, distortion causes a reduction or loss of this information.

- **Electromagnetic Immunity:**

Optic fibres are insulators. No electric current flows through them, either due to the transmitted signal or due to external radiation striking the fibre. For these reasons, fibres do not radiate or pick–up electromagnetic radiation as in copper cables. Any copper conductor acts like an antenna, either transmitting or receiving energy.

Since fibres do not radiate or receive electromagnetic energy, they make an ideal transmission medium. As a consequence, to fibre's electromagnetic immunity, signals do not become distorted by EMI. Fibres offer very high standards in error free transmission.

- **Small Size:**

Fibres are hair thin in size. Fibbers covered with protective coverings are still smaller than the equivalent copper conductor. The small size of fibre optic cables makes them attractive for applications where space is at a premium.

- **Greater Safety:**

A fibre is a dielectric. It does not carry electricity. If the cable is damaged, it does not present any spark or fire hazard, so it cannot cause explosions or fires as a faulty copper cable can. Moreover, it does not attract lightning. The fibre–optic cable can be run through hazardous areas.

- **Higher Security:**

Fibre optics is a highly secure transmission medium, because the fibres do not radiate energy that can be received by a nearby antenna without getting detected. It is also extremely difficult to tap a fibre.

Dense Wavelength Division Multiplexing (DWDM):

The purpose could be to allow the use of the channel by multiple users, to perform a better management of the available resource or just to boost the transmission capacity. Development of these systems was always limited by the maximum capacity allowed by the communications channel and the available technology. Several techniques such as Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM) can be used to improve the use of a communication channel. These are commonly used techniques in radio and copper transmission systems.

The available bandwidth is shared. In the case of optical systems, the available bandwidth can exceed several Terahertz (10^{12} Hz). TDM and FDM could not be used to take advantage of this tremendous bandwidth due to limitations on electrical technology. The solution was to use frequency multiplexing at the optical level or Wavelength Division Multiplexing. The basic idea is to use different optical carriers or colours to transmit different signals in the same fibre. A distinction is made between WDM and DWDM (Dense Wavelength Division Multiplexing). With WDM the spacing between channels can be relatively large. In Dense multiplexing, the frequency spacing between channels can be as small as 50 GHz or less, increasing the overall spectral density of the transmitted signal.

Advantages:

Technologies such as wavelength division multiplexing (WDM) and optical amplification are giving a multitude of ways to satisfy the exploding demand for capacity. New architectures will increase network reliability and decrease the cost of bit rates and distance, therefore, creating economic benefits for network operators and users alike. Optical networks are the future of the information superhighway.

DWDM Routes:

- **Short Route Length Application:**

Short lengths are of special interest in Metropolitan WDM networks. No optical amplification is used, therefore, the transmission distance is limited, in the range of 80 km.

- **Medium Route Length Application:**

If the DWDM Terminals are equipped with optical booster and optical preamplifiers, longer distances can be achieved, without additional optical amplifier units. This technique achieves hop lengths in the range of 140 km.

- **Long Route Length Application:**

Extremely long routes can be bridged without electrical regeneration by only utilizing optical amplification. Using this technique long hops without regeneration can be achieved, with a route length beyond 1000 km in special cases.

BROAD BAND TECHNOLOGY

Broadband indicates a means of connectivity at a high or 'broad' bandwidth, which is capable of delivering multiple services simultaneously. Recently ITU had stepped in and has defined Broadband. According to International Telecommunication Union, Broadband is defined as "Transmission capacity that is faster than primary rate ISDN, at 1.5 to 2 Mb/s".

Recognizing the potential of ubiquitous Broadband service in growth of GDP and enhancement in quality of life through societal applications including tele-education, tele-medicine, e-governance, entertainment as well as employment generation by way of high speed access to information and web-based communication, Government of India have finalized a policy to accelerate the growth of Broadband services.

Broadband Policy 2004 defines Broadband as "An 'always-on' data connection supporting interactive services including, – Internet access and has the capability of the minimum download speed of 256 kilobits per second (kbps) to an individual subscriber from the Point Of Presence (POP) of the service provider".

Features of Broadband:

Fast connection to the Internet

Access to the services which would otherwise be impossible on a slower dial up connection. These include facilities such as downloading music or video footage, listening to your favorite radio station or downloading (or sending) large attached files with emails.

“Always-on” connection

Means that you are permanently connected to the internet; hence no need to dial up a connection every time you want to surf the web, send email, etc.

Flat-rate billing

If you choose an uncapped rate there will be no additional charges for the time you are online. You can use it as much or as little as you would like, for a fixed fee. Some connections are available at a lower cost, but limit you to the amount of data being downloaded (known as 'capped rate').

Dedicated connection

Simultaneous use of both telephone & data line.

Broadband Services:

High speed Internet

Means that you are permanently connected to the internet, and don't need to dial up a connection every time you want to surf the web, send email, etc.

Broadcast (BTV) & Time-shifted TV (TVOD)

Besides regular BTV services, Time shifted TV provides subscribers with virtual DVD controls to pause, start, stop, rewind and fast forward live TV programs. Users also have the flexibility to watch any previous broadcasted programs without pre-recording.

Video on Demand

Enables the user to select from an online library of content and select any of the available choices for viewing at a convenient time with full DVD like controls. This is similar to borrowing a Video for viewing.

Video Multicasting:

Similar to cable or terrestrial broadcast – the user can join at any time but the stream begins and ends at the pre-appointed times.

Interactive Gaming:

Enables multiple players to play online games pitted against each other or against computers, through gaming servers employed by gaming content providers.

Audio and Video Conferencing:

Share ideas, information, and applications using video or audio.

Dial VPN Service:

This service allows remote users to access their private network securely over the service provider's core network.

Distant Learning:

Consists of electronic classrooms with two-way and multi-way communication among teachers and students.

Bandwidth on Demand:

Customer can change bandwidth as per his / her requirement. For example, a customer with 256 kbps can change to 1 Mbps during the video Conferencing session. Most of these services require the service provider to have tie-ups with the various content providers.

Network Architecture of Broadband:

Network architecture can be broadly classified into three networks:

- Core Network
- Access Network
- Home Network

➢ **Core Network or Provider's network:** It is the Service Provider's backbone network set up to provide the Broadband service. It will be having connectivity extended to all types of service or content network, which the service provider intends to extend. Also, it will be having nodes covering all geographical locations it intends to serve. Basically, its function is to route the customer's requests to the particular service/content network. So, the basic component in the core network is routers.

In BSNL, the core network is known by the name National Internet Backbone (NIB), as it was initially set up for extending internet access to all, all over the country, India. But, now its objective has been enhanced. Its objective is to connect anything to anything at anytime. The technology

used in the core routers is Multi Protocol Label Switching(MPLS), which is much faster and secure than the conventional IP routers.

- **Access Network:** Access network connects subscriber's home network to the Provider's Core network. It is the last mile connecting the subscriber. The connectivity can be either Wired & Wireless. Wire line technologies include traditional telephone lines, coaxial cable lines, and fiber optic lines. Wireless communications involve cellular and fixed wireless technology, high speed short range communications and satellite transmission.

Technology that works well in one geographic area may not work as well in another. Therefore, it is up to each individual locality to determine the technologies that best meet its needs. It is essential that communities and operators consider the present and future needs of their citizens in upgrading their current telecommunications infrastructure or installing new infrastructure.

Factors affecting Broadband Access Choices are: Population density, Existing infrastructure, Government policies, Competitive and regulatory dynamics, Technology evolution.

Home Network: It's the network at subscriber's premises, connecting his various communication devices to the broadband line.

SWITCHING

We can broadly classify any telecom network into three parts

1)Access Network:

It is the one which consists the CPE (customer premises Equipment) to the switching location.

Example: Copper wire, Microwave, OFC.

2)Switching Network:

It the location of switching station.

Example: Telephone exchange, MSC, etc.

3) Core Network:

Different Switching Networks will be combined to form to form a Core Network.

Switch:

Switch is defined as Establishing a Temporary Connection from the calling subscriber to the called Subscriber. Switch is a Device that makes the connection and breaks the connection. Switch is a device that channels incoming data from any of multiple input ports to the specific output that will

take the data towards its intended destination. The process performed by a switch is called Switching. The process of switch is called Switching.

Switching types:

1)Manual Exchange.

2)Automatic Exchange.

3)Electronic Exchange.

Manual Exchange:

- A transmitter, receiver and the ringer equipment is available at Customer premises.
- Call connectivity will be arranged manually by an operator present in the exchange.
- The operator feeds the ringing supply from the exchange to the calling customer for giving call alert.
- After that the operator physically connects the calling and the called parties.

Automatic Exchanges

- In this generation, complete automatic call connectivity was invented.
- Selectors in crossbar exchanges have horizontal and vertical bars (like matrix) operated by electromagnetic relay coils, so that the contacts at a particular point in a matrix may be operated under the control of these relays.

Electronic Exchange

- With the invention of electronic exchanges, the practical difficulties with the automatic exchanges were solved.
- The customer was provided with lot of advanced features.
- Chronological Development of Electronic Exchanges

Switching types

- Circuit switching
- Packet switching
- Message switching

Circuit Switching

- Dedicated communication path established for the entire duration of the conversation
- Example: Telephone network

Packet Switching

- Small chunks (packets) of data is sent out in sequence at a time
- Packets passed from node to node between source and destination
- Example: computer to computer communications

Digital Switching

- The switching network sets up a temporary connection between two or more exchange terminations and ensures transmission of signals (speech & data) between these terminations in digital form with reliable accuracy.

Switching network can be classified into

(i) Space Division and

(ii) Time Division systems.

Space Switching:

Same time slots of the incoming and outgoing PCM highways are interconnected. Example, Signals received in TS6 on I/C HWYS are transmitted in TS6 on O/G HWYS. Since the transfer of sample takes place in the same time slot, there is no delay in switching the sample. Different highways are interconnected.

Digital Space Switch:

This switch consists of several input highways X1, X2.... Xn and several output highways Y1, Y2….. Ym inter connected by a matrix of n rows and m columns. Individual cross point in this matrix consists of AND gate. Operation of an appropriate cross point connects a TDM channel of an incoming PCM highway to same channel of outgoing PCM highway during each time slot. During other time slots, same cross point may be used to connect other channels.

Time switching:

Different time slots of the incoming and outgoing PCM highways are interconnected. For example, Signals received in TS6 on I/C HWYS are transmitted in TS18 or any other TS on O/G HWYS including TS6. Same highways only are interconnected.

This involves time delay. A time switch is basically a time slot changer.

- In conventional telephone Voice signal is in analog form.
- In Exchange, it is converted into digital

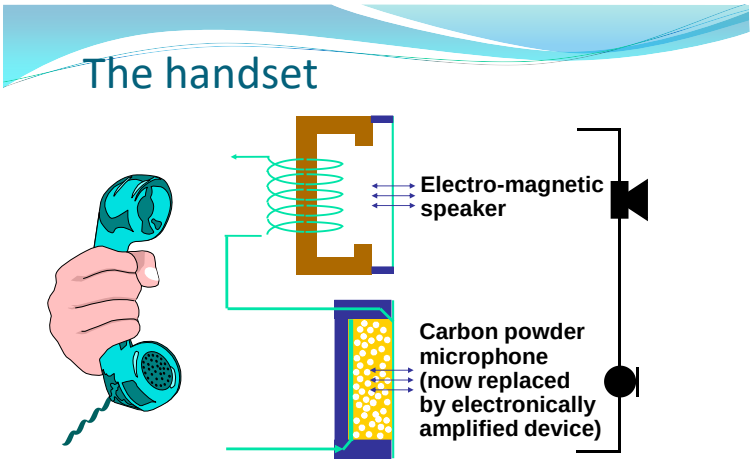
Line1(Analog) -> Exchange(Digital) -> Line2(Analog)

Analog

- infinitely variable information
- Mostly continuous: time, acceleration, chemical reactions

Discrete/Digital

- Information available in Discrete time.
- Sampling time decides information accuracy
- Information on non-sampled period is assumed as unknown and Not to be treated as ZERO.



- "If a band limited signal is sampled at regular intervals of time and at a rate equal to or more than twice the highest signal frequency in the band, then the sample contains all the information of the original signal"

- Fs $\geq$ 2 Fi

  Fs – Sampling Frequency

  Fi – Highest frequency in the sample.
- Filtering (0.3 to 3.4 KHz)
- Sampling (at the rate of 2 times more than the highest frequency)
- Quantizing (Finding bit values)
- Encoding (Voltage levels specification)
- PCM frame formed by 32 voice channels
- 1 voice channel = 64kbps
- 1 bit period for 1 voice = 1 / 64,000 = 15 µs
- 1 PCM frame= 32 voice * 64kbps= 2.048Mbps = 1 / 2.048Mbps = 125 µs

- **What is Signalling?** Sort of Instructions in the form of signals.
- **What for Signalling is?** To interchange information between an exchange and its external environment or between exchanges.
- Telephony started with the invention of magneto telephone which used a magneto to generate the ringing current, the only signal, sent over a dedicated line between two subscribers. The need for more signals was felt with the advent of manual switching.
- Two additional signals were, therefore, introduced to indicate call request and call release. The range of signals increased further with the invention of electromechanical automatic exchanges and is still growing further at a very fast pace.

MOBILE TECHNOLOGY

3G Cellular Systems:

3G systems are planned with objective of integration of all kinds of wireless systems into universal mobile telecommunication system. One of the main objective of 3G systems is that they will gather existing mobile services (cellular, cordless, paging etc.) into one single network. Among the objectives that have been assigned to 3G system designers are : voice quality as with fixed networks, satellite services for non-covered areas, low terminal and services costs, high bit rate mobile multi-media services (2 Mbps for indoor and reduced mobility users, 384 Kbps for

urban outdoor , and 144 Kbps for rural outdoor), multiple services per user (speech at 8 Kbps, data at 2,4 or 6 x 64=384 Kbps, video at 384 Kbps and multimedia, security and antifraud features against access to data by non-authorized people or entities.

CDMA:

CDMA stands for Code Division Multiple Access. The basic requirements for a CDMA system are:

Services (Voice, Low speed data, FAX)

Capacity- It should be high, PSTN connectivity, Maintainability, Cost- It is low when compared to Landline.

Advantages of CDMA systems:

- **Over Wire line:** Easy Installation, Maintenance, Low cost, Mobility, Ease of operation. Call drop < 2%
- **Over Mobile (GSM System):** Large Coverage, Large Capacity

Frequency reuse factor, network design and expanding become much easier, large coverage.

Salient Features of CDMA:

It is an advanced communication technology. It has Anti-jam and security features, Large capacity as compared to other Technology like FDMA and TDMA.

GSM

GSM stands for Global system for Mobile communication. A GSM system is basically designed as a combination of three major subsystems: the network subsystem, the radio subsystem, and the operation support subsystem. There are dominant interfaces, namely, an interface between MSC and the base Transceiver Station (BTS), and an interface between the BTS and MS.

GSM NETWORK STRUCTURE:

- GSM service area;
- PLMN service area;
- MSC service area;
- Location area;
- Cells.

The GSM service is the total area served by the combination of all member countries where a mobile can be serviced. The next level is the PLMN service area. There can be several within a country, based on its size. The links between a GSM/PLMN network and other PSTN, ISDN, or PLMN network will be on the level of international or national transit exchange. All incoming calls for a GSM/PLMN network will be routed to a gateway MSC. A gateway MSC works as an incoming transit exchange for the GSM/PLMN. In a GSM/PLMN network, all mobile-terminated calls will be routed to a gateway MSC.

MOBILE STATION

The MS includes radio equipment and the man machine interface (MMI) that a subscribe needs in order to access the services provided by the GSM PLMN. MS can be installed in Vehicles or can be portable or handheld stations.

Each MS is identified by an IMEI that is permanently stored in the mobile unit. Upon request, the MS sends this number over the signaling channel to the MSC. The IMEI can be used to identify mobile units that are reported stolen or operating incorrectly.

Functions of MS

The primary functions of MS are to transmit and receive voice and data over the air interface of the GSM system. MS performs the signal processing function of digitizing, encoding, error protecting, encrypting, and modulating the transmitted signals. It also performs the inverse functions on the received signals from the BS. MS keeps the GSM network informed of its location during both national and international roaming, even when it is inactive.

SIM Card

GSM subscribers are provided with a SIM card with its unique identification at the very beginning of the service. The subscriber is identified in the system when he inserts the SIM card in the mobile equipment. This provides an enormous amount of flexibility to the subscribers since they can now use any GSM-specified mobile equipment.

The Mobile Station Roaming Number (MSRN)

The MSRN is allocated on temporary basis when the MS roams into another numbering area. The MSRN number is used by the HLR for rerouting calls to the MS. It is assigned upon demand by the HLR on a per-call basis. The MSRN for PSTN/ISDN routing shall have the same structure as international ISDN numbers in the area in which the MSRN is allocated. The HLR knows in what MSC/VLR service area the subscriber is located. At the reception of the MSRN, HLR sends it to the GMSC, which can now route the call to the MSC/VLR exchange where the called subscriber is currently registered.

BASE STATION SYSTEM

The BSS is a set of BS equipment (such as transceivers and controllers) that is in view by the MSC through a single A interface for communicating with MSs in a certain area. The radio equipment of a BSS may be composed of one or more cells. A BSS may consist of one or more BS. The interface between BSC and BTS is designed as an A-bis interface. The BSS includes two types of machines: the BTS in contact with the MSs through the radio interface and the BSC, the latter being in contact with the MSC. The function split is basically between transmission equipment, the BTS, and managing equipment at the BSC. A BTS compares radio transmission and reception devices, up to and including the antennas, and also all the signal processing specific to the radio interface.

Functions of BTS

As stated, the primary responsibility of the BTS is to transmit and receive radio signals from a mobile unit over an air interface. To perform this function completely, the signals are encoded, encrypted, multiplexed, modulated, and then fed to the antenna system at the cell site. Trans-coding to bring 13-kbps speech to a standard data rate of 16 kbps and then combining four of these signals to 64 kbps is essentially a part of BTS, though, it can be done at BSC or at MSC.

Latest Telecom Services

- Land lines (Fixed Access)
- High speed Broad band
- FTTH (Fibre to the Home)
- Mobile services (GSM 2G/3G)
- Wi-MAX
- IN (Intelligent Network)

FTTH

- Fibre To The Home;
- Delivery of communication signals (Voice, Data & Video) over optical fibre up to home or business point;

Features

- Resilience and reliability of service;
- Unlimited scalability of the Telecom facilities;
- Continuous guaranteed service;

- Download speed up to 2.5Gbps and upload up to 1.2Gbps multi play services like Voice, Internet access, IPTV, Video on demand, VPN, LAN, VOIP services;

3G services

- Third generation Mobile Technology – HSDPA;
- Provides high speed band width compared to 2G;
- 2.05Mbps to stationary devices;
- 384 Kbps for slow moving devices;
- 128 Kbps for fast moving devices;

Wi MAX

- Worldwide Interoperability for Microwave Access

Features

- Providing wireless data over long distances 50 up to 10 Km
- Also called as Wireless MAN (Metropolitan Area Network)
- Works on OFDMA (Orthogonal Frequency Division Multiple Access)
- Supports Voice, Video and Internet data

TOLL FREE NUMBER (FPH)

- Call charges to this service will be paid by the called party.
- All charges are levied on the service subscriber
- The service is free of any charge to the calling user.
- Service is accessible from networks of other operators also.

Voice VPN

- Voice VPN is a service for providing a private network for institutions, businesses and communities using public network resources.

- PNP stands for Private Numbering Plan. Your telephone numbers which have to be in a VPN are given a 3 or 4digit short code for ease of dialling, which is called PNP number
- Ex: POLICE, INCOMETAX

REPEATER

Signals that carry information can travel a fixed distance before attenuation endangers it

- For Regenerating the signals repeater is used.
- Also called as LAN Extenders.
- Works in Physical Layer.
- 2 port devices
- Works in Half-duplex mode.
- Repeater is a regenerator not an amplifier
- Repeater is not a device that connects two LANs of different protocols
- The location of a repeater on a link is vital.
- Outdated.

HUB

- Also called as Dummy device.
- Works on Physical Layer.
- Works on the principle of Broadcasting.

Bridge

- Bridges have 2 effects on LAN

a) Raise the Bandwidth

- A bridge divides the N/W into 2 or more N/Ws
- Bandwidth in each network is independent.

– A Network with 10 nodes is divided into 2 N/W each with 5 nodes, now each N/W has an equal capacity.

b) Separate collision domains

– With bridging, collision domains become smaller.

ROUTER

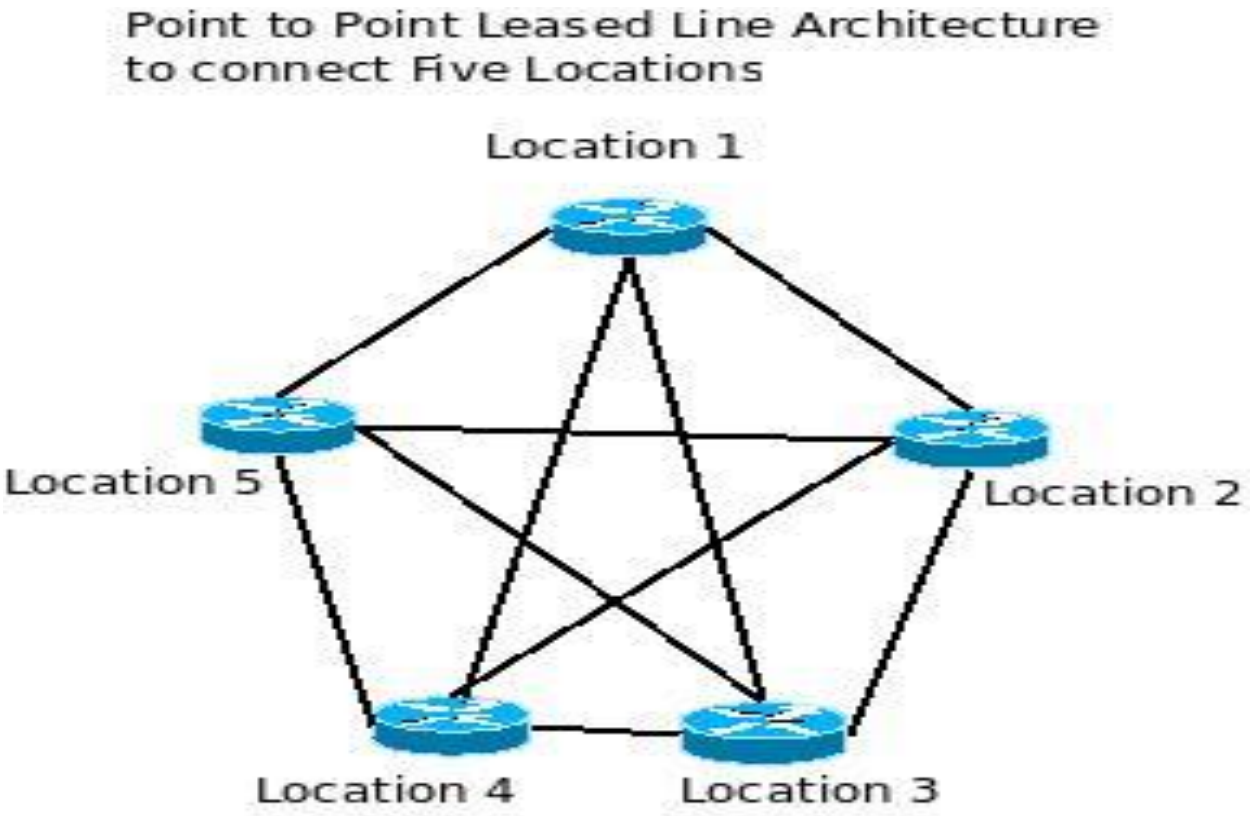
– Routers operate at the network layer.

– Routers connect two or more LANs/WANs that use the same or different data link protocols, but the same network protocol.

– Works based on IP address.

– Routing tables are maintained for packet forwarding.

POINT TO POINT Leased line



Features:
- A dedicated pipe line of require band width can be created
- Data can be transmitted in both ways with same speed
- Access for all types of applications from one point of location to other.
- Economical for lesser distances.

Telecom Infrastructure

Battery, Power Plant and Earthing

The power plant of any telecommunication system is usually referred as the heart of the installation since the communication system can function only if power supply is available. Failure of power supply system in any installation renders the communication facilities offered by it to be instantly paralyzed.

Requirement of Power Supply:

Any power supply arrangement for a communication system must have two basic characteristics.

- Reliability of the components of the power plant and continuity of the power supply.
- The power fed to the equipment should be free from noise or humor large ripple harmonics.

The support power system in BSNL consists of:

- Power plant: to convert ac input into desired dc output (-48 V dc)
- Battery system: To give a backup supply load in case commercial ac supply is not available.
- DG Set: Alternative supply to battery backup.

(The power plant has the capability to recharge the battery once they are discharged.)

1. VRLA Battery

Basically, VRLA stands for Valve Regulated Lead Acid Battery. In short term it means that it is a lead acid battery with a valve regulator, which does not allow the gases to escape the battery container and there is no need of topping up of the battery.

Various capacities of Batteries are 120 AH, 400 AH, 600 AH, 1000AH, 1500 AH, 2000 AH, 2500 AH, 3000 AH, 4000 AH & 5000 AH.

Monitoring of VRLA Batteries

Following steps are required for monitoring of the VRLA Batteries:

- Periodic physical inspection of each cell of the battery for cracks and leaking etc.
- Discharge of battery for a short duration and recording the voltages of each cell in the string.
- Measurement & recording of cell temp periodically.
- Float Voltage of cells & its comparison with the midpoint voltage.
- Float current in fully charged battery.

Temperature
The rise in battery temperature increases the chemical reaction in the battery. The SMPS power plant takes care of the temperature by reducing the charging voltage and it is 3 milli-volt per degree raise in temp but still it is important to measure individual cell temp periodically and keep record for study and analysis.

Life of VRLA battery:
 Batteries up to 200AH: 4 Years
 Batteries more than 200 AH: 6 years

Maintenance Schedule of VRLA batteries
Daily: Temperature and voltage of a pilot cell and all the cells as far as possible. The pilot cell should be cyclically selected on monthly basis.
Monthly: Voltage of each cell during partial discharge.
Float current measurement
Physical verification
Quarterly: Ensure the tightness of terminal bolts to 11Nm /100Lb inch Conductance measurement
Apply boost charge for 24Hrs.
Yearly: Test discharge the batteries @ C10 and measure the time battery
sustains the load till any of the cells falls to 1.75V.
Noise measurement

Some Do's and Don'ts for the maintenance of VRLA Batteries
Do's
 Clean the batteries as and when dust accumulates.
 Keep the batteries away from heat source, sparks, fire etc.,
 Keep the battery room neat and clean

Don'ts
 Do not add water or acid.
 Do not tamper the safety valves.
 Do not over tighten the terminal bolts.
 Do not allow any metal objects to rest on the battery or fall across the battery terminals.

2. SMPS (Switched Mode Power Supply) Power plant:
The power plant is used to rectify the ac input supply to desired output dc (-48v). Generally the conventional types of power plants were having following problems:
 Very large size
 Large weight
 Lower efficiency
 No scope for modular expansion

To get rid of all these problems now SMPS (Switched Mode Power System) power plant are used. In these systems, the conversion of AC to DC is accomplished in two stages as given below:

First Stage conversion: The input AC voltage is directly rectified to high voltage DC.

Second Stage Conversion:

 Rectified high voltage DC is stored in a capacitor.

 High voltage DC is then converted into a very high frequency AC (20 KHz and higher) by means of very powerful and fast semi-conductor switching devices.

 High frequency AC is stepped down to the required level, by means of a small high frequency transformer.

 Stepped down AC is rectified to DC of desired voltage and filtered by means of high frequency filters.

3. Earthing

Earthing plays a vital role in the protection of equipment and the personnel. Apart from protection from hazardous stray currents in electrical equipment in Telecommunication circuits and equipment, Earthing is provided for reduction of Crosstalk and Noise. Used as return path. Protection of buildings and equipment from lightning strikes.

Three types of earth electrodes are commonly used for earthing systems.

 Spike electrodes: are used where space is not a problem.

 Plate electrodes: Where there is not much space but digging is not a problem.

 Strip electrodes: In hilly areas where digging beyond 2-3ft depth is not possible and space is available.

 Nowadays **Chemical Earth** is also being made in which a chemical paste is deposited between the plates, which helps in maintaining the required level of moisture and is also known as maintenance free earth. It is specifically useful for hilly areas.

Engine Alternator, Air Conditioning & Fire Protection

Engine Alternator: The standby power supply commonly used in T.E buildings is from Diesel Engine Alternator Set.

Four –Stroke Principle Of Diesel Engines

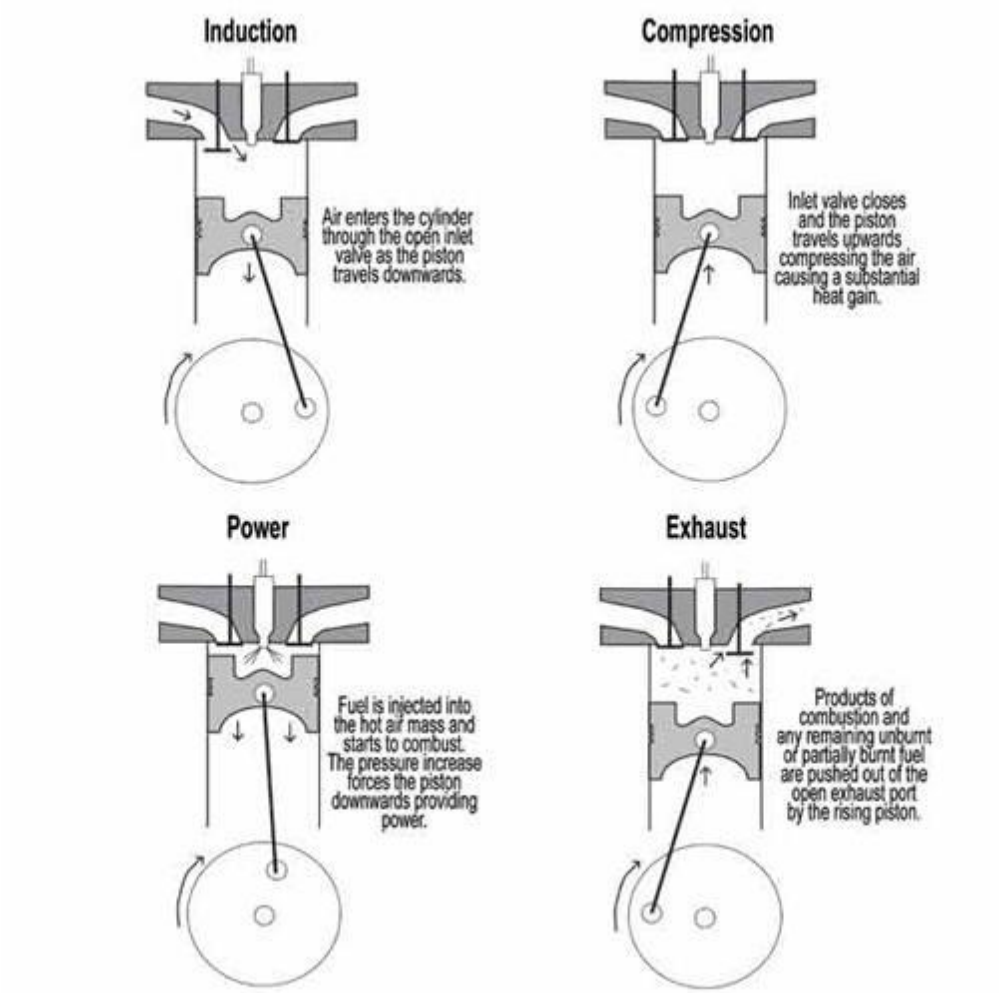
The four stroke working principle of Diesel Engine is as under:

 Admission stroke: The piston draws fresh air into the cylinder on its downward travel through the open admission valve. With turbo charged engines the air is first compressed by a blower and admitted to the cylinder under increased pressure.

 Compression stroke: On its upward travel the piston compress the fresh air in the cylinder with the valves closed. The temperature of the fresh air is thus increased to exceed the ignition temperature of the fuel. Shortly before the piston reaches the top dead center, fuel is injected into the combustion space.

 Power stroke: The fuel injected ignites in the hot air and burns. The combustion causes a high pressure which forces the piston down. Resulting into reciprocating movement of the shaft.

 Exhaust stroke: The piston moving upward forces the exhaust gas through the open exhaust valve into the exhaust pipe. When the exhaust stroke is terminated the exhaust valve close and the admission valve opens for a new operation cycle.



Systems of a diesel engine

Various systems of diesel engine constituting the working system are as below:

 Lubrication system: The moving parts of the diesel engine are lubricated for their optimum operation by this lubrication system. A dipstick in the oil sump serves to check the oil level. The lub oil level and the lubrication oil pressure have to be checked for satisfactory performance and long life of the engine.

 Fuel system: Depending on the position of the fuel, the fuel is supplied to the distributing pipe through fuel filter either by natural head from an elevated tank or by a fuel pump. Fuel is supplied inside the cylinder by injection nozzles.

 Air exhaust system: for the combustion of fuel sufficient quantity of the filtered air is taken in the combustion chamber. After the combustion the exhaust gases are taken away from the engine through suitable ducting or piping. This is known as air exhaust system.

 Cooling system : cooling system is essential for cooling the engine body, and to act as a heat exchanger for lubricating oil. This can be either water-cooled or air –cooled.

Starting system: The Diesel Engine can be equipped with the starting system i.e. with an electric starter with a pinion, which engages with the fly wheel of the engine. The power to the electric starter is provided by means of a battery which is kept in charged condition by means of a dynamo or electric rectifier.

Air Conditioning

The Air-conditioning is an essential requirement for a telecom installation as electronic equipment can work satisfactorily only in controlled environmental conditions. This air-conditioning system performs the following function:

 Maintaining the air at the desired temperature.

 Control moisture content of the air.

 Hold contamination to an acceptable level.

 Circulate the air properly

Components of A.C. System:

The components of any air-conditioning systems are as under:

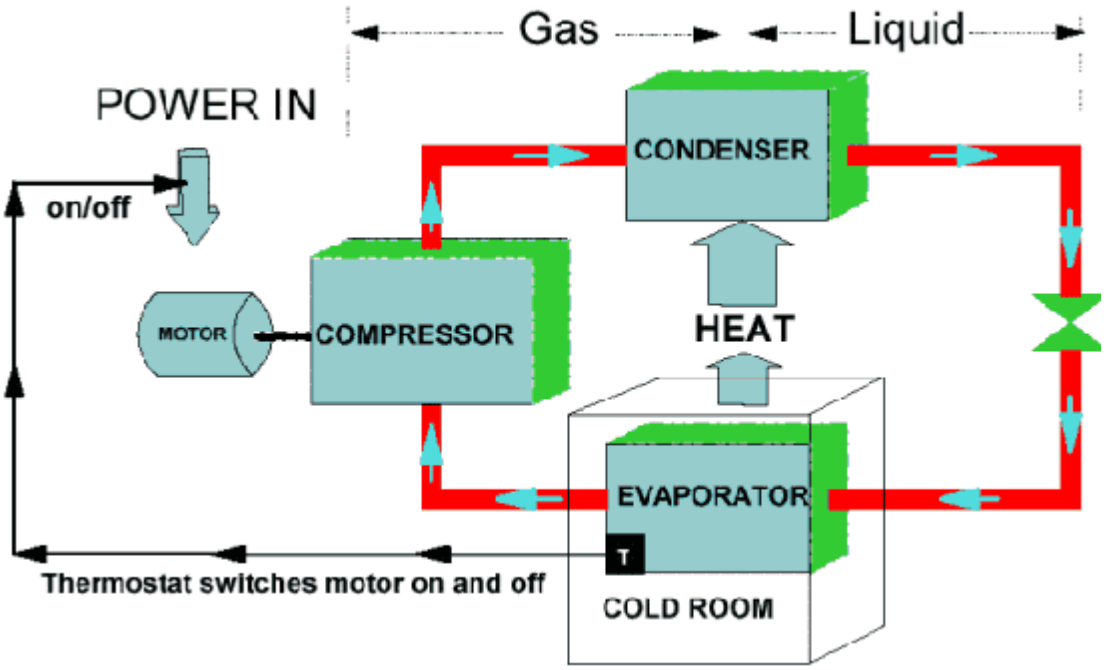
 Compressor: compressor compresses and discharges the refrigerant in gas form to the condenser at a high pressure. Because of rapid compression, the refrigerant becomes hot.

 Condenser: it is intended for cooling the hot gas and liquefying it under pressure. It may be air-cooled or water-cooled. The refrigerant releases heat to the condenser

BSNL, India water through heat transfer surface of condenser water tubes and converted in to liquid by the principle of Latent heat of condensation.

 Expansion valve: Its function is to control and regulate the rate flow of liquid Freon under pressure and allow it in to the evaporator under low pressure.

 Evaporator: This constitutes the cooling unit in which the liquid Freon under a low pressure evaporates and in doing so picks up heat from the air (Latent Heat of Evaporation) thereby cooling the medium surrounding the cooling coil.



Types of Air- Conditioning System:
Air-conditioning system in use may be categorized in to the following types:
- Window Type Units
- Split Type Units.
- Package Type unit
- Central Air-conditioning System

Each of these has its limitations as well as advantages and the most suitable one should be selected taking all relevant factors into account.

Important Factors Which Affect Ac Load:
The important factors affecting A/C plant capacity are as under:
- Orientation and Location of Building.
- Construction Materials Used.
- Number and types Of Window and Doors.
- Utility of the Space.
- Physical Dimensions of Space.
- Lighting.
- Occupancy.
- Appliances and Equipment.
- Ventilation and Infiltration.

 Leakages and Heat Loss in Ducts.

Important Daily Checks
 Check for room temperature.

 Check for any abnormal sound/vibration.

Important Monthly Checks
 Clean cooling & condenser coil periodically and comb mashed fins

 Check filters and clean/ change if required

 Ensure proper charging of refrigerant

 Check for tripping of compressor by thermostat

 Eliminate obstructions in front of condenser, if any

Important Yearly Checks
 Complete Servicing and testing of Window / split AC unit.

Fire Protection
A telecom installation with high concentrations of cables and electronics switching equipment within relatively small areas constitutes a HIGH-RISK installation. We have to prevent fire before everything is afire.

Fire protection measures in telecom building can be classified in two parts :
Passive fire protection: Passive fire protection measures are those which are adopted at the planning stage of the building or facility such as :
 Provision of adequate fire resistance of the structure.

 Provision of proper FAR, open spaces.

 Provision of adequate access to sufficient and readily available water supply etc. for fire brigade.

Active Fire Protection Measures: Active fire protection measures are those which operate (manual/Automatic) in the event of outbreak of fire such as:-

 Provision of suitable and adequate Fire detection system with audio visual alarm.

 Wet riser & fire Extinguishers.

Passive Fire Protection Measures: Telephone exchange buildings have been classified as E4 business buildings in the “National Building-Code of India”. As such
building Material(s) of suitable fire retardant ability as mentioned therein shall only be provided.

Fire detection and alarm
If outbreak of fire is detected promptly in its incipient stage and simultaneously, a correct firefighting media is applied, losses from fire can be minimized. Thus, philosophy of fire detection and alarm system is to provide an audio and visual signal for alerting the building occupants.

Manual Fire Alarm

All buildings excepting manual local exchange and MAX III, shall have a manual fire alarm system. In multistoried buildings, each floor shall constitute one or more zone depending on the area of floor. Fire alarm switches shall be mounted at conventional locations in the zones. The call boxes shall be accessible to all occupants without having to travel more than 22.5 meters and shall be mounted at a height of 1.2 meters from floor level. It shall be colored red.

Automatic Fire Detection System

All buildings above 15 meters height and all Digital Electronic exchanges and all the exchanges of 1K or above shall be provided with an automatic fire detection system, in addition to manual fire alarm system. In case of E-10 B exchanges, false floor plenum and false ceiling shall constitute separate zones.

The detectors shall be of rate of rise of temperature type and smoke type. Wherever smoke detectors are provided, a mixture of photoelectric and ionization type will be used.

A control indication panel to which detection circuits in all the zones are connected, shall be installed in the fire control room or in the main entrance lobby on the ground floor of the building. Light indications on the panels shall unable the fire to identify the fire site.

The alarm system shall provide both alert system and evacuation alarm with different distinctive tones.

The alarm system shall have a battery backup so that in case of mains failure, the backup batteries take over and feed the power to the system.

CONCLUSION

Finally, I conclude that I have learnt about different broadband services, working of internet and how the calls can be transmitted from one terminal to another through several elements like OMC to switching room to MDF to hand set, different types of mobile services like CDMA GSM etc. I came to know in which medium transmission takes place faster depending upon the application like in telephone coaxial or twisted pairs are apt whereas optical fibres are majorly used in some cases of long distance transmission where we should not have any information loss. I know that how the connections are to be done. They showed all the equipment what they had explained in the internship course with fully high qualified technicians. With those connections the electrical supply is very important to the broadcast. In telecom services, net browsing is important and it should improve throughout the world. The communication is the main process through the antennas and it is the data forwarding technique. Day by day technology is increasing and the telecom users are improving, so the broadcast is easier than before the days.