A STUDY OF NETWORKING & CONFIGURATION

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

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APPROVAL

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I do hereby declare that, the work presented in this internship project report is done by me under the supervision of **Rezwana Sultana, Lecturer, Department of Computer Science and Engineering**, Daffodil International University. Also declare that neither this report nor any part thereof has been submitted elsewhere for the award of any degree of diploma.

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ABSTRACT

TRST Network has to provide basic Networking services throughout the country. This company provided Internet Service Provider and Networking service all over of Bangladesh. Most of the user can also use internet service. This company has the largest ISP and Networking infrastructure comprising of Optical fiber, Radio and IIG link etc. Broadband internet service is available on this company. To study and monitoring the working principle of various department of this company. I admitted myself in TRST Network as an Internship for four months. In that time my duty was shifting between technical and system divisions. I am learn Mikrotik router configuration and all Fiber link and client end physical and logical support to study and observe the working procedure of networking. In my report I try to analyze them briefly.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

In the present world data Communication and networking is the fastest growing technologies in the world. Computer and computers networks are found in nearly every business and industry around us. And now the latest networking technology is wireless, the data transfer rate is enormous.

As a developing country Bangladesh is far behind from the developed country in technological development. The main reasons may be lack of trained people and unexpected actions from our Government. Anyway, Bangladesh has a long way to go in a very short time to enjoy the fruits of information age. It will be only possible when there will be political commitment with better IT infrastructure, internal network, country domain and above all a high speed fiber optic link to the Information Superhighway. By identifying these factors I can be sure about the revolutionary change over our IT sector, that's why I have decided to upgrade my knowledge in networking. Therefore as an internee student I choose Information Technology division of TRST Network. During my possession of work in TRST Network I got various experiences, which will be helpful in my future life.

1.2 Motivation

Motivation is the driving force by which human achieve their goals. I am very interested about networking in my study. Because Bangladesh Government announced "Vision 2021" and digital Bangladesh. It is not possible to achieve our target without strong networking system, so I select my internship networking company (TRST Network), the level one ISP Company of Bangladesh. In future, I build up my carrier as a network Engineer.

1.3 Objectives

The main objective of education is to acquire knowledge. I choose an internship because I wanted to benefit from the experience. I wanted a new challenge and to learn, improve and develop new sets of skills. Working as a Network Support Engineer performing duties and activities and analyzing them from different perspectives.

1.4 Internship Goal

The aim of the internship program is to help me comprehend how the theoretical knowledge obtained in the degree program can be applied in practice by being affiliated with a real life business organization as an interned. The internship experience is meant to serve as bridge between the theoretical learning practical applications.

1.5 Report Layout

At First Chapter contains the Objectives, Motivation and goals of my internship. Second chapter organizational overview describes the details about my internship organization. After that the concept of Networking and networking devices (Router, Cable and connector, Switch, Hub etc.) And then I discuss about MikroTik, router OS, features and MikroTik router basic configuration. Discussion and conclusion is the summarization of my report and explain the future scope by this Internship.

CHAPTER 2 ORGANIZATIONAL OVERVIEW

2.1 About the Company

TRST Network is an IT Support team where you will find complete IT solutions or Wire & WiFi Networking Solution, Domain Web Hosting, MikroTik Configure, Cisco R & S Configure, FTP/File/Media/Apache Server Configure, Graphic Design. TRST Network also providing you Bandwidth & System Configuration Service in your area. If you start ISP Business don't worry TRST Network here to provide Bandwidth & System Configuration. Available in all kinds of information on no information charge.

2.2 Branches

Now TRST Network has two branches. TRST Network-Dhaka: 12/c (2nd Floor), 3rd colony, Bashupara, Lalkuti, Mirpur-1, Dhaka-1216, Bangladesh.

TRST Network- Sylhet: 5762/8 Forayzi Villa, 3300 Habiganj, Sylhet, Bangladesh.

2.3 Company Profile

Register Head Office

TRST Network

400 Rella Blvd, Suite 165, Suffern, New York-10901, United States Mobile: +1 (518) 460-6563 E-mail: info@trstnetwork.com Website: www.trstnetwork.com

2.4 Services

TRST Network provides different types of services. Such as:

- > Office area networking with both wired & wireless in local zone.
- Setup or configure anywhere in Bangladesh local & zonal ISP. We provide best service or solution for ISP Wireless Internet Service Provider.
- > Point to Point connectivity with unlimited traffic.
- Configure web & ftp server in any server operating system. Provide OS & web page also.

Website Builder packages provide domain quality web hosting with unlimited resources.

2.5 Transmission Services

- Fiber Optic Cable (Primary & Secondary link)
- Radio Link Connectivity
- ▶ Router, Switch, MC and OLT etc.

2.6 Summary

In this chapter I have discussed about TRST Network. Where I have completed my internship is the level one networking and Internet Service Provider (ISP) service company in Bangladesh. There are many service provide by TRST Network. I have got a great opportunity to work some of the regions and offices as an intern and gain lot of experiences.

CHAPTER 3

NETWORK INTRODUCTION & NETWORKING DEVICES

3.1 Networking

Networking is the practice of linking two or more computing devices together for the purpose of sharing data. Networks are built with a mix of computer hardware and computer software. A network consists of two or more computers that are linked in order to share resources (such as printers and CDs), exchange files or allow electronic communications.

3.2 Types of Network

- LAN (Local area network)
- MAN (Metropolitan area network)
- ➢ WAN (Wide area network)

3.2.1 Local area Networking

The local area network is a network of computers located in the same building. This network's data transfer speed is 10 Mbps. The devices used in this network are Repeaters, Hub and Network Interfaces etc.



Figure 3.1: Local area Network.

3.2.2 Metropolitan Area Network

The interconnected interface of a few lanes in the same city is called Metropolitan Area Network. This type of network can extend up to 50-75 miles. This network's data transfer speed is Gigabit cross seconds. The devices used in this type of network are router, switches, microwave antennas etc.



Figure 3.2: Metropolitan area Network.

3.2.3 Wide Area Network

The network developed with remote lanes is called wide area network. Data transfer speeds of this type of network are 56 Kbps to 1.544 Mbps. The speed of the wans is slowly changing. The devices used in this type of network are router, modem, wan switches etc.



Figure 3.3: Wide area Network.

3.3 Types of Network Topology

- Bus topology
- Star topology
- Ring topology
- Hybrid topology

3.3.1 Bus Topology

All computer connected to the network are connected to bus topology by a single cable. Generally, this topology uses co-axial cables as network media. A device wanting to communicate with another device on the network sends broadcast message onto the wire that all other devices see, but only the intended recipient actually accepts and process the message.



Figure 3.4: Bus topology.

3.3.2 Star Topology

Star topology develop a central switch / hub in Star topology. This | If there is no computer on the network, then there will be no impact on the entire network. Through the server computer, other client computers interact with each other. If the switch or hub is closed in star topology, then the entire network will be closed. Because of communicating with the PC as a switch. It should be remembered that you have to use Straight-through Cable from PC to switch. Because switch and PC is a different device Normal switch does not have any type of configuration.



Figure 3.5: Star Topology.

3.3.3 Ring Topology

All computer networks in the ring topology are connected by a uniform cable to each other in the ring shape. If there is a breakdown of the cable or a computer that is networked in the network, then the entire network becomes idle. To overcome this problem, the secondary ring-cable system is placed in the ring topology.



Figure 3.6: Ring Topology.

3.3.4 Hybrid Topology

Generally, a mixture of star, ring, bus etc. is made up of topology very large and complex in the shape. The network is called hybrid or hybrid topology.

For example, the networks of WAN, Internet etc. are usually developed in hybrid topology.



Figure 3.7: Hybrid Topology.

3.4 Networking Devices

3.4.1 Hub

The hub is a multi-port repeater. It works with electric signals. There is no headache on the network address or the network adapter's Mac address. Hubs are simple devices that direct data packets to all devices connected to the hub regardless of whether the data package is destined for the device. It also works on the OSI model's physical layer.



Figure 3.8: Hub.

3.4.2 Switch

Switch is a type of hardware device that enables cable to be installed on multiple computers through a cable. Switch and Hub do the same, but Switch is better than Hub. The difference between Switch and Hub is the switch's own routing table on this table, he records all the networks connected to it and connected computers connected to the network. Switch As he uses the MAC address of the LAN card when he comes to a data switch then the recipients of that data match the MAC address of the computer with its routing table. If the match is received, the sender will send the data with the penalty attached to the computer that is connected to the search. As a result, any data reaches only to the particular recipient computer. Normal quality switches can always work on a network. However, the managerial switch is done by working with VLAN (Virtual LAN) and working on multiple networks. There are currently some advanced technology and layer switches that can work directly with the IP address from the it works on the physical and data link layer, the address of the computer connected to it network layer.



Figure 3.9: Switch.

3.4.3 Bridge

Bridges are used to divide larger networks into smaller sections. They do this by siting between two physical network segments and managing the flow of data between the two. It creates bridging tables for each segment to count different devices. It works on the OSI model's Data link Layer.



Figure: 3.10: Bridge.

3.4.4 Router

The router is a 3 layer device, that is, it can work with the OSI Layer's physical, data link and network layer. For this reason, the router can work with the IP address in the network layer. Routers usually help to create a WAN (Wide Area Network) by connecting LAN (Local Area Network). There are two types of router wired and wireless. Routing table replaces the MAC address with the IP address and all the records related to the networks associated with it, which means that it can easily indicate which way a data is going to go with or by a penalty.



Figure 3.11: Router

The router also fixes not just the connected networks, but also the way to send data to any network on the distant network. Each router updates itself after a few seconds and sends the update message to its adjacent router, which also makes updates to other routers. For example, if a network or LAN was disconnected from the router for some reason, the router will first update its own routing table and send the message to the surrounding router to inform that the lane is disconnected. There are several routing protocols for running this complete process: RIPv2, EIGRP, OSPF etc.

3.4.5 Media Converter

A media converter, in the context of network hardware, is a cost-effective and flexible device intended to implement and optimize fiber links in every kind of network. Among media converters, the most often used type is a device that works as a transceiver, which converts the electrical signal utilized in copper unshielded twisted pair (UTP) network cabling to light waves used for fiber optic cabling. It is essential to have the fiber optic connectivity if the distance between two network devices is greater than the copper cabling's transmission distance.



Figure 3.12: Media Converter.

3.4.6 Cable

3.4.6.1 Co-axial cable

Coaxial cable is used on some local area networks. Coaxial cables are of different types. For example, 50 ohms (RG-8, RG-11 ARG-58), 75 Ohm (RG-59) and 93-Ohm (RG-62). The price of the cable is very low. There is a problem with EMI being made of copper.



Figure 3.13: Coaxial cable

3.4.6.2 Twisted pair cable

- > UTP
- > STP

3.4.6.2.1 UTP

Unshielded twisted pair has no additional shields outside the pair, except that there is a plastic jacket outside. UTP is called four pairs of wire media and each pair is separated by Color Code. UTP Cable has 8 copper loads. Each copper is covered by its insulating material. The data transfer rate of this cable is 16 MBps.



Figure 3.14: UTP cable.

3.4.6.2.2 STP

Shielded twisted pair cables have a pair of tweezers, one in a tight assortment. As a result the electric interface is much less. The data transfer speed of this cable is 500 Mbps.



Figure 3.15: STP cable.

3.4.6.3 Optical fiber

This cable is used as a glass media than copper wire. As a result, electromagnetic interference is not available. This cable's data transmission speed is much higher. There are two types of fiber optic cable. Single mode fiber and multimode fiber. The main disadvantage is that the price is too high and it is difficult to install.



Figure 3.16: Optical fiber.

3.4.7 Connection Between cable and connector

There are several steps for connection steps for connection between cable and connector. Steps are given bellow:

Step 1: Now insert the wires into the connector making sure that each wire goes into its appropriate channel and extends all the way to the end of the connector underneath the gold crimping connectors. Sometimes we can look at the end of the connector to see the gold crimping connectors to see the copper wires if were using solid copper cable. If the wires don't extend to the end of the connector, the crimp may not make contact. Shows the figure 4.14 how to work Connection Cat5 & RJ-45 Connector.



Figure 3.17: Connection Cat5 & RJ-45 Connector.

Step 2: Repeat steps 1 then after successfully complete connection between cable and connector; we can use these for our computer networking. The day was the first time for me to connect a network cable with connector and also the way of connection was totally unknown for me, That is why first time I felt nervous but supervisor guide me how to complete connect connector with cable, Al last successfully complete my task.



Figure 3.18: RJ-45 Complete Connector.

3.4.7.1 Modular Connector and Configuration

We connect modular and Cat-5 wires to use Modular punch machine and Clamper for connection 2- jack RJ face plate. For Modular Connection the wire combination is

Modular Wiring Configuration				
Color Code	Α	В		
White-Blue	5	5		
Blue	4	4		
White-Orange	1	3		
Orange	2	6		
White-Green	3	1		
Green	6	2		
White-Brown	7	7		
Brown	8	8		

Table 3.1: Modular Wiring Configuration.

CHAPTER 4 MIKROTIK ROUTER CONFIGURATION

4.1 MikroTik Router

MikroTikls Ltd. Known internationally as MikroTik is a Latvian manufacturer of computer networking equipment. It sells wireless products and routers. The company was founded in 1995, with the inventor sell in the emerging wireless technology market. As of 2014, the company has more than 100 employees. The company's products are known for being low-priced alternatives to expensive routers and Ethernet radio relay lines.

4.2 Router OS

MikroTik is a Linux-based operating system known as MikroTik Router OS. MikroTik Router OS is the main operating system of MikroTik Router board hardware. If anyone install Router OS on standard x86-based PC it turn the PC into a MikroTik Router with all its feature routing, firewall, bandwidth management, backhaul link, wireless access point, hotspot gateway, VPN server and more. MikroTik provides free trial version of MikroTik Router OS with its entire feature without any limitation. Just need to go to MikroTik official website www.mikrotik.com and download the installation CD image. But if someone wants to use licensed version it's very easy to license the using product. Again if update version of Router OS is available users may able to upgrade their product easily.

4.3 Features

Router OS supports many applications used by Internet service providers. For example

- > Provides DHCP Server.
- Bandwidth management is very easy
- Provides PPPoE Client and Server.
- Provides VPN Client and Server.
- Provides Firewall rules.
- > Provide Wi-Fi and captive portal based Hotspot System.
- ➢ Easy administration

Supports both IPv4 and IPv6 etc.

4.4 Release history

MikroTik has released different version of Router OS at different times. Some of them are given below.

- Router OS version 6: May 2013
- Router OS version 5: Mar 2010
- ➢ Router OS version 4: Oct 2009
- Router OS version 3: Jan 2008

4.5 Router Board

The company manufactures a series of integrated circuit boards marketed under the name Router board as well as accessory components which implement a complete hardware operating platform for Router OS. The Router board line combined with Router OS is marketed at small- to medium sized wireless Internet service providers 4.19, typically providing broadband wireless access in remote areas. Also the Router board line includes a series of Mini PCI and Mini PCI Express wireless adapters supporting a range of IEEE 802.11 protocols and designed to be used together with the router board's lineup.



Figure 4.19: MikroTik Router.

Despite the fact that in-house developed Linux kernel patches required for hardware support are not made publicly available by MikroTik many Router boards and their versions are well supported by third-party Linux-based firmware's notably Openwork.

4.6 Cloud Core Router

In November 2012 MikroTik released the Cloud Core Router 4.20 figure integrated unit which is based on the Tilera CPU supporting 16 to 36 CPU cores, 12 1000BaseT Ethernet interfaces and up to four SFP (Mini GBIC) interfaces as well as "fast-path" packet forwarding between interfaces (with claimed 24 million packets per second forwarding rate). This unit targets the medium-sized network providers as well as try to be a well-priced alternative to the other more well-known brands.



Figure 4.20: MikroTik Cloud Core Router

4.7 IP Address assign on an Interface

➤ IP > Address > Click (+) > Assign address > Select interface > Ok.

	ARP Accounting Addresses Cloud DHCP Client DHCP Relay DHCP Server DNS Firewall Hotspot IPsec Neighbors Packing Pool Routes SMB SNMP	Address List Address / Network Address Network Network To items enabled	Find Find Interface
Address List Address Address 수 192.10 수 10.0.0	 <!--</th--><th>Network 192.168.100.0 10.0.0</th><th>Find Find Interface ether2-LAN ether1-WAN</th>	Network 192.168.100.0 10.0.0	Find Find Interface ether2-LAN ether1-WAN

Figure 4.21: Shows Screen Print ip address on an interface.

4.8 Add Default Route

A Default Route is configured to forward traffic to the next-hop where destination is unspecified or unknown. Generally Default Route is used to get access to the internet.

IP > Routes > Click(+) > General > Dst. Add > Assign gateway address > OK



Figure 4.22: Shows Screen Print routes & gateway

4.8.1 Configure Network Address Translation (NAT)

• In NAT terminology, the inside network is the set of networks that is subject to translation.

• Routers are able to change the source and destination address of packets that is traversing through itself.

- It can be used to reach public network from a private network.
 - IP > Firewall > NAT > Click(+) > General > Chain(srcnat) > Src. Add> action > action(masquerade) > Ok



Figure 4.23: Shows Screen Print firewall

🄏 Quick Set		New NAT Rule		
Interfaces	5[General Advanced Extra Action Statistics		ОК
Bridge		Chain Srcnat 6	Ŧ	Cancel
📑 PPP		Src. Address 1 192 168 100 0/24 7		Arabi
🛫 Switch		310, Address 1172, 100, 100, 0724		Арріу
°ī¦¦e Mesh		Dst. Address:		Disable
题 IP	1	Protocol:	•	Comment
MPLS	1	See Det		Copy
😹 Routing	1	arc. ron.		
System	1	Dst. Port:	▼	Remove
👰 Queues		Any. Port:	Ψ.	Reset Counters
📄 Files		In. Interface:		Reset All Counter
📄 Log		Out. Interface:		
🧟 Radius			46	
× Tools	1	Packet Mark:		
📰 New Terminal		Connection Mark:	▼	
MetaROUTER	3	Pouting Made		

Figure 4.24: Shows Screen Print NAT rule

🔏 Quick Set	New NAT Rule		
Interfaces	General Advanced Extra Action Statistics	10	ок
Sige Bridge	Action: masquerade		Cancel
PPP	9		A 1
🛫 Switch	Log		Apply
° <mark>t8</mark> Mesh	Log Prefix:	•	Disable
ध् <u>र</u> ा IP	1		omment
MPLS	7		Copy
💐 Routing	1		
System	7		Remove
Queues		Res	et Counters
Files		Reset	All Counters
E Log			
🥵 Radius			
🔀 Tools	<u>۲</u>		
📰 New Terminal			
	2		

Figure 4.25: Shows Screen Print NAT rule action.

4.8.2 Configure DNS

- Domain Name Service (DNS) protocol is used to resolve Internet names to IP addresses.
 - ➢ IP > DNS > Setting > Servers (one or more DNS address assign) > Apply > ok

5	0	Safe Mode				-		
	Interfa	aces	DNS	2				
	Bridge	•	Static	Cache				
	PPP		+		ings 3			Find
	Switc	h	#	Name Addr	ess	TTL (s)	1	
	Mesh							
K	IP			DNS Settings			3	
	MPLS	s 🗕 r		A Servers:	8.8.8.8	>	÷ 01	6
	Routi	ng ۲					Can	
	Syste	m ⊺			Allow Re	mote Requests	Carn	
	Queu	es		Max UDP Packet Size:	512		САрр	× 5
	Files			Cache Size:	2048		КB	
	Log			Cache Used:	1058			
	Radiu	JS						
	Tools	-1						
	New	Terminal						
	Metal	ROUTER						
	Make	Supout.rif						
	Manu	al	0 items					
	Exit							

Figure 4.26: Shows Screen Print DNS

Verify connectivity between PC and ISP



Figure 4.27: Shows Screen Print Command prompt.

4.9 DHCP Server

- This service automates the assignment of IP addresses, subnet masks, gateway and other IP networking parameters.
- In order for the DHCP server to work IP pools must also be configured (do not include the DHCP server's own IP address into the pool range) and the DHCP networks.
- \blacktriangleright IP > DHCP server > DHCP > DHCP Setup > then only next and assign > OK

Quick Set		
Interfaces		
Sig Bridge	ARP	
PPP	Accounting	DHCP Server
www Switch	Addresses 3	DHCP Networks Leases Options Option Sets Alerts
°t≋ Mesh 1	Cloud	+ - 2 22 T DHCP Config DHCP Setup 4
IP P	DHCP Client	Name / Interface Relay Lease Time Addr
MPLS N	DHCP Relay	Thanke Finishade Theat Leade Time Pada
😹 Routing	DHCP Server 2	
() System ►	DNS	
Queues	Firewall	
Files	Hotspot	
Log	IPsec	
🗙 🧟 Radius	Neighbors	
Cox Tools	Packing	
New Terminal	Pool	
MetaROUTER	Routes	
Partition	SMB	03
Make Supout nf	SNMP	

Figure 4.28: Shows Screen Print DHCP Server.

		All Guick Set	
		Interfaces	DHCP Setup DHCP Setup
		📲 Bridge	Select interface to run DHCP server on Select network for DHCP addresses
		PPP	DHCP Server Interface: ether2-LAN The DHCP Address Space: 192.168.100.0/24
		🛫 Switch	
		°t8 Mesh	
		≝ IP ►	O
		MPLS P	DHCP Setup DHCP Setup
		Routing	Select gateway for given network Select pool of ip addresses given out by DHCP server
		System 1	Gateway for DHCP Network: 192.168.100.1
I		Log	Back Next Cancel Back Next Cancel
		A Badius	10 12
	30.	X Tools	DHCP Setup
	inE	Mew Terminal	Select DNS servers Select lease time
	3	MetaROUTER	DNS Servers 8.8.8.8
	os	erition	13 4221
	BL	🛄 Make Supout.rif	
	out	🚱 Manual	Back Next Cancel Back Next Cancel
	Ř	Sew WinBox	14 16
	Boy	Bridge PPP Switch Mesh P P	P P P Setup has completed successfully 17
	2	New Terr	nal
	E.	New rem	Har

Figure 4.29: Shows Screen Print DHCP Setup.

4.10 Customize IP Pool

➢ IP > Pool > Pools > +dhcp_pool1(double click) > Assign IP address range > OK.

Quick Set	ARP		
Interfaces	Accounting		
Bridge	Addresses	Deservoirs	_
PPP	Cloud	IP Pool	
🕎 Switch	DHCP Client 3	Pools Used Addresses	
°t8 Mesh	DHCP Relay		Find
IP	DHCP Server	Name (Addresses Next Pool	
MPLS 1	DNS	@dhcp_pool1 192.168.100.50-192.168.100.100 none	
🜌 Routing 🗈	Firewall	4	
System 🗈	Hotsoot		
Queues	IPsec		7
Files	Neighbors		
Log	Packing	Name: dhcp_pool1 OK	6
😠 🧟 Radius	Pool	5 Addresses 192.168.100.50-192.168.100.100 Cancel	
🔒 🏏 Tools 🔹 🗅	Boutes	Next Pool: none F Apply	
E 🔤 New Terminal	SMR		
MetaROUTER	CNMD	Сору	
8 🦺 Partition	Sanicas	Remove	
Make Supout.nf	Settinos		

Figure 4.30: Shows Screen Print Customize IP pool.

4.11 Add IP Pool

➤ IP > Pool > Pools > Click (+) > Name > Assign IP address range > OK.

🔚 Interfaces	Accounting	
Bridge	Addresses	IP Pool
PPP 📑	Cloud 3	Pools Used Addresses
ም Switch	DHCP Client 4	Find
°t8 Mesh	DHCP Relay	Name / Addresses Next Pool
¶ ₽	DHCP Server	骨dhcp_pool1 192.168.100.50-192.168.100.100 none
MPLS 1	DNS	
😹 Routing 👘 🗈	Firewall	New IP Pool
O System ►	Hotspot	Name: pool2 5 OK
Queues	IPsec	Addresses 192.168.100.200-192.168.100.250 🗢 Cancel
Files	Neighbors	Next Pool: none 6 F Apply
E Log	Packing	
😞 🧟 Radius	Pool	Сору
🔓 💥 Tools 🛛 🔿	Routes	Remove
🧧 📰 New Terminal	SMB	
MetaROUTER	SNMP	1 item
👸 修 Partition	Services	

Figure 4.31: Shows Screen Print Add IP pool.

4.12 DHCP Client

IP > DHCP Client > Again DHCP Client > Click (+) > DHCP > Select interface > Add default route (yes) > OK.



Figure 4.32: Shows Screen Print DHCP client.

4.13. ARP (MAC) Bonding

> IP > ARP > Select ip address on right button click > Make static

Sull no. 1				
Bridge	Accounting			
🚅 PPP	Addresses	ARP List		
🕎 Switch	Cloud			Find
°t8 Mesh	DHCP Client	IP Address	/ MAC Address	Interface
题 IP	DHCP Relay	D 🖾 10001	E4:8D:8C:13:6E:A7	ether1-WAN
MPLS 1	DHCP Server	D 0 192.16***	Show Categories	2-LAN
📈 Routing 💦 🕅	DNS	3	Detail Mode	
🚯 System 🗈 🗎	Firewall		Inline Comments	
Queues	Hotspot		Change California	
📄 Files	IPsec		Show Columns	•
📄 Log	Neighbors		Find Ctr	I+F
🥵 Radius	Packing		Find Next Ctri	I+G
🔀 Tools 🗈 🕅	Pool		Select All Ctrl	I+A
📰 New Terminal	Routes			
🛃 MetaROUTER	SMB	2 items (1 select	Add	INS
🕭 Partition	SNMP	Z itoma (1 adiade	Remove	DEL
] Make Supout.rif	Services	1	Make Static	
😧 Manual	Settings	4		

ARP List						
÷		Find				
	IP Address	MAC Address	Interface 💌			
D	□ 10.0.0.1	E4:8D:8C:13:6E:A7	ether1-WAN			
	192.168.100.2	A0:48:1C:C2:36:BB	ether2-LAN			
			1			

Figure 4.33: Shows Screen Print ARP.

4.14 PPPoE Client Configuration:

Interface > PPPoE client > General tab > select interface > click dial out tab > set user name & password > apply > ok.



Interfaces	New Interfac	÷]			
Bridge	General [Dial Out Status Tra	flic		ОК	iding LTE			
PPP	Name:	popoe-out1			Cancel				
Switch	Tune	PPPoE Clart					L2 MTU	Tx	Rx
Mesh	type.	ITTOE CARIN			лфріу		4500	0 bps	
IP P	L2 MTU:				Disable		1598	0 bps	
IPv6	Max MTU:	1480			Comment		1598	0 bps	
MPLS P	Max MRU:	1480			Comi		1594	0 bps	
Routing	MRRU:			-	Сору		1598	68.6 kbps	43
System P	-				Remove		1500	0.has	
Queues	interfaces	Ether3		∓ ≑	Torch		1036	Ubps	
Files					PPPoE Scan		1598	41.5 kbps	25
Log									
Radius									
Tools									
New Terminal									
MetaROUTER				- D					
Make Supout If				-					
Manual	enabled	Instancional	dava	Statu	a:				
Ext	1	Lange of the			1840				

0	0	Safe Mode		
	Interfa	ces	Interface List	
	Bridge		Interface Ethemet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP	Bo
	PPP Switch			
			New Interface	
	Mech		General Did Oct Serve Tellio	1
	IP	1-		_
	IPv6	P*	Service: Cancel	1
	MPLS	(P)	AC Name: Apply	
	Routin	-1 Br	Disable	1
	Syster	19 P	Chadre	-
	Queur		Comment	_
	Files		Profile: default Copy	_
	Log		Dial On Demand Remove	8.0
	Radiu	5	Add Default Route	
	Tools	1-	Use Peer DNS	_
	New 7	Terminal	- Allow	in
	MetaF	ROUTER	🖌 pap 💽 chap	
	Make	Supout nf	🐼 mschap1 🐼 mschap2	
	Manus	al		
	Exit			
			enabled Status	
			Learning Learning Learning	_

Figure 4.34: Shows Screen Print PPPoE client.

4.15 PPPoE Server

At first create an ip pool:

> IP > Pool > Click (+) > Assign name & ip address range > Ok

terfaces	1	
veless		
dge		(The Control of Contro
		Profs Lines Addresses
	402	
	Accounting	Name Addresses Next Pool +
dina P	Addresses	
steen 7	DHCP Own	
euros	DHCP Relev	New Difference In 19
	OHCP Server	New 200x6 Part
9	DNS	
dus	Frend	Addresses 101111200 Cancel
ola P.	Hotspot	Apply
w Terrinal	(Peec	Copy
Re Supert of	Neighbors	Person
rual		
. (Pod	
	-COTTA	0 tons
	SNMP	
	Services	
	Socka	
	TETP	
	Traffic Flow	
	UPvP	

Figure 4.35: Shows Screen Print create pool.

Once I have the ip pool done, I can proceed to creating the PPPoE server. Once I have a new PPPoE server creation window open, simply choose the interface of the Mikrotik router that I would like to act as the PPPoE server, in this example I have chosen the wlan1 card.



Figure 4.36: Shows Screen Print create PPPoE Server.

I can now create a profile for the PPPoE server to use. This profile is where I will do some basic bandwidth management .This is also where I will specify the use of the ip pool I created earlier. I can create as many profiles as I like, all with different bandwidth restrictions and simply apply them to the relevant users.

C* Safe Mode	1			🖌 Hde Passwords 🔳
interfaces Waveless Bindge ppp				
Mesh: IP P	878 ·		_	
MPLS P Routing P	Treface PPPoE Servers Sec	Notes PPP Pote	80	Find
System 7 Queues	Name / Local Ad Odefault Odefault-encr	Deel General Projection Lines	OK	
Log Radus		Local Address PPPoE Pool F .	Acciv	
Tools / New Territral		Bidge.	Copy	
Make Supout If Manual		Incoming Filter	Fiemove	
Бя		Address List.		
	2 tens	DNS Server 0		
		Onange TCP MSS Fishfault Circ Circs		
		(min.)		

Figure 4.37: Shows Screen Print create a profile.

C* Sale Mode				🖌 Hide Passwords 🔳
Interfaces Wireless Bridge PPP				
Mesh	-			66
IP P	Madava PPD-E Capacity Ca	ante Perfilez Anton Connections		
Routing 1				Find
System 1	Name / Local A	New PPP Prote		-
Queues	fuebo	General Protocile Limits	OK	- 15
Res	* @defaut-encr	Seasion Timeout:	Cancel	
Log		idle Timeout:	Apply	
Radkus	1		[Common]	
Tools 7		Rate Limit (x/tx): 129k	Commerk	
New Terminal	1	- Only One	Copy	
Make Supout of		€ default C no C yes	Remove	
Manual				
Eet				
	2 tons			
		ida.t		

Figure 4.38: Shows Screen Print create a PPP profile for limits.

Once the profile has been created I can proceed to creating some users. This is done in the "Secrets" tab. Simply choose the username and password I like to dedicate to my client select the profile that was created and I ready to go. I may creating many users as I wish. My client can now dial up to this PPPoE server by creating a PPPoE client.



Figure 4.39: Shows Screen Print PPPoE server.

4.16 Bandwidth Management

4.16.1 Simple Queue

 Queues > simple queues > click (+) > general > name assign > Target address > Max limit (Target upload, Target download) > OK.



Figure 4.40: Shows Screen Print simple queue.

4.16.2 Limit Different Bandwidth In Day and Night

Step: 01

Day:

/queue simple name="DAY" target-addresses=192.168.1.0/24 dst-address=0.0.0.0/0 interface=all direction=both priority=8 queue=default-small/default-small limit-at=256k/256k max-limit=256k/256k total-queue=default-small



Wireless							
Bridge		Simple Queue <	DAY>				
PPP	G	General Adva	anced Statistics Tra	ffic Total	Total Statistics		ОК
Mesh	-	P2P:				+	Cancel
IP D	-	Paulos Madea	r				Analy
IPv6 ▷	#	Facket Marks.				.	Abbil
MPLS F		Dst. Address:	0.0.0.0/0			-	Disable
Routing P		Interface:	al				Comment
System P	11		Target Upload		Target Download		Copy
Queues		Limit At:	256k	Ŧ	2564	∓ bits/s	Pamaua
Files	11	Queue Type:	default-small		default-small		Tranove
Log	ш. н			1 Control		1040	Reset Counters
Radius		Parent:	none				Reset All Counter
Tools 1		Priority:	8				Torch
New Terminal							
ISDN Channels							
KVM	22						
Make Supout rf	240						
Manual		enabled			1		
Exit	-						

Figure 4.41: Shows Screen Print simple queue for day.

Night:

/queue simple

name="NIGHT" target-addresses=192.168.1.0/24 dst-address=0.0.0.0/0 interface=all direction=both priority=8 queue=default-small/default-small limit-at=512k/512k max-limit=512k/512k total-queue=default-small



Figure 4.42: Shows Screen Print simple queue for night.

Step: 02

System > Script > click (+) add name=DAY source="/queue simple enable DAY; /queue simple disable NIGHT"

CAPeMAN CAPeMAN CAPeMan CAPeMan CAPeMan CAPeMan Cancel PPP CAPP CAPPP CAPP CAPPP CA	C# Safe M	Mode		🔽 Hide Passwords 📕
CAPeMAN Iminificaces Wireless Bidge PPP Somet CDAYS Name DAY OK	A Quick Set			
Image: Interfaces Image: Wreless Image: Pp Image: Pp Image: Policy Image: Policy <t< td=""><td>I CAPSMAN</td><td></td><td></td><td></td></t<>	I CAPSMAN			
Wreless Bidge Bidge PPP Statut (DAY) Name: DAY OK Cancel Apply Owner: admin Policy MPLS Policy MPLS Policy If a Comment O Ourse: admin Policy If a Concel Policy If a Comment O Policy If a System Files Last Time Stated: Bus Songet Redus Redus Redus New Terminal Source: KVM Maice Support of Manual Ext	Une Interfaces	_		
Sendge PPP Name DAY Name DAY Owner: admin Policy MPLS Policy MPLS Policy MPLS Policy MPLS Policy Meab Comment O Policy Meab Comment O Policy Meab Comment O Password Summer Remove Password Source Password Name Password	T Wireless			
Name: DAY OK Image: Im	Bridge		Senpt «DAY»	
**** Owner: admin Cancel IP F IP F MPLS F MPLS F Policy in reboot Policy it est	PPP		Name: DAY OK	
IP F IP <td>ଂଞ୍ଚ Mesh</td> <td></td> <td>Cancel</td> <td></td>	ଂଞ୍ଚ Mesh		Cancel	
ig0 IPv6 P Ø NPLS P Ø NPLS P Ø Routing P Ø System P Ø Oueues Ø Ø Radus Ø Ø Radus Pain Script Ø Nex Pain Script <td>IP IP</td> <td>1</td> <td>Owner: admin</td> <td></td>	IP IP	1	Owner: admin	
WPLS F W read ♥ write Comment 0 System F Courses F Courses Remove Files Last Time Started: Log Run Count: New Terminal Source: KVM Gashle NIGHT* Make Support of Manual Ext Ext	IPv6	1	v ftp v reboot	
Souting Policy Policy Policy Password Password <td>MPLS</td> <td>-1</td> <td>read write Comment</td> <td></td>	MPLS	-1	read write Comment	
	Routing	P.	Copy	
	System	1	Password Shaff Remove	
	age Queues		(✔) senstive	51 1
Log Log Redus Run Count: D Source: /queue simple enable DAY; /queue simple deable NIGHT* Maice Support of Manual Ext	Files	_	Last Time Gaded:	
Radius Hun Count: U Tools F More Support of Ware Support of Ext Source: /Queue simple enable DAY; /queue simple deable NIGHT*	Log	_	De Control	
New Terminal Source: /queue simple enable DAY; /queue simple Marke Support rif Markual	Radius		Run Count: U	
Image: New Terminal /queue simple enable DAY; /queue simple Image: Not the state of the st	X Tools	F	Source:	
KVM KVM Koke Support of Manual Ext	New Termin	nal	/queue simple enable DAY; /queue simple	
Make Supout nf Manual Ext	ES KVM			
Manual Ext	Aake Supe	out nf		
E bit	Manual 🚱	_		
	Ext			

Figure 4.43: Shows Screen Print script for day.

add name=NIGHT source="/queue simple enable NIGHT; /queue simple disable DAY"

I CAP+MAN			
jum Interfaces			
I Wreless			
🔰 Bridge	Script «NIGHT»		
Rea PPP	Name: UGHT	OK	
PIS Mesh		Cancel	
-1 9 49	Owner, admin	Acoby	
业 IPv6 P	Forcy Film Finhort	7444	nt 🔻
MPLS 1	v read v write	Comment	0
Resting P	P policy V test	Сору	
System P	Password Soft	Bemove	
The contract of the contract o	iv senstive		
E Fles	Last Time Started	Hun Script	
Log	Ren Count 0	i i	
94 Hadus	Haroux. U	1	
Tools	Source:		
Mill New Terminal	disable Day		
ES KVM			
Make Supplier			
er manual			
R CM			

Figure 4.44: Shows Screen Print script for night.

Step: 03

Create Scheduler for day:

Add name=DAY > on-event=DAY > policy=read, write start-date=Oct/25/2017 starttime=60:00:00 interval=24:00:00 > ok

Inte	erfaces			Schedule <d< th=""><th>IAY></th><th></th><th></th><th>6</th><th></th><th></th></d<>	IAY>			6		
Wir	reless			Name:	DAY		ОК	1		
Bric	dge		(instant	Start Date:	Oct/25/2014	1	Cancel		and a local	
PP	P		CONTRACTOR OF	Start Time:	06:00:00	*	Annh			60
Me	rlae		C C C	Internal	14 00:00:00		14000			
IP		T		Fildevia.	10 00.00.00		Disable			Find
1Pv	v6	7	1	DAY1		141	Comment	n Event	Owner Uter 0171795	Run Count
MP	PLS	1					Conv	IGHT	tites-0171795.	0 00
Re	suting	1					Copy			
Sys	stem	1					Nemove			
Qu	ieues									
File	0.0									
Log	g			1		100				
Ra	dius			Owner	Hom-01717955362	1				
Tee	ole	1		- Pelicy		194				
Ner	w Terminal			reboot	🖌 read					
ISC	DN Channels	6		🗹 write	policy					
KV	/M		+	test	password				10	
Ma	ske Supout rit	f	2 items	sniff	sensitive					
Ma	inual			Bun Count:	0					
Ext	R.			Next Run:	Oct/25/2018 06:00:00					
				anablad				-		

Figure 4.45: Shows Screen Print scheduler for day.

Create Scheduler for Night:

Add name=NIGHT > on-event=NIGHT > policy=read, write > start-date=Mar/25/2018 start-time=18:00:00 interval=24:00:00 > ok

NO C# Safe Mode				💌 Hide Passwords 📲 🚘
Guick Set	1	Schedule <night></night>		
Bidge		Name: NICITI	ОК	
ugu iP P		Start Date: Mar/05/2010	Cancel	
Operation (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	Scheckuler anna Laura Blaine Laura Maria Mari	Interval: 24.00.00	Apply Ritherin	
Files	Name Start Date	On Event: NIGHT	Comment Run (Count Next Run
A Radue	NKGHT Mar/05/2011 DAY Mar/05/2011		Сору	0 Mar/06/2010
Tools 1			Remove	
Make Supout rf				
Manual				
		Owner: admin		
X		□ ftp □ reboot ♥ read ♥ write □ policy □ test		
VinBe	2 items (1 selected)	password sensitive		
eros.		Run Count: 0 Next Run: Mar/06/2018 11:59:00		
the second		enabled		

Figure 4.46: Shows Screen Print scheduler for night.

4.17 Firewall

Assume that, I want to allow only source IP 192.168.100.10 to get access to the internet, all other source IPs from this subnet are restricted.

IP > Firewall > Filter rules > click (+) > General > chain (forward) > src. Add assign > click action tab > action (accept) > OK.



Figure 4.47: Shows Screen Print limit filter rules

4.17.1 Address List

The concept of Address List is to gather some IP addresses or some IP blocks randomly which to be used as source or destination in configuring filtering rules, routes etc. later on. I can add multiple IPs or IP blocks in an Address List.



Figure 4.48: Shows Screen Print address list.

After creating an Address List I can use it in a filter rules to specify source or destination.

🔏 Quick Set		Firewall Rule <192.168.100.10>		
🔚 Interfaces		General Advanced Extra Action Statistics		OK
👷 Bridge		Src. Address List	Ţ,	Cancel
🚅 PPP		Det Address List		Acoly
🛒 Switch				Λψμιγ
⁰t <mark>%</mark> Mesh		Layer7 Protocol:	+	Disable
ESE IP	۸			Comment
🖉 MPLS	1	Content:	▼	Conv
💐 Routing	1	Connection Bytes:	Y	Denous
🎲 System	1	Connection Rate:	•	Remove
Queues		Per Connection Classifier:	•	Reset Counters
📄 Files		Con MAC Address		Reset All Counters
E Log				
🗙 🧟 Radius		Out. Bridge Port:	•	
🔏 🎇 Tools	1	In Bridge Pat:	•	

Figure 4.49: Shows Screen Print Firewall Rule advance.

4.17.2 Website Filter

IP > Firewall > Filter rules > click (+) > General > chain (forward) > Src. Add assign > advanced > content (facebook.com) > action tab > action (select drop) > OK.

	ARP	1				
Bridge	Accounting	Desural				
PPP	Addresses	Dittor Di	In NAT IN L	C . D . C		1.1 1 78.1
Switch	Cloud	- Hiller Nu	NAI Mangle	Service Ports Conne	ctions Addre	ess Lists Layer / Proto
°t% Mesh	- DHCP Client	4 🖽 -		Reset Cou	nters 00 R	leset All Counters
	DHCP Relay	#	Action Chain	Src. Address Dst.	Address Prot	o Src. Port Dst. I
MPLS	DHCP Server					
Routing	DNS					
Queues	Firewall 2					
Files	Hotspot					
Log	IPsec					
🖂 🧟 Radius	Neighbors					
🔏 🔀 Tools	Packing					
E 🔤 New Terminal	Pool					
MetaROUTER	Routes					
Guick Set	New Frewall Rule					
Cuick Set	New Firewall Rule General Advanced I	Extra Action S	atistics			OK
Cuick Set	New Firewall Rule General Advanced 1 5 Chain	Extra Action S	atistics		Ŧ	OK Cancel
Guick Set	New Firewall Rule General Advanced 1 5 Chain Src. Address	Extra Action S	atistics		Ŧ	OK Cancel
Cuick Set	New Firewall Rule General Advanced I 5 Chain: Src. Address	Extra Action S forward	atistics		¥	OK Cancel Apply
Cuick Set	New Firewall Rule General Advanced 1 5 Chain: Src. Address Dst. Address	Extra Action S forward	atistics		×	OK Cancel Apply Disable
Cuick Set	New Firewall Rule General Advanced R 5 Chain: Src. Address Dst. Address:	Extra Action S forward	atistics		×	OK Cancel Apply Disable Comment
Cuick Set Cuick	New Frewall Rule General Advanced I 5 Chain Src. Address Dst. Address N Protocol: N Sro. Ref.	Extra Action S	.0/24 7		×	OK Cancel Apply Disable Comment
Cuick Set Cuick	New Frewall Rule General Advanced I 5 Chain: Src. Address Dst. Address: Protocol: Src. Port:	Extra Action S	atistics		×	OK Cancel Apply Disable Comment Copy
Cuick Set Cuick	New Frewall Rule General Advanced 5 Chain: Src. Address Dst. Address: N Protocol: N Src. Port: N Dst. Port:	Extra Action S	atistics		×	OK Cancel Apply Disable Comment Copy Remove
Cuick Set Cuick	New Frewall Rule General Advanced I 5 Chain: Src. Address Dst. Address: N Protocol: N Src. Port: N Dst. Port: Any. Port:	Extra Action S	atistics		×	OK Cancel Apply Disable Comment Copy Remove Reset Counters
Cuick Set Cuick	New Frewall Rule General Advanced I 5 Chain Src. Address Dst. Address Dst. Address N Protocol: N Src. Port: Dst. Port: Any. Port: P2P:	Extra Action S	atistics			OK Cancel Apply Disable Comment Copy Remove Reset Counters Reset All Counters
Cuick Set Cuick	New Frewall Rule General Advanced I 5 Chain: Src. Address Dst. Address: N Protocol: N Dst. Port: N Dst. Port: Protocol: N Dst. Port: Protocol: Prot	Extra Action S	atistics			OK Cancel Apply Disable Comment Copy Remove Reset Counters Reset All Counters

Figure 4.50: Shows Screen Print Firewall filter Rule & general option.

All GUICK DEL		Firewall Rule <192.168.100.10>		
🔚 Interfaces		General Advanced Extra Action Statistics		ОК
Bridge		8 Src. Address List:	•	Cancel
PPP		Dst. Address List:	•	Apply
₩ Switch				
°t% Mesh		Layer7 Protocol:	•	Disable
메필	1	Contract Disseleade com		Comment
Ø MPLS	1			Сору
20 Routing	1	Connection Bytes:	¥	Remove
(ig) System	12	Connection Rate:		
Queues	_	Per Connection Classifier:	•	Reset Counters
Hies		Src. MAC Address:	•	Reset All Counters
E Log				
				144.00
🔏 Quick Set		Firewall Rule <192.168,100.10>		
				and the second se
Interfaces		General Advanced Extra Action Statistics	12	ОК
imm Interfaces		General Advanced Extra Action Statistics	12	OK Cancel
Interfaces		General Advanced Extra Action Statistics	12	Cancel
Interfaces		General Advanced Extra Action Statistics Action drop Log	12	Cancel Apply
Imm Interfaces Bridge PPP Switch Cit Mesh		General Advanced Extra Action Statistics Action drop Log Log Prefix:	12 •	Cancel Apply Disable
Interfaces	1	General Advanced Extra Action Statistics Action drop Log Log Prefix:	12 •	Cancel Apply Disable Comment
Imm Interfaces Sig Bridge PPP Switch Switch Sig Mesh Sig IP WPLS	4	General Advanced Extra Action Statuscs Action drop Log Log Prefix:	12	Cancel Cancel Disable Comment Copy
Imminterfaces Signature PPP Switch Signature IP MPLS Routing	4	General Advanced Extra Action Statutes Action drop Log Log 11	12	Cancel Cancel Disable Comment Copy
Imminterfaces Signatures Signatures Switch Signatures Switch Signatures Switch Signatures Switch Signatures Switch Signatures	4	General Advanced Extra Action Statutes Action drop Log Log Prefix:	12	Cancel Apply Disable Comment Copy Remove
imminterfaces immin	4 4	General Advanced Extra Action Status	12	Cancel Cancel Disable Comment Copy Remove Reset Counters
Imminterfaces Sig Bridge Imminterfaces Bridge PPP Imminterfaces Switch Imminterfaces Switch Imminterfaces Imminterfaces Switch Imminterfaces I	7 7 7	General Advanced Extra Action Statuscs Action drop Log Log Prefix:	12	Cancel Cancel Apply Disable Comment Copy Remove Reset Counters Reset All Counters
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Figure 4.51: Shows Screen Print Advance & action option.

CHAPTER 5 CONCLUSION AND FUTURE SCOPE

5.1 Discussion and Conclusion

Review this internship has been a wonderful and rewarding experience. I have seen the future and I will be able to help me with the opportunity to network with a lot of people have been able to confirm that. Through this internship, I have learned that one of the main issues and time management skills as well as self-motivation. When I first started I was eight hours a day, six days a week is going to be able to sit in an office and did not think that. Once I realized what I had to do my hours of overlapping is not broken so I organize my day job. Organized and it was the right time, when I get a response prepared for questions that need to be learned. This internship and time management of the office for many hours, I had to learn how to motivate yourself through. I'm still looking for using the company came up with the various proposals and ideas. I'm still keeping my options open to new opportunities, however are continuing to work for the University of Bangladesh in the world. I'm enjoying this line of work. I continue to work hard for my position and hope to continue to learn about the industry and meet new people will. It was a wonderful experience and I hope the other intern got a lot out of it.

5.2 Future Scope

In this digital era, everything is related with networking. I think it is a great opportunity for me to get a job. There are many ISP companies in our country and also in abroad. So I have a lot of options. The plus point is, I have also learned something about networking and configurations. In this era, every major company needs IT support to keep its networks running smoothly. Within IT departments, there are a variety of jobs. The benefits of entering this career field are numerous. There's no career field hotter than information technology. With huge advances in technology over the past few decades, companies need professionals who can help keep their computer networks working and improving them with the times. So i think it is a great opportunity for me to get a job.

APPENDIX

LAN	Local Area Network
MAN	Metropolitan Area Network
WAN	Wide Area Network
MAC	Media Access Control
NAT	Network address translator
RJ	Registered Jack
STP	Shielded Twisted Pair
UTP	Unshielded Twisted Pair
DNS	Domain Name Server
DHCP	Dynamic Host Configuration Protocol
IP	Internet Protocol
ISP	Internet Service Provider
ARP	Address Resolution Protocol
VLAN	Virtual Local Area Network

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