EAST WEST UNIVERSITY

Department of Electronic & Telecommunication Engineering

Internship report on

Asymmetric Digital Subscriber Line (ADSL) and .bd domain

Under Exchange Installation and Admin & Co-Ordination division

Bangladesh Telecommunication Company Ltd (BTCL)

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BTCL

দেশ ও মানুষের সেবায়

Declaration

We are gratified to announce that this internship (ETE 498) report on –Asymmetric digital line subscriber (ADSL) under Exchange Installation Division and .bd domain under Admin & Co-ordination division of Bangladesh Telecommunication Company Ltd. has been prepared by us under the guidance of Professor Dr. Md. Mofazzal Hossain and Dr. M. Ruhul Amin for the partial fulfillment of B.Sc in ETE program from the Department of Electronics & Communications Engineering (ECE), East West University. We also affirm that this report is original in nature and has not been submitted elsewhere for any other purpose.

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Our heartfelt gratitude goes to Engr. Md. Golam Baharul, General Manager of exchange installation division and Engr. Md. Shahidul Islam of administration & co-ordination division in Bangladesh Telecommunication Company limited, for their kind consultation and support. Their hearty cooperation created the inspiration that made us enthusiastic in accomplishing our internship.

Lastly and most importantly, we would like to express our gratitude to all our colleagues especially the Technology Teams of Bangladesh Telecommunications Company Limited for helping us throughout the internship period.

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We would like to thank to all the Faculty members.

Signature

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Abstract

Internet is becoming a very common measure of telecommunication in Bangladesh. The number of internet users is increasing day by day. It is very attractive market for the mobile-telephone connection providers. Internet is the groundbreaking discovery of 20th century. In this epoch of modernization we have observed massive development of the internet as well as the different programs supported by it.

To accomplish and to know the networking process in practically we wanted to do intern in an established company like BTCL.

From BTCL, we learn the working procedure of asymmetric digital line subscriber (ADSL), the process and working principle of public switched telephone network (PSTN). We learnt about different types of cables and their uses, how AAA server works, procedure of new connection, migration, temporary disconnection, permanent close, billing and shifting. We also learnt the set up of VPN, LAN and register procedure of .bd domain.

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References

[1] BTCL Website

[2] Wikipedia

Chapter 1

Introduction

In this era of modern technology everyone expects to work efficiently in an environment where communication is easy, fast and cost effective. That distinctly specifies that we were in need of a cheaper and user friendly technology which should be simply available everywhere.

BTCL or Bangladesh Telecommunications Company Limited is the largest telecommunications company in Bangladesh. The company was founded as the Bangladesh Telegraph & Telephone Board (BTTB) following Bangladesh's independence in 1971. On July 1, 2008 the BTTB become a public limited company and was renamed as BTCL. The Bangladesh government initially owned all BTCL shares, but stated it would sell the shares to the public the following year. The value of BTCL is estimated to be at Tk 15,000 crore. BTCL has a total of 12,636 officials and staff.
BTCL provides land-line telephone services in Bangladesh's urban areas, including domestic long-distance calling and international services as well as internet services. In 2004, the Bangladesh Government issued a number of PSTN licenses to private companies, but they were barred from providing services in the lucrative Dhaka market (which accounts for the majority of the nationwide market). The monopoly held by BTCL was broken when other operators started to receive licenses from 2007.

BTCL has a mandate to provide basic telecommunication services throughout the country. At present, BTCL is providing telephone service to about 1 million telephone subscribers down to upzilla (thana) and growth centre level. Most of them can also use dial-up internet service. BTCL has the largest telecom infrastructure comprising of copper cabling, microwave links, satellite links, optical fiber networks etc. BTCL server has the google & you tube crash memory server. The call rates and internet rates are cheaper than those of other operators. ADSL Broadband internet service is available now with present capacity of 33 thousand. BTCL earned 15653 million taka revenue in 2007-08 and 20813 million taka revenue in 2008-09 year. Number of Sanctioned posts is 19066. Working manpower on 30th June 2009 was 10325 (regular). In addition to this, about 5000 employees have been working as work-charged and casual. The organ-gram of the company is approved along with 8703 posts in 28th Board of Directors' meeting held on 27thDecember 2009.

1.1 Rationale of the Study

The main reason is doing internship at BTCL to introduce myself with corporate world. The study is about ADSL, .bd domain. Basically this department is considered to be one of their prior concerned departments of Bangladesh Telecommunication Company Ltd. Therefore, the activities carried out by the personnel needs to be well acquainted with the customer oriented services. So, being a business graduate it is a challenging experience for us to concentrate on technology services being provided by BTCL. Apart from the educational knowledge, the study

added extra advantage regarding the practical field and real life activities followed in the company. Moreover, the study carried out also added value to the technical mechanisms and operations of the BTCL. Along with our experience, it will be helpful for the company to get their flow of technology and can identify in which sector, the company needs to put extra concentration so that the technology get well acquainted with the technology get well acquainted with the desired services offered by the BTCL to its customers.

1.1.1 Why BTCL?

BTCL is a voice carrier, IGW, IIG, ICX, ISP, NTTN, PSTN operator and cc domain (.bd) registrar. We have copper, optical fiber and microwave networks almost all over the country. BTCL started it's journey in 1853 as Posts and Telegraph Department. BTCL is now a Govt. owned company. Major services we provide are land line telephone, dial-up internet, ADSL internet, high bandwidth local and international leased line, VPN, MPLS, country domain (.bd), co-location etc. Soon launching NGN soft switch based services and triple play over fibre to home. Have plan to go for LTE wireless services

1.2 Background of the organization

The Telegraph branch under the Posts and Telegraph Department was created in 1853 in the then British India and was regulated afterwards under the Telegraph Act-1885. The Telegraph branch was reconstructed in 1962 in the then East Pakistan as Pakistan Telegraph and Telephone Department.

On 1 July 2008, BTTB transformed to a government-owned Public Limited Company under a new name of Bangladesh Telecommunications Company Limited BTCL. BTCL has launched a 24-hour call centre for customers' benefit. Customers in Dhaka will be able to call the number 16402 and reach the BTCL for enquiry, according to a company media release issued on Wednesday. BTCL runs a red telephone exchange for the VIPs which are secured and always live.

Table-1: History of BTCL

1853	**Telegraph Branch/ PoT Dept, British India**	**Regulated afterward by Telegraph Act, 1885**
1947	**Pakistan Post & Telegraph Department**	**Regulated afterward by Telegraph Act, 1885**
1962	**Pakistan Telegraph & Telephone Department**	**Regulated by Telegraph Act, 1885 & Wireless Act, 1933**
1971	**Bangladesh Telegraph & Telephone Department**	**Created by executive order under MoPT**
1975	**Bangladesh Telegraph & Telephone Board**	**Corporate Body created by T & T Board Ordinance,1975**
1979	**Bangladesh Telegraph & Telephone Board**	**Govt. Board created under MOPT by Ordinance, 1979**
2008	**Bangladesh Telecommunications Company Ltd.**	**PLC - 100% share owned by Govt. created by BTTB**

1.3 Recent services

Currently BTCL is running its operation from Dhaka office with six core departments. BTCL services are:

Telephone Service-	a) PoTs (Plain Old Telephone System) – On net/ Off net Voice Calls, International Calls, FAX, Different Supplementary Services(e.g. Call Forwarding, Hot Line, Do Not Disturb, Alarm etc.), PABX, Centrex
	b) Interconnection Exchange Service
	c) International Gateway Service
Internet Service	a) Dial-up Internet
	b) ADSL
	c) Leased Internet through Optical Fiber
	d) International Internet Gateway Service
Data Link	a) Digital Data Node (DDN)
	b)Optical Fiber Based MPLS
Transmission	a) Optical Fiber/ Microwave Based Nationwide Backhaul
	b) Copper/ Optical Fiber based Local loop
	c) GPON(Gigabit Passive Optical Network)- Voice, Video & 20 Mbps data over optical
Infrastructure	Co-Location
	Space
	Power
	Tower Space
	Dark Fiber/ Fiber duct

DNS parking
.bd domain name registration
Web server
Billing

1.3.1 Telecom Service Licenses Issued in favor of BTCL

Public Switched Telephone Network (PSTN)
International Gateway (IGW)
Interconnection Exchange ICX)
International Internet Gateway (IIG)
Internet Service Provider (ISP)

1.3.2 Telecom Service Licenses intended to acquire

Broadband Wireless Access (BWA)
International Terrestrial Cable (ITC)
Nationwide Telecom Transmission Network (NTTN)
Besides these some others departments like Accounts, Sales and Marketing are also working to keep this business stable for BTCL. All these products includes 24/7 real time CDR traffic monitoring and standard customer care from expert support team.

1.3.3 Competitors

- Private Sector telecom operators
- The use of PoTs is reducing
- Rapid Change of Telecom Technology

1.4 Mission & Vision

BTCL aims to serve the nation with the latest telecom services at a cheaper cost without compromising the quality. To serve its customers with enhanced values by adopting -

- Improve quality of customer Services
- Fulfill demand for telephone and develop proper infrastructure
- Increase Institutional Efficiency
- Fundamental change in network planning
- Adopt Modern Marketing Principles and practices
- Augment revenue management

The vision is to make BTCL a dynamic organization and lead the county's Telecommunication sector through proliferation of Telecommunication Infrastructure

1.5 Organ-gram of BTCL

Figure1.5.1 Organ-gram of BTCL

1.6 Internet Services of BTCL

The Internet is a global system of interconnected computer networks that use the standard Internet Protocol Suite (TCP/IP) to serve billions of users worldwide.

BTCL provides dial-up Internet access in all 64 districts of the country, making it the most-accessible Internet service provider in the country. As of January 2009 its total dial-up subscriber is 32,433. Since the beginning of 2007 BTCL have improved its Dial-up Internet service for better customer satisfaction. It also handles the .bd domain.

BTCL provides consumer-level broadband Internet services under the branding of BCUBE. The service is provided through ADSL2+ technology. BTCL has outsourced its BCUBE sales and customer support to EMEM Systems Ltd, System & Services Ltd (SSL) and Sisview Technologies Ltd. Till now btcl have got about 15,000 customers. BTCL's monthly income about Tk1,90,00,000 per month from this service.

The state-owned telephony firm will develop a broadband wireless access network across the country soon with Korean help to provide uninterrupted upgraded services to its clients, officials said. Bangladesh Telecommunications Company Limited (BTCL) in cooperation with Korean Economic Development Cooperation Fund (EDCF) will establish the modern network.

Chapter 2

Asymmetric digital subscriber line (ADSL)

Asymmetric digital subscriber line (ADSL) is a type of digital subscriber line (DSL) technology, a kind of internet, a data communications technology that enables faster data transmission over copper telephone lines rather than a conventional voice band modem can provide. ADSL differs from the less common symmetric digital subscriber line (SDSL). Bandwidth (and bit rate) is greater toward the customer premises (known as downstream) than the reverse (known as upstream). This is why it is called asymmetric. Providers usually market ADSL as a service for consumers to receive Internet access in a relatively passive mode: able to use the higher speed direction for the download from the Internet but not needing to run servers that would require high speed in the other direction.
ADSL works by utilizing frequencies that are not used by a voice telephone call. A splitter, or DSL filter, allows a single telephone connection to be used for both ADSL service and voice calls at the same time. ADSL can generally only be distributed over short distances from the telephone exchange (the last mile), typically less than 4 kilometers (2 mi),but has been known to exceed 8 kilometers (5 mi) if the originally laid wire gauge allows for further distribution.
At the telephone exchange the line generally terminates at a digital subscriber line access multiplexer (DSLAM) where another frequency splitter separates the voice band signal for the conventional phone network. Data carried by the ADSL are typically routed over the telephone company's data network and eventually reach a conventional Internet Protocol network.

There are both technical and marketing reasons why ADSL is in many places the most common type offered to home users. On the technical side, there is likely to be more crosstalk from other circuits at the DSLAM end (where the wires from many local loops are close to each other) than at the customer premises. Thus the upload signal is weakest at the noisiest part of the local loop, while the download signal is strongest at the noisiest part of the local loop. It therefore makes technical sense to have the DSLAM transmit at a higher bit rate than does the modem on the customer end. Since the typical home user in fact does prefer a higher download speed, the telephone companies chose to make a virtue out of necessity, hence ADSL.
The marketing reasons for an asymmetric connection are that, firstly, most uses of internet traffic will require less data to be uploaded than downloaded. For example, in normal web browsing a user will visit a number of web sites and will need to download the data that comprises the web pages from the site, images, text, sound files etc. but they will only upload a small amount of data, as the only uploaded data is that used for the purpose of verifying the receipt of the downloaded data or any data inputted by the user into forms etc. This provides a justification for internet service providers to offer a more expensive service aimed at commercial users who host websites, and who therefore need a service which allows for as much data to be uploaded as downloaded. File sharing applications are an obvious exception to this situation. Secondly internet service providers, seeking to avoid overloading of their backbone connections, have traditionally tried to limit uses such as file sharing which generate a lot of uploads.

2.1 ADSL Network Design

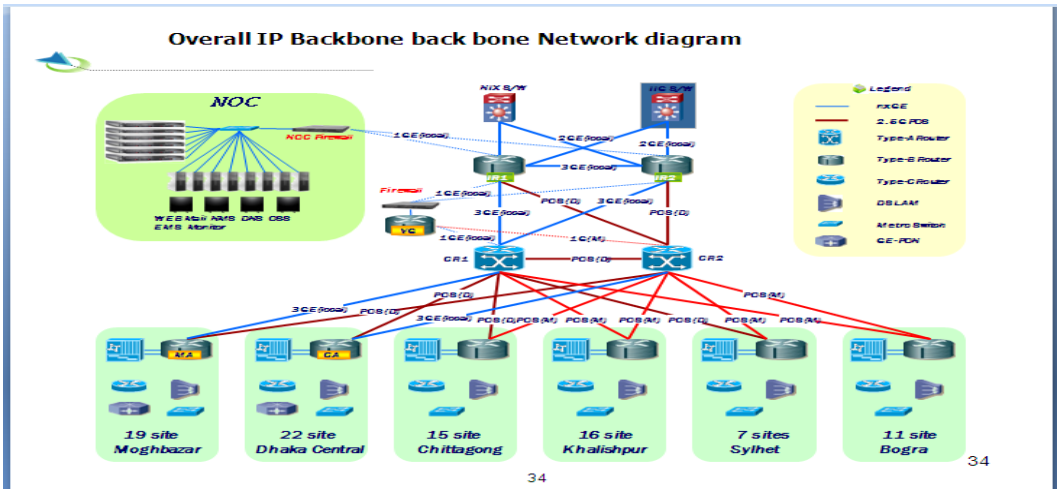


Fig.2.1 ADSL Network Design

- ❑ 6 B-RAS(Broadband-Remote Access Server) are to be installed in each division border node (Moghbazar, Dhaka Central, Chittagong, Sylhet, Bogra and Khalishpur)
- ❑ ADSL PPP session should be established from ADSL CPE to BRAS based on layer 2 connection
  - o PPPoE(from DSLAM to router) and EoMPLS(from router to BRAS)
- ❑ Deploy the EoMPLS VPN between DSLAM and BRAS
  - o Transparent packet forwarding without any change over PPPoE packet header
  - o Each DSLAM node have a point-to-point EoMPLS virtual circuit based on VLAN ID
  - o Division border router have multipoint EoMPLS virtual circuit based on VLAN ID
  - o B-RAS need to support 802.1q and multiple IP address over IP interface

2.2 NMS/NOC: (Network Operation Center):

NMS stands for Network Monitoring System & NOC stands for Network Operation Center.NOC room is used to manage the network.

- ❑ NMS word is for input the IP for different sectors or places.
- ❑ NOC has been installed at the Moghbazar center to monitor overall IP/MPLS network status and detect any fault of links or network equipments
  - Location : 4th floor at Moghbazar center
  - Space : 40 feet * 40 feet
  - O&M staffs : 8 persons
- ❑ Management server
- ❑ NMS word is for input the IP for different sectors or places.

Fig.2.2.1 NOC room

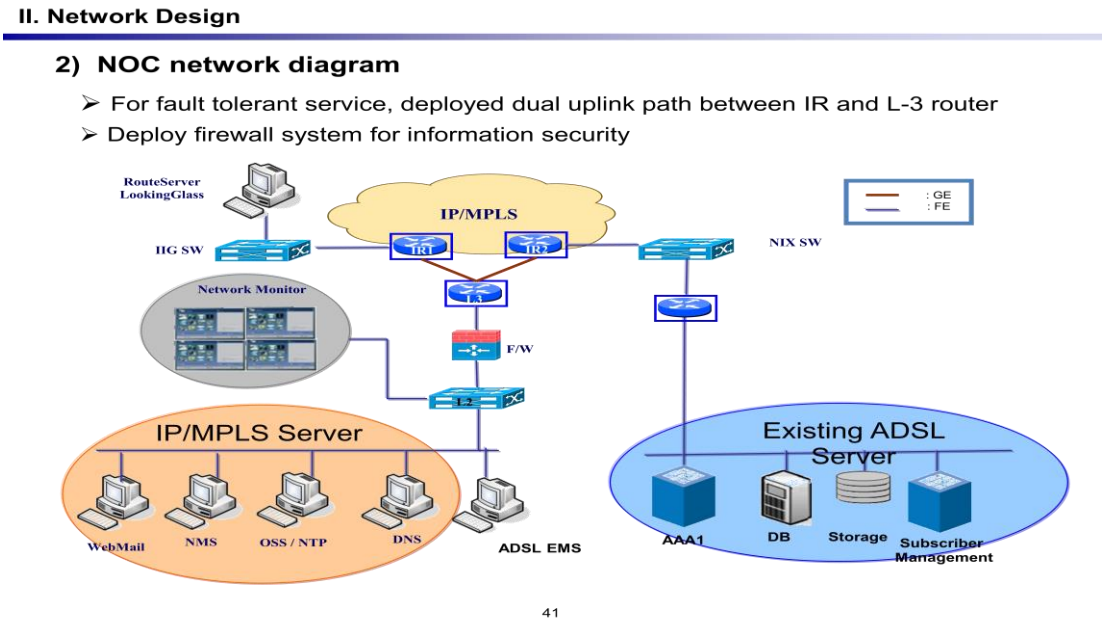


Fig.2.2.2 NOC Network Design

2.3 IP/MPLS Service

IP/MPLS service can be developed based on the categories as follows

- Internet access service
- Virtual leased line service(transport layer 2 frame over MPLS L2 VPN)
- L2/L3 VPN services(Silver service)
- L2/L3 VPN services with QoS(Gold service)

L2/L3 VPN services with QoS and managed network service

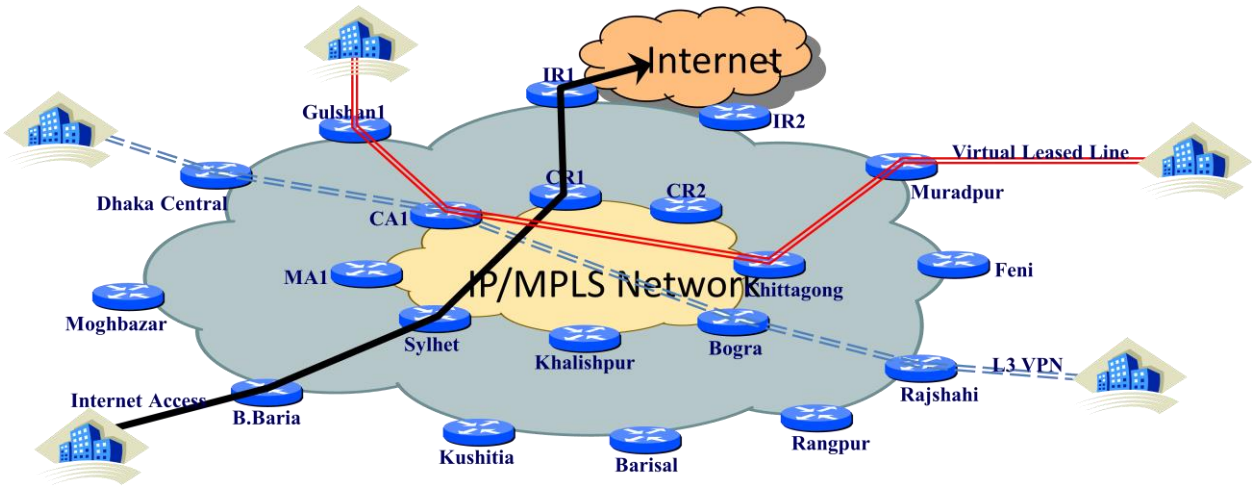


Fig.2.3.1 IP/ MPLS Network

Table-2: IP/MPLS Components & Features

Classification	Components	Feature
IP/MPLS Network servers	NMS(Network Management Server)	Monitor IP/MPLS network status Gathering traffic statistics per link or protocol
	NTP(Network Time Protocol) Server	Synchronize the time between network equipments
	OSS(Operating Support System)	Syslog, TACAS+, TFTP System management tool of network equipment
	Route server	BGP routing information management
	Looking glass	Search BGP routing status between ISPs

2.4 GE PON network diagram

As copper wire is old, optical fiber takes places in modern technology. The new version is GE PON. The speed is very high.

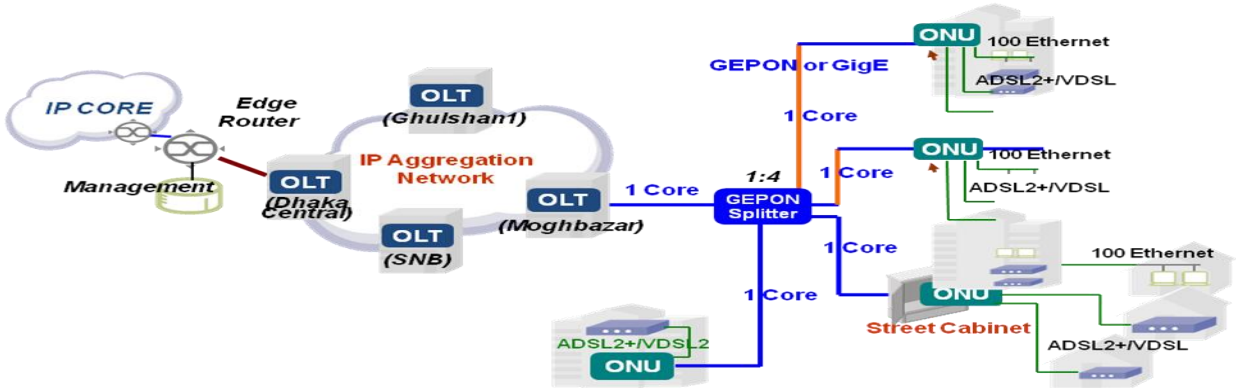


Fig.2.4 GEPON Network Design

2.5 Authentication procedure

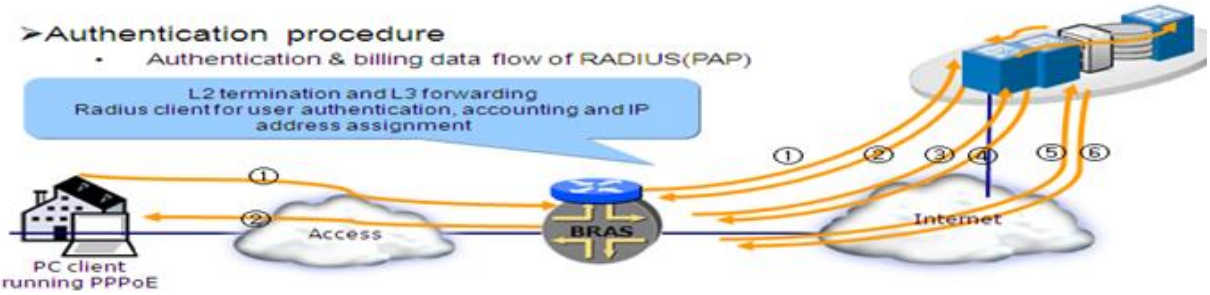


Fig.2.5 Authentication

Explanation of authentication & billing flow

B-RAS requests authentication to AAA when user tries to connect. AAA checks the user authentication if success, processing to next step. If fail, disconnect the user request. B-RAS sends accounting signal to AAA server.AAA responds to the B-RAS. B-RAS sends service termination signal to AAA when user terminates the service. Finally AAA responds to the B-RAS

2.6 Digital subscriber line access multiplexer (DSLAM)

A digital subscriber line access multiplexer (DSLAM, often pronounced *dee-slam*) is a network devices, often located in telephone exchanges that connects multiple customer digital subscriber line (DSL) interfaces to a high-speed digital communications channel using multiplexing techniques. DSLAM connects all data and then multiplex those data.

2.7 Path taken by data to DSLAM

1. Customer premises: DSL modem terminating the ADSL, SHDSL or VDSL circuit and providing a LAN interface to a single computer or LAN segment.
2. Local loop: the telephone company wires from a customer to the telephone exchange or to a serving area interface.
3. Telephone exchange:

- Main distribution frame (MDF): a wiring rack that connects outside subscriber lines with internal lines. It is used to connect public or private lines coming into the building to internal networks. At the telco, the MDF is generally in proximity to the cable vault and not far from the telephone switch.
- xDSL filters: DSL filters are used in the telephone exchange to split voice from data signals. The voice signal can be routed to a plain old telephone service (POTS) provider or left unused whilst the data signal is routed to the ISP DSLAM via the HDF (see next entry).
- Handover distribution frame (HDF): a distribution frame that connects the last mile provider with the service provider's DSLAM
- DSLAM: a device for DSL service. The DSLAM port where the subscriber local loop is connected converts analog electrical signals to data traffic (upstream traffic for data upload) and data traffic to analog electrical signals (downstream for data download).

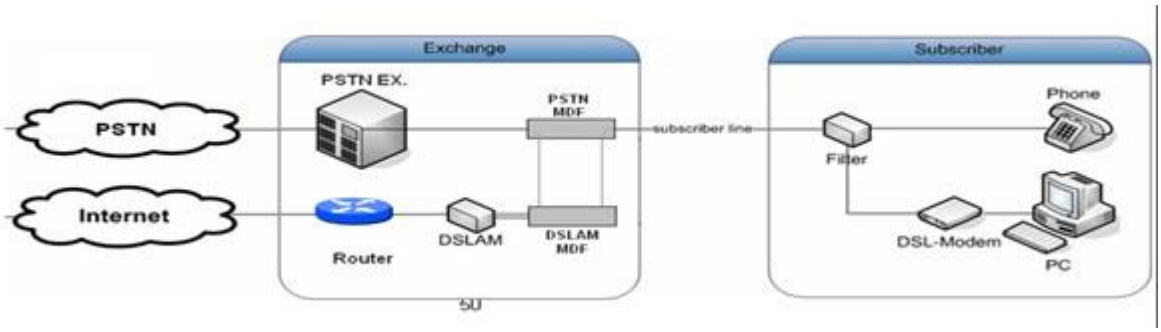


Fig.2.7.1 Path taken by data to DSLAM

Fig.2.7.2 Path taken by data to DSLAM

2.8 Public Switched Telephone Network (PSTN)

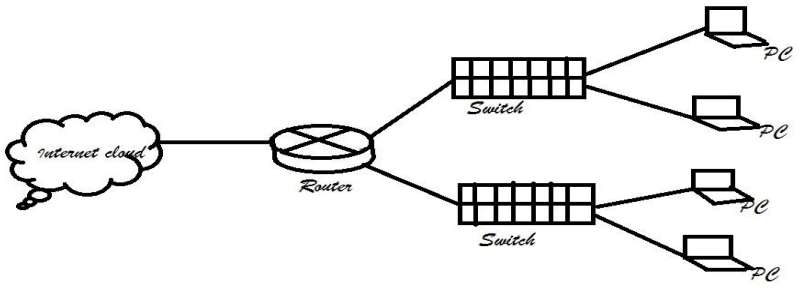


Fig: PSTN

Fig.2.8.1 PSTN

PSTN (Public Switched Telephone Network) or Landline
PSTN has many services.

1. Local call- within same exchange or multi exchange
2. NWD- Nation Wide Dialing. It requires NWD code.
3. ISD- International Subscriber Dialing. From an ISD phone, dial 00, then country code and number.
4. ISDN- Integrated Services Digital Network. At BTCL we learn, BTCL provides value added services(VAS) like call barring, Abbreviated dialing, Call Conference, Call waiting, Wakeup call(Alarm), Subscriber absence massage facilities, call establish facilities to busy subscriber, Hotline facilities, Call forwarding, Temporary disconnection on request, Don't disturb massage etc.

There are two reasons for using landline. These are:

1. Voice
2. Data

For voice;
Suppose, at Gulshan exchange, there are 5000 lines and 30 cards. The lines are connected with horizontal & vertical terminator on MDF room. MDF means Main Distribution frames. Horizontal is shorted with vertical. Then from vertical, lines are separated in different parts. Those separate parts go to the cabinet. In cabinet, there are two steps. These are, primary and secondary. From cabinet wires are connected to the digital port (DP). Then DP supplies the lines to home of user & that is voice.

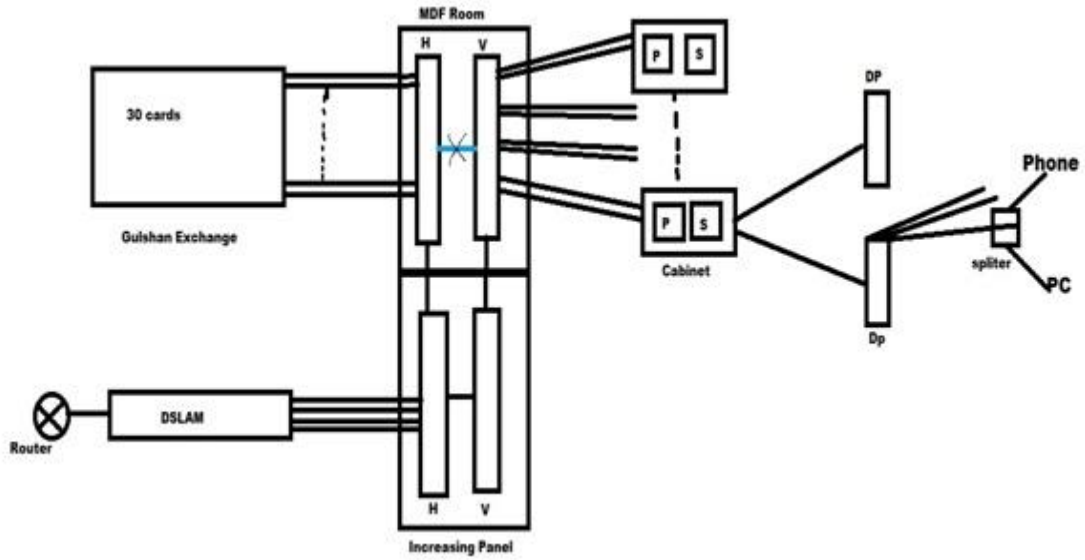


Fig.2.8.2 PSTN

But when user want to use internet, have to use DSLAM. DSLAM connected with a router. And router connected with switch. It has three servers-

1. AAA server (Authorization Accusting Authentication)
2. Billing server
3. BRAS (Broadcast Remote Access Switch)

DSLAM has also many cards. For this, the panel of MDF room, have to increase, the connection of horizontal & vertical have to be open & the horizontal of MDF will be connected to the horizontal of increasing panel. DSLAM multiplex all the data & connected to the Horizontal terminator of increasing panel. Here horizontal will be shorted with the vertical. The vertical terminator of increasing panel is connected with the vertical of MDF room. Thus data and voice both are passes together from MDF to cabinet. Now have to use spliter at home with DP. Spliter split the data & voice. There are two ports. One is for voice/ phone & another is for data/PC. Thus internet is used in telephone exchange.

2.9 Bandwidth versus distance

Balanced pair cable has higher attenuation at higher frequencies. Therefore, the longer the wire between DSLAM and subscriber, the slower the maximum possible data rate due to the lower frequencies being utilized to limit the total attenuation (or due to the higher number of errors at higher frequencies, effectively lowering the overall frequency/data rate). The following is a rough guide to the relation between wire distance (based on 0.40 mm copper and ADSL2+ technology) and maximum data rate. Local conditions may vary, especially beyond 2 km, often necessitating a closer DSLAM to bring acceptable bandwidths:

- 25 Mbit/s at 1,000 feet (~300 m)
- 24 Mbit/s at 2,000 feet (~600 m)
- 23 Mbit/s at 3,000 feet (~900 m)
- 22 Mbit/s at 4,000 feet (~1.2 km)
- 21 Mbit/s at 5,000 feet (~1.5 km)
- 19 Mbit/s at 6,000 feet (~1.8 km)

- 16 Mbit/s at 7,000 feet (~2.1 km)
- 8 Mbit/s at 10,000 feet (~3 km)
- 3 Mbit/s at 15,000 feet (4.5 km)
- 1.5 Mbit/s at 17,000 feet (~5.2 km)

2.10 Projects

In BTCL ADSL connection there are five projects. These are:

1. Huawei
2. KT
3. Jica
4. AGW
5. ONU

BTCL has three outsourcing company to support the network of the outside area. There is a condition between these company and BTCL. It can be change after ending the condition if could not satisfy. These companies are:

1. Emem
2. Sisview
3. SSL

KT

Each DSLAM has five slots or subscriber cards & one control card. Each slot has 24 ports. If the control card won't work then the system will fail and got an alarm.

JICA

1 card has 64 ports.

First active the last port, then enter the information that given in the application form.

Huawei

Huawei has total 16 cards. Each card has 32 ports. If any card open then the color is red.

There are 2 types of cards.

1. ADGE- Subscriber card
2. SCUA- Control card

   14 cards for subscriber and 2 cards for control

ONU

ONU stands for Optical Network Unit. It is used for small area of ADSL. ONU has 4 cards. Each card has 32 ports. We can only use 128 ports for subscriber not more than that. It's for the user who stays 3 or 4 kilometers away from ADSL port.

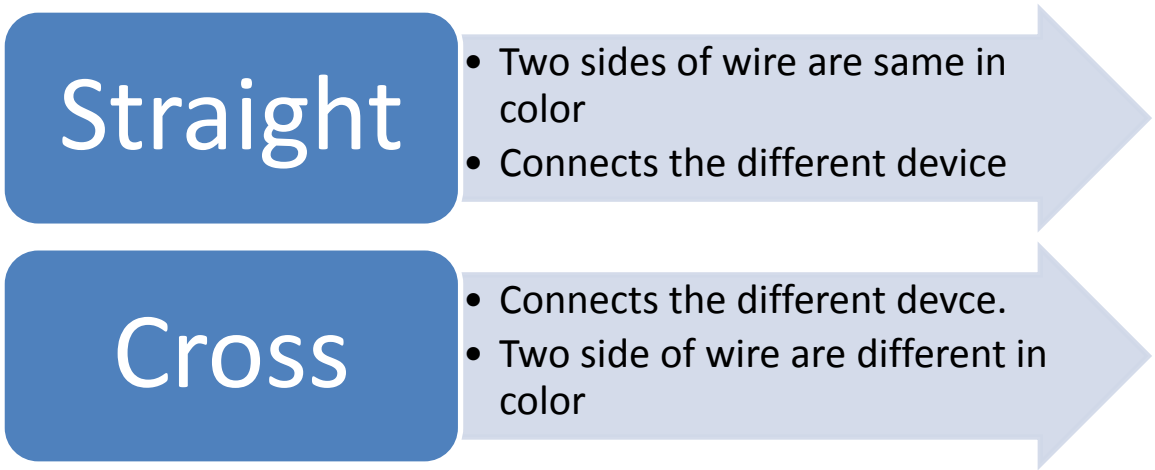
AGW

The digit number is 8 and starts with 5. There are 2 control cards. One is running and another is standby. If one is fault then other is automatically start to run.

In the server room we see the system. At the system we get voice from the telephone exchange & mix them with data in DSLAM then send them to the subscriber to use.

2.11 Ethernet Cable:

There are two types of Ethernet cable.



There are total eight colors of cable of Ethernet cable. Four are full color and four are mix with white.

1. White green
2. Green
3. Orange white
4. Blue
5. Blue white
6. Orange
7. Brown white
8. Brown

2.11.1Port

1. Consol port: Used to work in device
2. Subscriber Port : Used to connect with other device
3. Management Port: Used to work in NMS

2.12 Procedure

We learn the procedure of;

- New Connection
- Re-Connection
- Temporary Disconnection

- Permanent Close
- Migration
- Billing
- Shifting
- Disconnection

2.12.1 Procedure of New Connection:

A customer who wants to take BTCL ADSL connection, first they come to BTCL office and pay an amount 400/- and fill up an application. That is demand note. Then an advice note is given to them by Local BTCL main office. Then it is signed by the DE of BTCL and sends it to the Junior Assistant Manager. Then data entered at billing server. After that, data are checked by the JAM and verified and then data are re-checked by the Assistant Manager and approved. After approving the data, a massage including user name and password send to the user. Finally jumpering from BTCL local office MDF room, the outside workers reach the line to the user home.

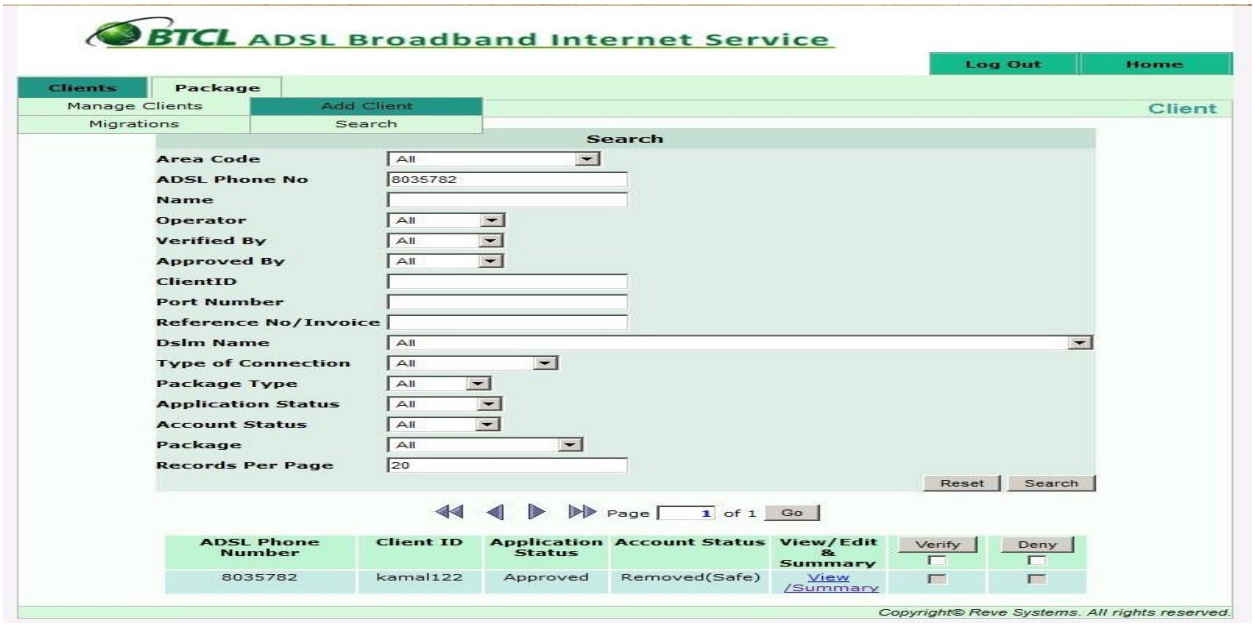


Fig.2.12.1.1 Form of adding client

In the BTCL website enter the client tab> add client

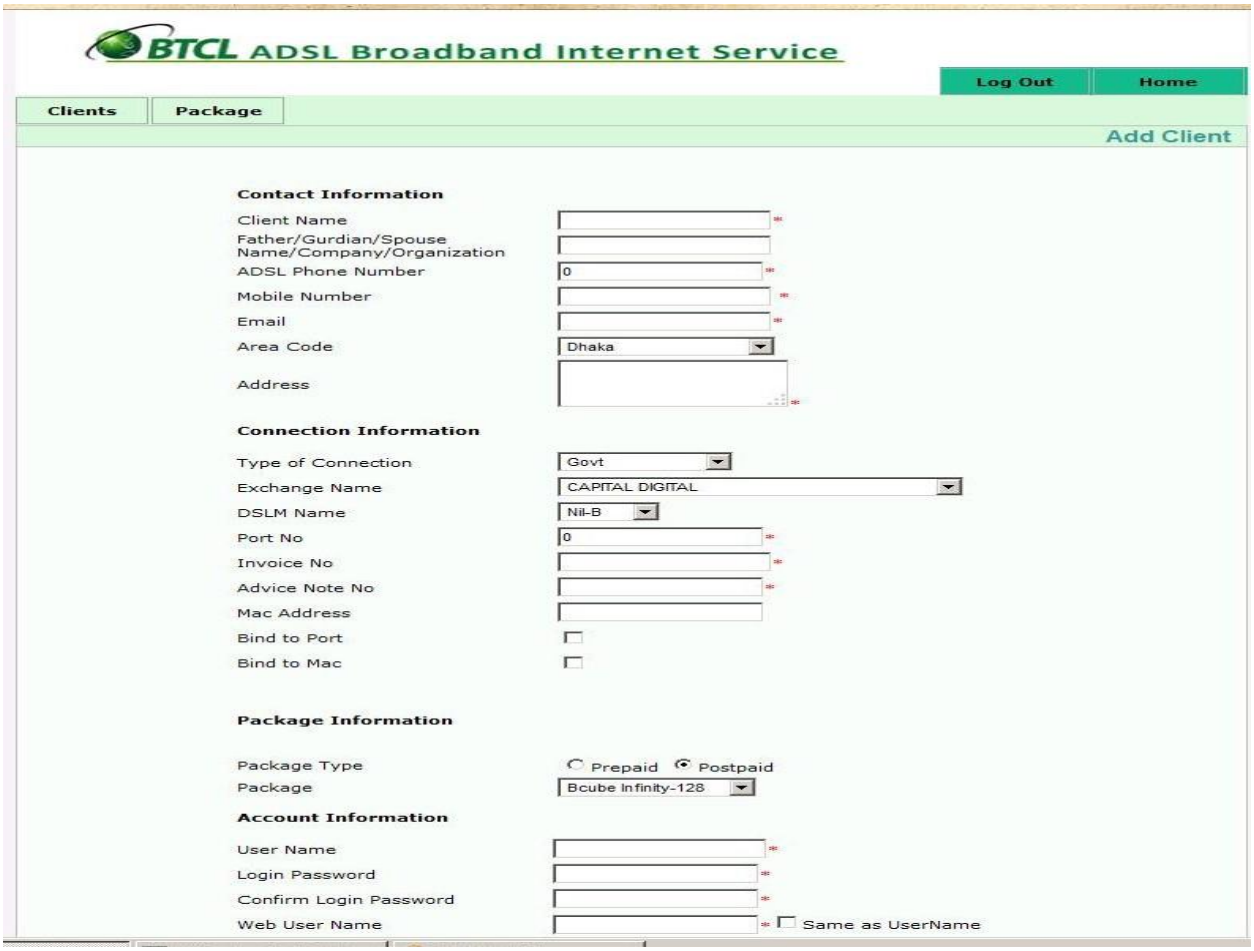


Fig2.12.1.2 Data entry form of add client

2.12.2 Migration

'Migration' is used if any client wants to increase or decrease their speed of package. User applies to change their package to the local office of BTCL Mogbazar or in the outsourcing company of BTCL. Then they send the hard copy or mail the softcopy to the BTCL. Then list all the names of migration. For this, have to enter the BTCL website. Then the form of BTCL ADSL broadband internet service page will be opened. Have to enter in the manage client. Then have to enter the phone number and there from migration package have to change the package. To show the user summery have to enter the manage client then have to search the user by phone number.

manage client -> search -> client phone number -> summary

↳ migration -> phone number ->migration package; charge (if large to small), invoice number and description -> add

From high to low speed have to pay an amount of charge.

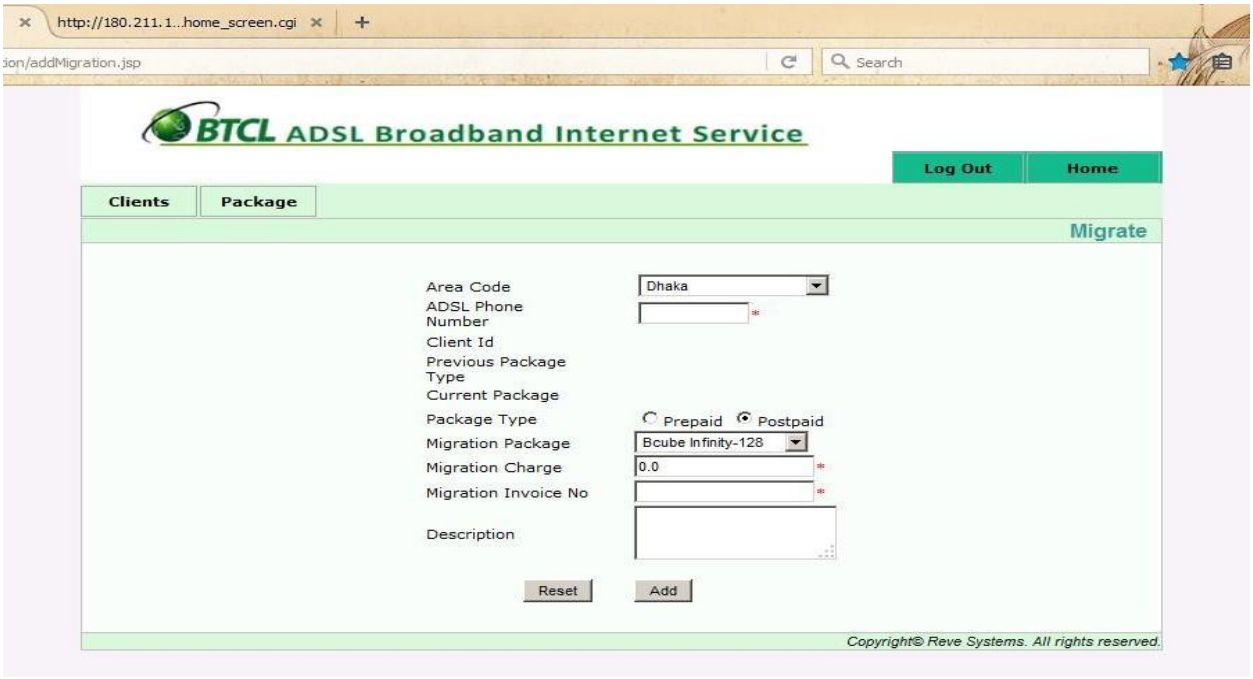


Fig.2.12.2 Migration form

2.12.3 Temporary Disconnection:

If any client didn't pay their bill at due time then their connection would be disconnected temporary. For this, 1st have to search the IP then go to the btcl website> ADSL> Line config & info> Line Configuration. Then have to search the serial number by changing the slot & port. Have to click the serial number and in the admin box have to off and then modify. After that from side bar have to click in the LT ADSL port service. There have to write 'td' that means temporary disconnect.

2.12.4 Transfer number

To transfer from Huawei to ONU first have to deactivate that number from Huawei project. Then in the ONU-

Search (ctrl+F) > type the number

Then activate at ONU project.

2.12.5 Shifting

Shift (new tab) -> enter old and new information

The new information has to alise in new port and has to remove previous port so that old port is not knocked by anyone and have to close the old port permanently.

Chapter 3

Administration & Co-Ordination

In BTCL Administration & Co-Ordination division there are many projects. These are:

1. VPN or Virtual Private Network

2. Co-location

3. .bd domain etc.

3.1 VPN or Virtual Private Network

A VPN or Virtual Private Network is a method used to add security and privacy to private and public networks, like

A Virtual Private Network (VPN) is a network technology that creates a secure network connection over a public network such as the Internet or a private network owned by a service provider. Large corporations, educational institutions, and government agencies use VPN technology to enable remote users to securely connect to a private network.

A VPN can connect multiple sites over a large distance just like a Wide Area Network (WAN). VPNs are often used to extend intranets worldwide to disseminate information and news to a wide user base. Educational institutions use VPNs to connect campuses that can be distributed across the country or around the world.

In order to gain access to the private network, a user must be authenticated using a unique identification and a password. An authentication token is often used to gain access to a private network through a personal identification number (PIN) that a user must enter. The PIN is a unique authentication code that changes according to a specific frequency, usually every 30 seconds or so.

3.2 VPN Security

Security is the main reason why corporations have used VPNs for years. There are increasingly simple methods to intercept data traveling to a network. WiFi spoofing and Fire-sheep are two easy ways to hack information. A useful analogy is that a firewall protects your data while on the computer and a VPN protects your data on the web. VPNs use advanced encryption protocols and secure tunneling techniques to encapsulate all online data transfers. Most savvy computer users wouldn't dream of connecting to the Internet without a firewall and up-to-date antivirus. Evolving security threats and ever increasing reliance on the Internet make a VPN an essential part of well-rounded security. Integrity checks ensure that no data is lost and that the connection has not been hijacked. Since all traffic is protected, this method is preferred to proxies.

3.3 Setting up a VPN

Setting up a VPN is a straightforward process. It's often as simple as entering a username and sever address. The dominant smart phones can configure VPNs using PPTP and L2TP/IPsec protocols. All major operating systems can configure PPTP VPN connections. Open VPN and L2TP/IPsec protocols require a small open source application (Open VPN) and certificate download respectively.

3.4 VPN Protocols

There are a number of VPN protocols in use that secure the transport of data traffic over a public network infrastructure. Each protocol varies slightly in the way that data is kept secure.

IP security *(*IPSec*)* is used to secure communications over the Internet. IPSec traffic can use either transport mode or tunneling to encrypt data traffic in a VPN. The difference between the two modes is that transport mode encrypts only the message within the data packet (also known as the payload) while tunneling encrypts the entire data packet. IPSec is often referred to as a "security overlay" because of its use as a security layer for other protocols.

Secure Sockets Layer *(*SSL*)* and **Transport Layer Security** *(*TLS*)* use cryptography to secure communications over the Internet. Both protocols use a "handshake" method of authentication that involves a negotiation of network parameters between the client and server machines. To successfully initiate a connection, an authentication process involving certificates is used. Certificates are cryptographic keys that are stored on both the server and client.

Point-To-Point Tunneling Protocol *(*PPTP*)* is another tunneling protocol used to connect a remote client to a private server over the Internet. PPTP is one of the most widely used VPN protocols because of it's straightforward configuration and maintenance and also because it is included with the Windows operating system.

Layer 2 Tunneling Protocol *(*L2TP*)* is a protocol used to tunnel data communications traffic between two sites over the Internet. L2TP is often used in tandem with IPSec (which acts as a security layer) to secure the transfer of L2TP data packets over the Internet. Unlike PPTP, a VPN implementation using L2TP/IPSec requires a shared key or the use of certificates.

VPN technology employs sophisticated encryption to ensure security and prevent any unintentional interception of data between private sites. All traffic over a VPN is encrypted using algorithms to secure data integrity and privacy. VPN architecture is governed by a strict set of rules and standards to ensure a private communication channel between sites. Corporate network administrators are responsible for deciding the scope of a VPN, implementing and deploying a VPN, and ongoing monitoring of network traffic across the network firewall. A VPN requires administrators to be continually be aware of the overall architecture and scope of the VPN to ensure communications are kept private.

3.5 VPN Providers

There are many choices when it comes to VPN providers. There are some VPN providers who offer free service and there are some which charge for VPN service. We have found that the

paid VPN providers such as VyprVPN are preffered to the free service providers. They offer robust gateways, proven security, free software, and unmatched speed.

3.6 Advantages & Disadvantages

A VPN is a inexpensive effective way of building a private network. The use of the Internet as the main communications channel between sites is a cost effective alternative to expensive leased private lines. The costs to a corporation include the network authentication hardware and software used to authenticate users and any additional mechanisms such as authentication tokens or other secure devices. The relative ease, speed, and flexibility of VPN provisioning in comparison to leased lines makes VPNs an ideal choice for corporations who require flexibility. For example, a company can adjust the number of sites in the VPN according to changing requirements.

There are several potential disadvantages with VPN use. The lack of Quality of Service (QoS) management over the Internet can cause packet loss and other performance issues. Adverse network conditions that occur outside of the private network is beyond the control of the VPN administrator. For this reason, many large corporations pay for the use of trusted VPNs that use a private network to guarantee QoS. Vendor interoperability is another potential disadvantage as VPN technologies from one vendor may not be compatible with VPN technologies from another vendor. Neither of these disadvantages has prevented the widespread acceptance and deployment of VPN technology.

3.7 Connection of VPN

Here's how you can use the Web the way it was intended: with access to content from any websites in the world, from wherever you are.

But Internet freedom is only part of it. You also want to be safe, with peace of mind knowing that NO ONE can intercept your data, eavesdrop on your Internet activity, or trace any email or blog posts back to you...whether that's an airport or hotel hacker, or a government censor or spy.

What you need is a simple way to keep them out of your computer.

You can thwart anyone (even advertisers) from tracking your Internet activity and more by signing up for a reliable virtual private network...a VPN. Maybe you've heard that there are free proxy services that let you access some blocked content online and offer some security. But for better speed and security, you need a top-rated VPN.

3.8 How does it works

You won't believe how simple it is. A virtual private network lets you use the entire Internet as if it's your own private network. As a result, you get high security and exclusive access to content that you normally would be blocked from seeing.

- You don't switch Internet service. A VPN is an online service. You simply open an account, download their software and then get back online.
- It's very affordable for the safety and flexibility you get.
- A good VPN account works for computers, smart phones and other devices.

3.8.1 No one can block you, No one can find you

Have you worried about accessing Web content at work, at school or internationally? And do stories—true stories!—about Internet snoopers and hackers worry you?

With a VPN, you're in control.

- No hacker can read your data as it travels because VPN software encrypts your data—turns it into unreadable code—and gives you total privacy online.
- Read content from other countries. Want to view content from other countries? If you're looking for blocked content from abroad, all you have to do is choose your virtual "nation" from a choice of countries.

3.8.2 IP address gives us location (and computer) away

Here's how a good VPN fools everyone

Right now, the computer you use tells a website to send information right back to our computer's electronic (ISP) address.

But not when we use a VPN. Instead of our computer giving out its real IP address, our VPN switches it to a substitute...one that we're borrowing from them. When we go online and log in to our VPN account, our actual IP address is invisible to the world.

So anything want to see on the Internet—any emails you're getting or results from a Google search—are first delivered to your virtual "P.O. box"—the borrowed IP address. After that, all content you have requested is forwarded to you, instantly and securely.It works the other way around too. Anything you send out goes through your VPN first.

3.8.3 VPN means safety

If you choose a good VPN service, your address will stay a total secret with them. So a curious government sensor or eavesdropper would have no idea you're not where they think you are.

And what about Internet spies, snoopers and hackers? Even they can't trace your emails, blog posts, YouTube posts or anything else back to your real location. They won't be able to find out what city or neighborhood you're in!

3.9 Co-location

Co-location is a server, usually a Web server that is located at a dedicated facility designed with resources which includes a secured cage or cabinet, regulated power, dedicated Internet connection, security and support.

These co-location facilities offer the customer a secure place to physically house their hardware and equipment as opposed to locating it in their offices or warehouse where the potential for fire, theft or vandalism is much greater.

Co-location -the moving or placing things together, sometimes imply a proper order. This term derived from collocation and often spelled "co-location", is used to mean the provision of space for a customer's telecommunications or computer equipment at the service provider's premises. For example, a Web site owner could place the site's own computer servers on the premises of the Internet service provider (ISP). Or an ISP could place its network routers on the premises of the company offering switching services with other ISPs. Businesses often co-locate their equipment with a service provider in order to take advantage of higher bandwidth availability and backup power.

3.9.1 Digital Defense

Co-location sites are being erected at various points around the world to provide services to the rapidly expanding Web hosting and e-commerce marketplace. The term co-location is also known as colo.

3.10 Co-Location Facilities

Most co-location facilities offer high-security, including cameras, fire detection and extinguishing devices, multiple connection feeds, filtered power, backup power generators and other items to ensure high-availability which is mandatory for all Web-based, virtual businesses.

Co-location Services are composed of two (2) basic components:

1. Rack Space Rental Fees - These fees are paid to the provider to "lease" space at the provider's data center. Normally the rental fees include basic electrical service up to a certain voltage and amperage. Additional fees may be assessed if there are unique power requirements. Fees are typically assessed by the single rack unit (1U), 1/2 rack (21U) or full rack (42U). Most rack mount servers are between 1U and 4U in size. If you colocate more than a single server, you will most likely be charged for at least one additional rack space to accommodate an Ethernet switch.
2. Internet Connection Charges - These are fees paid to the provider for bandwidth. Most modern data centers provide bandwidth to their connected clients via a dedicated 10 Mbps or 100 Mbps Ethernet connection. 1000 Mbps (1 Gigabit) connections are available but usually cost more and few clients need this level of connectivity to the Internet. Fees are based upon the connection speed and not upon the total volume of data transferred. Typically, co-location providers meter data that is actually transferred across the client's dedicated port and passed to the Internet. Connections between a colocated client's equipment connected to their Ethernet switch is not metered and is transferred at the full speed supported by the switch.

In BTCL there are three main operator services:

1. Rack Space

Rack space refers to the amount of physical space your server or servers take up in a rack in a co-location facility. Typical full racks are 42 units (see below) and run from floor to ceiling. The co-location facility provides the access to the network and you basically rent space to house your servers in either a cabinet or an open rack. You typically buy a server that can be mounted on racks in the cabinet, therefore the space you rent is referred to as "rack space".

2. Core /Optical fiber

Fiber Optic Broadband gives small Businesses fast access to the Internet and our Data Centre. We offer very low contention ratio, they are some of the lowest contention ratios in the industry. We are very transparent when it comes to our service, there are no Fair Usage policies to slow your internet connection down at any time. Fiber Broadband is delivered over Fiber Optic and copper cables, therefore the speed that you sign up to will be the speed that you receive.

3. Power

One of the costs associated with server co-location is the amount of power you need to run your servers. Selecting power saving equipment will help ensure you do not utilize more power than allotted for the space you are renting. Additionally even if you have enough power based on your contract you may end up breaking a circuit if you use too much power. Therefore it's best to choose power-efficient equipment and work with your selected provider prior to purchasing equipment to make sure that you purchase the right equipments with the right power requirements.

With the proliferation of power-hungry equipment, it is becoming more common for co-location providers to meter power on a per customer basis. Those that do not meter power today will do so in the very near future. Don't be surprised when your provider incorporates this aspect into your monthly billing.

In addition to the amount of power you use, you will want to make sure the facility where you host your servers has failover such as batteries and generators in case of a power failure, and temperature control and monitoring to ensure your equipment does not overheat.

Prior to co-locating, it is vital that you understand the power needs of your equipment. Is your equipment 110 V with standard plug connectors or does your equipment require special voltages, amperages or outlets? With many corporations moving to blade type server configurations, understanding power and cooling requirements is critical. This types of server usually require 204 V or pull more amps than most data center racks are equipped to handle. In addition, these types of servers generate an extreme amount of heat that must be removed from the data center.

Co-location facilities include:

- Fully redundant high-capacity power feeds
- AC or DC power included
- Battery UPS back-up to generator power
- Fully redundant HVAC system
- Controlled temperature and humidity
- Remote outlet management
- Fire-threat detection and suppression (including pre-warning systems)

3.11 IPLC Circuit Diagram

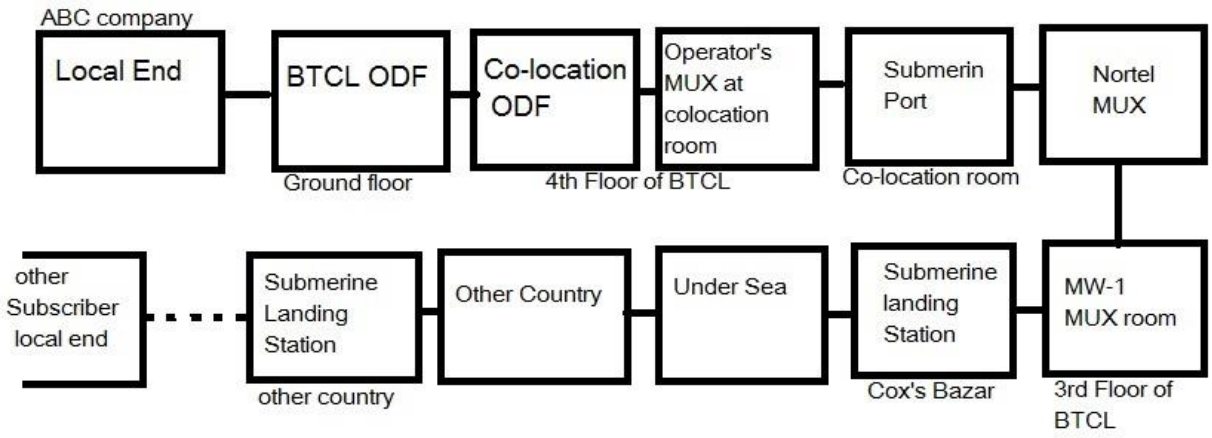


Fig.3.11 IPLC Circuit Diagram

3.12 Various Operator's List at Moghbazar Co-location Room

Table3.1: List of the "IGW" Operators

SL. Nos.	Name of the Operators	Status
01	APPle Networks	**T/D**
02	Bangla Tel	**Active**
03	Bangla Trac	**Active**
04	BG Tel	**Active**
05	Cel Telecom	**Active**
06	DBL Telecom	**Active**
07	Digicon Telecommunication	**Active**
08	Global Voice	**Active**
09	HRC Tenhnologies	**Active**
10	Kay Telecom	**T/D**
11	Mir Telecom	**Active**
12	Mos-5 Tel	**T/D**
13	Novo Tel	**Active**
14	Ratul Telecom	**T/D**
15	Roots Communication	**Active**
16	SM Communication	**T/D**
17	Telex	**T/D**
18	Unique Infoway	**Active**
19	Vision Tel	**T/D**
20	Venus Telecom	**Active**

Table3.2: List of the "IIG" Operators

SL Nos	Name of the Operators	Status
01	Aamra Technology	**Active**
02	BD Hub	**Closed**

03	BD Link Communication	**Active**
04	Cyber Gate	**Closed**
05	Delta Info	**Active**
06	Earth Communication	**T/D**
07	Fiber at Home	**Active**
08	Level-3 Carrier	**Active**
09	Link-3	**Active**
10	Mango Tele Services	**Closed**
11	Novo Com	**Active**
12	1-Asia-AHL JV	**Closed**
13	Rego Telecom	**T/D**
14	Sumit Communication	**Active**
15	Managewell Communication	**Active**

Table3.3: List of the "ICX" Operators

SL Nos	Name of the Operators	Status
01	E-Bangla	**Active**
02	M & H Telecom	**Active**
03	SR Telecom	**Active**
04	Getco	**Active**

Table3.4: List of the "ITC" Operators

SL Nos	Name of the Operators	Status
01	BD Link	**Active**
02	BSCCL	**Active**
03	Fiber at Home	**Active**
04	Novocom	**Active**
05	Mango Tele Service	**Closed**
06	1 Asia-AHL JV	**Closed**
07	Sumit Communication	**Active**

Table3.5: List of the "DDCSP" Operators

SL Nos	Name of the Operators	Status
01	Aamra Networks	**Active**
02	ADN Telecom	**Active**
03	BD Online	**Active**
04	BD Com Online	**Active**
05	Dhaka Com	**Active**
06	Telnet	**Active**
07	World Tel	**T/D**

Table3.6: List of the "NTTN" Operators

SL Nos	Name of the Operators	Status
01	Fiber at Home	**Active**
02	Sumit Communication	**Active**

Table3.7: List of the "IPTSP" Operators

SL Nos	Name of the Operators	Status
01	Agni System	**Active**
02	Connect BD	**Active**
03	Eastern Bank	**Active**
04	Fusion Net	**Active**

05	Global Networks	**Active**
06	HN Telecom	**Active**
07	ISN	**Active**
08	Idea Networks	**Active**
09	IS Pros	**Active**
10	Metro Net	**Active**
11	Next Online	**Active**
12	N-Reach Networks	**Active**
13	Ranks ITT	**Active**
14	Ranks Telecom	**Active**

Table3.8: List of the "Telephone E1" Operators

SL Nos	Name of the Operators	Status
01	Rahim Afrooz	**Active**
02	Southeast Bank	**Active**
03	Bank Asia	**Active**

Table3.9: List of the "Mobile" Operators

SL Nos	Name of the Operators	Status
01	Air Tel	**Active**
02	Bangla Link	**Active**

Table3.10: List of the "ISP" (Local) Operators

SL Nos	Name of the Operators	Status
01	Broad Band Tele Service(BBTS)	**Active**

3.13 Domain

Domain names are used to identify one or more IP addresses. For example, the domain name *microsoft.com* represents about a dozen IP addresses. Domain names are used in URLs to identify particular Web pages. For example, in the URL *http://www.pcwebopedia.com/index.html,* the domain name is *pcwebopedia.com.*

Every domain name has a suffix that indicates which top level domain (TLD) it belongs to. There are only a limited number of such domains. For example:

- **gov** - Government agencies
- **edu** - Educational institutions
- **org** - Organizations (nonprofit)
- **mil** - Military
- **com** - commercial business
- **net** - Network organizations
- **ca** - Canada

 bd - Bangladesh

Because the Internet is based on IP addresses, not on domain names, every Web server requires a Domain Name System (DNS) server to translate domain names into IP addresses.

3.14 Server

Servers are often dedicated, meaning that they perform no other tasks besides their server tasks. On multiprocessing operating systems, however, a single computer can execute several programs at once. A server in this case could refer to the program that is managing resources rather than the entire computer. Server is a computer or device on a network that manages network resources. There are many different types of servers. For example:

- File server: a computer and storage device dedicated to storing files. Any user on the network can store files on the server.
- Print server: a computer that manages one or more printers, and a network server is a computer that manages network traffic.
- Database server: a computer system that processes database queries.
- Web server: are computers that deliver (*serves up*) Web pages. Every Web server has an IP address and possibly a domain name. For example, if you enter the URL *http://www.webopedia.com/index.html* in your browser, this sends a request to the Web server whose domain name is *webopedia.com*. The server then fetches the page named *index.html* and sends it to your browser. Any computer can be turned into a Web server by installing server software and connecting the machine to the Internet. There are many Web server software applications, including public domain software and commercial packages
- Proxy server: A proxy server is a server that sits between a client application, such as a Web browser, and a real server. It intercepts all requests to the real server to see if it can fulfill the requests itself. If not, it forwards the request to the real server.
- Application server: Also called an *app server*, an application server is a program that handles all application operations between users and an organization's backend business applications or databases. An application server is typically used for complex.
- Cloud server: Cloud server hosting is a type of hosting in which hosting services are made available to customers on demand via the Internet. Rather than being provided by a single server or virtual server, cloud server hosting services are provided by multiple connected servers that comprise a cloud. Cloud server hosting is also sometimes referred to as cluster server hosting or server on-demand hosting.

3.15 Domain Name Servers

Domain Name Servers (DNS) are the Internet's equivalent of a phone book. They maintain a directory of domain names and translate them to Internet Protocol (IP) addresses.

This is necessary because, although domain names are easy for people to remember, computers or machines, access websites based on IP addresses.

Information from all the domain name servers across the Internet are gathered together and housed at the Central Registry. Host companies and Internet Service Providers interact with the Central Registry on a regular schedule to get updated DNS information.

When you type in a web address, e.g., www.royal.edu.bd, your Internet Service Provider views

the DNS associated with the domain name, translates it into a machine friendly IP address (for example 216.168.224.70 is the IP for jimsbikes.com) and directs your Internet connection to the correct website.

After you register a new domain name or when you update the DNS servers on your domain name, it usually takes about 12-36 hours for the domain name servers world-wide to be updated and able to access the information

3.16 .bd Domain

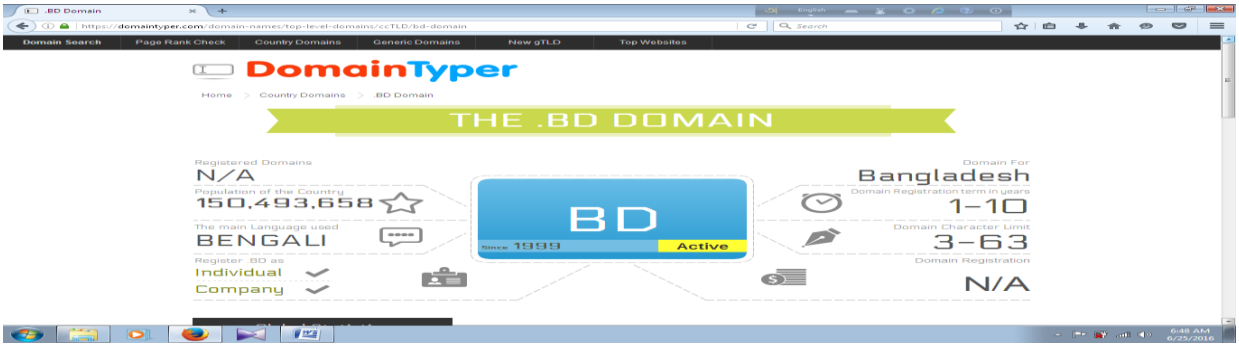


Fig.3.16.1 .bd domain page

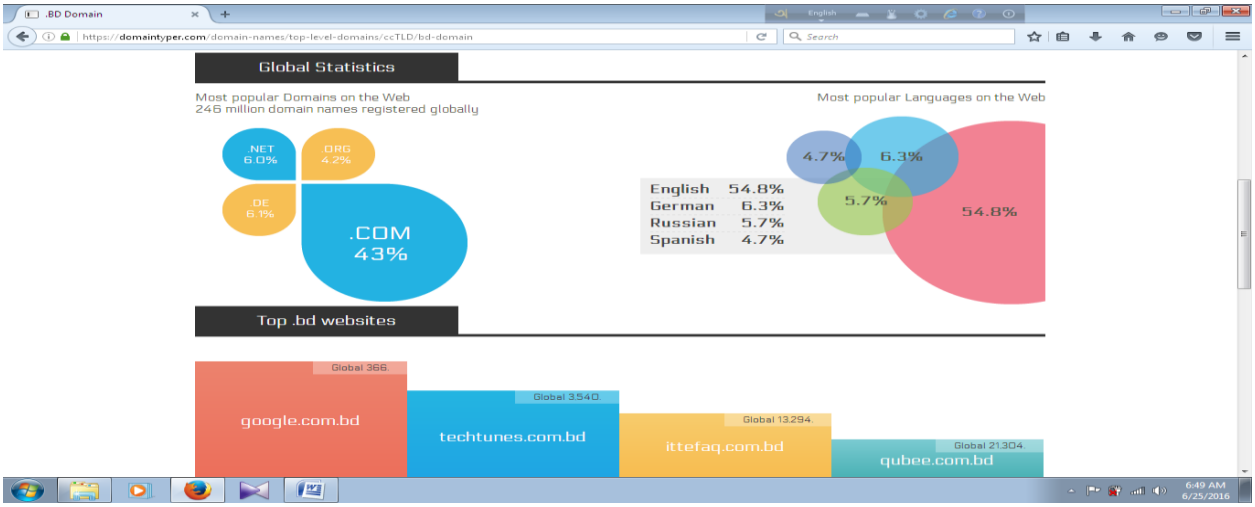


Fig.3.16.2 Statistics of .bd domain

The .bd web name is the country code top-level domain (ccTLD) for Bangladesh. Bangladesh with its estimated population of 150, 493, 658, ranks as the 5th most populous country in Asia. These domains with the .bd extension are very popular in Bangladesh and around its geographical area. You can register your own .bd domain and create a professional web page, a personal website, a blog or an online portal to demonstrate the connection to this region.

The .bd ccTLD (country code top-level domain) is very active and gaining popularity since 1999.

3.17 Register .bd domain

The .bd web name can be registered by legal entities or individuals.

3.17.1 Choose a domain name with a .bd extension

A .bd domain name could be one of the best choices for local and international companies wanting to represent their business in Bangladesh. In Bangladesh the primary used language is Bengali. The 6 most popular languages used for websites is English, German, Russian, Spanish, French and Chinese, but you can use any other languages as well. A website with a .bd extension helps you reach your audience easier and also give a professional look to your company. When you target this local market with a local domain name, you demonstrate proof of your commitment to the local customers. In this way you can maximize your website's revenues. Along with this, it is much easier to register a short or a common word in a ccTLD (country code top-level domain) than with other more popular domain names like .com or .net. Additionally, country code top-level domain gives you the opportunity to find domain hacks much easier.

The following characteristics that a domain name can have

For a .bd web name use only letters, numbers, or hyphen. A domain may start with a letter or a number and end with a letter or a number. The domain cannot start or end with dashes. A .bd name does not contain dashes in the third and fourth positions (e.g. www.ab- -cd.bd). Spaces and special characters and stressed vowels (such as à, é, ò, í) are never permitted. The .bd web name length may vary, from 3 to 63 types. The web name that does not follow the above limitations will not be accepted for registration.

3.17.2 Domain name registration term allowance

The .bd domain name registration interval: 1-10 years registrations are allowable at a time.

3.18 Wireless technologies

3.18.1 Repeaters and hubs

A repeater is an electronic device that receives a network signal, cleans it of unnecessary noise and regenerates it. The signal is retransmitted at a higher power level, or to the other side of an obstruction, so that the signal can cover longer distances without degradation. In most twisted pair Ethernet configurations, repeaters are required for cable that runs longer than 100 meters. With fiber optics, repeaters can be tens or even hundreds of kilometers apart.

A repeater with multiple ports is known as a hub. Repeaters work on the physical layer of the OSI model. Repeaters require a small amount of time to regenerate the signal. This can cause a propagation delay that affects network performance. As a result, many network architectures limit the number of repeaters that can be used in a row.

Hubs have been mostly obsoleted by modern switches; but repeaters are used for long distance links, notably undersea cabling.

3.18.2 Bridges

A network bridge connects and filters traffic between two network segments at the data link layer (layer 2) of the OSI model to form a single network. This breaks the network's collision domain but maintains a unified broadcast domain. Network segmentation breaks down a large, congested network into an aggregation of smaller, more efficient networks.

Bridges come in three basic types:

- Local bridges: Directly connect LANs
- Remote bridges: Can be used to create a wide area network (WAN) link between LANs. Remote bridges, where the connecting link is slower than the end networks, largely have been replaced with routers.
- Wireless bridges: Can be used to join LANs or connect remote devices to LANs.

3.18.3 Switches

A network switch is a device that forwards and filters OSI layer 2 datagrams (frames) between ports based on the destination MAC address in each frame. A switch is distinct from a hub in that it only forwards the frames to the physical ports involved in the communication rather than all ports connected. It can be thought of as a multi-port bridge. It learns to associate physical ports to MAC addresses by examining the source addresses of received frames. If an unknown destination is targeted, the switch broadcasts to all ports but the source. Switches normally have numerous ports, facilitating a star topology for devices, and cascading additional switches.

Multi-layer switches are capable of routing based on layer 3 addressing or additional logical levels. The term switch is often used loosely to include devices such as routers and bridges, as well as devices that may distribute traffic based on load or based on application content (e.g., a Web URL identifier).

3.18.4 Routers

Fig.3.18.4 A typical home or small office router showing the ADSL telephone line and Ethernet network cable connections

A router is an internetworking device that forwards packets between networks by processing the routing information included in the packet or datagram (Internet protocol information from layer 3). The routing information is often processed in conjunction with the routing table (or forwarding table). A router uses its routing table to determine where to forward packets. A destination in a routing table can include a "null" interface, also known as the "black hole" interface because data can go into it, however, no further processing is done for said data, i.e. the packets are dropped.

3.18.5 Modems

Modems (MOdulator-DEModulator) are used to connect network nodes via wire not originally designed for digital network traffic, or for wireless. To do this one or more carrier signals are modulated by the digital signal to produce an analog signal that can be tailored to give the required properties for transmission. Modems are commonly used for telephone lines, using a Digital Subscriber Line technology.

3.18.6 Firewalls

A firewall is a network device for controlling network security and access rules. Firewalls are typically configured to reject access requests from unrecognized sources while allowing actions from recognized ones. The vital role firewalls play in network security grows in parallel with the constant increase in cyber attacks.

3.19 Organizational scope

Networks are typically managed by the organizations that own them. Private enterprise networks may use a combination of intranets and extranets. They may also provide network access to the Internet, which has no single owner and permits virtually unlimited global connectivity.

3.19.1 Intranet

An intranet is a set of networks that are under the control of a single administrative entity. The intranet uses the IP protocol and IP-based tools such as web browsers and file transfer applications. The administrative entity limits use of the intranet to its authorized users. Most commonly, an intranet is the internal LAN of an organization. A large intranet typically has at least one web server to provide users with organizational information. An intranet is also anything behind the router on a local area network.

3.19.2 Extranet

An extranet is a network that is also under the administrative control of a single organization, but supports a limited connection to a specific external network. For example, an organization may provide access to some aspects of its intranet to share data with its business partners or customers. These other entities are not necessarily trusted from a security standpoint. Network connection to an extranet is often, but not always, implemented via WAN technology.

3.19.3 Internetwork

An internetwork is the connection of multiple computer networks via a common routing technology using routers.

3.19.4 Internet

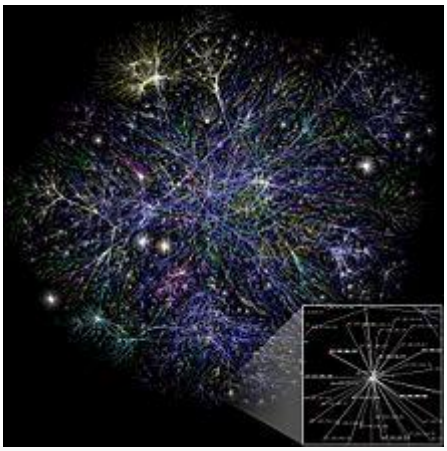


Fig.3.19.4 Internet

The Internet is the largest example of an internetwork. It is a global system of interconnected governmental, academic, corporate, public, and private computer networks. It is based on the networking technologies of the Internet Protocol Suite. It is the successor of the Advanced Research Projects Agency Network (ARPANET) developed by DARPA of the United States Department of Defense. The Internet is also the communications backbone underlying the World Wide Web (WWW).

Chapter 4
Conclusion

We have learnt a lot of things from the courses, but didn't know the applications and sources in real life. During the internship in BTCL, we accomplished the networking process in practice. From BTCL, we learn the working procedure of asymmetric digital line subscriber (ADSL), the process and working principle of public switched telephone network (PSTN). We learnt about different types of cables and their uses, how AAA server works, procedure of new connection, migration, temporary disconnection, permanent close, billing and shifting. We also learnt the set up of VPN, LAN and register procedure of .bd domain. BTCL gave us this opportunity to know the present situation of Networking in Bangladesh and the applications.