

MAINTENANCE & WORKING PROCEDURE OF BTCL

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This Report Presented in Partial Fulfillment of the Requirement for the Degree
Of Bachelor of Science in Computer and Engineering.

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MAY 2018

APPROVAL

This Internship title “**Maintenance & working procedure of BTCL,**” submitted by MONJUR ALAM, ID No: 152-15-6287, to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirement for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 6 may 2018.

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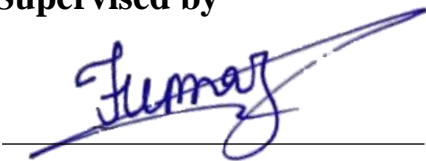
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DECLARATION

We hereby declare that, this internship project report is done by us under the supervision of, Dr. Fernaz Narin Nur, Assistant Professor, Department of CSE, Daffodil International University, in partial fulfillment of the requirement for the degree of Bachelor of Science in Computer Science & Engineering. We are declaring that this report is our original work, we also declare that neither this report nor any part thereof has been submitted elsewhere for the award of Diploma or any Degree.

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ABSTRACT

This Internship is on “Maintenance & working procedure of BTCL,” This is kind of experience on telecommunication network. We were interested to internship basic telecommunication Company Ltd (BTCL). Because now a day communication is talk of the world. In this guide we are trying to say what we learn about real world field installation and working processes of telecommunication networking on BTCL in this internship period.

BTCL has to period basic telecommunication services throughout the country. It was a great opportunity for us work on BTCL. This company provided telephone services all over Bangladesh. Most the user can also use dial-up internet services. This company has the largest telecom in-fracture comprising of copper cabling, microwave links, satellite links, and Optical fiber network etc. ADSL Broadband internet services are available on this company. We have gain practical knowledge about microwave transmission, internet, ADSL, IGW, IIG, ICX, ISP, NTTN, PSTN services, MDF, switch room.

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Chapter 1

Introduction

1.1 Introduction

Networking is no longer a stranger Computer networking has existed for many years, and as time has passed the technologies have become faster and less expensive. Networks are made up of various devices computers, switches, routers connected together by cables or wireless signals. At this time all offices, industries and Home has more than one computer and mobile devices there are need to communicate each other to share data, for this reason there are connected to the internet. In day by day the internet user growth very firstly. Because of this, we have to think about internet. Internet Create new jobs on the remotely [6].

1.2 Motivation

The most important thing in the era of information technology is the Internet. BTCL is going through various services of the Internet such as (Telephone, Broadband, Gateway, web service etc.). I found out that BTCL has an excellent reputation for customer satisfaction and service. BTCL is well known IIG, ISP, and ICX service provider in Bangladesh. The internship experience in BTCL will give me an idea about my future life and will be a stricter step in my future education and in my profession. My desired hope will be fulfilled from there. In all, I hope that I can use my education in real life.

1.3 Internship Objectives

Intern to get the practical experience in the field in computer engineering. It is important that use our theoretical knowledge with the practical field to increase our professional experience in engineering job market. Follow rules and regulation of the organization in my intern period, it is help to make me professional. That is why I choose intern for my future professional life. I hope internship skill will keep ahead me face to challenge in present job competition.

- To gain experience in Telecommunication.
- To provide awareness of the project.
- To understand the situation of networking practical fields.
- Observe interpersonal and organizational dynamics.

- To learn official environment and attitude.
- Study on Operation & maintenance Copper cable in BTCL
- Study on Submarine cable in BTCL
- Study on Operation& maintenance of optical fiber in BTCL
- Study to install & Operation of GPON technology in BTCL
- Study about using PCM & E-1 in BTCL
- Study to install & operation of IPV-4 & Sub-Netting in BTCL [6].

1.4 Introduction of Company

Bangladesh Telecommunication Company Limited is a voice carrier, IIG, IGW, ICX, ISP, NTTN, PSTN Operator and cc domain (.bd) register. There have a copper, optical fiber and microwave networks almost all over the country, almost all over the country BTCL started its journey in 1853 as Posts and Telegraph Department.

Bangladesh Telecommunication Company Limited (BTCL) is now a Govt owned company. Major services there provide are land line telephone, dial-up connection, High-speed bandwidth local and international leased line, VPN, MPLS, country domain (.bd), co-location etc. Soon launching NGN soft switch, GPHONE base services and triple play over fiber to home. Have plane to go for LTE Wireless Services [6].

1.5 Report Layout

- 01: In chapter 1 we have discuss introduction, motivation, internship objective, about BTCL, and also we talking about preview of ICT.
- 02: In chapter 2 we discuss about organizational information introduction, history of Telecom Industry, basic structure of Organization, capacity and connection of BTCL.
- 03: In chapter 3 we discuss about Daily Task and Activities of internship, Events and Activities, Project Task and Activities, Challenges.
- 04: In chapter 4 I'm discussed about Competencies Earned, Smart Plan, and Reflection.
- 05: In chapter 5 Discussion and Conclusion are briefly describe Scope for Further Career of Networking field in this chapter

Chapter 2

Organization Information

2.1 Introduction

The telegraph branch under the posts and telegraph department was created in 1853 in the then British India and was regulated afterward under the telegraph Act of 1885. Pakistan Telegraph and Telephone Department was created in 1962, after the independence of People's Republic Of Bangladesh in 1971, Bangladesh Telegraph and telephone Department was setup under the ministry of Posts and telecommunications. This was converted into a corporate body named "Telegraph and Telephone Board" by promulgation of Telegraph and Telephone Board Ordinance 1975. In Pursuance of Ordinance No. XII of 1979 Promulgated on 24th February 1979. Telegraph and Telephone Board was converted to "Bangladesh Telegraph and Telephone Board (BTTB)" as a Government Board. In Pursuance of "Bangladesh Telegraph and Telephone Board (Amendment) ordinance, 2008" Dated 01-June-2008 (Later on Bangladesh Telegraph and Telephone board (Amendment) Act 2009) a company namely "Bangladesh Telecommunication Company Limited (BTCL)" was incorporated and registered in Bangladesh under the companies Act, 1994 as a public limited company having its registered head office situated at 37/E, Telejogajog Bhaban, Eskaton Garden, Dhaka-1000, The Entire Undertaking of the BTTB was transferred to BTCL Through a Deed of Agreement between Ministry of Post Telecommunications and BTCL signed on 30-June-2008. From 01-July-2008 BTCL started its journey. Optical Communication systems date back to the 1790s, to the optical semaphore telegraph invented by French inventor Claude Chappe, in 1880, Alexander Graham Bell Patented an optical telephone system, which he called the photo phone. However his earlier, invention, the telephone was more practical and took tangible shape. The photo phone remained an experimental invention and never materialized. During the 1920s, John Logie Baird in England and Clarence W. Hansell in the United States patented the idea of using arrays of hollow pipes of transparent rods to transmit images for television or facsimile systems. In 1954 Dutch scientist Abram van Heel and British Scientist Harold H. Hopkins separately wrote papers on imaging bundles. Hopkins reported on imaging bundles of unclad fibers, whereas Van Heel reported on simple bundles of clad fibers.

[6].

2.2 Transmission Network for Nationwide Communication.

Transmission region is responsible to connect the submarine backhaul connectivity for international user, ITC connectivity, nationwide digital exchanges connectivity, internet connectivity, corporate connectivity and data nodes connectivity. BTCL has a strong nationwide transmission network up to Upazilla level and in some cases the network is extended up to Union Parishad level. This Nationwide transmission network (NTTN) of BTCL is mostly composed of Optical Fiber except few districts and a number of upazillas, which are still connected through Radio links. The transmission backbone connecting the district headquarters is mostly Optical Fiber based; few district headquarters (5 nos.) are still connected to the transmission backbone through radio links. Though most of the Upazila headquarters are presently connected to the respective district headquarters through radio links, but BTCL "son going two projects is changing the scenario. Presently Only 179 Upazila headquarters (other than sadar upazila) are connected through Optical fiber but around 169 Upazila are almost ready to connect .BTCL is also providing backhaul connectivity for submarine landing station of Bangladesh at Cox's Bazar through a high capacity of 240Gb/s which has redundant optic fiber transmission link between Dhaka (Moghbar station of BTCL) and Cox's Bazar. The redundancy of the link has been provisioned through Optical Fiber of the Power Grid Company of Bangladesh. BTCL is providing backhaul connectivity of 10 GB/s internet bandwidth for Agortola, India from Cox's Bazar to Akhaura. Recently BTCL launched ITC connectivity from Benapole to Dhaka and started with 10 GB/s internet bandwidth from Tata, India. BTCL transmission capacity increased with their existing facilities without bearing any cost. The length of the optical fiber cable in BTCL's transmission network was around 6,000 Km in 2015. Recently BTCL has taken several projects through which seven out of the rest eight districts headquarters will come under Optical Fiber Cable network, also 290 Upazila and 1006 Union Parishad will be connected with optical fiber. Till November 2016 around 6,000 Km Optical Fiber cable has been layer throughout the country under the running projects and total length of transmission Optical fiber cable is around 12,000 Km which will be more after finishing of the projects [6].

2.2.1 IP and Data Network

BTCL has a strong IP based data network through which all the district headquarters have been brought under the IP Cloud of BTCL. Now BTCL can provide Internet bandwidth from its IP PoPs (Point of Presence) located at all the district headquarters. BTCL is also providing point to point and point to multi point MPLS VPN services at all the district HQs through its IP Cloud. BTCL is providing retail broadband Internet services (256 kbps to 1.5 Mbps) to its customers through its legacy copper network using ADSL technology in almost all the district headquarters. For customers using higher bandwidth (2 Mbps or more), connectivity is provided directly from the BTCL IP PoP nearest to the customer using optic fiber cable. At present BTCL is also providing Internet broadband in around 800 Union Parishads at a speed of 2Mbps in each union. Hopefully, BTCL will be able to provide Internet broadband in more than 1100 Union Parishads by the end of 2016.

2.3 Installation of High Capacity DWDM Optical Fiber Transmission Network to connect Kuakata, Benapole and Akhaura.

Installation of High Capacity DWDM Optical Fiber Transmission Network to connect Kuakata, Benapole and Akhaura" project, financed by BTCL, is under implementation process. Project cost is 49.909 crore BDT. Implementation period of this project is from February, 2016 to January, 2017. Under this project, backhaul connection for 2nd Submarine Cable from Kuakata will be established. Also, for the purpose of Bandwidth transportation, high capacity Transmission equipment at Benapole and Akhaura will be established under this project. Procurement process of High Capacity Optical Fiber Transmission Network Equipment from government owned Telephone Shilpa Shangstha ltd" has already been completed [3].

2.3.1 Dense web length division multiplexing

Dense Web length division multiplexing is a core technology in an optical transport network. In fiber-optic communications, wavelength-division multiplexing (WDM) is a technology which multiplexes multiple optical carrier signals on a single optical fiber by using different wavelengths (colors) of laser light to carry different signals.

2.3.2 Optical Fiber Cable Network Development in 1000 Union Parishads.

Implementation work of the project titled “Optical Fiber Cable Network Development in 1000 Union Parishads” at the cost of Tk679.87 crore, financed by GoB fund, is going on in BTCL. This project was started in January 2012 and will be completed by December 2016. Under the scope of the project around 8,000 km OFC along with necessary transmission and D.C power equipment will be deployed in 1109 unions of 114 upazilas. As a result, people from distant part of the country will be able to connect to the information super highway through Broadband Internet [5].

2.3.3 Optical Fiber Cable Network Development at Upazila level.

With the view of connecting all the Upazila sadars of the country through Optical Fiber cable network, a project titled “Optical Fiber Cable Network Development at Upazila level” has been taken by BTCL at a cost of TK 590.61 crore which is being financed by Gov. Official implementation of the project was started in July, 2013 and is expected to be completed by June, 2017. The project covers installation of 9000 km of OFC and associated transmission, DC power and IP network equipment in 339 Upazilas (Zila to Upazila connectivity). After completion of the project people from almost all the Upazilas of the country will be able to have modern telecom facilities including high speed Broadband Internet Services [5].

2.3.4 Installation of Wireless Broadband Network (4G, LTE) for Digital Bangladesh.

Installation of Wireless Broadband Network (4G, LTE) for Digital Bangladesh” Project at the cost of TK 956.84 crore (including Korea Government aid of TK 612.15 crore) is under implementation by BTCL. The project started in May 2014 and will be completed by June 2017. To facilitate high speed wireless Broadband Internet Services throughout the country, e-Node B(BTS) will be installed in various Metropolitan Cities, District Towns and, Upazilas. Also, 300 km Optical Fiber backhaul and a number of Microwave radio backhaul will be installed under this project to connect the e-Node Bs to the core equipment. LTE (Long-Term Evolution) network will ensure Broadband service facility throughout the country. At present, Tender Evaluation is under process [3].

2.4 Structure of BTCL Exchange

Every communication system has a structure. BTCL also have a structure of its communication. The block diagram figure is a part of BTCL communication structure.

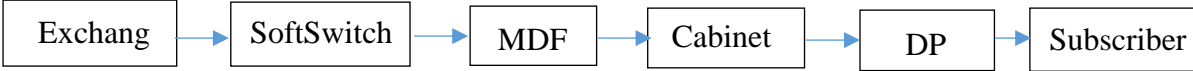


Figure 2.1: BTCL Communication Structure

Exchange: Exchange is connected to other exchange to communicate. Exchange to exchange connected with satellite, micro wave, fiber optic, submarine cable etc.

Soft switch: soft switch analysis the signal & send it to the MDF. Soft switch is deciding who connect in the signal.

MDF: MDF is main distribution frame. All the wire is connected in MDF.

Cabinet: MDF send a group of wire in cabinet. Such as 800 to 2400 pair.

DP: DP means distribution point. Cabined connected with multiple DP. A DP has 10 to 100 pair cables.

User: DP to user connected 2 pair cable & Stable a Communication [6].

2.5 SOWT Analysis

SWOT stands Strengths, Weaknesses, Opportunities, and Threats. SWOT analysis aims to identify the key internal and external factors seen as important to achieving an objective.

Strength	Weakness	Opportunities	Threats
fixed phone services provider	Worse Brand image	Improve service quality	Growth private land phones
Only one landline provider	Equipment's Inadequate	Lowest call rate	prefer mobile phone
integrated service package	Poorer organization's CSR activities	increased the tax and tariff on mobile set & SIM	Competition with private company's

Chapter 3

Tasks, Projects and Activities

3.1 OSI Layers

There are n numbers of users who use computer network and are located over the world. So, to ensure, national and worldwide data communication, systems must be developed which are compatible to communicate with each other. ISO has developed this. ISO stands for International organization of Standardization. This is called a model for Open System Interconnection (OSI) and is commonly known as OSI model. The ISO-OSI model is a seven layer architecture. It defines seven layers or levels in a complete communication system [7].

3.1.1 Feature of OSI Model:

1. Big picture of communication over network is understandable through this OSI model.
2. We see how hardware and software work together.
3. We can understand new technologies as they are developed.
4. Troubleshooting is easier by separate networks.

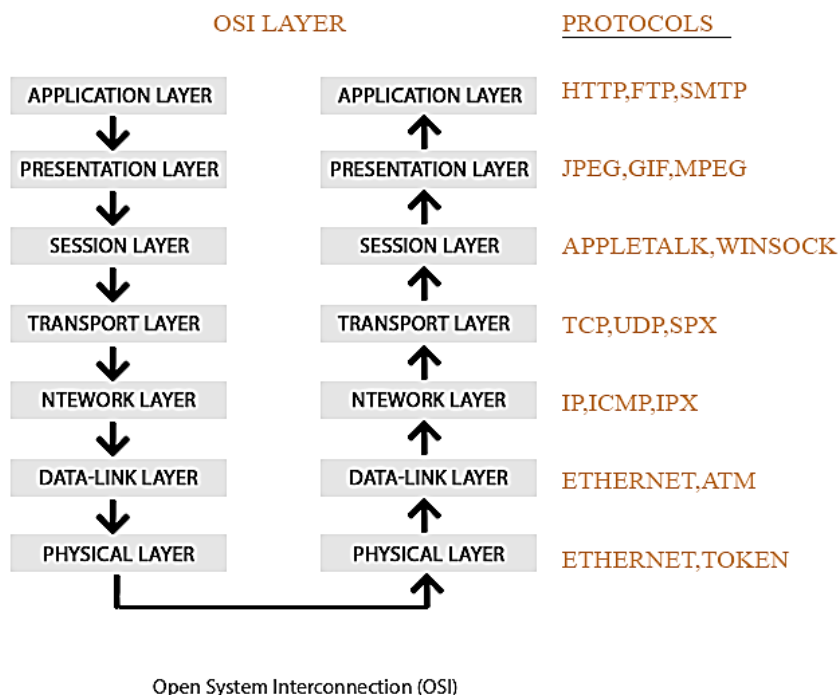


Figure 3.1: OSI Standard model

3.1.2 Functions of Different Layers: Function of different layer given bellow

➤ The Application Layer:

The Application is responsible for user service this is the layer at which user communicates with the computer (Google chrome, IE, Yahoo, Mozilla Firefox, skype etc.)

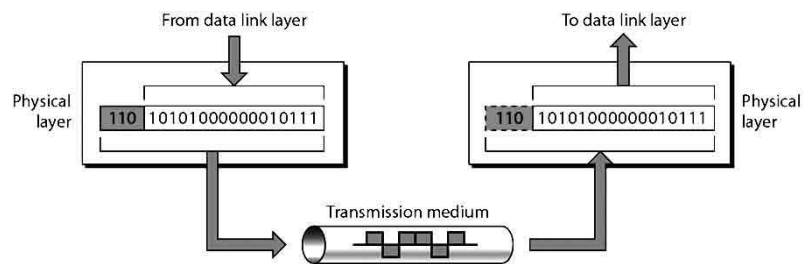


Figure 3.1.1: Application layer

- Application Layer concerned for user interface.
- Physical layer working with HTTP, FTP, Telnet, SNMP, DNS protocols.

➤ The Presentation Layer:

Presentation layer defines the formats of communication data is to exchange between systems.

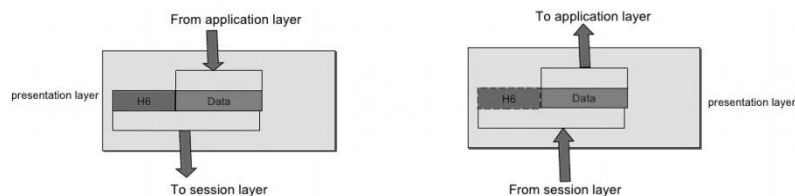


Figure 3.1.2: Presentation layer

- Video, Bitmap protocols work in the layer.
- Data representation, encryption & decryption.

➤ Session Layer:

The session layer is responsible for Network dialog control and synchronization. Session layer establishes, maintain, and synchronizes the interaction among communication system.

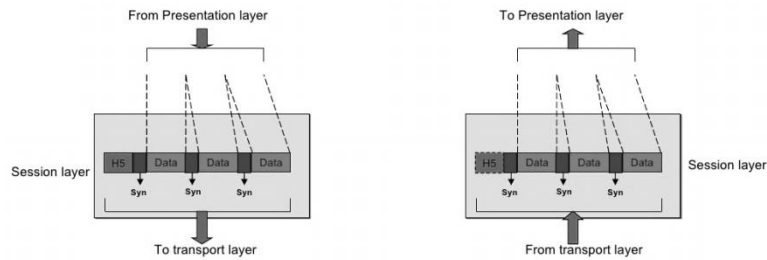


Figure 3.1.3: Session layer

- Session Layer provides a mechanism for controlling the dialogue between to host.
- Set up, monitor & terminate the connection session.
- It has two or more protocols SQL, RFC, NetBIOS.

➤ **Transport Layer:**

The Transport layer is does not recognize any relationship between packets, its ensure that

The whole message arrives intact and in order. It's responsible for process to process delivery of the entire message.

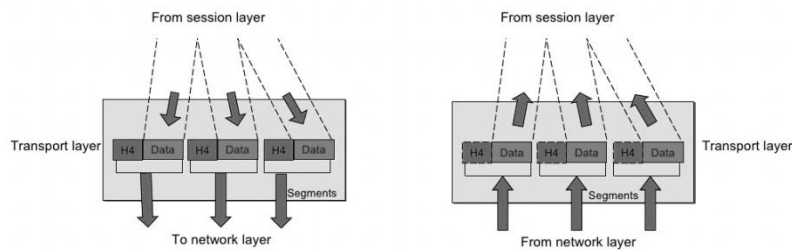


Figure 3.1.4: Transport layer

- Transport Layer prevent the loss of segments on the networks.
- Its need to retransmit losses data.
- Maintain the flow control.
- TCP, UDP are the protocol of transport layer.

➤ **Network Layer:**

The Network is responsible for delivering packet from source to destination possibly across multiple networks.

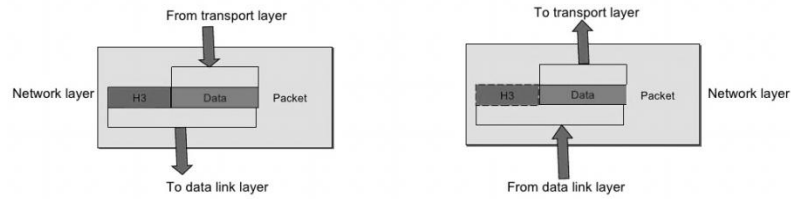


Figure 3.1.5: Network layer

- Network Layer observe path determination
- Network layer make a logical path from source to destination
- IP, IPX & AppleTalk major Internet protocol for this layer.

➤ **The Data Link Layer:**

The data link layer is responsible for moving frames from one hop (node) to the next.

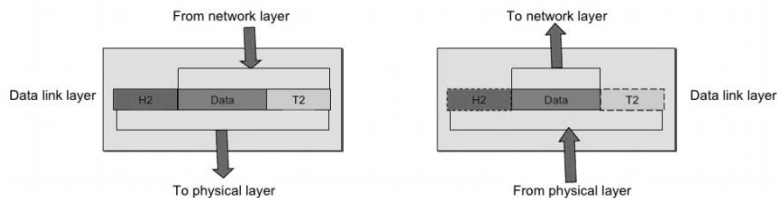


Figure 3.1.6: Data link layer

- Data Link Layer is the second Layer in OSI Model layer.
- LAN, WAN Protocols are works in this layer.
- Working with Physical Address
- Data Link Layer separated into 2 sub layers:
 - Upper Layer (Logical Link Control - LLC)
 - Lower layer(Media Access Control - MAC)

➤ **The Physical Layer:**

The Physical is responsible for movement of individual bits from one hop to another hop. It deals with the mechanical and electrical specifications of the interface and transmission

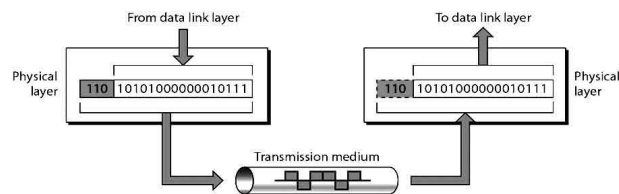


Figure 3.1.7: Physical layer

- Physical Layer encodes and transmits data bits.
- Physical layer working with electrical signals and radio signals.
- It has two protocol FDDI & Ethernet.
- It passes bits (0, 1) to the next hop [2].

3.1.3 Pulse-code modulation

There are many modulation techniques, which are classified according to the type of modulation employed. Of them all, the digital modulation technique used is Pulse Code Modulation (PCM). Pulse Code Modulation is a standardized method used in telephone network (POTS) to change an analog signal to digital one. The analog signal is first sampled at an 8-KHz sampling rate. Then each sample is quantized into 1 to 256 levels and then encoded into digital eight bit word. This process is illustrated in the Figure below.

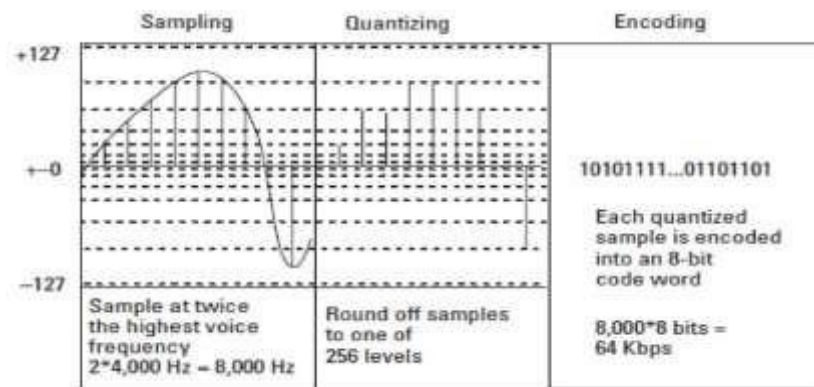


Figure 3.2: Three steps for PCM

3.1.3.1 Sampling

After sampling, the signal value is known only at discrete point in time, called sampling instants. If these point have a sufficiently close spacing, a smooth curve drawn through them allows us to interpolate intermediate values to any degree of accuracy. We can therefore say that a continuous curve can be adequately described by the sample values alone. If the sampling frequency, f_s , is higher than two times the highest frequency component of the analog signal, B , the original analog signal is completely described by this instantaneous samples alone. That is, $f_s > 2B$. This maximum sampling frequency is sometimes called the Nyquist rate [1].

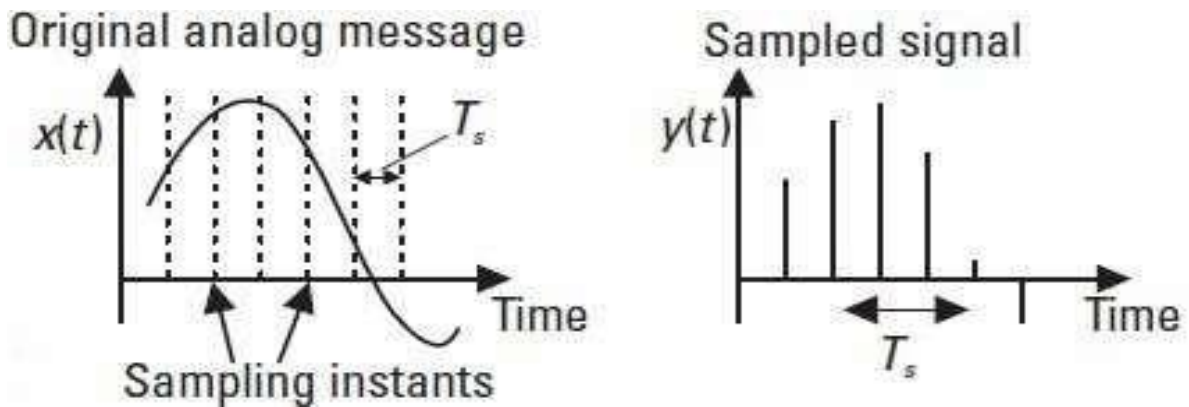


Figure 3.3: Sampling

The sampling time T_s is:

$$T_s = 1/f_s < 1/(2B)$$

And $1/(2B)$ is maximum sampling time.

3.1.3.2 Quantization

To transmit the sampled values via a digital system, we have to represent each sample value in numerical form. This requires quantizing where each accurate sample value is rounded off the closest numerical value in the numerical value in a given numerical set. In quantizing process the information in accurate signal values is lost because of rounding off and the original signal cannot be reproduced exactly any more. The most quantum levels we use, the better performance we get.

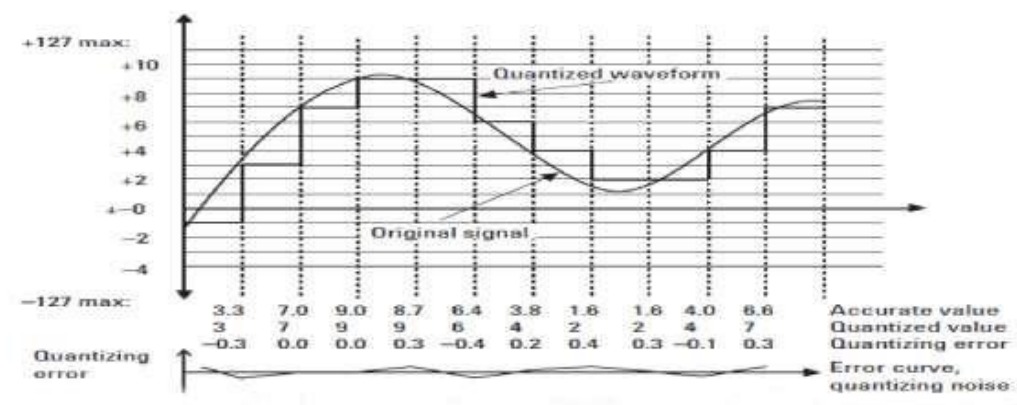


Figure 3.4: Quantization

[Book: Data Communications and networking]

For binary coding, the number of quantum level is $q = 2^n$

Where q denotes the number of quantum level and n is the length in bits of the binary code words that describe the sample values [7].

3.1.3 Pulse code modulation – A digital representation

The original analog message is represented by a sequence of samples, each of which takes on one of the L present quantization levels. The transmission of this quantized sequence is the task of digital communication system. For this reason signal waveforms must be used to represent the quantized sample sequence in the transmission process. Pulse code modulation is the very simple and yet common mechanism for this purpose [7].

Table 3.1.3: Digital Representation of PCM

Digit	Binary Equivalent	Pulse code Waveform
0	0000	
1	0001	
2	0010	
3	0011	
4	0100	
5	0101	

3.1.4 Encoding

In PCM encoding process each sample is represented as one in the set of eight-bit binary words. An example An example binary coding, the structure of the eight bit binary word in the case of BTCL PCM coding, the law, is defined in the following way:

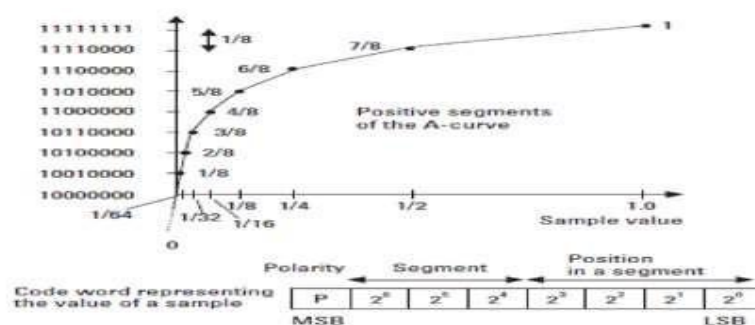


Figure 3.5: Binary word ending

Bit 1, the most significant bit (MSB): is the first bit, reveals the polarity of the sample; “1” represents positive polarity, “0” is negative polarity.

Bit 2,3and4: Define the segment where the sample value is located. Segment”000” and “001” together from linear curve for low-level positive or negative samples. An a-law curve has 13 linear sections as shown in Figure

Bit 5, 6, 7 and 8: least significant bits (LSBs), they reveal the quantized value of the sample inside one of the segments. Thus each segment is divided in a linear fashion in to 16 values (Quantum levels)[7].

3.1.5 PCM encoder and decoder

PCM encoder and decoder block diagram given In Figure.

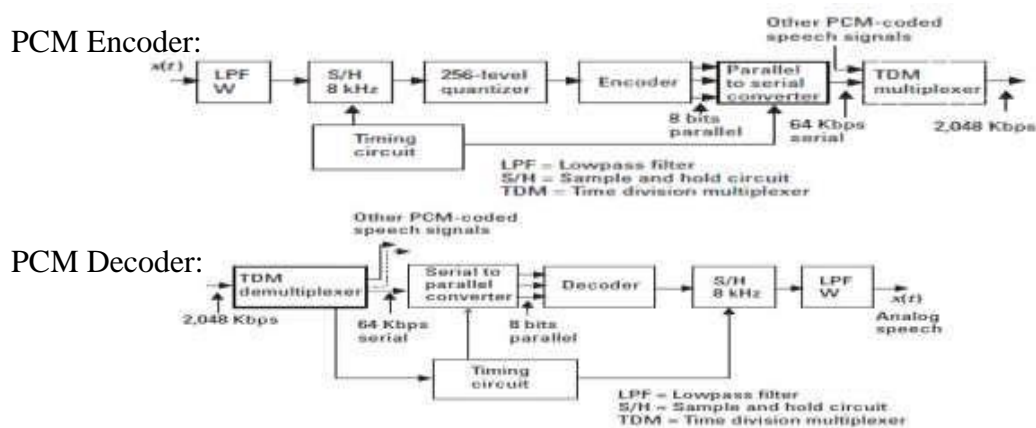


Figure 3.6: PCM Encoder & Decoder

3.1.6 Main Distribution Frame (MDF)

MDF is called to Main Distribution Frame. MDF Some Photos shows in this Figure-4.1(Add Photo Using Photoshop). In MDF I saw the Vertical & Horizontal connection. Horizontal is telephone number connect and Vertical cable is connector from switch room to the MDF. All user connect to MDF from own telephone line in wire to be install with MDF is the exchange that has been connected to the exchange. In this reason we are should maintenance the MDF. Otherwise all the Line can be disconnected [6].

3.1.6.1 Maintenance MDF

- Check keep it the vertical & Horizontal Clip, If remove any clip, we should do the lock the clip as soon as possible.
- We use fuse to protect MDF & switch room. (Discuss fuse in 4.3).
- Keep INERGENgas.
- 24 hour check the MDF and Work carefully inside of MDF.
- All the cable is connector from vertical to horizontal using jumper.
- Check all the connection and wire carefully.
- Don't mix wire from different pair
- Connect only active telephone fuses in horizontal and remove all the fuses from horizontal which telephone is in active to protect from high voltage.

3.1.6.2 Soft switch

Soft switch is a restricted area in every communication system. Discuss About setup of BTCL Sher-e-Bangla Nagor (SBN) soft switches in below.

Installed Equipment/System		
Soft Switch	:	02 Nos
Trunk Gateway (TGW)	:	07 Nos
Access Gateway (AGW)	:	196 Nos
Installed AGW	:	195 Nos
Uninstalled AGW	:	01 Nos
Gigabit Passive Optical Network (GPON) OLT		07 Nos
Total Telephone Capacity		1,39,072 Nos
AGW Based		1,96,672 Nos
Gigabit Passive Optical Network (GPON)		42,400 Nos
Existing connectivity		
Voice Subscriber		65,041 Nos
GPON Subscriber		54 Nos
PRA Subscriber		29 Nos (1225)

3.1.6.3 Network Topology of Soft Switch

In 2017 BTCL wants to Connected all over the world using one Exchange. BTCL new Network Topology of the Soft Switch Shows in Figure. Here SBN Exchange used as primary Switch Room / Soft switch and Ramna Exchange used as backup Switch Room / Soft Switch. IN SBN 171k can provide GPON, Telephone and internet. This can soft switch install as the mother soft switch. In this Project Huawei vendor helps BTCL to complete. This network built in using Optical Fiber able to be communicate. How this optical fiber do is distributed frame (ODF) shows in this Figure (Add Using Photoshop). Here using ODF replace of MDF. Cabinet replace by splitter and Distributed Point (DP) replace by Optical Network Terminal (ONT) / Unit (ONU) or Multi dual unit do (MDU) [6].

3.1.7 IPV 4 & Sub netting

3.1.7.1 IPV4 Setup

We know about IPV4. Now setup / assign my device with ipv4 following this way.

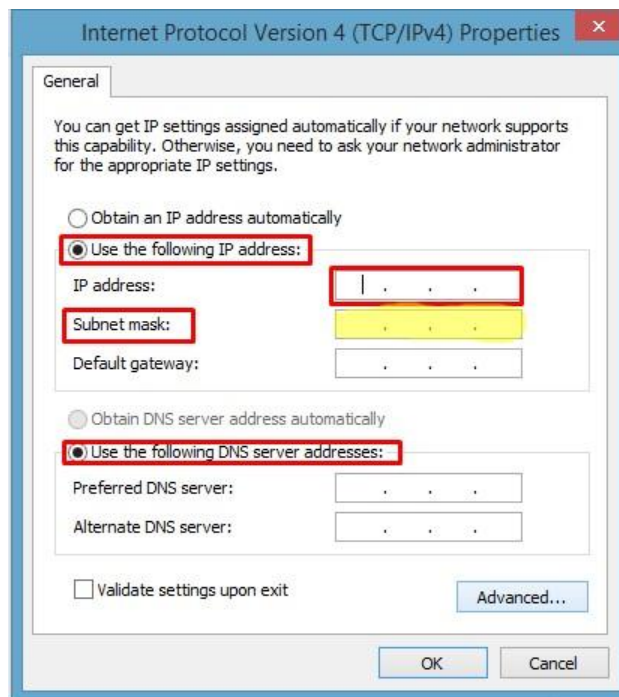


Figure 3.7: IPV4 Setup

Click the right button with network icon and click the network sharing center. Then Click network which we want to assign as IPV4. In have three network I marking my all network to easily understanding. And I have selected Ethernet. Show in the Figure.

- Now I click the properties of the Figure. And double click in IPV4. Show in Figure.

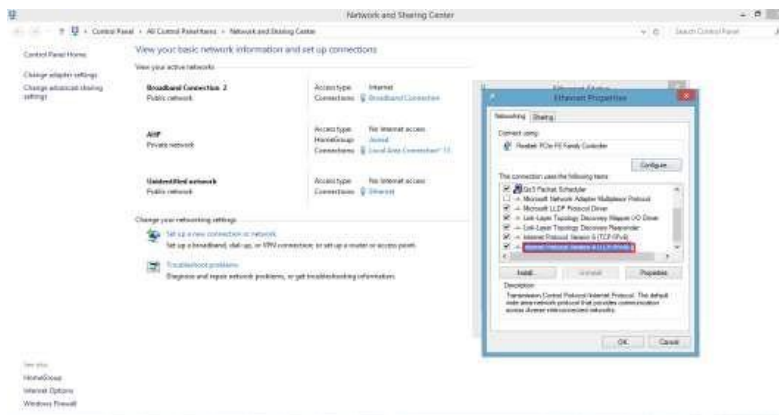


Figure 3.8: IPV4 Configuration

- Now select use the following IP address show in Figure. And give the IP address according to the router [2].

3.1.7.2 Sub-Netting

We have in understanding of Sub-Netting, put this knowledge to use. In this example, I am given two addresses / mask combinations, written with the prefix/length notation, which have been assigned to two devices. My task is to determine if these devices are on the same subnet or different subnets. I can use the address and mask of each device in order to determine to which subnet each address belongs.

Device A: 172.16.17.30/20

Device B: 172.16.28.15/20

Determine the Subnet for Device A:

172.16.17.30 - 10101100.00010000.00010001.00011110

255.255.240.0 - 11111111.11111111.11110000.00000000

Subnet = 10101100.00010000.00010000.00000000 = 172.16.16.0

Looking at the address bits that have a corresponding mask bit set to one, and setting all the other address bits to zero (this is equivalent to performing a logical "AND" between the mask and address), shows to which subnet this address belongs. In this case, Device A belongs to subnet 172.16.16.0.

Determine the Subnet for Device B:

172.16.28.15 - 10101100.00010000.00011100.00001111

255.255.240.0 - 11111111.11111111.11110000.00000000

Subnet = 10101100.00010000.00010000.00000000 = 172.16.16.0

From these determinations, DeviceA and Device B have addresses that are part of the same subnet.

Given the Class C network of 204.15.5.0/24, subnet the network in order to create the network in Figure with the host requirements shows Figure.

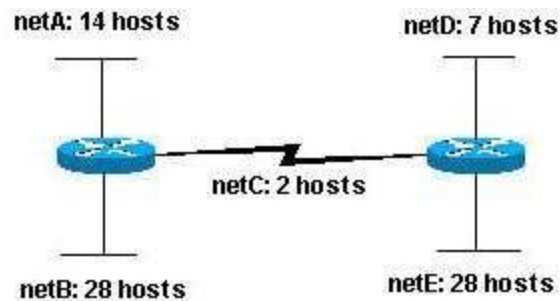


Figure 3.9: Sub-Netting

Looking at the network shown in Figure. I can required to create five subnets. The largest subnet must support 28 host addresses. I can start by looking at the subnet requirement. In order to create the five needed subnets would need to use three bits from the Class C host bits. Two bits would only allow four subnets.

Since I need three subnet bits that leaves with five bits for the host portion of the address. $2^5 = 32$ (30 usable) hosts support. This meets the requirement. Therefore I have determined that it is possible to create this network with a Class C network. An example of how I might assign the subnetworks is:

- Net A: 204.15.5.0/27 host address range 1 to 30
- Net B: 204.15.5.32/27 host address range 33 to 62
- Net C: 204.15.5.64/27 host address range 65 to 94
- Net D: 204.15.5.96/27 host address range 97 to 126
- Net E: 204.15.5.128/27 host address range 129 to 158

3.1.7.3 Copper cable maintenance

When any user complained that his/her telephone doesn't work properly. First of all BTCL Engineers check copper cable using a temporary handset. If cable work correctly, they will suggest change/repairing this device. Otherwise check the cable using MTDR-070 device. This device is also called a fault locator which is shown in Figure. Fault locator identify can the fault and show the correct distance where cable fault or cut off. Then the engineer's reach the location where cable fault with cable joiner (CJ). The cable joiner (CJ) join the cable

correctly and other engineers check the cable from MDF. If successfully repair the cable, then the engineers return to his office and wait for next complain [8].

3.1.7.4 Optical fiber maintenance

The recent communication medium is use to optical fiber. When we fail to transmit a signal using fiber optic. This time we can check the fiber using TBERD 8000 device. The device is also called OTDR which is shown in Figure. The device send signal and the signal break where fiber optic break or damage or cut off. OTDR detect the correct distance where fiber fault created. Then engineers reached the location with CJ and Splicing device [5].

DWDM (Dense wavelength division multiplexing)

DWDM is a core technology in an optical transfer network. In fiber-optic communications, wavelength-division multiplexing (DWDM) is a technology which multiplexes multiple optical carrier signals on a single optical fiber by using different wavelengths (colors) of laser light to carry different signals.

- It has send multiple carriers over a single fiber.
- In DWDM technology each wavelength single fiber can be passes 10GB/s data at the time
- A single core fiber cable could divided into multiple channels instead of using 12 fiber core [8].

3.1.7 Microwave

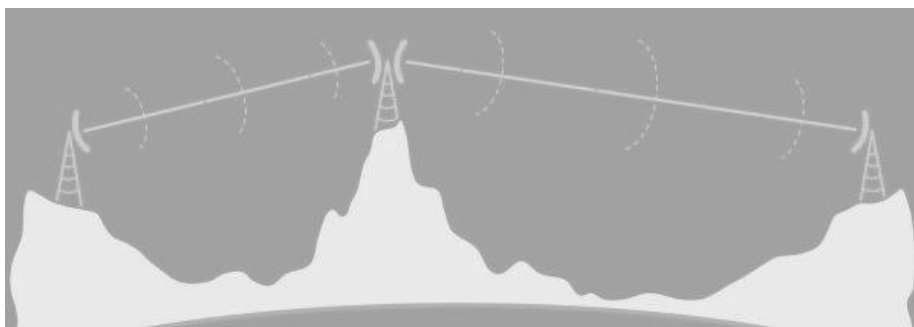


Figure 3.10: Microwave Line

Before the advent of fiber-optic transmission, most long-distance telephone calls were carried via networks of microwave radio relay links run by carriers such as AT&T Long Lines. Starting in the early 1950s, frequency division multiplex was used to send up to 5,400 telephone channels on each microwave radio channel, with as many as ten radio channels

combined into one antenna for the hop to the next site, up to 70 km away. Wireless LAN protocols, such as Bluetooth and the IEEE 802.11 specifications used for Wi-Fi, also use microwaves in the 2.4 GHz ISM band, although 802.11a uses ISM band and U-NII frequencies in the 5 GHz range [8].

3.1.8.1 Cellular Network

Cellular telephony service provide communication between two moving units, called mobile station (MSs) or between one mobile units to stationary units often called land unit.

Each base station, in turn, is controlled by a switching office, called a mobile switching center (MSC). The MSC coordinates establish can communication between all the base station and the telephony central office. It's a computerized center that's it responsible for connecting calls, recording calls, recording call information, and billing.

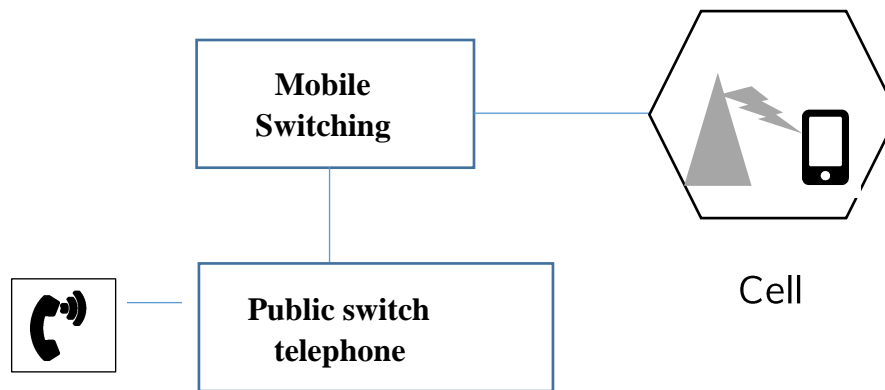


Figure 3.11: cellular system

Mobile switching center (MSC): mobile switching center piece of a network switching subsystem. MSC mostly connected with communication switching function, such as a call set-up, release and routing.

Public Switch Telephone network: The public switched telephone network is the aggregate of the world's circuit-switched telephone networks that are operated by national, regional, or local telephone operators, providing infrastructure and services for public telecommunication[7].

3.1.9 GSM Network (Global System for Mobile communication)

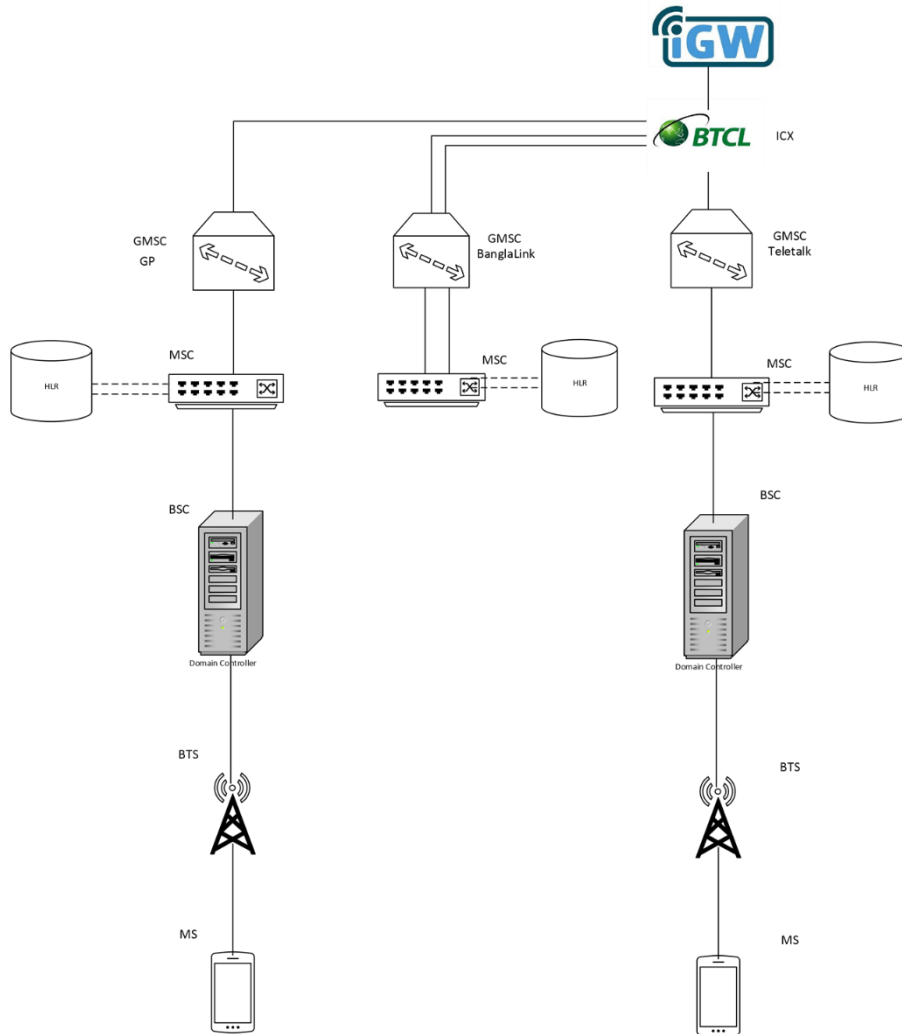


Fig 3.12: Voice calls in GSM Network

Working Procedure of GSM Network in Nationwide: Firstly a mobile subscriber (MS) dial phone number then it's originate a call in the GSM network is routed through the core network to the destination party.

- To initiate a call, the MS sends a request for radio resource allocation to the BSS, which mediates further connection to the Mobile Switching Center (MSC). The BSS assigns the MS a channel with a given frequency and time slot, which constitutes the communication route between the MS and the BSS.
- Once the MS confirms the established channel, the BSS can initiate the connection to the MSC.
- Once the MS has connected to the network, the subscriber needs to be authenticated. This can be done using the IMSI number stored in the SIM card, which allows the

Authentication Center in the core network to verify the subscriber's identity. After this step, the MS and the MSC can start communicating.

- To make sure the data sent over the radio network between the BSS and MS/MSC is secure, the MSC initiates a ciphering procedure which is transmitted to the BTS, which in turn forwards the message to the MS. The MS enables ciphering towards the BTS; as the BTS starts receiving ciphered data, it will start the ciphered transmission of information, finalizing the encryption procedure [7].

3.1.10 Roaming: One feature of cellular telephony is called roaming. Roaming means in principle that a user can have access to communication or can be reached where there is coverage. A service provider usually has limited coverage. Neighboring service providers can provide extended coverage through a roaming contract.

3.1.11 PSTN CALL FLOW BY NATIONAL & INTERNATIONAL WITH DESCRIPTION

- ✓ International Call flow System from Bangladesh BTCL to Singapore SingTel
PSTN -> BD -> SingTel -> Singapore

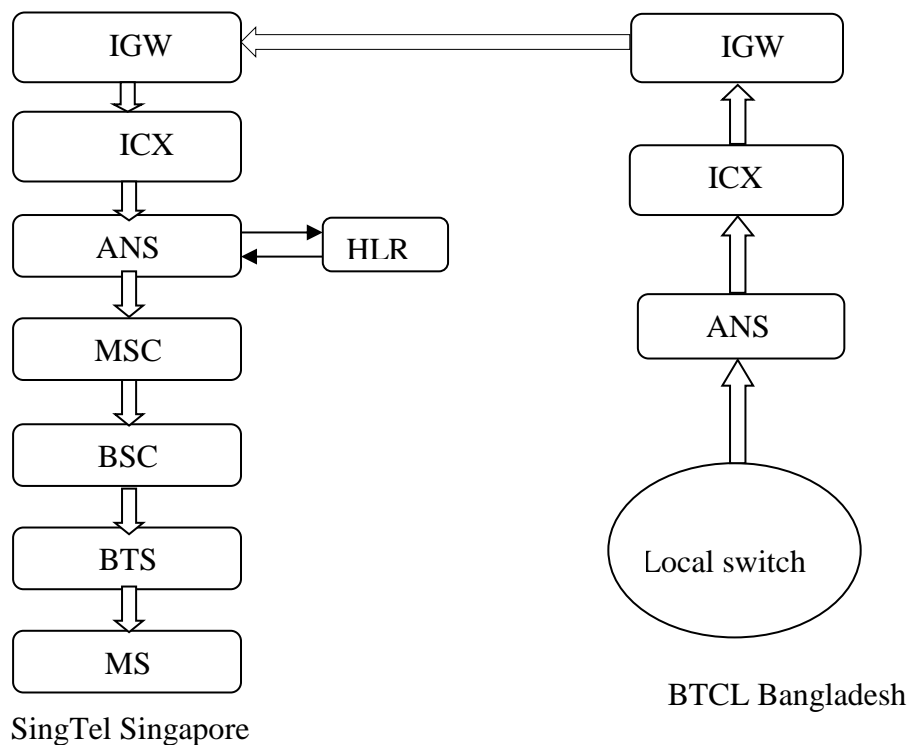


Figure 3.13: International call flow

First call generate by BTCL to send ANS and to send ICX send this operator to IGW and IGW send this data to another country's operator, this operator send this data ICX and ICX send this data ANS and ANS send this data MSC and MSC send this data their HLR and HLR will call that data is SingTel operator and HRL send this data MSC and MSC send this data BSC and BSC send this data BTS and BTS send this data MS by SingTel operator in Singapore.

National Call flow System from Bangladesh BTCL to Grameen Phone

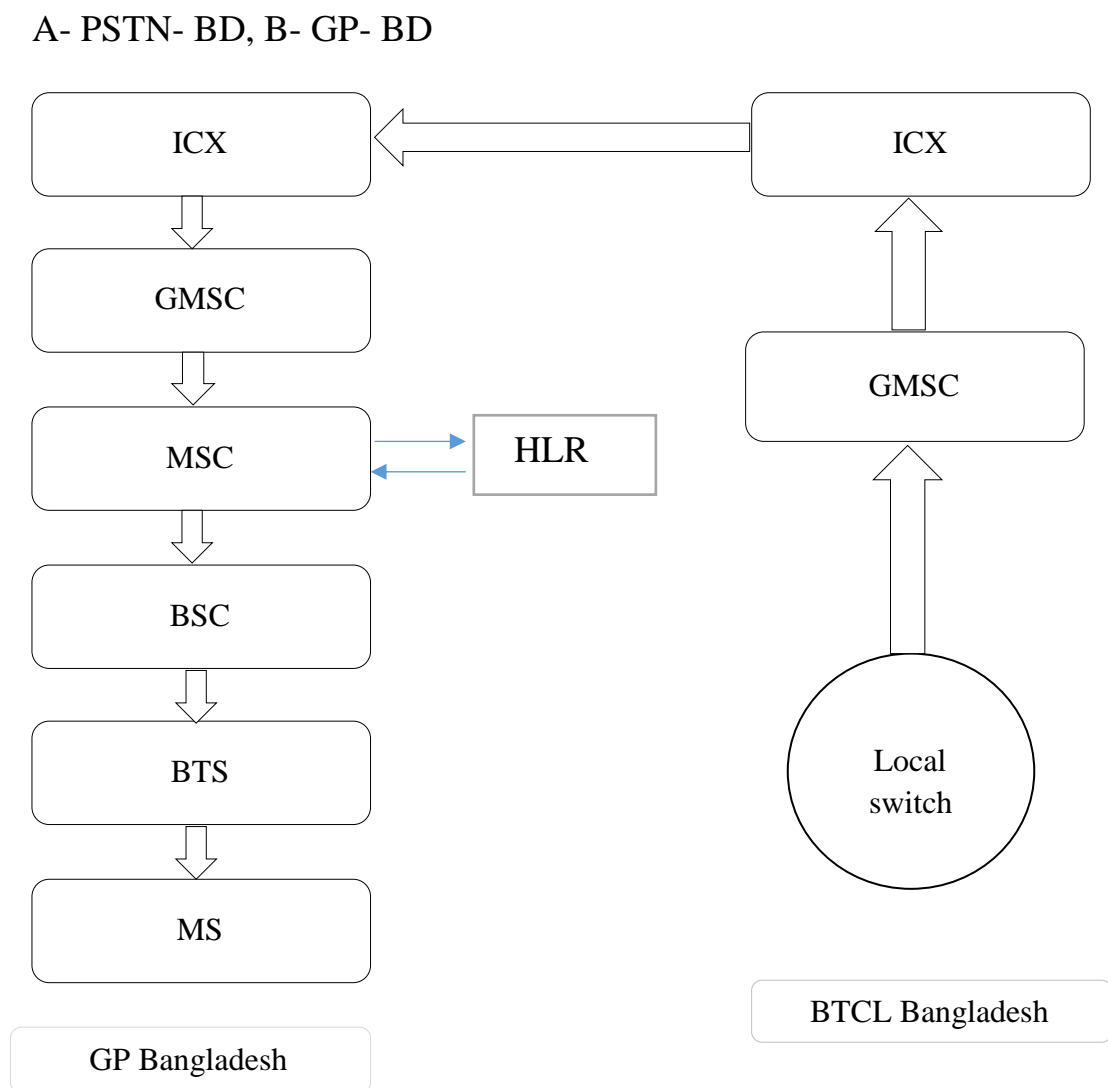


Figure 3.14: National call flow

First call generate by BTCL Local Switch to send GMSC and to send ICX this operator send to data another, operator send this data to GMSC and send this data MSC and MSC send this data their HLR and HLR send this data their nearest MSC and MSC send this data BSC and BSC send this data BTS and BTS send this data MS and MS call flow by GP in Bangladesh.

3.1.12 BTCL COMMUNICATION OF INTRA-CITY AND INTER-CITY BY DEVICES

- ❖ There are two types of this devices use by separate in connection line
 - i. **Tandem**
 - ii. **Tax**
- ✓ **Tandem:** This device is used in always between one offices when connection line one office not to another office.it has been used to BTCL line make.

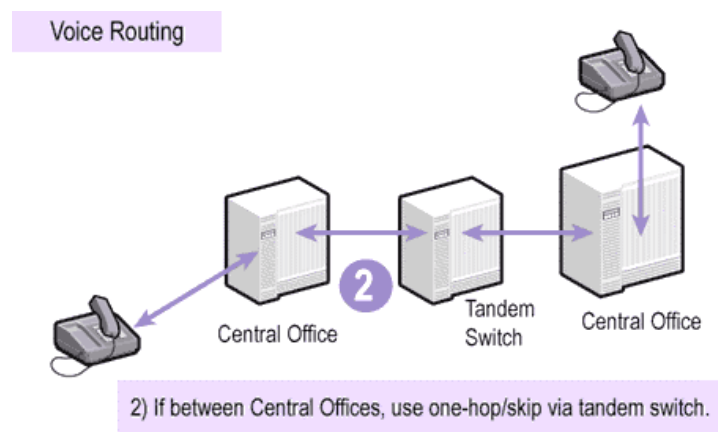


Figure 3.15: Tandem

- ✓ **Tax:** This device is used to inter-city when make a connection between central offices to out of central office then use this devices it has no low-cost and no available buy in any place. This device is only use in central Office to other office make a line [2].

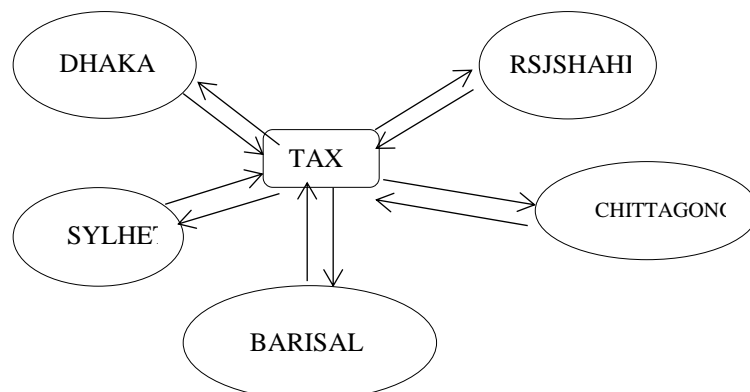


Figure 3.15: Tax Technology Installation

3.2 Events and Activities

When we was in Mirpur Telephone Exchange we are get knowledge about MDF (Main Distribution frame) and how to maintain and how to connect a new subscriber with PSTN.

We just gather some idea about cabling and some types of them.

3.3 Project Task and Activities

In Three month duration internship we passed two month in Mirpur Sub-divisional Exchange and One month passed Sher-e-bangla Nagar West Divisional Exchange we solve some task which was relevant with networking maintenance.

3.4 Challenges

Main distribution frame is a signal distribution frame for connecting equipment (inside plant) to cables and subscriber carrier equipment MDF is very sensitive & secure place because all data, voice, and sensitive information is passed through the MDF so, everyone is not allowed to entrance without skillful engineer. It is very difficult to work under these circumstances.

With it we are visited switch, Server, and firewall room these places are very secure & safe area.

Chapter 4

Competencies and Smart Plan

4.1 Competencies Earned

In this short intern period, we tried to learn Communication and Networking and we could learn something. The current world is very developed and it's keeping with it. Strong Computer knowledge is highly needed in the competitive job market

4.2 Smart Plan

I am concerned to the future of my career now. In intern period, I gather practical knowledge that is help my future career in IT sector. Day by day, it is high demand in modern technology. I learned some real life things in my internship period with in a team. Now I try my best increase knowledge and practice more and more. My plan completely learns about Network Engineering, then implementation in real world.

4.3 Reflections

Intern gets the practical experience in the field of Network Engineering. It is help to increase experience in engineering job. In intern period, I learned Network Practical knowledge. IT is a smart and dynamic profession at present. This experience will help me to be seeking smart job. Intern provides advance tricks and trips that practiced by the professional. Now I know how to manage Switch, Router, Firewall, IP & how to solve real life problem and how to overcome critical situation and getting the experience to work on a professional team.

Chapter 5

Conclusion and Future Career

5.1 Discussion and Conclusion

My internship has completed 07 Feb 2018. After completing my internship what I understand all off these thinks discuss in previous chapter. Now communication system depends on internet. So we should upgrade the internet speed. This Internship provides the opportunity to test interest in a particular career before Permanent commitments are made.

The Internet now plays a substantial role in business, probably to the extent that we take it for granted. Consider, for example, how extensively used a data-heavy function like video conferencing is, how often we access cloud-based apps, stream videos or download large files from a website. Your bandwidth is taxed for any of those high-demand activities. One video service recommends that you need 5.0 megabits per second, just to stream an HD video.

If multiple users on your network are streaming multiple videos, uploading large files or doing other high-demand tasks concurrently, the needs multiply. If you only have limited bandwidth such as a 20 megabit per second speed, you can see how quickly a few heavy demands on your Internet access can eat up your access and slow everything and everyone down. Still, businesses tend to use the same Internet connection for years, blithely oblivious to the speed of technology's progress. Bandwidth problems can slow down your company's productivity, waste your employees' time and result in lost sales. Before you can figure out how to ensure your operation is Internet optimized, you first need to know what you're dealing with. Consider this a primer regarding the three basic materials we use to connect to the Internet:

- Copper
- Fiber optics
- Wireless

These three mediums for Internet connections are available today in the marketplace. Each has advantages and disadvantages. Let's look at the pros and cons of each.

Since the telephone's advent over 100 years ago, the dominant way to "wire" the home involved the use of copper cabling. The copper phone wire is perfectly adequate for a voice signal, which is what it was intended for. All things considered, however, it offers very

limited bandwidth. Still, so many are familiar with copper that they doubted any other medium would ever supplant it. Until fiber optics came along. Fiber optics refers to technology that transmits data through thin strands of a highly transparent material that usually is either glass or plastic. Fiber optic communications were launched in the 1970s, though the first fiber optic telecommunications networks were not installed until the early 1980s. By the mid-1980s, fiber's bandwidth and distance capabilities made it significantly less expensive than other communication mediums, so it has replaced them. In the mid-1990s, cable television discovered fiber could enhance performance reliability, as well as enable the offering of both phone and Internet service on the same fiber. Assessing which type of network cable is optimal for a particular company requires consideration of several factors. Copper does offer advantages for those in rural areas. It already exists (it has been used, as noted, to wire telephones, so copper already found its place in the household) and is less expensive when used to connect network devices. Those in rural areas where no fiber optics have been run may find copper the most cost effective, because they don't have to pay to run new cabling. Still, fiber optic cable offers many advantages over copper

Fiber optic cables are impervious to electromagnetic interference: Copper wires, if not properly installed, will produce electromagnetic currents that can interfere with other wires and wreak havoc on a network. An added benefit of fiber optic cables is that they are not a fire hazard. (Fiber optic cables, unlike copper cables, do not conduct electricity.)

Fiber optic cables do not break as easily: This means that you will not have to worry about replacing them as frequently as copper wires.

5.2 Scope for Further Career References:

BTCL Is the one of the largest telecommunication company in Bangladesh, Major services there are provide are land line telephone and dial-up internet over the Bangladesh. BTCL need more manpower to provide service in whole Bangladesh.

Therefore, we will be much ahead of the next recruitment examination and we have a great opportunity.

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Appendix A: Internship Reflection

I am so grateful to complete my internship. I have to thank my supervisor, **Dr. Fernaz Narin Nur** who was always prepared to answer my questions and show me how to simplify assigned tasks. Over the couple of months a lot of changed for me. This internship has been meaningful as I am about to enter the real world. This daunting idea is slowly diminishing after having such an incredible time with the BTCL team. Reflecting on my internship and taking action based on what i have learned and experienced can be every bit as important as the internship itself.

Appendix B: Company Detail

The Bangladesh Telecom Company Limited (BTCL) started functioning on July 1, 2008 as PLC (Public Limited Company) by taking over all assets and liabilities of the now-defunct Bangladesh Telegraph and Telephone Board (BTTB), initially a sole Telecommunications service operator of Government of Bangladesh.

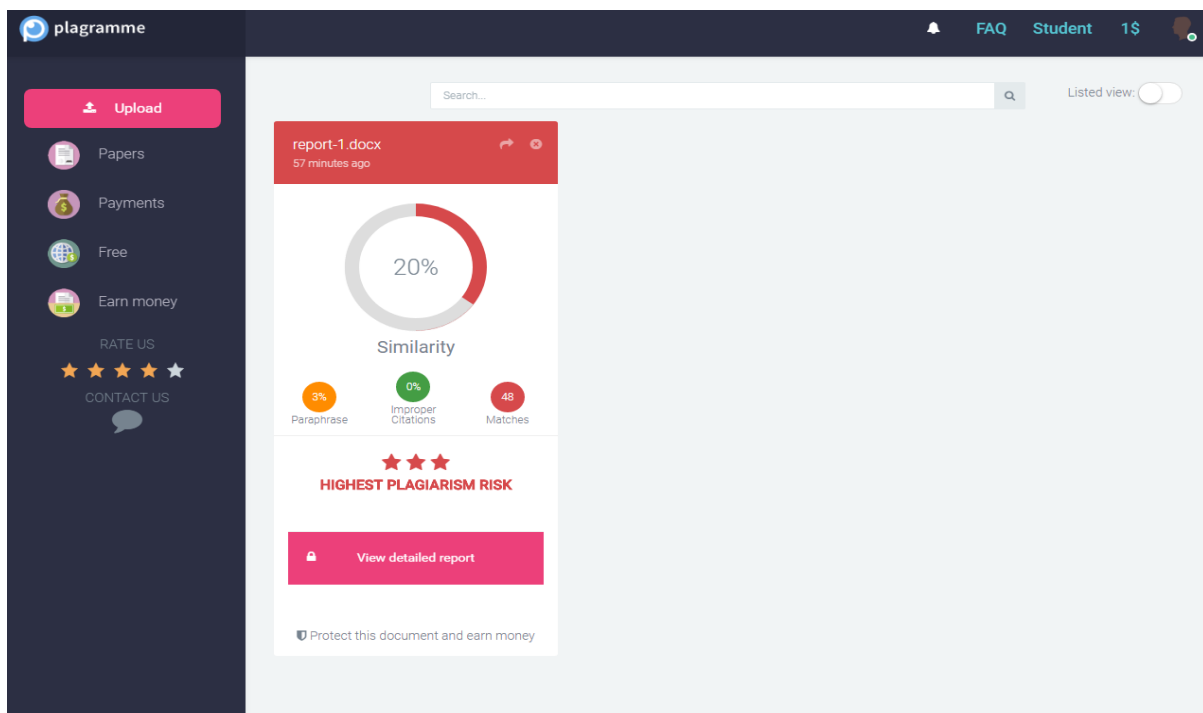
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