

**A Network Management System using MikroTik**

**SUBMITTED**

**BY**

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

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**DAFFODIL INTERNATIONAL UNIVERSITY**

**DHAKA, BANGLADESH**

**MAY, 2019**

## APPROVAL

This internship titled "A Network Management System using MikroTik", submitted by **Md. Kamrul Tarek**, ID No: 153-15-6499 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on **04 May, 2019**.

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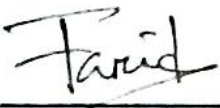
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## DECLARATION

I hereby declare that, this internship report is prepared by way of me **Md. Kamrul Tarek**, ID NO: **153-15-6499** to the department of Computer Science and Engineering, Daffodil International University. Under the supervision of **Mr. Md. Swakshar Mahmud**, Lecturer, Department of Computer Science and Engineering, Daffodil International University in partial fulfillment of the necessities for the diploma of Bachelor of Science in Computer Science and Engineering. I ensure that neither this report nor any part has been introduced somewhere else for the award of any degree.

Supervised By

 05.5.19

**MR. MD. SWAKSHAR MAHMUD**

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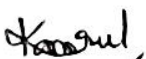
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## **ABSTRACT**

The MikroTik operating system is designed as a network router. This is an operating system and software. In particular, this network device is suitable for small networks in all cases, including client rules and security. These features include firewall and NAT, bandwidth throttling, routing, access points, and more. So it is very useful for our daily life. Linux is simply an operating system. Applications and computers are software on a computer that allows an operator to access devices on a computer and perform the functions it needs. Medium or large organizations need server systems to support complex IT infrastructures. Since servers are a bit expensive, I would try to use an economical server system. This system improves network reliability and network security. Organizations that want to implement this system can easily use this system for greater reliability than other systems. This project was implemented using VMware Workstation 10.0 and CentOS 6. After the implementation of all services, if this system has tested in many stages and functions as a prototype.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

The foremost goal of schooling is to collect knowledge. A network system are join to computer, peripherals, even IoT devices. Switches, routers and Wi-Fi access factors are the fundamental networking basics. I pick out an internship due to the fact I desired to benefit from the experience. Through them machine related to community can communicate with one pc to every other laptop and different community as public, which can accessed by all user. Computer gadget and peripheral are linked to form a network. Networks, like the internet. So networking is so plenty important.

- To fulfill the requirement of the internship application beneath CSE program.
- To achieve details information about MikroTik and Linux.

### 1.2 Motivation

I am currently following my Bachelor of Science in Computer Science & Engineering at Daffodil International University. It is very necessary to gaining sensible knowledge. Which will complement the textbook expertise and help a pupil gain a wider standpoint of the subjects. I realize that my ability degree is quite in the details of MikroTik and Linux network during my internship. I agree with this place is very perspective and important, because we have community in all places proper now. To work on the protection and effectiveness of them will be makes me joyful in my daily life.

### 1.3 Internship Objectives

The main objectives of the internship is gain practical knowledge. These internship program helps me strong and confident in the job market.

1. Learn briefly about the networking elements.
2. MikroTik Configuration
3. How we speak with clients
4. Step by step instructions to give better service to Clients.
- 5 To get a wide knowledge about the networking.
6. To learn out how to install and configure the various server and other software.
7. Linux Server Installation and Configuration.

## **1.4 Introduction to the Company**

Daffodil on-line restricted is one of reliable net carrier issuer (ISP) and one of the most experienced and unique company in the ICT field, with long-term relationships with enterprise morals who feel there is .They are exceedingly future. In the time of 2002 they are begun their excursion. Since the beforehand years, they expounded grateful of what they have picked up, and moreover extra enthusiastic about their viewpoint for a similarly cheerful their workout routines and administration office following to the customer's notion and thinking about need have time. They work with a variety of national challenge and global association and picked up the stable stage.

## **1.5 Report Layout**

**Chapter 1:** Described goal of internship, motivation of internship goals and introduction to the company organization.

**Chapter 2:** I have describe about the organization where the internship has been connected to undertake this program, and also about the IT service they provided and the roles in jobs market of MikroTik and Linux.

**Chapter 3:** Show training, I have described the each day assignment and activities, Events and things to do and Challenge.

**Chapter 4:**I have described Conclusion and Future Scope, and also mentioned Future Scopes of MikroTik and Linux

**Chapter 5:** I have described Conclusion and Future Scope.

## **CHAPTER 2**

### **ORGANIZATION**

#### **2.1 Introduction**

Daffodil Online Limited (DOL) is one of the most significance organization for internship and giving ICT services and solution since July 2002. It has its personal Fiber Optic & Radio Link WAN infrastructure to serve corporate, ME and Individual customers. The foundation worked with numerous national project and internationall associations with high gratefulness from all concerned. It utilizing the most recent technologies and upgrading services wherever it is required.

#### **2.2 Product and Market Situation**

Daffodil Online Ltd is one of the most important across the country of an Internet Service Provider (ISP) in Bangladesh and most seasoned enterprise in the ICT field the place they are integral commercial enterprise morals is Long Term Relationship with their clients.

They provides many IT services and Professional Training services. These are given below:

- ❖ IT Services
  - Corporate Internet Solution
  - Security protection
  - Web Site Development
  - Internet service provider
  - IT expert by providing efficient Training
  - State of the are data centers
  - professional course and trainings

## 2.3 Organizational Structure



Figure 2.1: Organizational Structure of Daffodil Online Limited (DOL)

## **CHAPTER 3**

### **TASKS, PROJECT AND ACTIVITIES**

#### **3.1 Daily Task and Activities**

➤ **Month 1:** In the 1<sup>st</sup> month I have learned about the following tasks

- Basic Networking Concepts
- Basic Network Addressing (IPv4 Addressing)
- Basic Concepts of VLAN and configuration
- UTP cabling and Optical Fiber

➤ **Month 2:** In the 2<sup>nd</sup> month I have learned about following tasks

- MikroTik Router OS Configuration
- Installation
- Static Configuration
- Bridge Configuration
- DHCP configuration
- Bridge and Wireless Configuration

➤ **Month 3:** In the 3<sup>rd</sup> month I have learned and performed the following tasks

- Learning about basic network components
- Learning about basic of Linux
- Learning & Understanding Linux HDD Partitions
- Learning about Linux Run Level
- Learning about Linux Installation

➤ **Month 4:** In the 4<sup>th</sup> month I have learned the following tasks

- Basic Centos commands
- Linux User create and Password management
- File directory and accessing
- Root password break-single user mode
- Compressed and Decompressed File and Directories

#### **3.2 Events and Activities**

- Monitor and Maintain Computer Systems and Network.
- Setting up person accounts, permissions and passwords.
- Troubleshooting servers and routers.
- Troubleshooting nearby place networks and switches.
- Fixing community faults.
- Technical guide for people using the network.
- Day to day admin and monitoring of community use.
- Suggesting IT options to commercial enterprise problems.
- Client Support over the telephone or Physical move to client Ends.
- Checking Fiber Optic Media Converter and Fiber Optic Transmission devices.

### 3.3 Project Task and Activities

### 3.4 RouterOS

MikroTik router is the working device of MikroTik router board hardware. It is a standalone running system based on the Linux v2.6 kernel. It can also be established on a laptop will turn it into a router with all the necessary features-firewall, routing, wireless get admission to point, bandwidth management, VPN server and more [7].

### 3.5 Features

The feature of RouterOS supports are-

- Router OS can be used as a switch or bridge
- It provide DHCP server service
- Can be used as e router
- Provides BGP, OSPF, Mu
- It provides firewall rules
- Easy management of bandwidth

### 3.6 Cloud Core Router

MikroTik released the cloud core router in November 2012.It is an industrial grade router with cutting edge 36 core CPU with Unprecedented power and unbeatable performance .Cloud Core Router with 36 cores is the best choice if we need many millions of packets per second. It has up to four SFP ports, twelve Gigabit Ethernet ports, a serial reassure link and a USB port. It also has two DDR3 SODIMM slots, by default it is shipped with 4GB of RAM, but has no memory limit in RouterOS (will accept and utilize 16GB or more). CPU Tiler Tile-Gx36 CPU (36-cores, 1.2GHz per core) Memory [9].

- 8 mbps standard forwarding
- 24 mbps fast path forwarding (wire speed for all ports)
- Up to 16Gbit/s throughput



Figure: 3.1 Cloud Core Router

### 3.7 MikroTik Router

MikroTik is a Latvian organization which was established in 1996 to create switches and remote ISP frameworks. Presently it gives programming and equipment to web network far and wide.

#### 3.7.1 Propose Network Diagram Using (MikroTik Router)

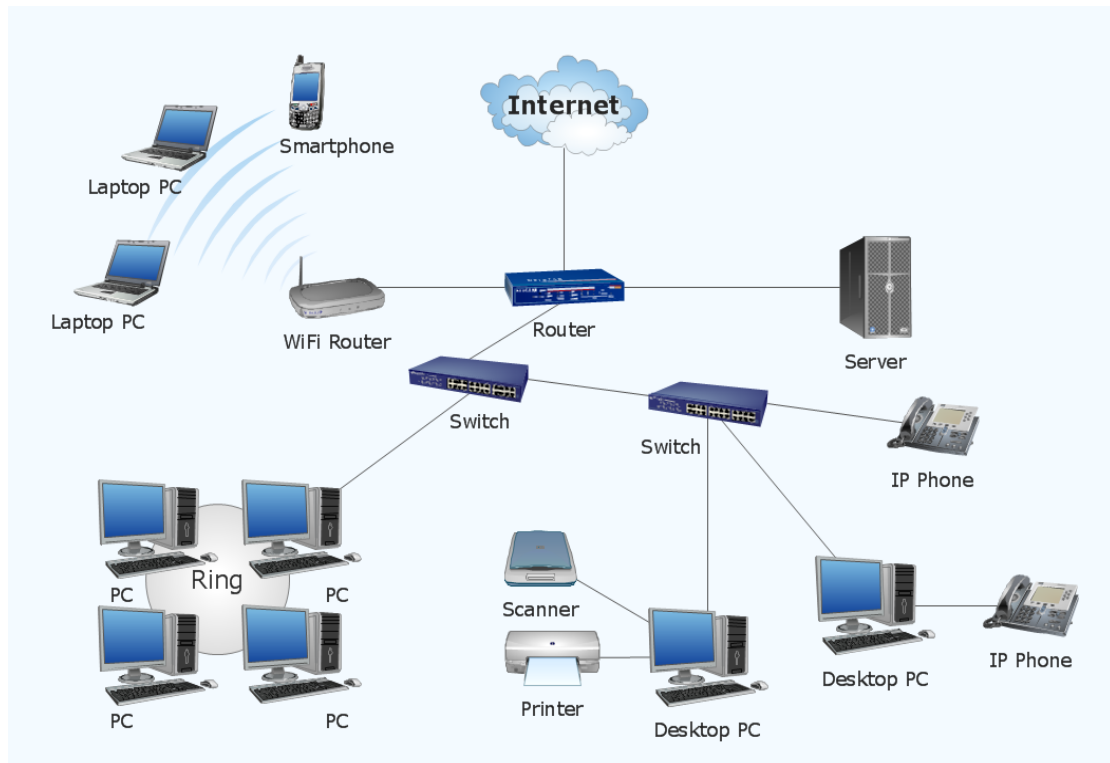


Figure3.2: Network Diagram using MikroTik Router

### 3.8 VMware Workstation Installation and Configuration:

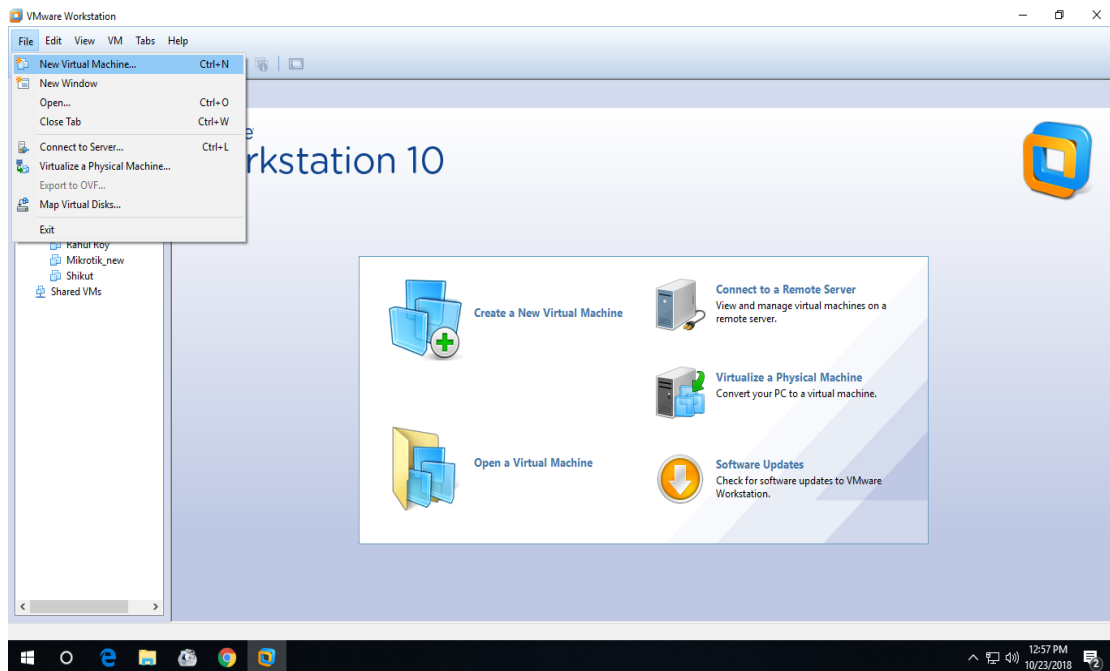


Figure 3.3: Create a new virtual machine

- ❖ **Step-1:**  
Open VMware workstation and go to >> file >> then click “New Virtual Machine”.
- ❖ **Step-2:**

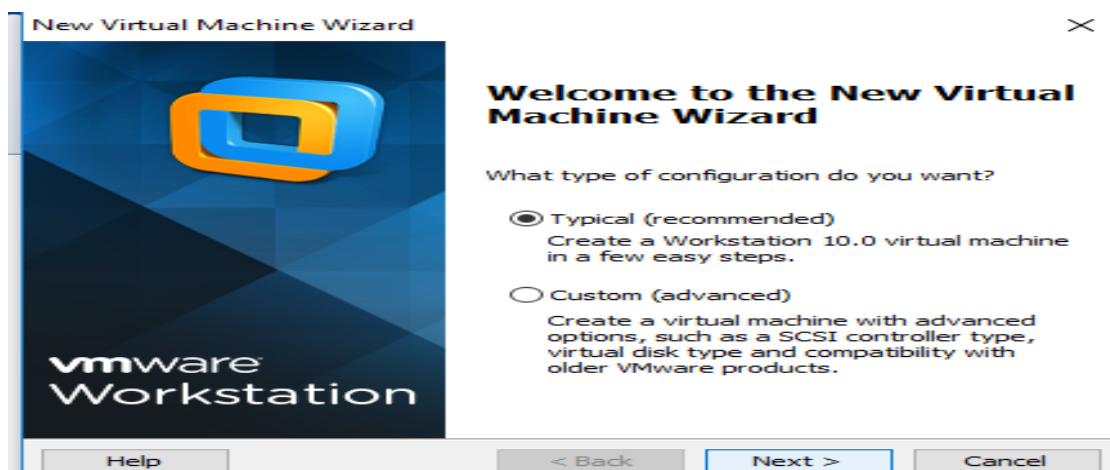


Figure 3.4: VMware Installation Method



### Step-3:

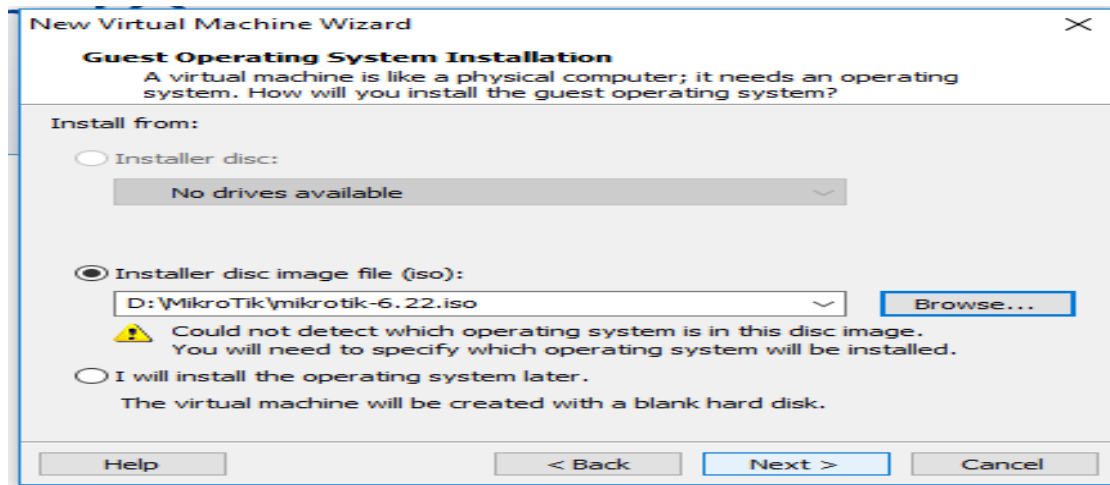


Figure 3.5: VMware Installation Method

### Step-4:

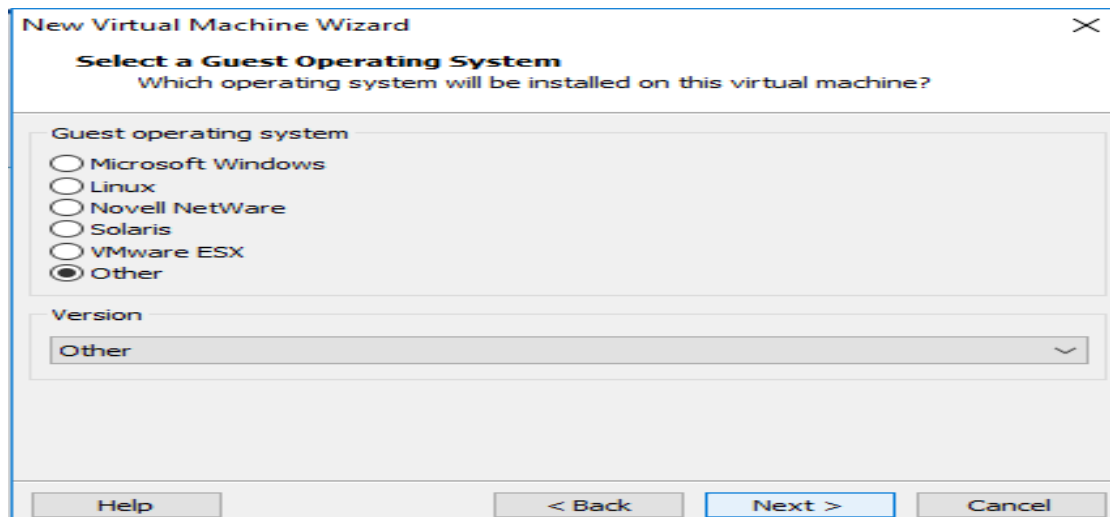


Figure 3.6: VMware Installation Method

❖ Step-5:

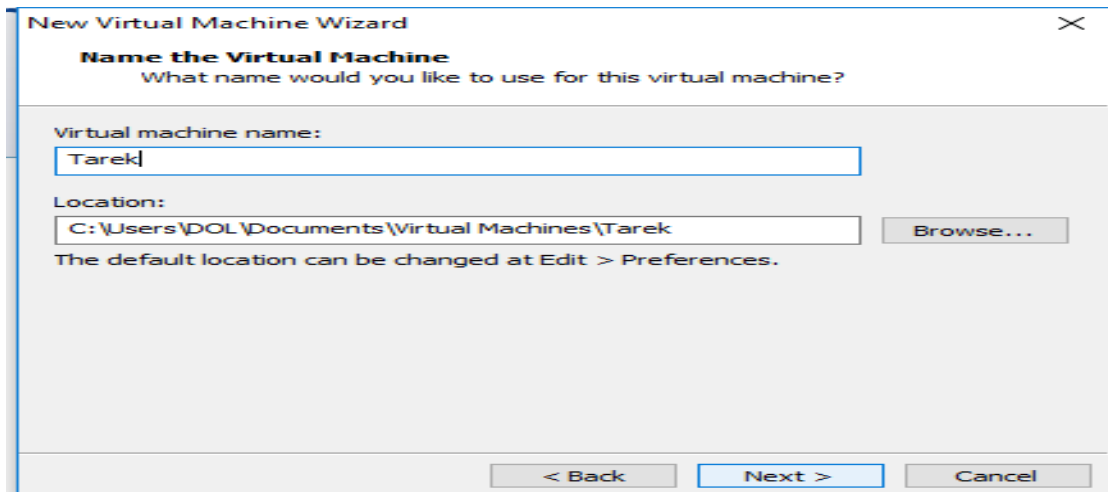


Figure 3.7: VMware Installation Method

❖ Step-6:

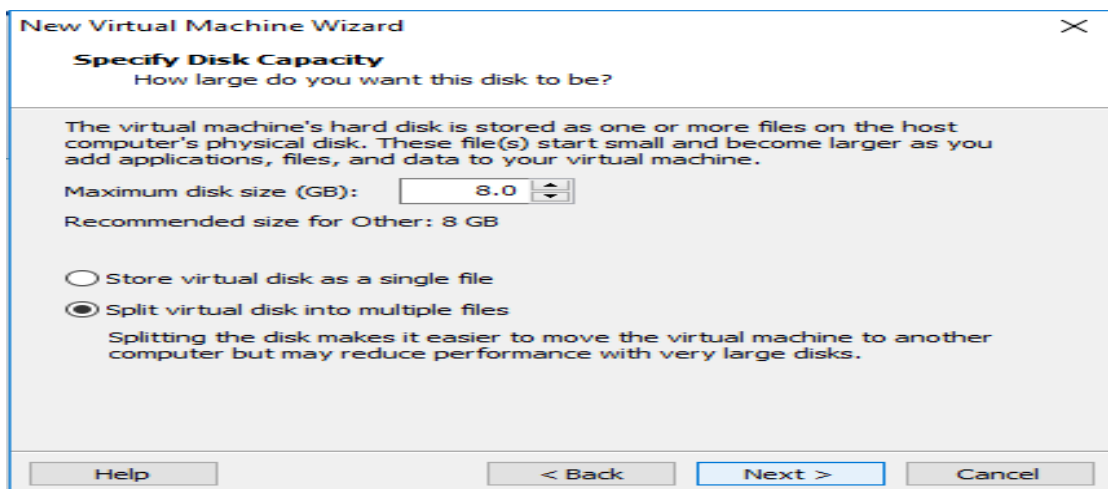


Figure 3.8: VMware Installation Method

### ❖ Step-7:

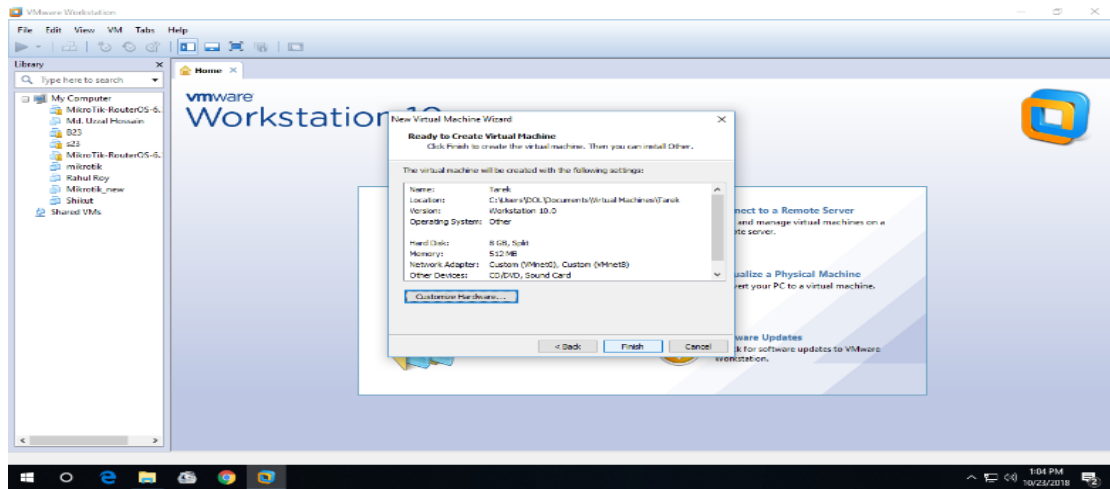


Figure 3.9: VMware Installation Method

### ❖ Step-8:

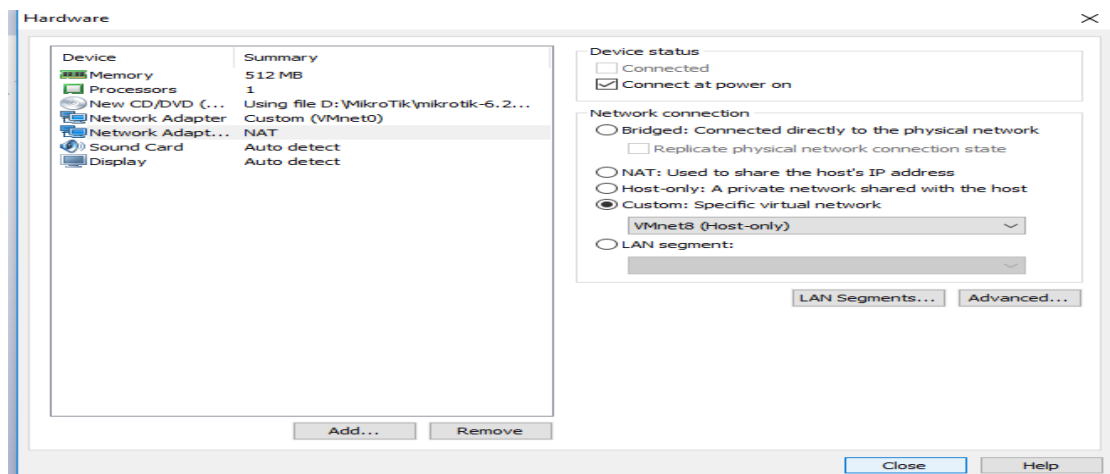


Figure 3.10: VMware Installation Method

## ❖ Step-9:

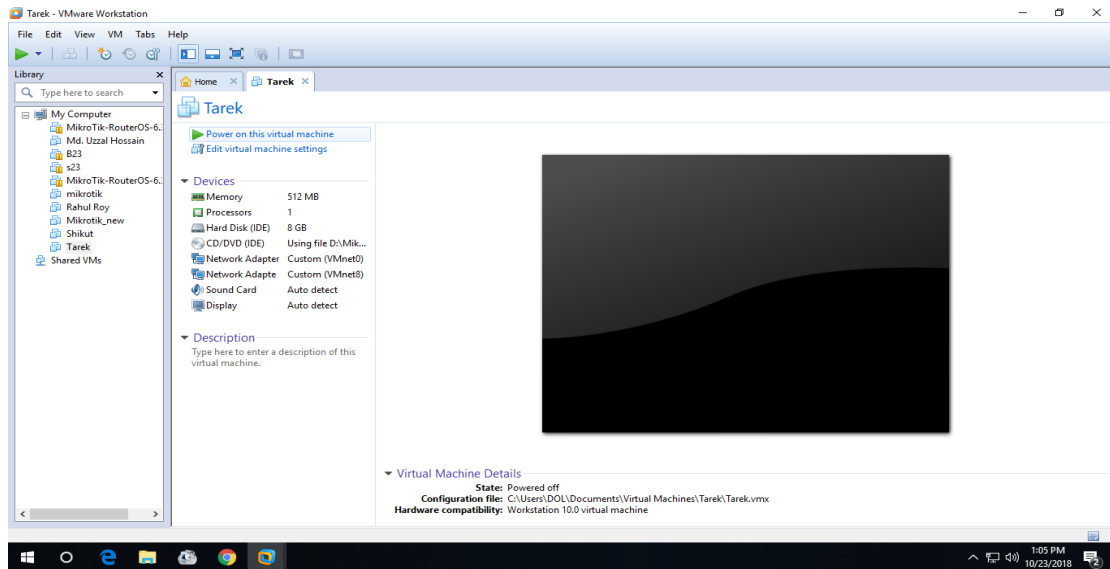


Figure 3.11: VMware Installation Method

## ❖ Step-10:

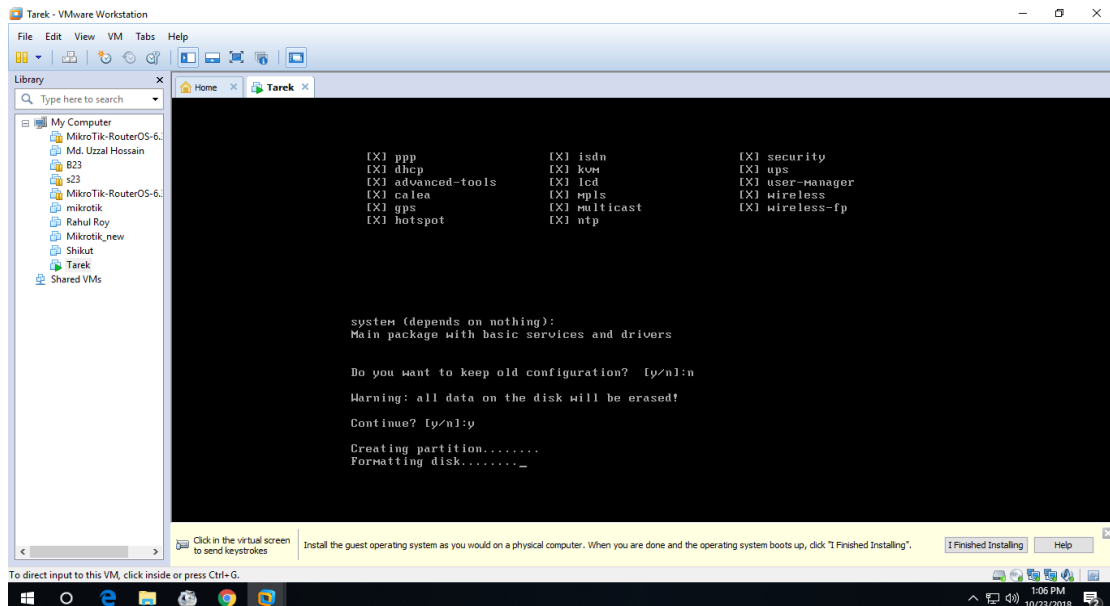


Figure 3.12: MikroTik Installation Method

❖ **Process:**

- Power on this virtual machine >> Press >> a >> Press >> i >> Then Press >> n >> Press >>y >>after that “login”.

### 3.9 Static Configuration:

❖ **Step-1:**

First open the “**Win box**” then click >> Interface >> (+) >> Then AddName for ether1-WAN and ether2-LAN >> Apply >> Ok.

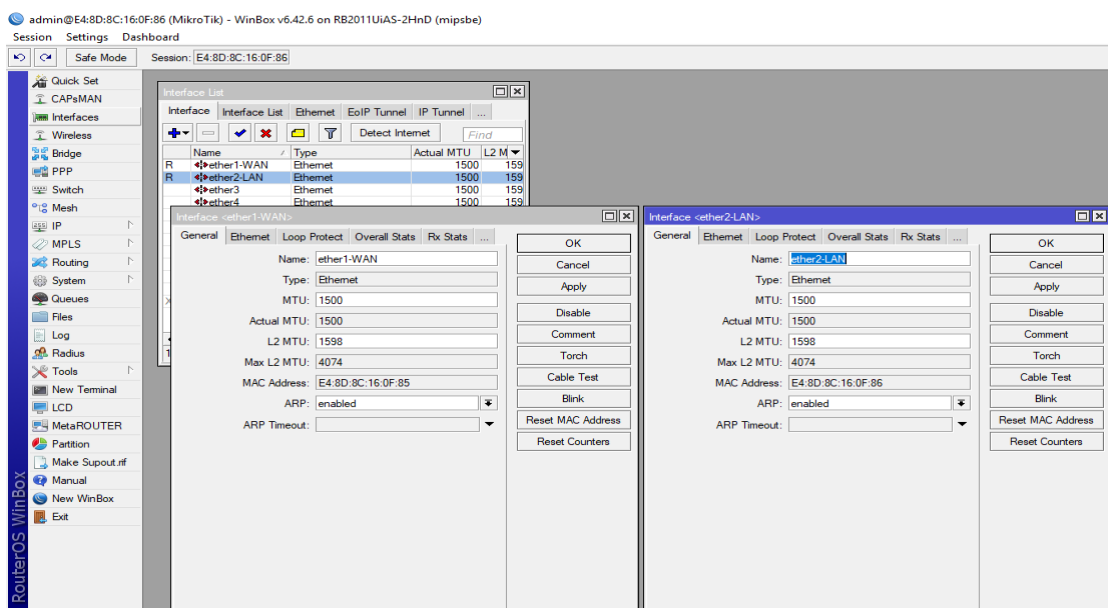


Figure 3.13: Interface Name Selection

❖ **Step-2:**

Click>> IP >> Addresses>> Click >> (+) >> Then give the IP address for ether1-WAN and ether2-LAN >> Apply >> Ok.

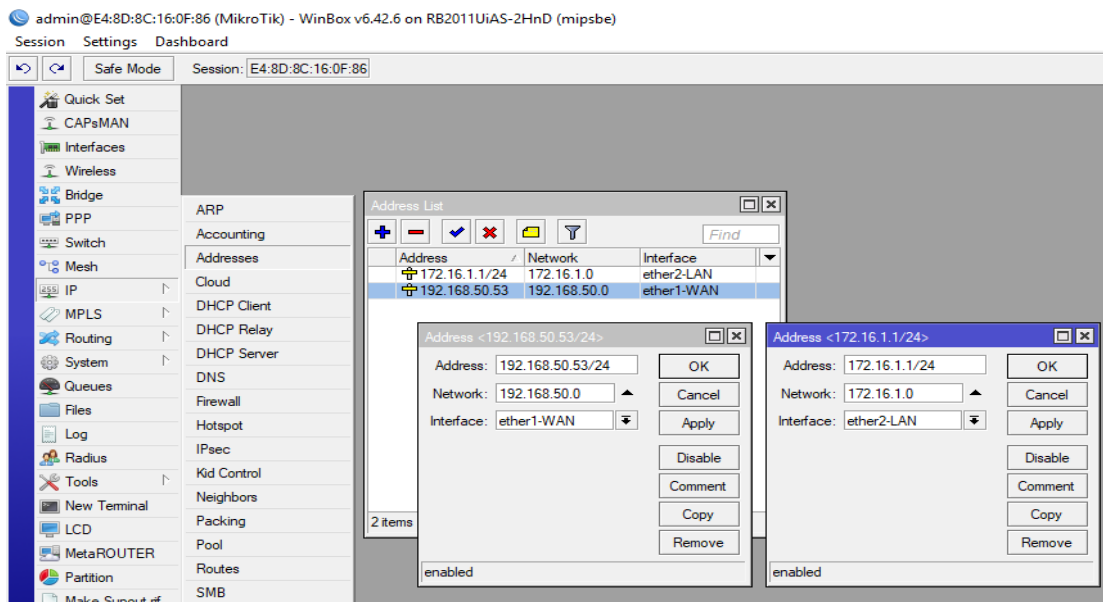


Figure 3.14: Add IP Address for Interface

❖ **Step-3:**

Go to >> IP >> Routes >> Click >> (+) >> Then give only ether1-WAN (Gateway) >> Apply >> Ok.

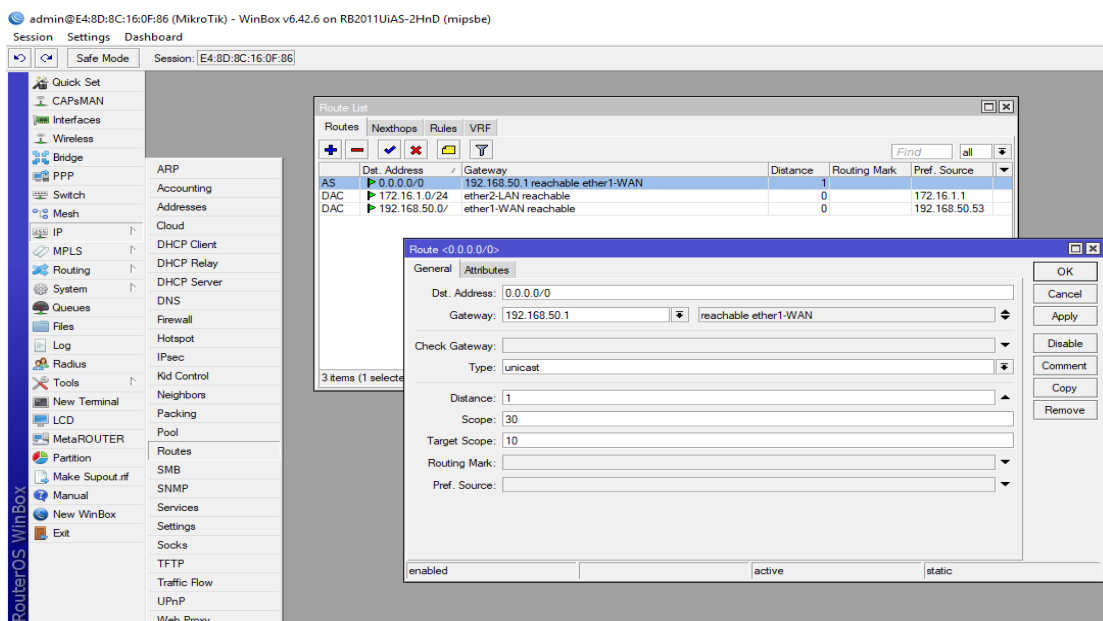


Figure 3.15: Gateway Address for Route List

❖ **Step-4:**

Click >> IP >> DNS >> Then give **DNS**server IP >> Apply >> Ok.

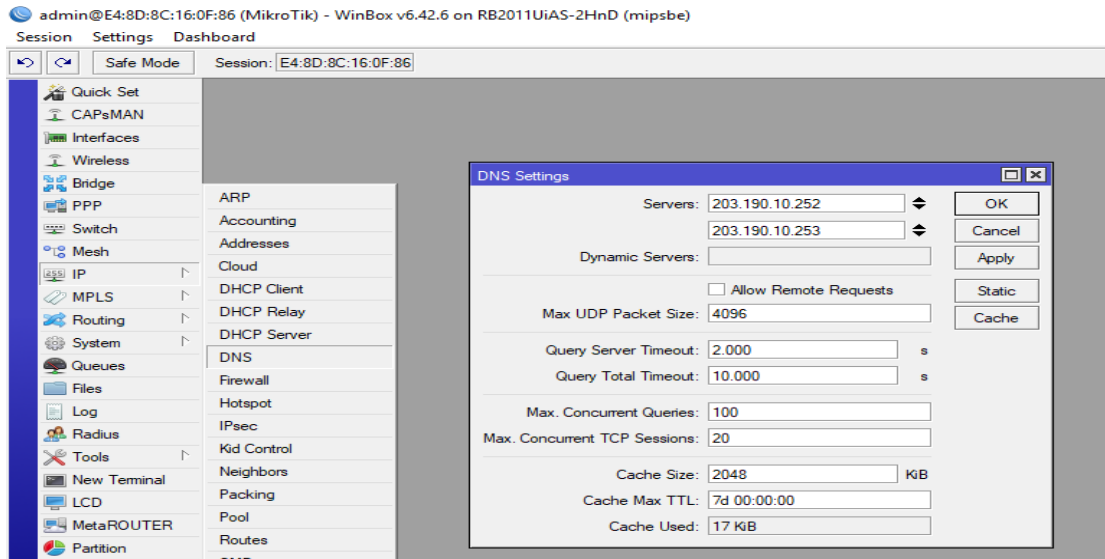


Figure 3.16: DNS Setup

❖ **Step-5:**

Click on IP >> Firewall >> Then click on NAT >> Action >> Then select “Masquerade” >> Apply >> Ok.

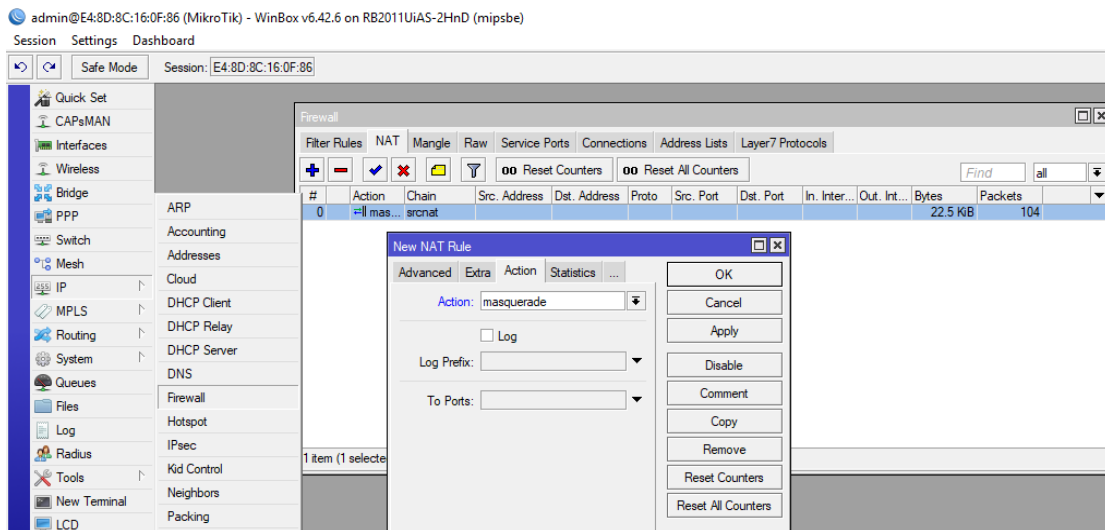


Figure 3.17: Firewall and NAT

❖ **Step-6:**

Go to >>“Network and Internet settings” then click on Ethernet>> Change adapter options >>**Properties**>> Internet Protocol Version 4 (TCP/IPv4) >> Then use the following IP address, Subnet mask, Gateway, and DNS Server IP >>Then click “OK”.

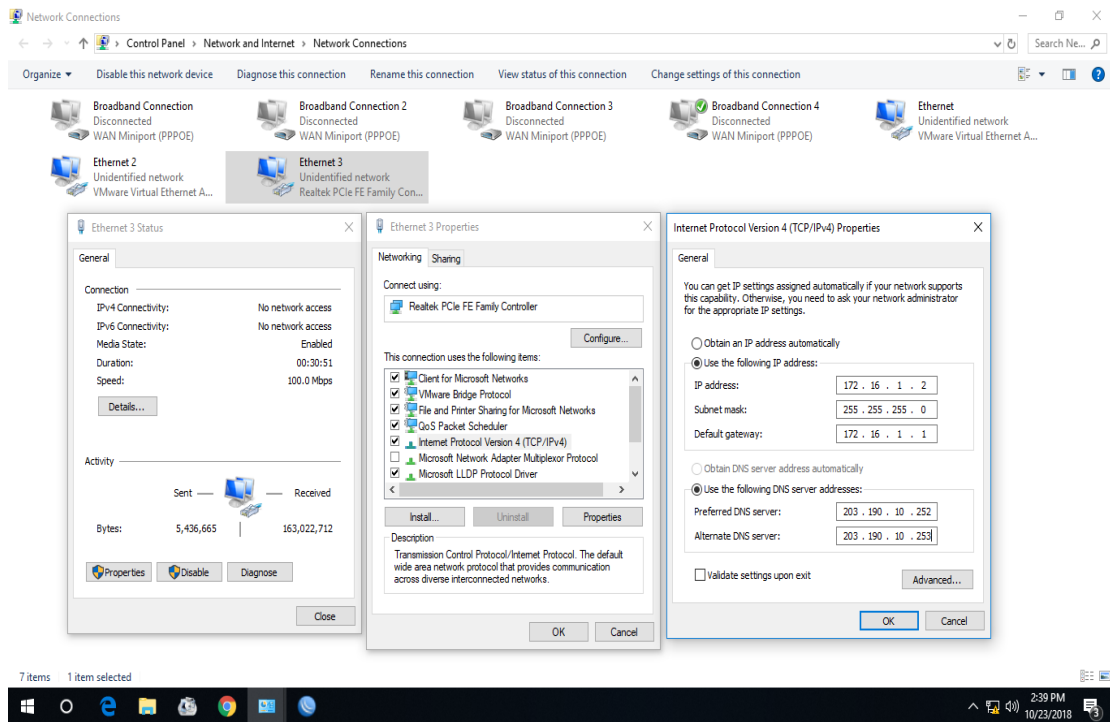


Figure 3.18: Network and Internet Settings (TCP/IPv4)



## ❖ Step-7:

After that – We can browse the internet.

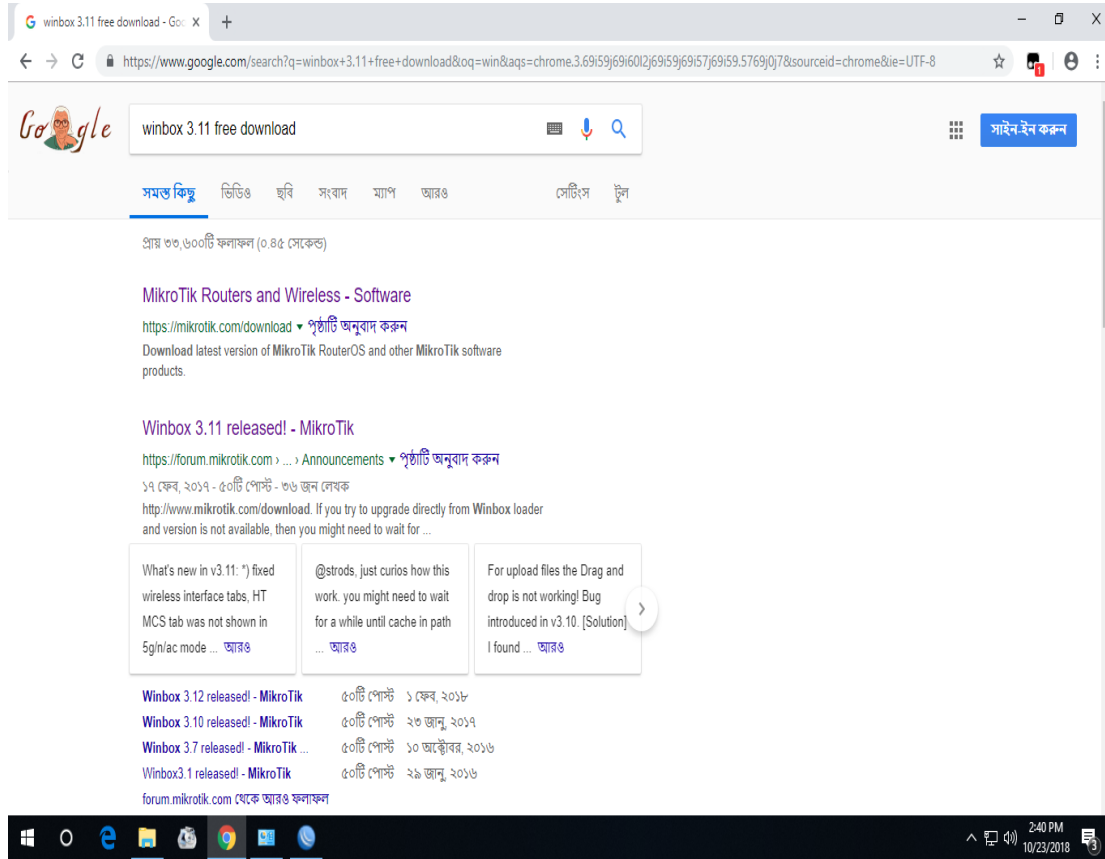


Figure 3.19: Internet Access

### 3.10 DHCP Configuration

#### ❖ Step-1:

Click on >> IP>> DHCP Server >> DHCP Setup >> Then click >> Next

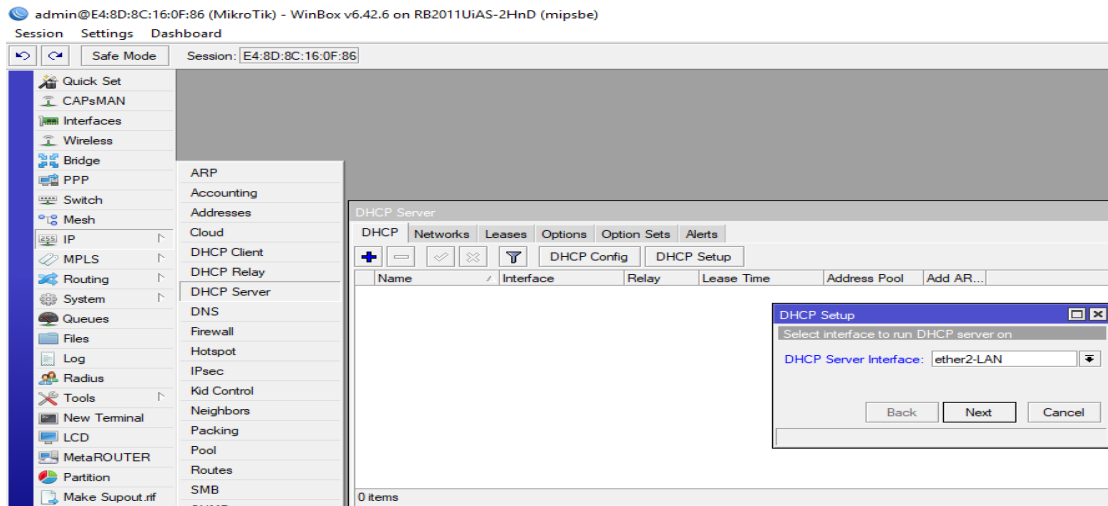


Figure 3.20: DHCP Server Setup

#### ❖ Step-2:

Click >> Next

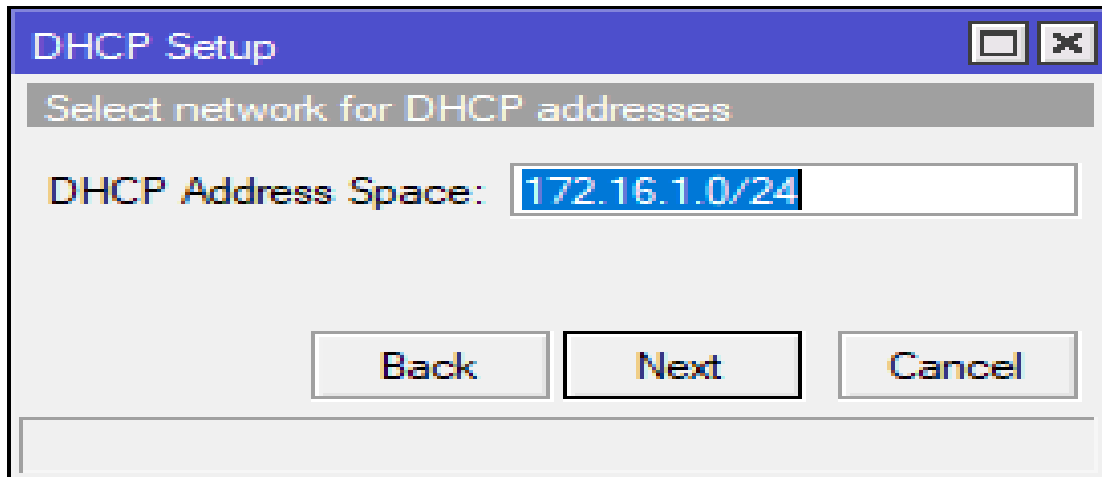


Figure 3.21: DHCP Setup

❖ **Step-3:**

Click >> Next

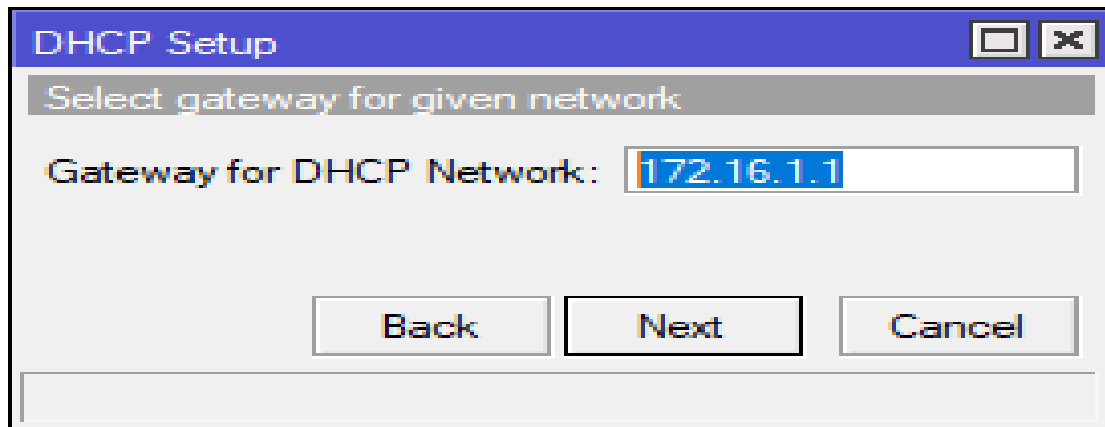


Figure 3.22: DHCP Setup

❖ **Step-4:**

Click >> Next

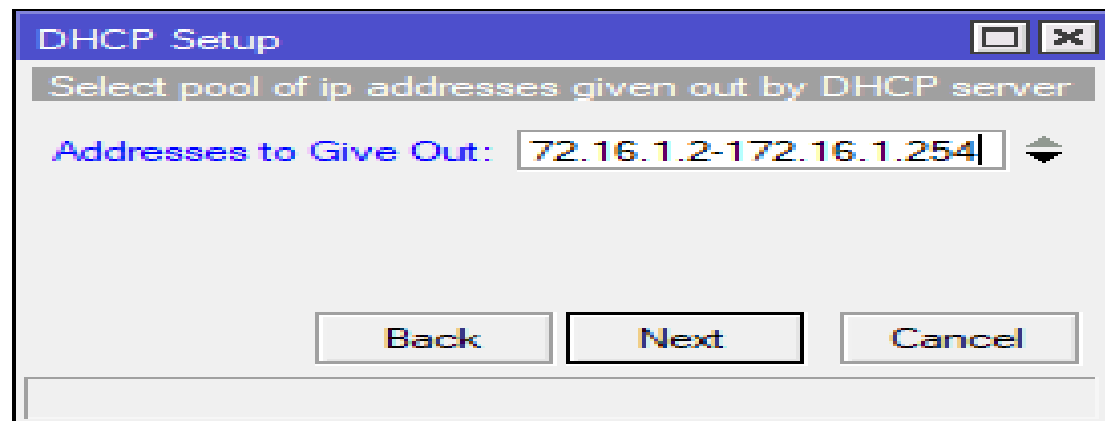


Figure 3.23: DHCP Setup

❖ **Step-5:**

Click >> Next

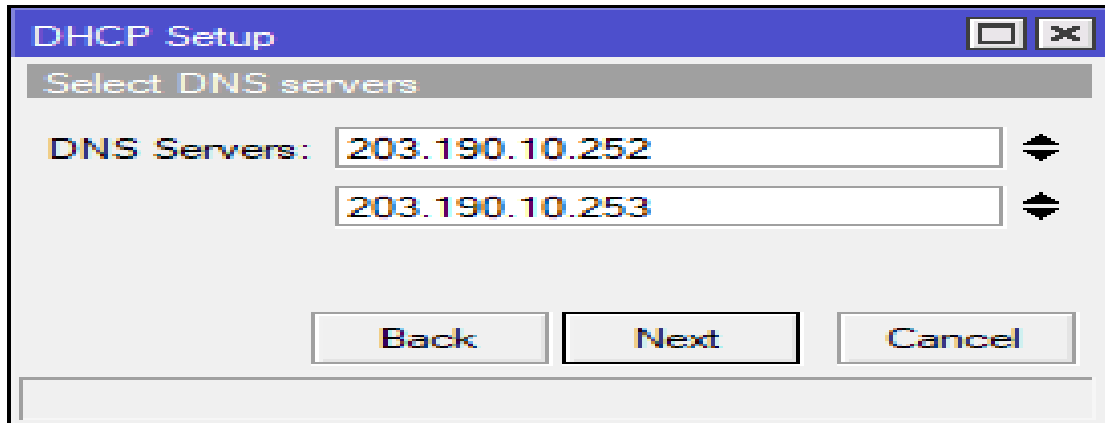


Figure 3.24: DHCP Setup

❖ **Step-6:**

Click >> Next

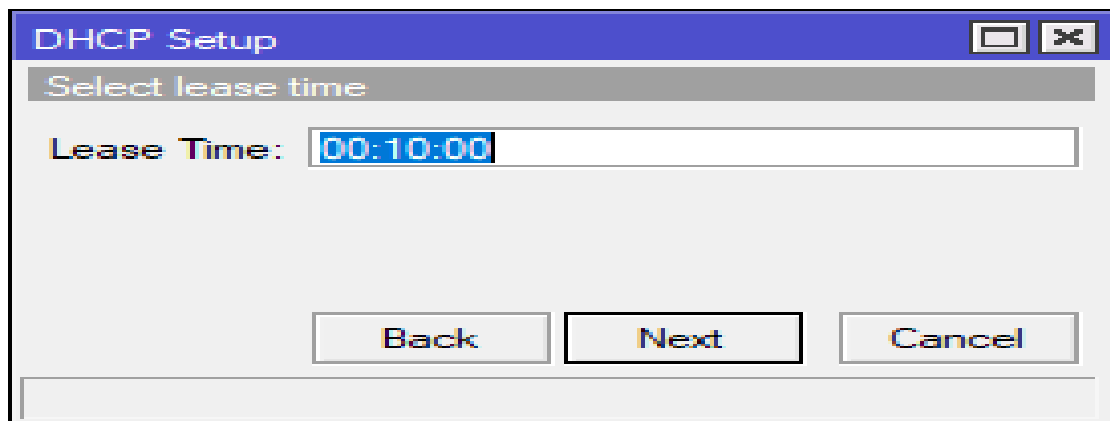


Figure 3.25: DHCP Setup

❖ **Step-7:**

Click >> Next

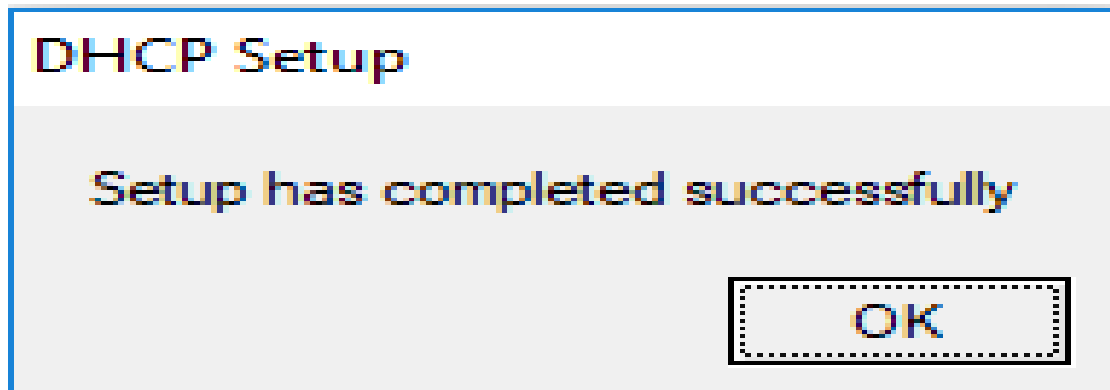


Figure 3.26: DHCP Setup

❖ **Step-8:**

Open Network & Internet Settings >> Change Adapter Options >> Click on "Details"

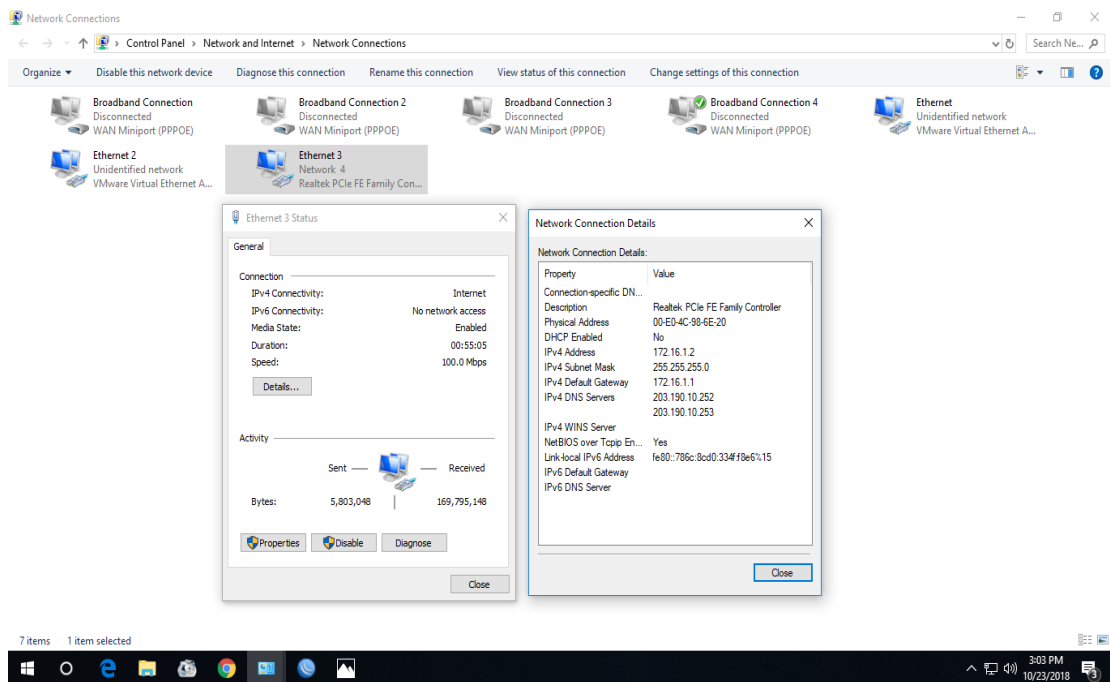


Figure 3.27: Network Connection Details

### 3.11 Bridge Configuration

➤ **Step-1:**

Go to >> Bridge >> Then click on >> '+' >> Select Interface “**General**”

Now, Select: Name, Type, and ARP

ARP: enable >> Apply >> Ok

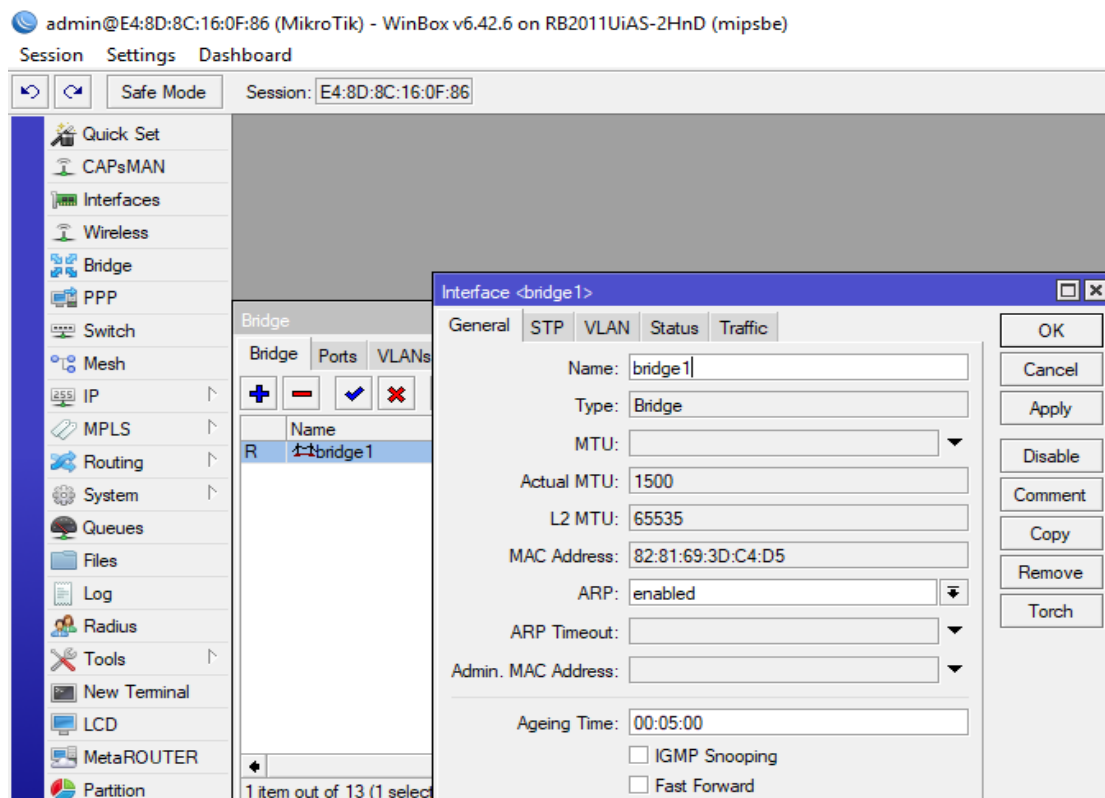


Figure 3.28: Create a Bridge

➤ **Step-2:**

Go to >> Bridge >> Now select bridge ports

Select >> Bridge Ports “**General**”

Then select interface “**Name**” and “**Bridge**”. Same way assign one or more interface on the bridge ports.

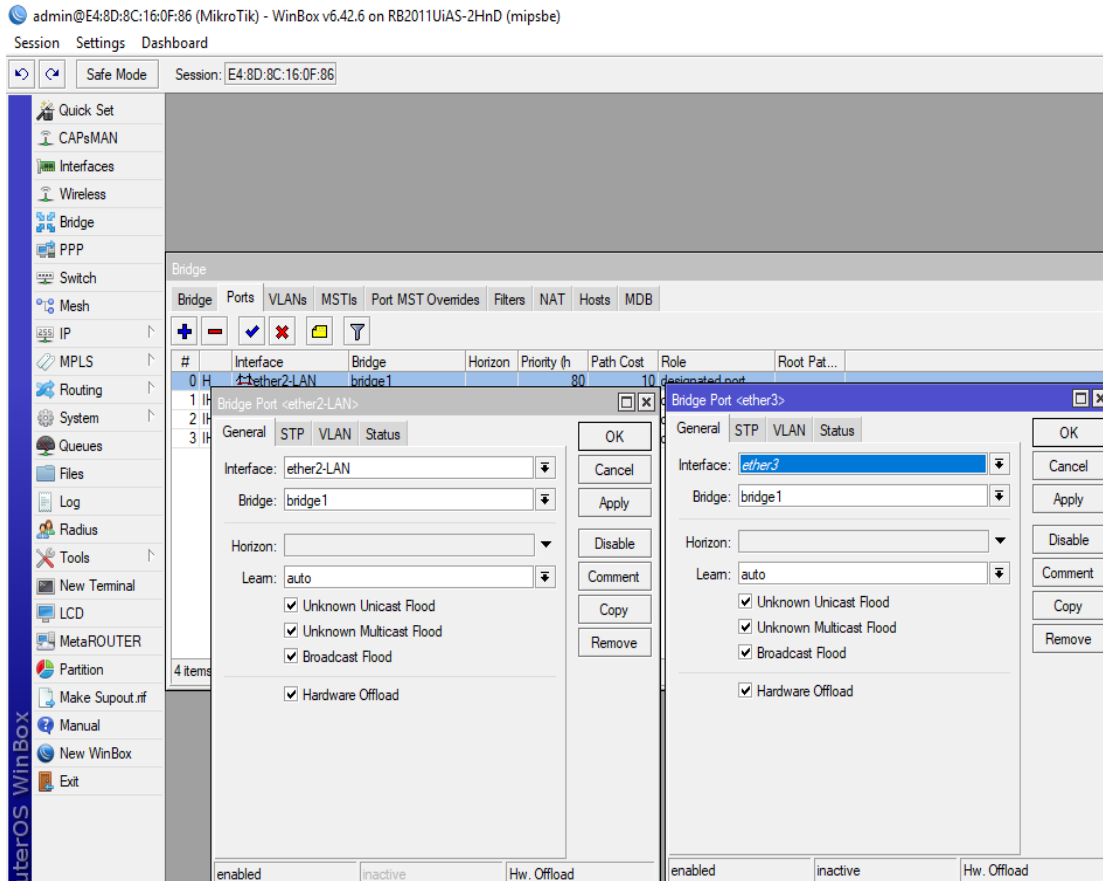


Figure 3.29: Bridge Ports

➤ **Step-3**

Click on >>**IP**>>Address

Select Address list Address and Double click

Then select interface >> Apply >> Ok

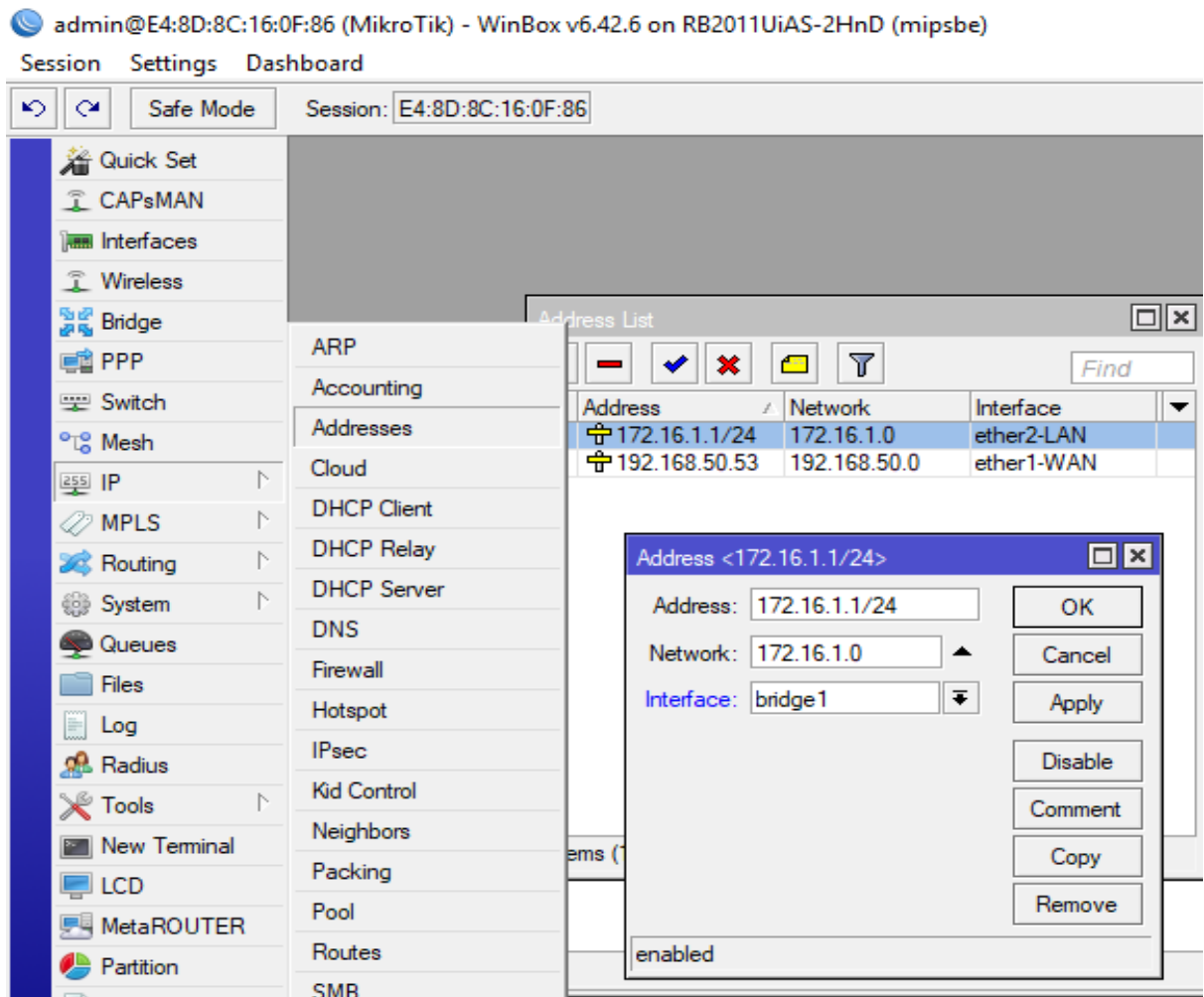


Figure 3.30: Address for bridge1



## 3.12 Wireless Configuration

### ➤ **Step-1:**

Click on >>**Wireless**>>Show the wireless tables.

Now select >>**WiFi Interface**>> Select **Wlan1** and click on these interface

Select >>**Wireless** >> Then select Mode

Mode: ap bridge

Band: 2GHz B/G/N

SSID:

After that click >> Apply >> Ok

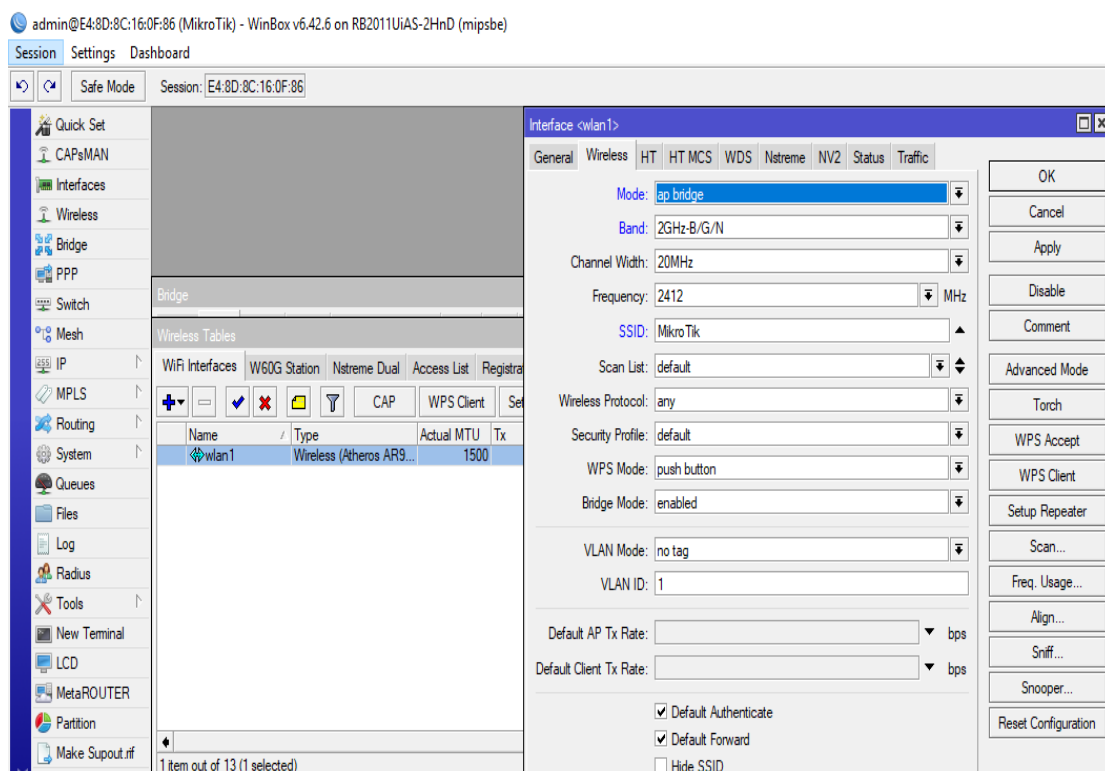


Figure 3.31: Wireless Tables and Interface (wlan1)

➤ **Step-2:**

Wireless >> Wireless Tables >> Select “**New Security Profiles**”

After that, Click on >> (+) >> Select New Security Profiles “**General**”

Now select Name, Mode: Dynamic Keys

Authentication Type: Select “WPA PSK” and “WPA2 PSK”

Select,

**WPA Pre Shared Key: 12345678**

**WPA2 Pre Shared Key: 12345678**

Then click >> Apply >> Ok

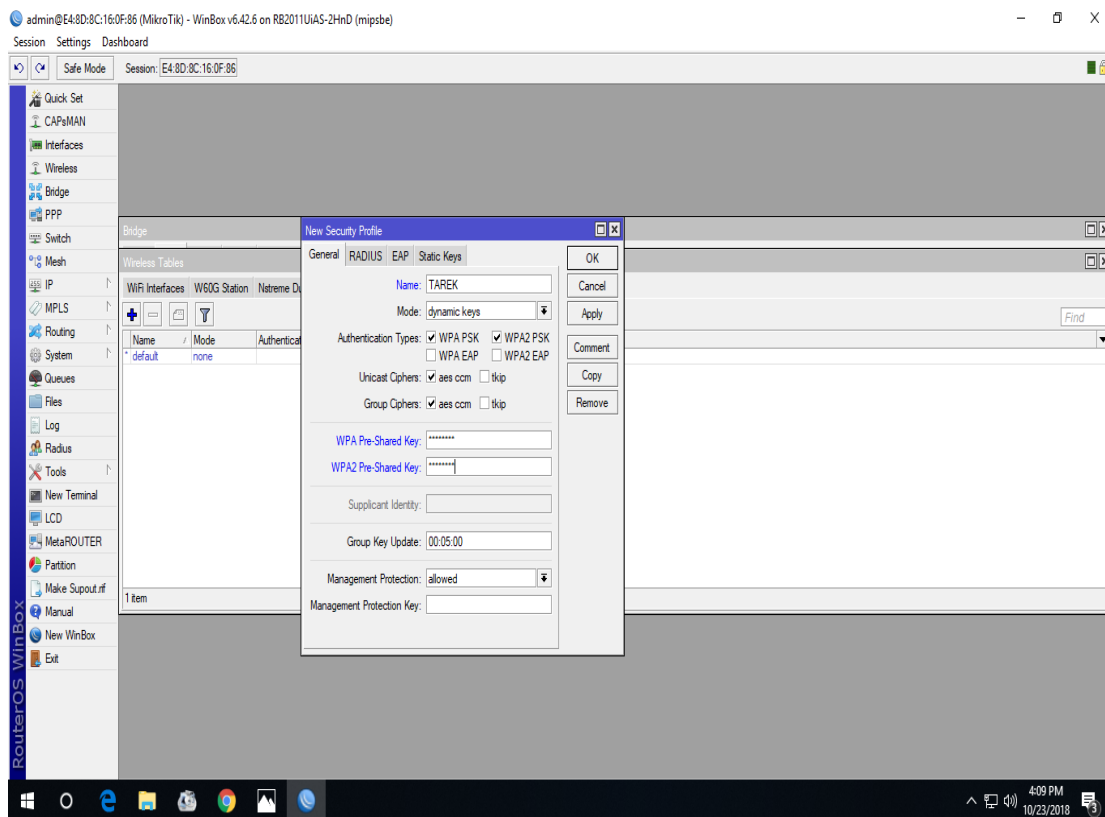


Figure 3.32: New Security Profiles

### 3.13 Class of IP Address

It has numerous classes such as Class A,B,C,D and class E.

Class A consists 8 bit Network ID and 24 bit Host ID

Class B consists 16 bit Network ID and 16 bit Host ID

Class C consists 24 bit Network ID and 8 bit Host ID

**Table1:Address Classes**

Class	1 <sup>st</sup> Octet Decimal Range	1 <sup>st</sup> Octet High Order Bits	Network/Host ID (N=Network, H=Host)	Default Subnet Mask	Number of Networks	Hosts per Network (Usable Addresses)
A	1 – 126*	0	N.H.H.H	255.0.0.0	126 ( $2^7 - 2$ )	16,777,214 ( $2^{24} - 2$ )
B	128 – 191	10	N.N.H.H	255.255.0.0	16,382 ( $2^{14} - 2$ )	65,534 ( $2^{16} - 2$ )
C	192 – 223	110	N.N.N.H	255.255.255.0	2,097,150 ( $2^{21} - 2$ )	254 ( $2^8 - 2$ )
D	224 – 239	1110	It reserved for Multicasting			
E	240 – 254	1111	used for research			

### 3.14 Color coding for crossover cable

Orange/White

Orange

Green/White

Blue

Blue/White

Green

Brown/White

Brown

### 3.15 CentOS Installation and Basic Command

The easiest method of installing CentOS 6 in a virtual machine is to use the standard CentOS distribution CD. Installing CentOS via the boot floppy or Network method is also supported.

#### ➤ Prerequisites:

Before the installation, Select CentOS 6 (64-bit) Option for the guest operating system when creating the virtual machine. Otherwise, Select Red Hat Enterprise Linux 6 (32-bit or 64-bit).

Configure the virtual machine with at least 512MB of memory for 32-bit and 1 GB of memory for 64-bit.

#### ➤ Working Process:

At first, Open VMware workstation and go to “File” Then create a New Virtual Machine. Select >> Typical >> Next >> Select Guest (OS) “Linux” and select Version “CentOS 6 64-bit” Then >> Next

Select Virtual Machine Name and Browse (CentOS ISO) file then give the maximum size of Split virtual disk >> Next >> Finish

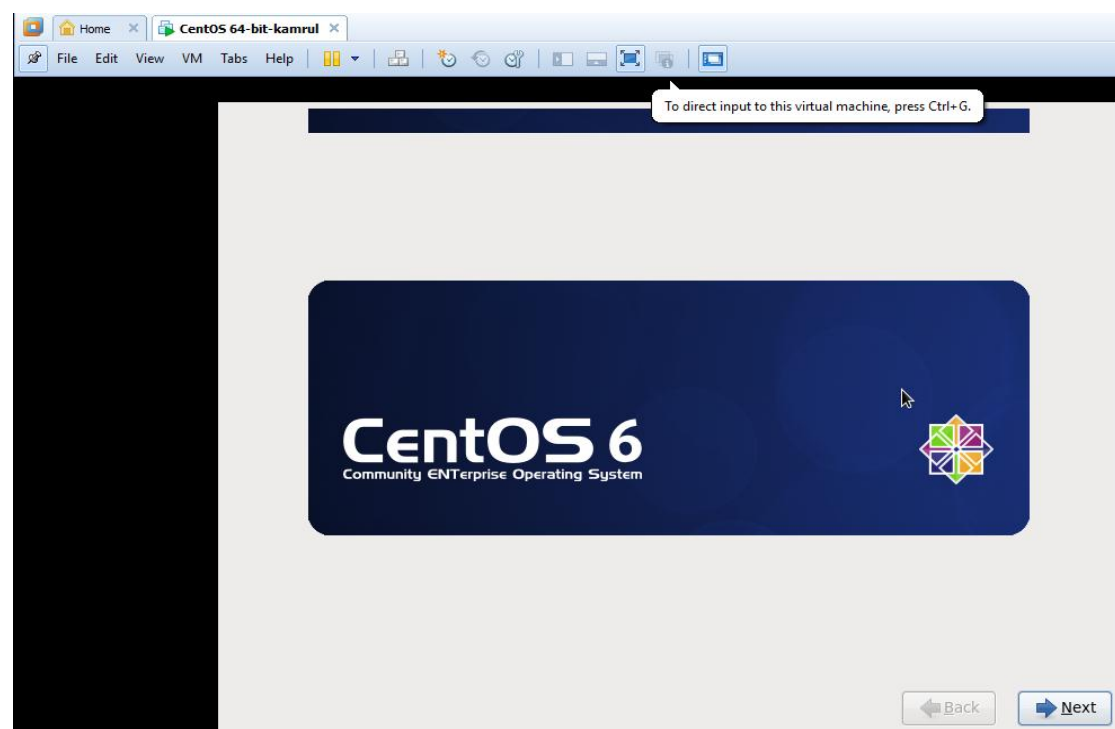


Figure: 3.33: CentOS Installation Method

- ✓ Power on Virtual Machine, when show CentOS 6 on the screen then click >> Next
- ✓ After that select language and keyboard and click >> Next
- ✓ Installation involve type: Basic Storage Device then click Next
- ✓ Click on “**Yes, discard any data**” of storage device then >> Next
- ✓ Now, Give Hostname and Next

✓ Select City for time zone

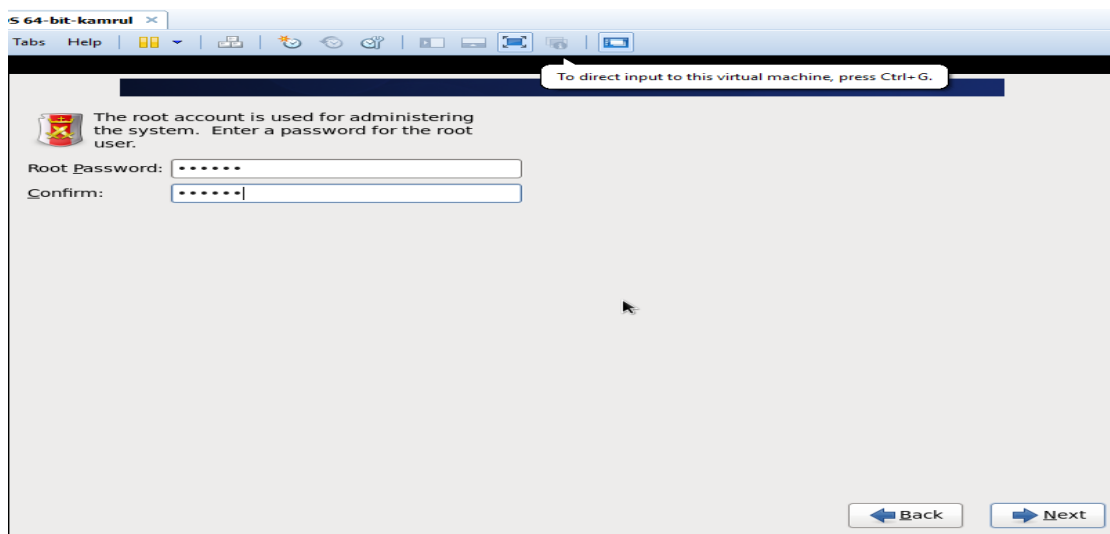
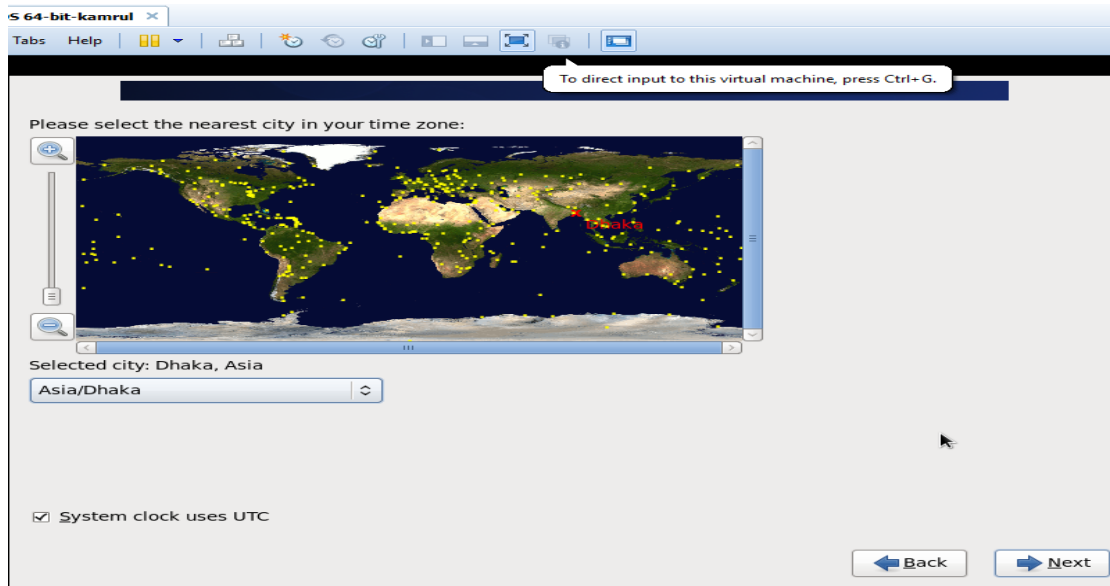
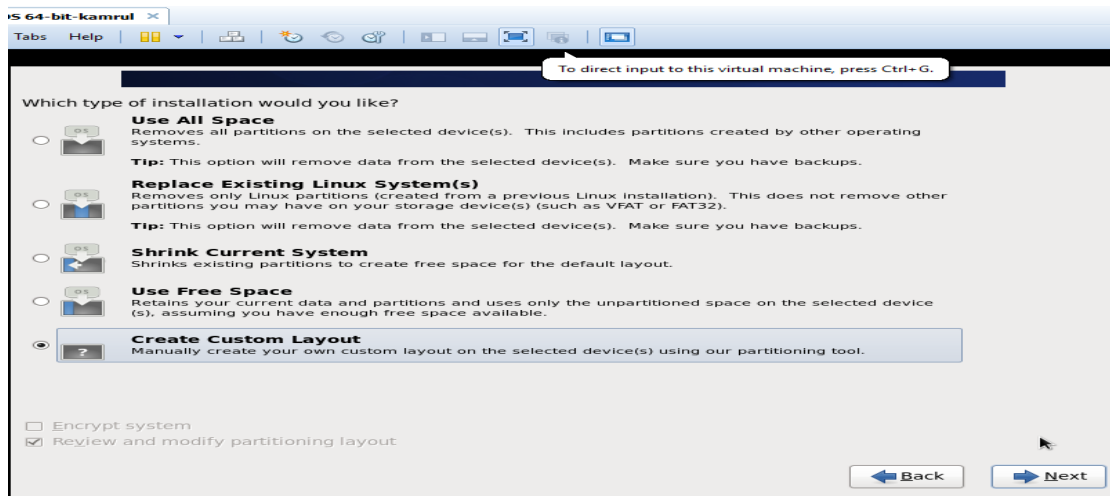


Figure 3.34: CentOS Installation Method

- ✓ Create a Custom Layout then click Next



- **Creating Partition:** Installing Linux we have to need create at least threepartitions, root (/) boot and swap.

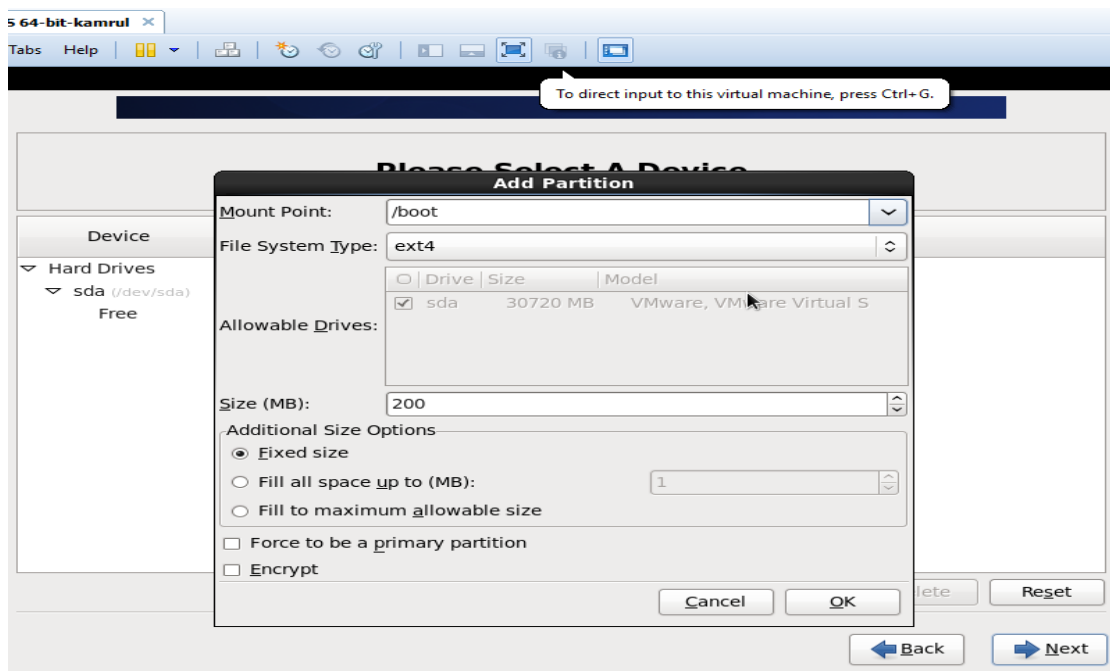
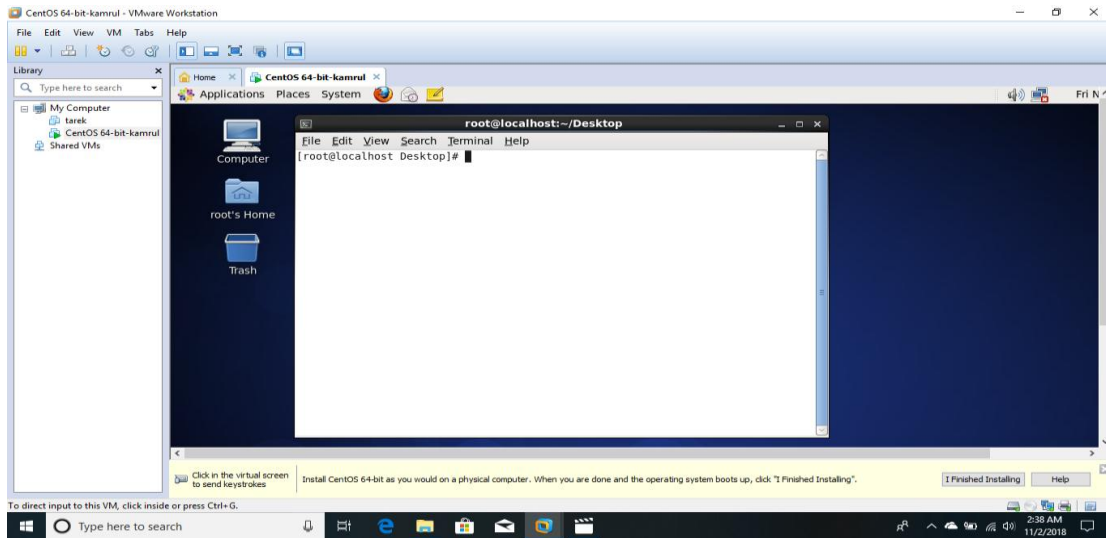


Figure 3.35: Create Custom Layout and Add Partition

- ✓ After creating root, boot and swap partition, Select the Applications for Install and click >> Next
- ✓ When the Installation is Successful click on “**Finish**” then reboot the PC
- ✓ Give Username and Password to Login
- ✓ Setup is Completed !!

Figure 3.36: Open in Terminal



## Linux Run Level Directory

- Init 0 = Shut Down
- Init 1 = Single User Mode
- Init 2 = Multi User Mode
- Init 3 = Full User Mode
- Init 4 = Unused
- Init 5 = X- Window
- Init 6 = Reboot

## Basic Command of CentOS

Cat[Filename]	Display file constants to the standard output device
Cd/directory path	Change to directory
Chmod [Options] mode filename	Change a file permissions
Chown [Options] filename	Change who owns a file
clear	Clear a command line screen
cp [Options] source destination	Copy files and directories
Kill [Options]	Stop a process
Less [Options] [Filename]	View the contents of a file one page at a time
ls [Options]	List the directory contents
Man [command]	Display the help information
mkdir [Options] directory	Create a new directory
mv [Options] source destination	Rename or move files
Passwd [name of password]	Change the password
Pwd [Present working directory]	Display the pathname for current directory
rm [Options] directory	Remove file or directories
rmdir [Options] directory	Delete empty directories



## **CHAPTER 4**

### **COMPETENCIES AND SMART PLAN**

#### **4.1 Competencies Earned**

There are many workstation areas on the network side, and network engineers are responsible for executing, caring, helping creating, and sometimes panning discussions within an organization or between enterprises. Their motivation is to ensure the integrity of a highly accessible network infrastructure to provide the most common implementation for their customers. Customers may be teachers, customers, customers and providers. Network engineers can coordinate internally as an organization's IT support team or as part of an outsourced IT network consulting firm that works with certain customers. Obligations may benefit from the use of the size and sector of the business. For example, in a large investment finance base, engineers may also need to search for problems with any IT-related issues that arise.

#### **4.2 Smart Plan**

My smart plan is an internet service provider for all businesses. Each enterprise organization provides MikroTik utilization from the bandwidth. In fact, at the speed of excessive bandwidth utilization of the MikroTik router, it can be easily used for manage smart bandwidth, MikroTik bandwidth control best practices. Because it can easily configure LAN, WAN and DHCP servers. This is my wise plan in my life of destiny.

#### **4.3 Reflections**

I learned palms in the discipline of engineering. It is help to build experience in engineering job. In intern period, I realized network administration the usage of MikroTik. IT is a intelligent and dynamic profession at present. I learned hands-on-expertise in intern offers propel traps and outings that honed by using the professional. Now I comprehend how to oversee network undertaking and how to beat primary circumstance and getting the trip to work on an expert team.

## **CHAPTER 5**

### **CONCLUSION AND FUTURE SCOPE**

#### **5.1 Discussion and Conclusion**

Through this temporary work, we must discover one of the principles issues, time management skills, and even self-development. Web server Apache, Telnet, SSH, FTP, DNS, Mail etc. Make sure that this temporary work is a wonderful and rewarding background. I am aware of the future and in order to have the ability to confirm it I will have the ability to enable myself with the opportunity to connect with many individuals. I have great interest in talented professionals such as Linux and MikroTik.

#### **5.2 Scope for Future**

Open occupations are accessible in various areas under Linux. Desktop application development, kernel and device driver development today, their huge demands are for designers and system engineers of open source programming and open source program. There are many organizations and open source software that have moved to Linux today. The organization moved to Google, Yahoo, Lufthansa, wiki.org, an open source arrangement that is financially savvy. I have great interest in talented professionals such as Linux and MikroTik.

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## Appendix A: Internship Reflection

The professional placement for true international turmoil, the main purpose of my internship with rational answers, is to use the understanding gained in the classroom. And the ability to determine professionally appropriate efficiency and relationships as a trader, trading with new know-how, studying, progressing and planning how to disseminate. Join the community with the willingness of various professional supervisors and experts. I am an expert in the rule circle with the consumer and best courtesy and expert supervisors and other employees to study from seeing the perception of the deal, and to work favorably through interactions. I am a commitment of effort, a path to specific partners, how to share power, how to form miles, how to enjoy, how to grasp the subculture of a professional company, and a certificate of feedback to the company.

## Appendix B: Company Detail



**Head Office Name:** Daffodil Online Limited **Address:** 102, Shukrabad (3rd floor), Mirpur Road, Dhanmondi, Dhaka - 1207, Bangladesh

**Telephone:** 02-9143258-60

**Fax:** 880-2-8116103

**E-mail:** info@daffodilnet.com

**Website:** www.daffodilnet.com

**Type of Organization:** Nationwide Internet Service Provider (ISP)

**Employees:** 12