Independent University, Bangladesh (IUB)

Department of Computer Science and Engineering

Spring'20 Internship Report

Study on Networking System of Carnival Internet – A Brand of System Solutions and Development Technologies Limited (SSD-TECH)

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27 January, 2021

Letter of Submission

Mohammad Noor Nabi

Senior Lecturer

Department of Computer Science and Engineering

Independent University, Bangladesh (IUB)

Subject : Submission of internship report

Respected Supervisor,

This letter is regarding the submission of my internship report, entitled "A Study on Networking System of Carnival Internet - A Brand of System Solutions and Development Technologies Limited (SSD-TECH)". SSD-Tech being the organization I was attached with during the period of my internship. The purpose of this report is to learn about the overall services of SSD-TECH and the networking sector of Carnival Internet.

I have successfully completed my internship program at SSD-TECH and I worked there as an intern for three months under the supervision of Mr. Didarul Islam Bhuyan, Manager, Core network. I only worked physically for two months due to COVID-19 and then continued work from home for few more weeks. Working on this report was a great learning experience for me as I got to learn the differences between practical and theoretical work. I hope you will find the report to be objective, systematic and reliable.

I shall be highly obliged if you are kind enough to receive this report and provide your valuable judgment. It would be my immense pleasure if you find this report useful and informative to have an apparent perspective on the issue.

Sincerely,

Tazkia Hassan Soha

ID : 1521835

Acknowledgement

At the beginning of preparing this report, I would like to convey gratitude to the Almighty Allah for giving me the strength to perform my responsibility as an intern and complete the report successfully. This internship report is an accrual of many people's effort. For this, I am obliged to a number of people who helped me to organize this report and for their kind opinion, suggestions, instructions and support and appropriate guidelines for this. I have received endless support and guidance in preparation of this report from numerous sources. I would like to take this opportunity to thank them all.

First of all, I would like to thank ***Mohammad Noor Nabi, Senior lecturer, CSE, IUB*** for guiding me with lots of effort and time to perform the internship program. I want to convey my gratefulness to Mr. ***Didarul Islam Bhuyan, manager, core network, SSD-TECH*** who helped me greatly by providing valuable suggestion whenever required my internship report. They also gave the opportunity to hold that flagship of the topic.

I would also like give to acknowledgments to every one of the System Management Department of Carnival Internet for providing suggestion on how to work and what is the procedure to work in a practical manner and also how to make the internship report in a better way. They helped me in many ways by allowing whatever assistance I needed. Otherwise it was not possible for me to complete my report.

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Executive Summary

This is the internship report based on the internship program that I had successfully completed in Systems Solutions and Development Technologies (SSD-TECH) Limited under Network Infrastructure and Technology division from January'20 to April'20 as a requirement of my bachelor program on Department of Computer Science and Engineering, Independent University, Bangladesh. As being completely new to practical, corporate world setting, every hour spent in Networking Division gave me some amount of experience all the time all of which cannot be explained in words. But nevertheless, they were all useful for my career.

This report includes the company introduction of SSD-TECH, Products and Services, Operation details and the brands. The main focus is one of the most demanding brands of this company, *Carnival Internet* and how the networking department of this renowned ISP works, what are the possible divisions and work distribution in an ISP, real time IP monitoring and configuring, learning their devices, experiencing the Network Operation Center (NOC) etc.

I have gathered experiences in SSD-TECH from almost all the wings of Carnival Internet like support team, core team, contact center, transmission, network engineer, NOC and web developing team. In networking team, I have mainly assisted the team by monitoring the server, ticketing through OTRS and setting up web portal. In developing team, I have designed the layout of a small project website creating login, OTP and status pages.

My personal views about the ISP, my value addition to the company are also included in the report. With limited knowledge and experience I tried my best to make this report as much understandable as possible and translated the real world experience into a document. The various boundaries to process improvement and maintaining ethical standards in a corporate environment have also been experienced.

Before drawing any conclusion based on this report it may be noted that the report was prepared in a very short term and there is lack in data. But still the report may be useful for designing any further study to evaluate the facilities provided by the company.

Chapter1 : Introduction

1.1 Company profile

1.1.1 Vision, mission, objective

SSD-TECH is a multi-channel, digital content & service management and delivery company serving the Mobile Operators and Large aggregators around South East Asia and Asia Pacific.

- They provide solution on a managed service, their Customer's focus on =6content/service and they manage the technology operations for them.
- Their solution manages content and service delivery across Voice over IP, SMS, web and applications covering a wide range of services/service providers e.g. health, lifestyle, news/media, utility payments etc.

Systems Solutions & Development Technologies Limited (SSD-TECH) is a famous software development company in Bangladesh and in various countries across the globe. Since its foundation in 2004, it has showed its excellence by providing solutions and services to large and small enterprises, Banking and Non-Banking Financial Institutions and Telecom Operators. After a few years of successful operation within the country, SSD-TECH expands its business in global sphere horizon in 2007 by establishing its Asia Pacific Regional subsidiary in Malaysia. In Malaysia SSD-TECH gained the prestigious MSC status. SSD-TECH established another subsidiary in United Kingdom to serve the customers in Europe. At present, they are operating in five different countries across the world with liaison offices in Nepal, Bhutan and corporate office in Bangladesh. [4]

The vision of SSD-TECH is to build a technology-aided ecosystem of related entities where participants can enjoy respectful, happy, exciting and rewarding relationships that facilitate innovation and collective value creation.

The mission is to deliver the best customer experience to the clients through continuous improvement driven by efficiency, teamwork, and innovation.

1.1.2 Corporate division

SSD-TECH has certain structure to operate their company as the figure below :

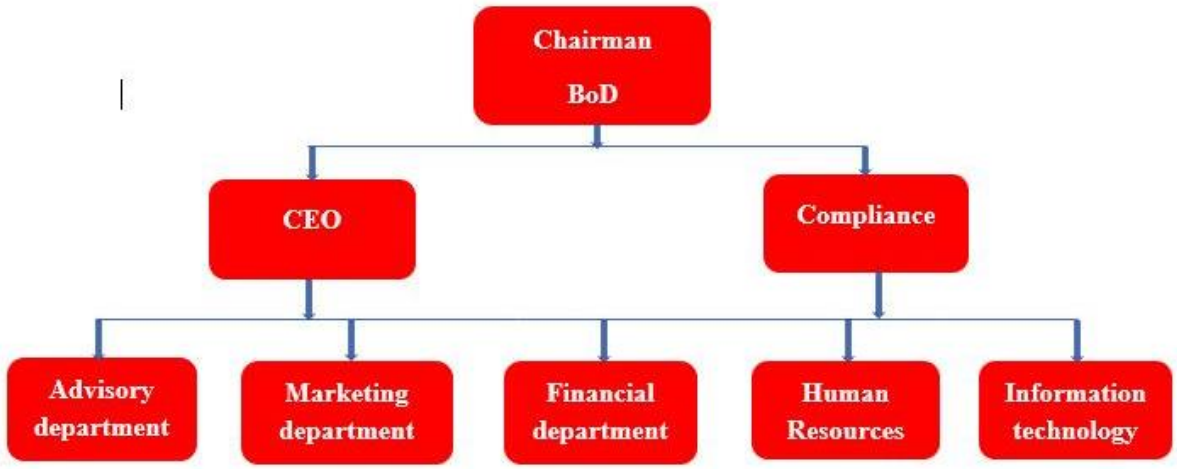


Fig 1.1.2 Operating division of ssd-tech

1.1.3 Details of Product Lines or Services

Customized Solutions for Enterprises	**Financial Solutions for Banks and NFBI'S**	**Value Added Service for Telecom Operators**	**Internet Service Provider (ISP) : Carnival Internet**
Business process integration	FIntellegent-Integrated Solutions for Financial Institutions	Intelligence Service Management platform over voice, SMS and Data Advertising Customer life cycle and management	Corporate internet service, home internet, Video conferencing service
Customized web application development	Mobile and internet banking suit	Aggregation and managed VAS	Carnival Assurance

Table 1.1.3 Different services of ssd-tech concern

- **Radio2008**

  Radio 2008 is a IVR based mobile music radio which is accessible from everywhere in Bangladesh, just a call away. User can access huge music library categorized under folk, modern, pop and movie songs, by browsing through IVR. The in-built AI based CMS tracks user behavior and feeds customized user preference content from the next time the user dials. This AI powered IVR music radio currently has 1 million users across Bangladesh.

- **LIFESTYLE**

  Lifestyle IVR is a gateway to unlimited infotainment through IVR that can be accessed just by dialing a short code from anywhere in Bangladesh. Users enjoy a wide variety of contents like daily horoscope, magazines including favorite stars' interview, regular audio drama under different categories. The religiously inclined can start their day by listening to a hadith, surah, qirat or duah with its rich Islamic content library. This IVR lifestyle service with wide content library currently has 1 million users across Bangladesh.

- **VOICE CHAT**

  Voice chat is the first ever IVR based anonymous friendship portal in Bangladesh. User journey starts from dialling a shortcode from their mobile and creating profiles with a unique ID. This IVR based social media currently has 1.5 million users across Bangladesh.

- **CARNIVAL INTERNET**
  - Internet
  - Data Communication
  - Network

1.1.4 Operation details

Call Center/Helpdesk	Receiving customer complain	
	Answering customer queries	
	Managing customer complain/query ticket	

OTRS System	Ticket handling system	New Installation
		Customer Complain
		Customer Queries
		Any kind of related with customer service

Proactive monitoring Panel	Proactively monitoring OLT	
	Proactively monitoring Customer End Device	

Cacti	Customer's Bandwidth Monitoring	

Customer Complain Medium	Hotline	
	SMS	
	IVR- Interactive Voice Response	
	VIVR - Visual interactive Voice Response	
	Email	

Tele sales	Acquiring new client	

Table 1.2.4 Operation details of ssd-tech

1.1.5 CSR

SSD-TECH is affiliated with so many philanthropic organizations to carry out their corporate social responsibilities. Such as :

- Donated ambulance to Shaheed Suhrawardy Hospital, Dhaka to increase their emergency ambulance service.
- Donated more than two lacs trees to the forest department during tree plantation week.
- During COVID-19 SSD-TECH arranged and donated free KN95 mask and oxygen cylinder to various organizations.
- A session on Fire Safety was arranged at SSD-TECH on April 2019.

Chapter 2: Internship Experience

2.1 Job Responsibilities

2.1.1 Duties as an Intern at Carnival Internet- A brand of SSD-TECH

Name of the Company: Carnival Internet

role: Systems Solutions development Technologies Limited

address: Uday Tower, Level 12, 57 & 57/A, Gulshan Avenue, Dhaka-1212, Bangladesh

phone: +8801713404007

fax no: +8801713404007

admin-c: SSDT2-AP

tech-c: SSDT2-AP

nic-hdl: SSDT2-AP

mnt-by: MAINT-SSDTL-BD

changed: hm-changed@apnic.net 20140811

source: APNIC

% Information related to '103.239.254.0/25AS63526'

route: 103.239.254.0/25

descr: SSDTECH Route Object3_1

origin: AS63526

mnt-by: MAINT-SSDTL-BD

changed: hm-changed@apnic.net 20140811

source: APNIC

% This query was served by the APNIC Whois Service version 1.69.1-APNICv1r0 (UNDEFINED)

2.1.2 ISP NOC Support System

This report is about ISP network design and maintenance in Network Operation Center (NOC). The main works of NOC is to ensure high security, proper maintenance service and reliable connection to the clients.

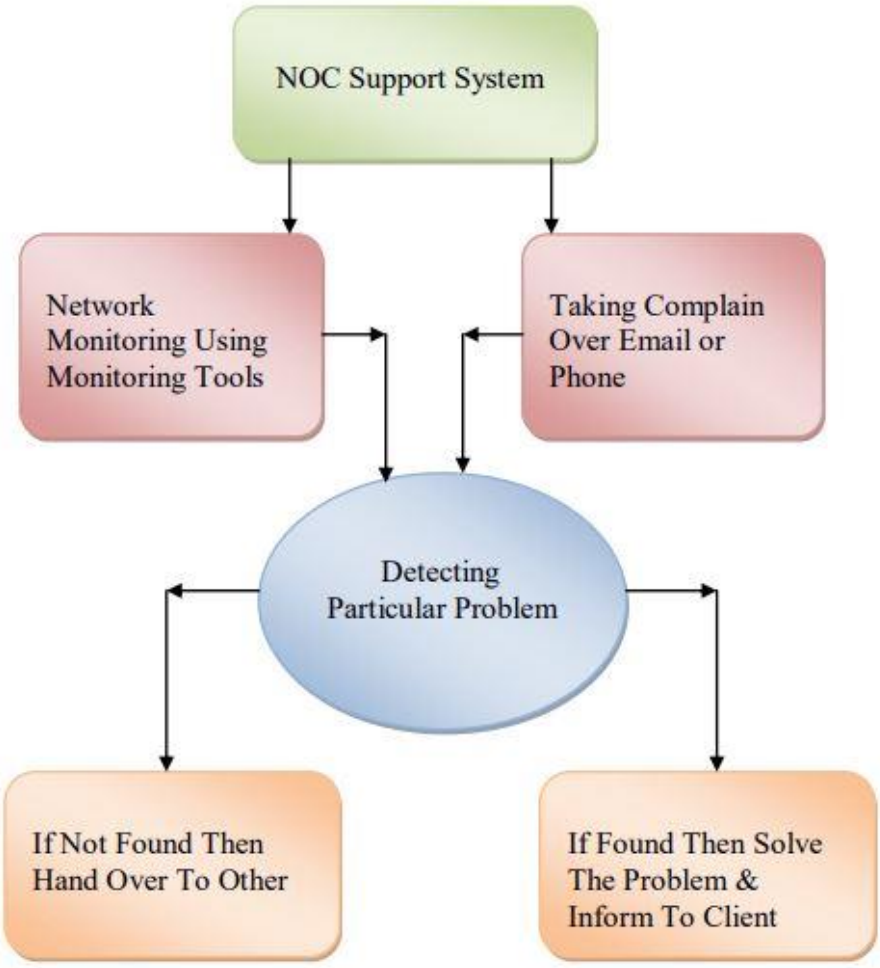


Fig 2.1.2 NOC support system of Carnival Internet

To achieve these features the main task of NOC is monitoring all of the connections. For monitoring purposes Carnival Internet uses Network Performance Monitoring tools like Nagios, Cacti with MRTG and OTRS.

2.1.3 NOC Zone of Carnival Internet

The NOC Zone of Carnival Internet is Shahjadpur DO which connects the nearby area. The other two NOC Zone is Uttara DO and Khilgaon DO which also is connected by the main NOC Shahjadpur DO [5]

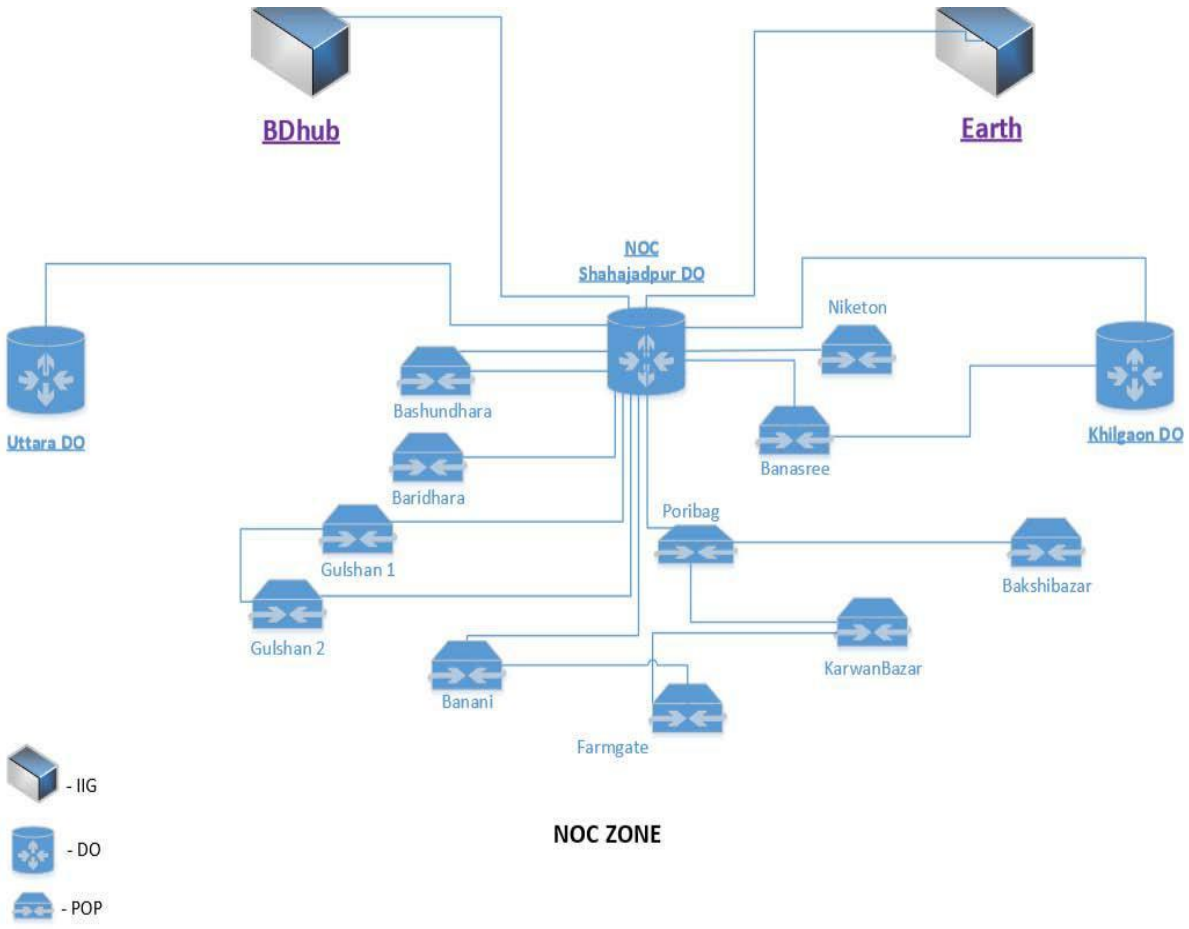


Fig 2.1.3 NOC Zone of Carnival Internet

2.1.4 Learning Real Time IP Configuration and DNS Setting

Real time IP of a client can be configured remotely from NOC on the request of a client. To set a static IP address you need to go to network and sharing center from control panel and change the adapter setting to Wi-Fi or Local Area Connection. From properties we need to select Internet Protocol Version 4 (TCP/IPv4) and select the following IP address, Subnet mask, Default gateway and DNS server.

DNS stands for "Domain Name System"; a system that lets you connect to websites by matching human-readable domain names (like google.com) with the unique ID of the server where a website is stored. It can directly process all translation requests, be a backup server, or pass the translation requests to a remote server. This role can be changed for existing domain names (**Websites & Domains** > domain name > **DNS Settings**).

2.1.5 Network Address Translation

Network Address Translation (NAT) is designed for IP address conservation. It enables private IP networks that use unregistered IP addresses to connect to the Internet. NAT operates on a router, usually connecting two networks together, and translates the private addresses in the internal network into legal addresses, before packets are forwarded to another network.

As part of this capability, NAT can be configured to advertise only one address for the entire network to the outside world. This provides additional security by effectively hiding the entire internal network behind that address. NAT offers the dual functions of security and address conservation and is typically implemented in remote-access environments.

Basically, NAT allows a single device, such as a router, to act as an agent between the Internet (or public network) and a local network (or private network), which means that only a single unique IP address is required to represent an entire group of computers to anything outside their network.

In order to configure traditional NAT, you need to make at least one interface on a router (NAT outside) and another interface on the router (NAT inside) and a set of rules for translating the IP addresses in the packet headers need to be configured.

2.1.6 Internet Hut

Introducing with scratch card system internet access – a new project introduced in rural area where people can buy low budget internet packages and login with their phone number and use internet for limited hours.

Creating Login, OTP and Status page with HTML,CSS and PhP and connecting with DB was done by me.

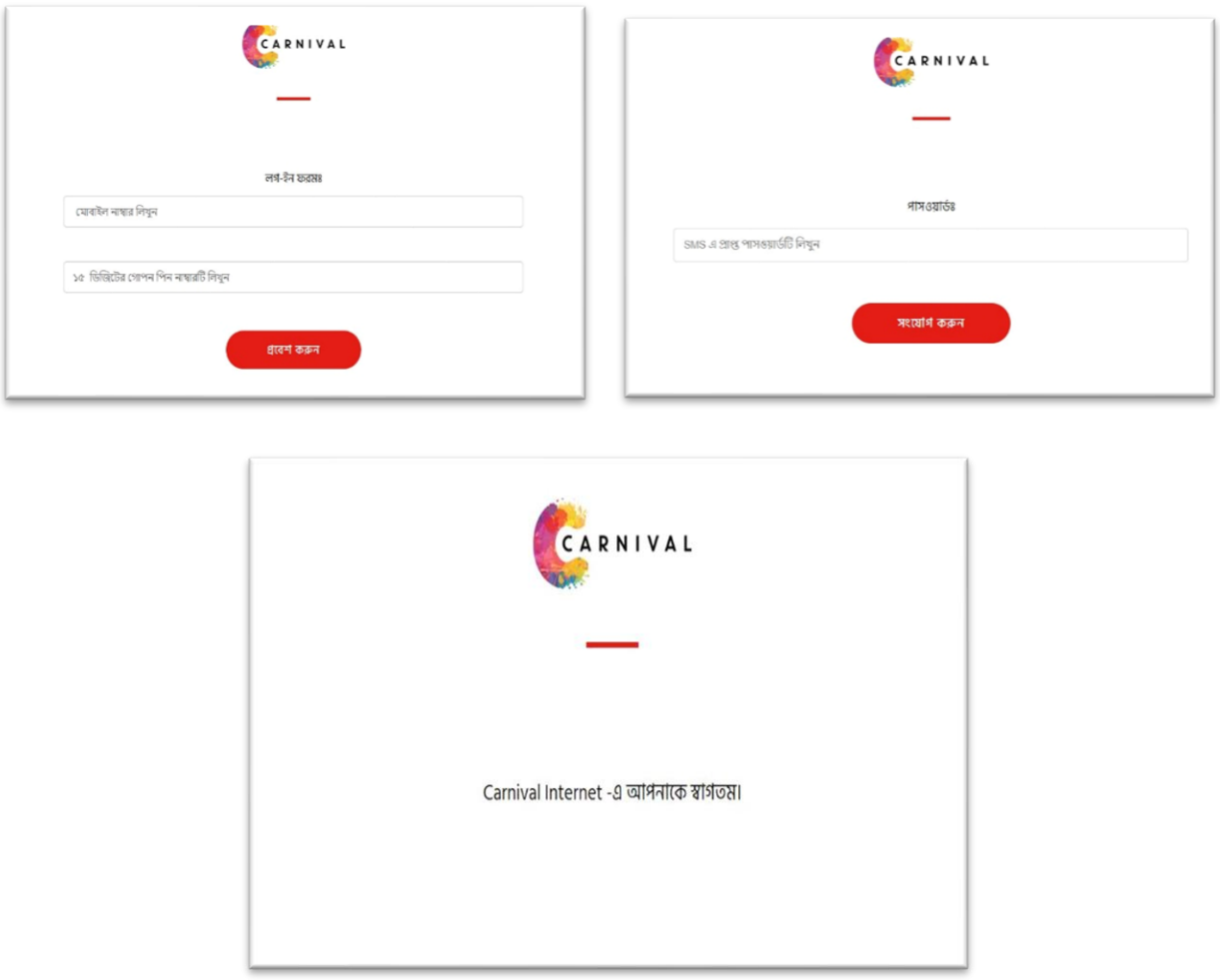


Fig 2.1.6 Login, OTP and Status page of Internet Hut

2.2 Functions of the Department

2.2.1 Devices

2.2.1.1 Onubha Router: Carnival Internet company's own creation is **onubha** router. Onubha (UG1000) (Unified Gateway) is a network gateway that serves as a router, firewall, proxy, bandwidth controller & profiler, softswitch and IVR. It is a single gateway that will serve all corporate needs related to IP and voice service network. The product is designed in a modular structure and user can choose the modules required only. Unified Gateway comes with a GUI and CLI based configuration interfaces. The gateway can be deployed as Virtual Machine as well.

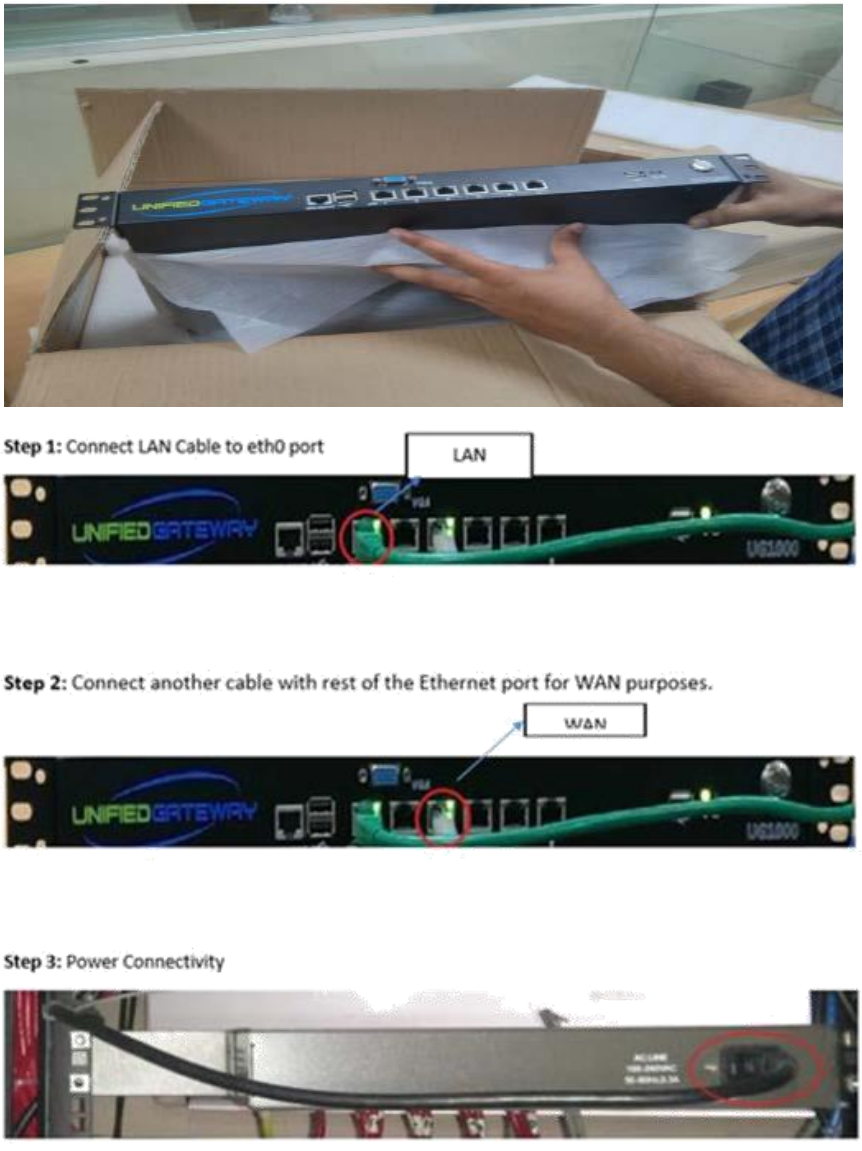


Fig 2.2.1.1 Onubha Router and LAN,WAN and Power connectivity in Onubha router

2.2.2 Nagios

- Nagios is an open source network monitoring application. It is originally designed to run under Linux.It watches hosts and services that you specify, alerting you when things go bad and when they get better.
- Nagios network analyzer provides an in-depth look at all network traffic sources and potential security threats allowing system admins to quickly gather high-level information regarding the health of the network as well as highly granular data for complete and thorough network analysis.

Fig 2.2.2 Nagios

2.2.3 Cacti

Cacti is an open source network monitoring and graphing tools. Cacti allows a user to provide services at predetermined intervals and graph the resulting data. It is generally used to graph time series data of metrics such as CPU load and network bandwidth utilization. And we used cacti for monitoring our network bandwidth utilization.

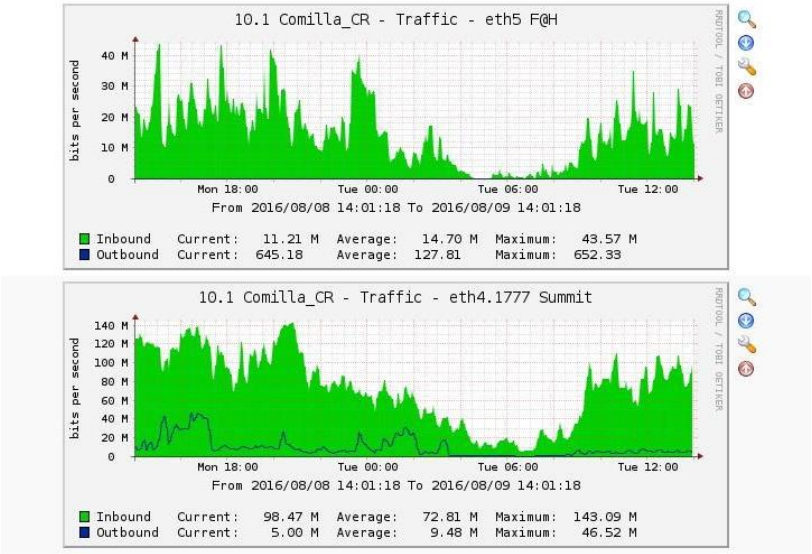


Fig 2.2.3 Cacti with MRTG

2.2.4 MRTG

MRTG stands for Multi Router Traffic Grapher is a utility that is mainly works for administrators and users to keep track of the data transfer occurring through a router or other type of device. The devices that support the Simple Network Management Protocol (SNMP) can be subject to monitoring through MRTG.

By using Simple Network Management Protocol (SNMP), MRTG sends requests with two object identifiers to a device. The device, which must be SNMP-enabled, will have a management information base to look up the object identifiers specified. After collecting the information, it will send back the raw data encapsulated in an SNMP protocol. MRTG records this data in a log on the client along with previously recorded data for the device. The software then creates an HTML document from the logs, containing a list of graphs detailing traffic for the selected devices in the server.

2.2.5 OTRS

OTRS stands for Open Source Ticket Request System which is a help desk ticket solving software tool with ticket ID, queue, customer ID, client name, contact connected DO (distribution Office), problem, closing summary and closed date and closed by. OTRS detects the technical issues and convey it to the respective team accordingly. OTRS has an admin dashboard, agent portal and customer portal. The admin dashboard allows system administrators to manage the system. Each issue or queries are called ticket here. Tickets are appeared to be answered or solved by the admins.

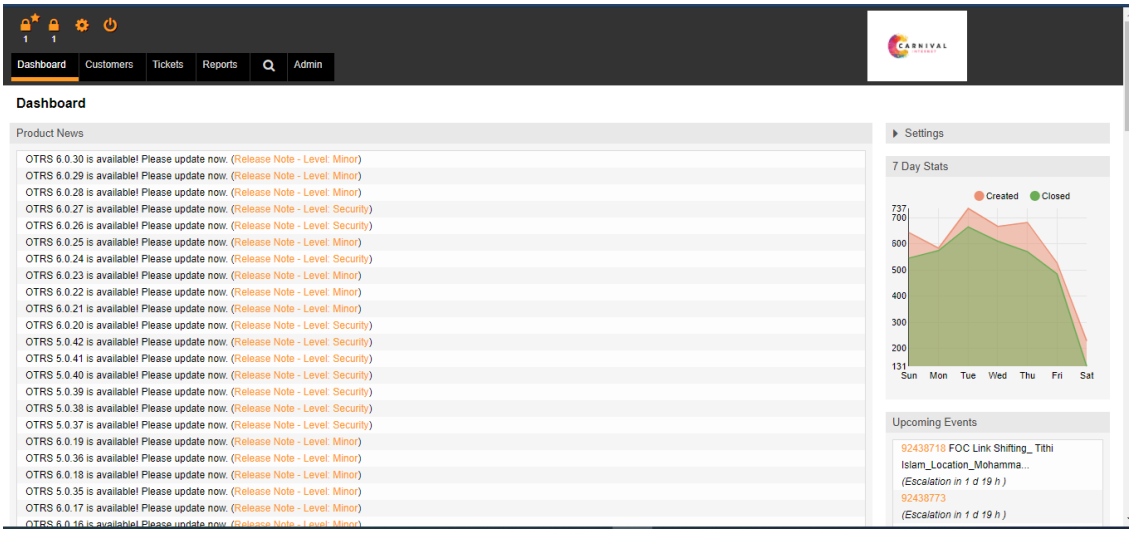


Fig 2.2.5.1 OTRS Dashboard

Fig 2.2.5.2 OTRS Agent

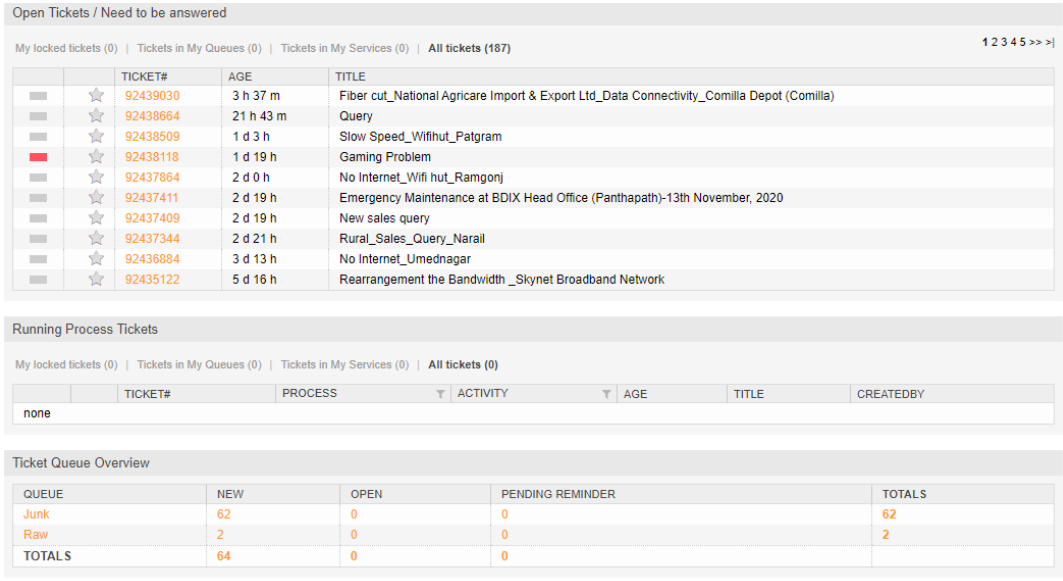
		TICKET#	AGE	TITLE
	☆	92438847	16 h 21 m	User Info
	☆	92438711	20 h 12 m	Bill Collection Request
	☆	92438709	20 h 21 m	Slow-Internet
	☆	92438696	20 h 47 m	Slow Speed
	☆	92438693	20 h 50 m	LAN-OFF
	☆	92438691	20 h 54 m	Slow-Internet
	☆	92438690	20 h 54 m	Slow-Internet
	☆	92438689	20 h 54 m	Slow-Internet
	☆	92438685	21 h 2 m	Slow-Internet
	☆	92438677	21 h 18 m	Slow Speed

New Tickets

My locked tickets (1) | Tickets in My Queues (0) | Tickets in My Services (0) | **All tickets (5406)** 1 2 3 4 5 >> >|

		TICKET#	AGE	TITLE
	☆	92439208	2 m	Bill Collection Request
	☆	92439207	4 m	Others
	☆	92439206	5 m	Fiber Cut_LOS-RED blinking
	★	92439205	5 m	Slow-Internet
	☆	92439204	6 m	Link_Shift
	☆	92439203	6 m	Package Migration_REAL IP
	☆	92439202	8 m	Fiber Cut
	★	92439201	9 m	Slow-Internet
	☆	92439200	10 m	Link_Shift_Churn_Back (Need ONU Device)
	☆	92439199	10 m	Discontinue

Fig 2.2.5.3 OTRS Ticketing



Open Tickets / Need to be answered

My locked tickets (0) | Tickets in My Queues (0) | Tickets in My Services (0) | **All tickets (187)** 1 2 3 4 5 >> >|

		TICKET#	AGE	TITLE
	☆	92439030	3 h 37 m	Fiber cut_National Agricare Import & Export Ltd_Data Connectivity_Comilla Depot (Comilla)
	☆	92438664	21 h 43 m	Query
	☆	92438509	1 d 3 h	Slow Speed_Wifihut_Patgram
	☆	92438118	1 d 19 h	Gaming Problem
	☆	92437864	2 d 0 h	No Internet_Wifi hut_Ramgonj
	☆	92437411	2 d 19 h	Emergency Maintenance at BDIX Head Office (Panthapath)-13th November, 2020
	☆	92437409	2 d 19 h	New sales query
	☆	92437344	2 d 21 h	Rural_Sales_Query_Narail
	☆	92436884	3 d 13 h	No Internet_Umednagar
	☆	92435122	5 d 16 h	Rearrangement the Bandwidth _Skynet Broadband Network

Running Process Tickets

My locked tickets (0) | Tickets in My Queues (0) | Tickets in My Services (0) | **All tickets (0)**

		TICKET#	PROCESS	ACTIVITY	AGE	TITLE	CREATEDBY
none							

Ticket Queue Overview

QUEUE	NEW	OPEN	PENDING REMINDER	TOTALS
Junk	62	0	0	62
Raw	2	0	0	2
TOTALS	64	0	0	

Fig 2.2.5.4 OTRS Open tickets that needs to be answered

2.2.6 Internet Hut

Introducing with scratch card system internet access – a new project introduced in rural area where people can buy low budget internet packages and login with their phone number and use internet for limited hours.

Carnival Internet provides internet service through scratch card in rural area in different mini internet packages. The network is maintained by a network tower and people living within the coverage area can use the service according to their needs.

2.2.7 Wi-Fi Hub for Premier University by Carnival Internet

Carnival Internet team worked in a wifi hub of Premier University, Chittagong for each of the students and employees. Students and employees can access the prepaid wifi service according to their need by loging in with their mobile number and ID.

The connectivity diagram is shown below :

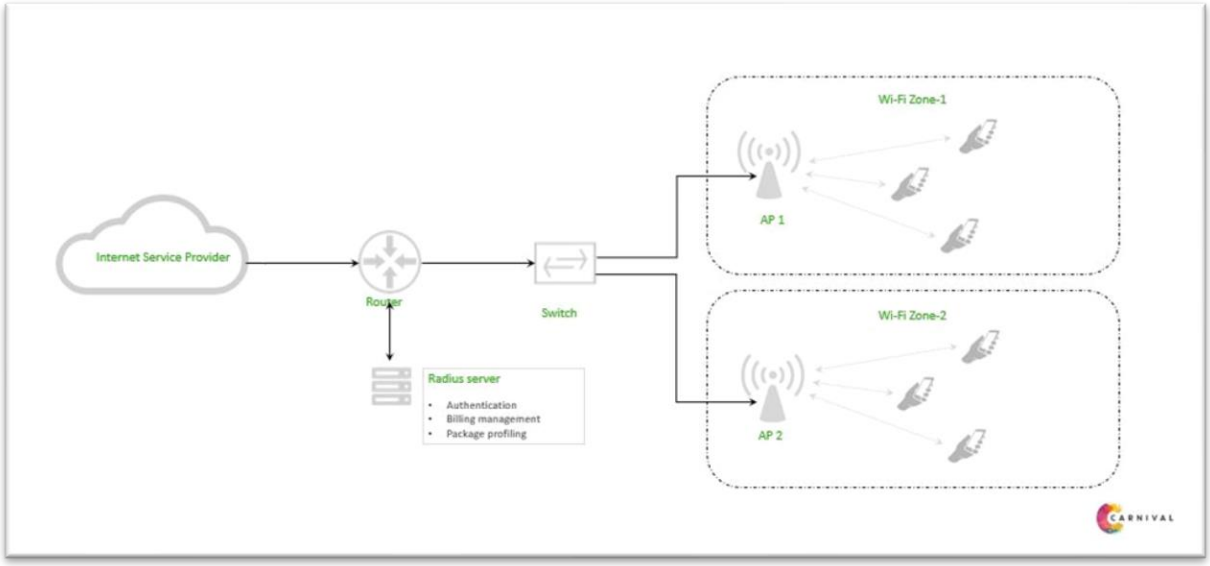


Fig 2.2.6.1 Simplified Connectivity Diagram for Premier University

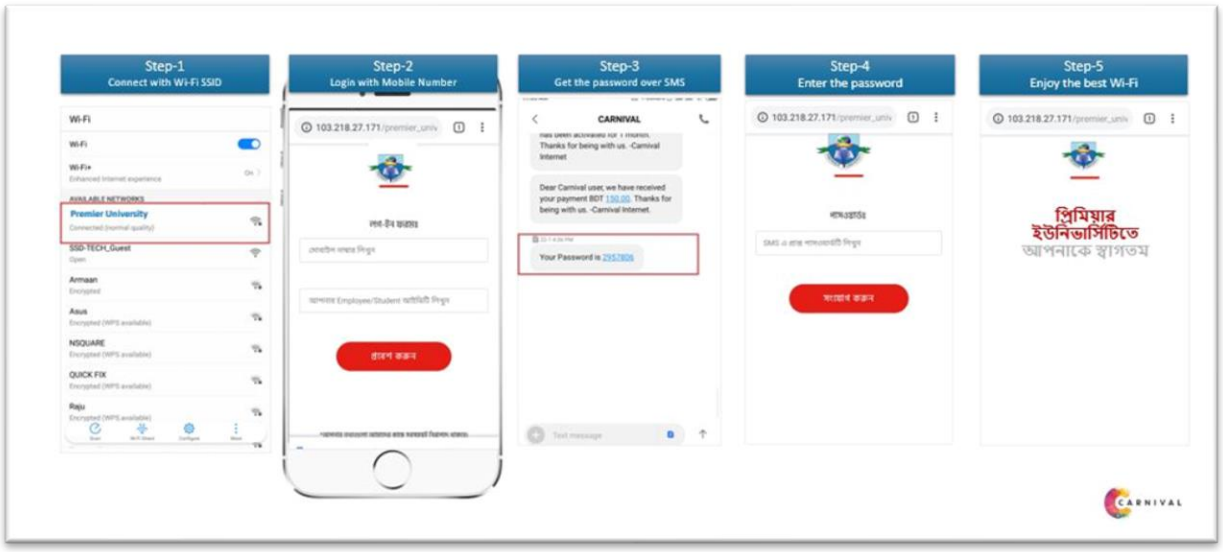


Fig 2.2.6.2 Connectivity Steps for Wi-Fi hub of Premier University

2.2.8 Ansible

Ansible is an open-source automation tool, or platform, used for IT tasks such as configuration management, application deployment, intra-service orchestration, and provisioning.

Ansible works by connecting to your nodes and pushing out small programs, called "Ansible modules" to them. Ansible then executes these modules (over SSH by default), and removes them when finished. Your library of modules can reside on any machine, and there are no servers, daemons, or databases required.

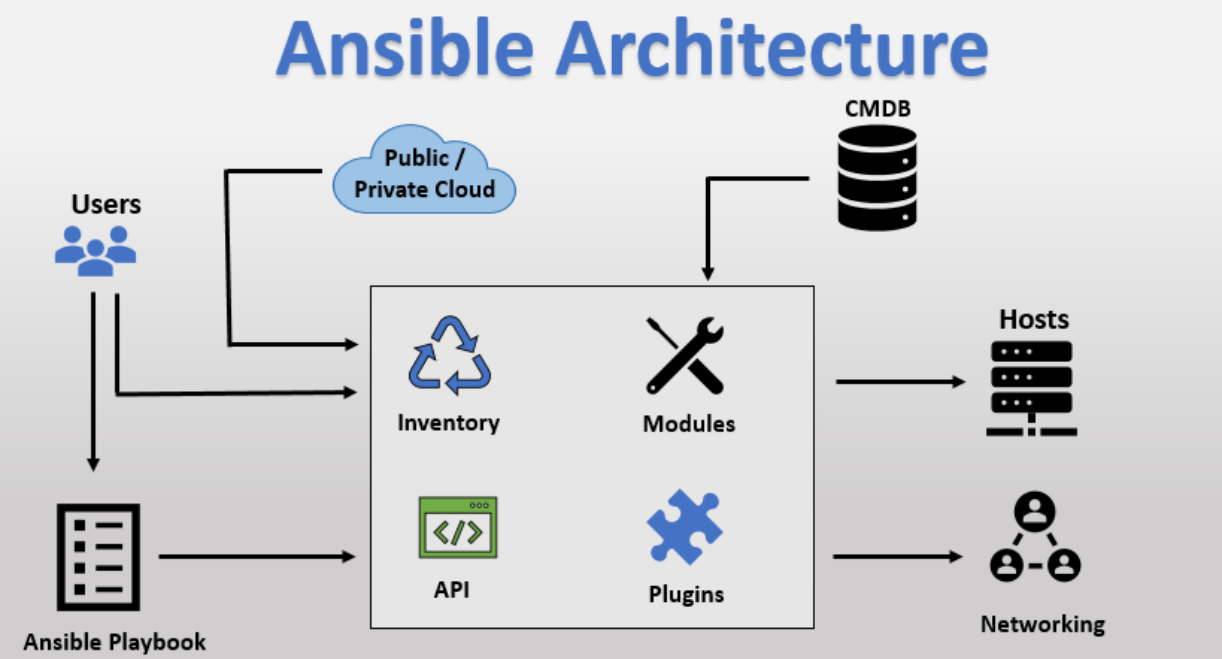


Fig 2.2.8 Ansible Architecture

Chapter 3: Internship Outcomes

3.1 Computer Network Design

3.1.1 Design of a Network

Below the steps of a business network design. It will fulfill all of the requirements of any organization.

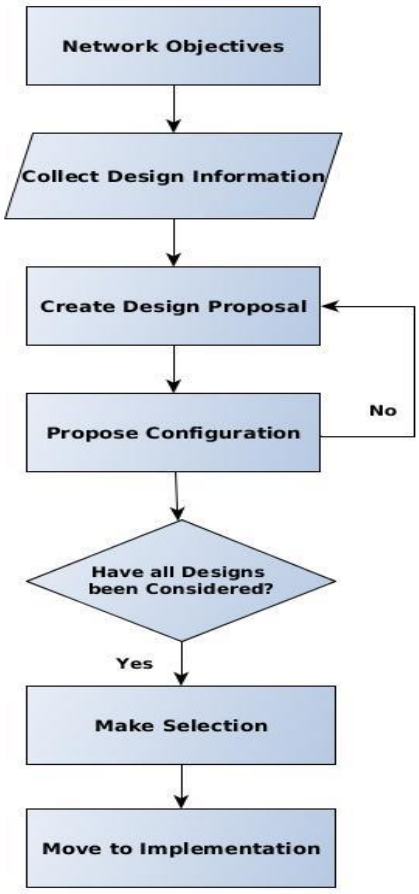


Fig 3.1.1 Design steps of a business design

3.1.2 Objectives of a Network Design

1) Who are the users of this network and what are the requirements?
2) What types of application will be supported?
3) Does the design replace of existing network?
4) Overall Responsible for network management
5) What is the budget?
6) designed consideration
7) Do your network and its data need to have built-in security?

3.1.3 Requirements to design a network:

1) Bandwidth Requirements
2) Performance Requirements
3) Protocols Required
4) Quality of Service/Type of Service (QoS/ToS)
5) Sensitivity to Packet Loss and Delay
6) Multicast
7) Scalability
8) Security
9) Way of troubleshooting

3.1.4 Backbone Network Design

To design a network, we need to follow some rules or steps that create a network more efficient and give high performance. A designed network has some goals that are discussed earlier.

I. Scalability
II. Availability
III. Security
IV. Manageability

To fulfill the fundamental goals of a network must be built an architecture that allows for both flexibility and growth.

Hierarchical networks have some advantages over flat network designs. The benefit of hierarchical design is that local traffic remains local. Only traffic goes to other networks and it's moved to a higher layer. A flat network using Layer-2 devices provide to control broadcasts or to filter undesirable traffic. As more devices and applications are added to a flat network then response times degrade until the network becomes unusable.

Keeping all of the above, we can use the hierarchical method to design of our desire network.

Actually hierarchical network is divided into three layers.

1) Core layer: Connects distribution layer devices
2) Distribution layer: Interconnects the smaller local networks
3) Access layer: Provides connectivity for network hosts and end devices

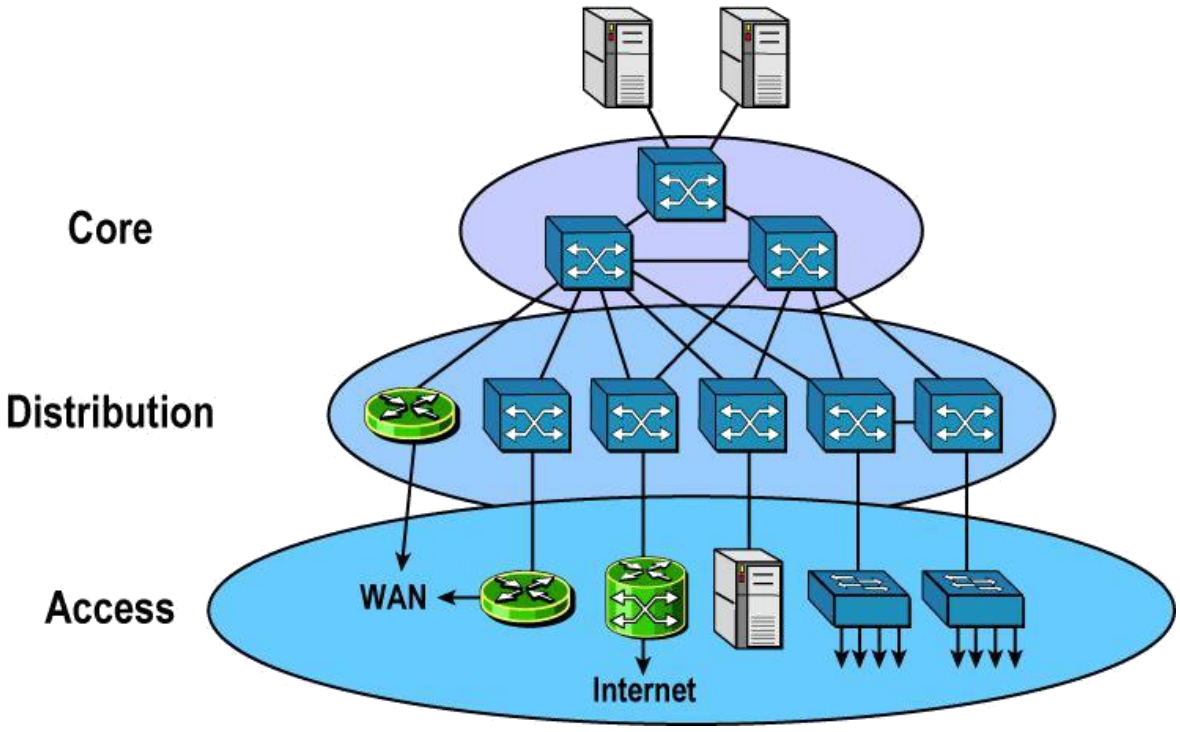


Fig 3.1.4 Hierarchical design of a network

3.2 Problems Identified in the Workplace

3.2.1 Technical Issues

- Monitoring issues of DNS 158- issue faced in Nilphamari area
- IP Clone: Clients nearby could not access the internet due to getting same IP address
- PoP down issue faced in Gulshan 2 due to DNCC routine work (fiber cut)

3.2.2 Challenge faced

- Due to excessive rush in NOC, it is quite challenging to learn from the employees if new issues arise.

3.3 Analyzing Issues Based on Relevant Theory

3.3.1 Quality of Service of a corporate network:

- Bandwidth management
- Availability for all the time
- Network traffic prioritization
- High latency control
- Security maintenance

By using redundant backup links, a corporate network can be ensured maximum availability and power monitoring with solar enabled power backup system can ensure maximize the network uptime. Multiprotocol Label Switching (MPLS) best for ATM's circuit switching and IP packet routing that can reduce latency. Traffic classification, prioritization and assuring proper security can provide a best QoS. To avoid any other violence ensuring network security, update mechanism and proper monitoring can also ensure QoS. Besides, to reduce downtime of a network we can use renewable technology than any other power backup system.

3.3.2 Solving IP Clone for Clients

Company provide ONU (Optical Network Unit) device for each client with an unique MAC address to refrain from cloning IP. Each customer has an individual IP and MAC address and both addresses remains bind in Mother router at NOC so that no one can clone the IP from anywhere else within the same network. IP Clone occurs when the MAC is not bind due to misinformation of field engineer.

3.4 Recommendations

3.4.1 Assigning Mentor for Interns

SSD-TECH should assign few mentors for interns who can guide and assist them and always available in need. Mentors can make group or team of a few interns and assign them into a same project. Thus the company also can get skilled interns.

3.4.2 Providing Interns with Technical Facilities

Company should provide intern students with technical facilities like individual laptop/desktop with proper configuration so it can be easier to work at office along with internet connectivity at home so work from home can be done smoothly.

3.4.3 Arranging Workshops

It would be better if few workshops could be arranged during office hour to enhance the learning outcomes of intern.

Chapter 4: Conclusion

Internship is an opportunity to acquire a real life experience of what I learned in my academic life. Working as an intern in the Network operations center of Carnival Internet. I have learnt to be dedicated to the job. Dedicative mind set is the most important thing to work in such a sophisticated environment. It is beyond more official matter. For most of the engineering or technical company, the engineers have to get attached with the working process. 24x7 service monitoring has taught me how to handle technical staffs in an efficient manner. As there was an opportunity to serve Carnival Internet many ways. I have gathered a lot of experience throughout the entire internship period. There was a scope in the field of computer network planning and designing, Data connectivity, ensuring security, different types of application configuration and maintain. In this report I have explained my experiences and about Network Designing and Optimization. I have learned so many significant procedures from my supervisors and colleagues and conducted some tasks on a regular basis throughout my entire Internship period and ultimately earned the confidence to deal with assignment myself.

SSD-Tech is a leading IT company in Bangladesh. Within a short period of time they create a good grasp in the IT industry compared to others. Their main strength is their skilled employee. It is a great opportunity to use the knowledge and skills that I had acquired. I also learned how to handle critical faults and got the new ideas. Doing this kind of work is really helpful for my career and I like to do this kind of work again.

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