

Empirical Study on Network System Administration with MikroTik Platform

By

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183-19-2048

This Report Presented in Sectional Gratification of the Requirements of the Degree of
Bachelor of Science in Electronics and Telecommunication Engineering.

Supervised By

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DHAKA-1207, BANGLADESH

INTERNSHIP CERTIFICATE



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Ref: AT/HR/014/2022

Date: November 08, 2022

INTERNSHIP CERTIFICATION

This is to certify that Mahfuja Alam Khushbo, ID: 183-19-2048, a student of ETE, Daffodil International University, Dhaka, Bangladesh has successfully completed 03(Three) months (From 03rd December 2021 to 13th March 2022) long internship program at this company. During the period of him internship program with us she was found punctual, hardworking, and inquisitive.

We wish him every success in life.


08.11.2022
Ferdosh Alam
Founder & CEO
Atova Technology



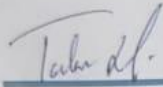
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Approval

This report title "Empirical Study on Network System Administration with MikroTik Platform" submitted by Mahfuja Alam Khushbo to the department of Electronics and Telecommunication Engineering (ETE), Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. Electronics and Telecommunication Engineering and approved as to its style and contents. The presentation will be held on January 2023.

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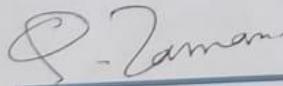
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DECLARATION

I hereby declare that, this internship report is prepared by me Mahfuja Alam Khushbo. ID: 183-19-2048 to the Department of Electronics and Telecommunication Engineering, Daffodil International University, under my honorable Supervision Professor Dr. A. K. M. Fazlul Haque, Professor, Department of Electronics and Telecommunication Engineering Faculty of Engineering Daffodil International University.

I also declare that, I collect information from my internship organization Atova Technology, Books, Internet and my friends also.

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Special thanks go to the “Md. Taslim Arefin, Associate Professor and Head, Department of ETE” who have given their full exertion in directing the group in accomplishing the objective just as their support to keep up with our advancement on target. My profound thanks go to all, especially for spending their time in helping and giving support whenever I need it in fabricating my internship.

ABSTRACT

MikroTik operating framework is planned as an organization switch. The functioning programming and programming can be used to make a PC into a trustworthy association switch. The PC fuses a combination of components for IP organization and remote organization. These limits join Firewall and Nat, Bandwidth Limiter, Routing, Hotspot, Point to Point Tunneling Protocol, DNS server, DHCP server, Hotspot, and various components. On an organization that has various clients, it requires an exchange speed change instrument to hinder the information transmission over the limit. All clients get their exchange speed fairly. Information move limit Management is the method used to resolve those issues. Limiting bandwidth on MikroTik Hotspot is imperative to perform. Distant space of interest can be gotten to wherever to whom it may have the entry methodology. Bandwidth Limitation is expected to propel value in all the space of interest customer.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Through temporary employment, which was not as long ago as the course review, I became more accustomed to the certified work environment, which became a stage for people who needed to transition from school life to the corporate level. Limiting data transfer is a crucial task performed by an online access provider. Using a computer or other device that might have a web speed cap, this should be possible. One piece of equipment and programming that traders provide to speed up the board at work is the MikroTik router. It also provides the operational system that is utilized to clearly make a changeover. Bring it to the PC to accomplish this. For a continuous and dependable switch collection, MikroTik routers offer devices that are remarkable.

1.2 Motivation

To advance my profession in an environment that is both challenging and ideal for putting my insight to work. I believe I am capable of maintaining the newly constructed facility. I am devoted, adept at leading others, and good at explaining my goals to others. I agree with the many principles and virtues contained in this information.

Having the capacity to pick up new concepts, techniques, and innovations quickly. Cooperative individual or developer who is dedicated, creative, and self-motivated and has a strong work ethic. Strong hierarchical, innovative, directive, and initiative skills. dominance in both unrestricted and group settings. Friendly, compassionate, confident, and self-driven outgoing individual. Any issues with hiring employees that arise, I can handle. I have the ability to accomplish numerous work tasks effectively and with optimism.

I was introduced to a lot of important information and capabilities to build up and improve the MikroTik system and organization during my preparation program for a temporary role.

1.3 Objectives

- Acquire observational data about computer networking
- Acquire observational data about Countrywide ISP
- Acquiring technical skills
- Securing central establishment data
- Work on social capacities
- Work on administrative capacities
- Information on key specialists
- Cognizance of expert ethics, characteristics and conviction
- Data on master affiliations works out

CHAPTER 2

ORGANIZATION

2.1 About the company

One of Bangladesh's professional training institutions is called Atova Technology. In Shat Gambuz market, Mohammadpur, Dhaka-1207, Bangladesh, Atova Technology is one of the professional IT administration-based organizations and moreover a specialist training institute. They have fundamental business ethics in long-term relationships with their clients. They have designers and trainers with extensive experience who are managed by people that work incredibly fast. [1]

2.2 Product and market situation

There are various kind of IT administrations and expert administrations are given by Atova Technology Ltd. These are given below:

- IT services
- Web site development
- Security arrangement
- Corporate web arrangement
- Application develops
- Web facilitating and space enrollment
- Wi-Fi zone services
- Information network, server farm and co-area
- Intermediary and DNS server arrangement
- Mail server arrangement
- Proficient course and preparing

Professional training services:

- Cisco certificated network Associate (CCNA)
- Linux System Administration
- MikroTik Routing and Security
- Database Management

2.3 SWOT Analysis

A SWAT test is a simple framework for identifying the advantages, disadvantages, opportunities, and threats related to a project or an initiative. Understanding the SWAT check is essential because it allows them to continue on and attempt to achieve the goal. Strengths, Weaknesses, Opportunities, and Threats (SWOT) are the main topics. It is an amazing device for analyzing a relationship's internal and exterior environment.

Strength

This internship provides substantial advantages and is tailored to your needs, as validated by the association:

- Teamwork helps me to undented the depth part
- The work pressure familiar with the job pattern
- Strong connection with users
- Very good concept about the daily activates
- Customer feedback is the main focusing point
- People get various opportunity from here

Opportunities

- Financial development
- Expanded Socialization
- Dispatch of new offices
- Develop the capacity of people

2.4 ORGANOGRAM STRUCTURE OF ATOVA TECHNOLOGY



Figure 2.1: Organogram structure

CHAPTER 3

PROJECT TASKS, EVENTS AND

ACTIVITIES

3.1 Daily task and Activities

I first educate myself on the MikroTik technology. I'm here to help you grasp the entire process by posing challenges. Like; Prepare. System configuration and overall. I also work with PPPoE, sub-netting, and DHCP system setting, among other things. Within four months, I was done. I find that the concept of training motivates the organization.

1st month:

I have taken in the accompanying points at the 1st month of my internship:

- Understanding essential systems administration
- Understanding IPV4 tending to and sub-netting
- Being familiar with MikroTik Basic Configuration
- Being familiar with Network Address Translation
- Fundamental part of the switch
- Picking up steering setup
- Knowing how Resetting MikroTik

2nd month:

I have taken in the accompanying points at the 2nd month of my internship:

- Finding out with regards to DHCP the board
- Web Proxy design
- Area of interest Solution
- Transfer speed the executives
- Prearranging and Scheduling
- Port Forwarding
- Span and STP

- VLAN Management
- Firewall and ACL
- MikroTik Failover

3rd month:

I have taken in the accompanying points at the 3rd month of my internship:

- MikroTik Load Balancing
- Remote Management
- Organizing and Routing convention
- Virtual Private Network (VPN)
- Client Administration
- Reinforcement and Recovery

3.2 Events and Activities

The preparation can be settled different sorts of ideas. Some are given:

- Getting the hang of, understanding and arranging
- WEB server
- DNS server
- MAIL server
- Intermediary server
- Setting up client records, consents and secret word
- Server and switch investigating
- Neighborhood and switches
- Specialized help
- Acknowledging IP tending to
- IT answers for business confusion
- Customer support

WEB server

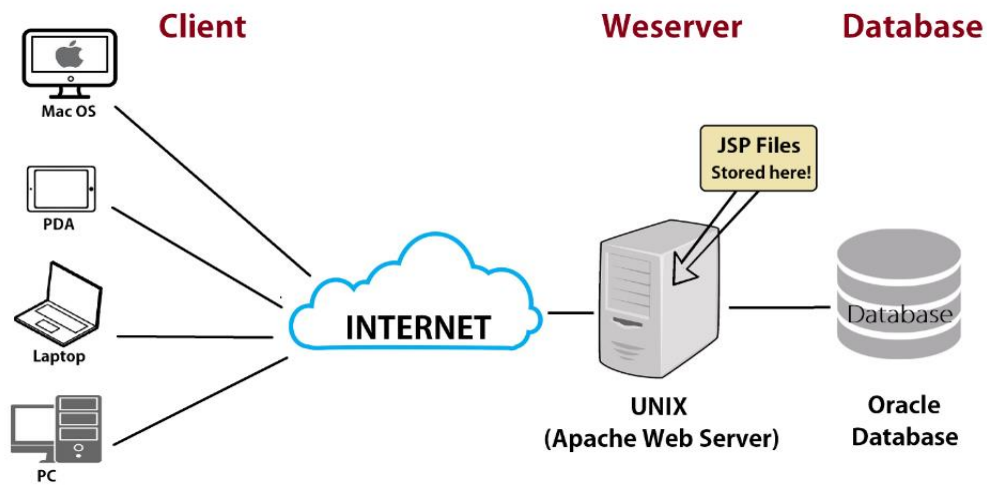


Figure 3.1: Web server

Delivering online pages to clients is the main responsibility of a web server. The Hypertext Transfer Protocol is used for communication between the client and server nodes. In addition to text information, the supplied web pages also contain graphics, style sheets, and scripts.

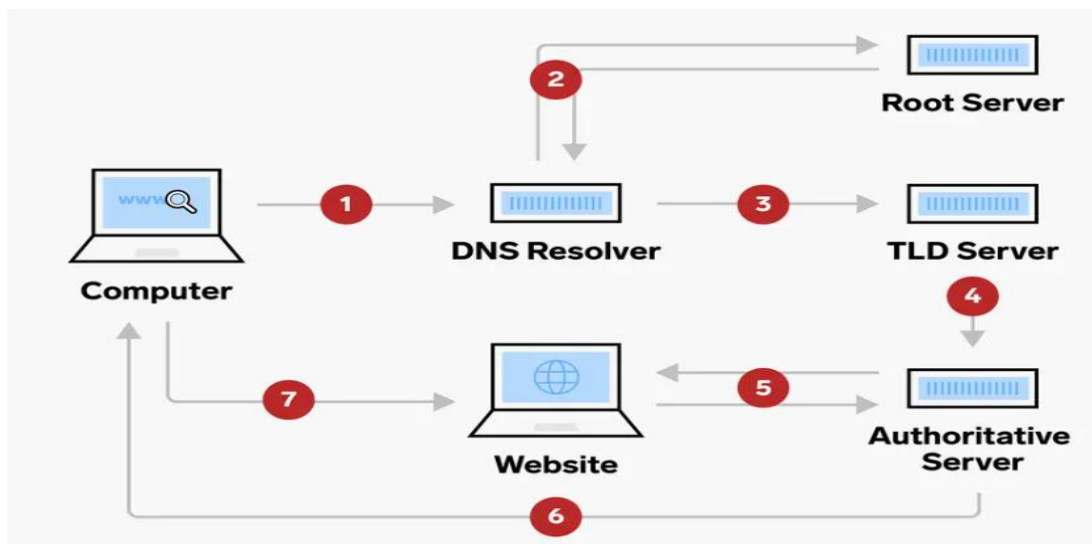


Figure 3.2: DNS process step-by-step

Without a Domain Name System (DNS) server, it would be impossible to use a web browser to find websites. DNS servers are an essential component of the internet's infrastructure.



Figure 3.3: Mail Server

A mail server is a computer that manages and transmits email through a network, most frequently the Internet. Emails can be delivered to other mail servers by a mail server after being received from client PCs. Emails can also be sent from a mail server to client computers.

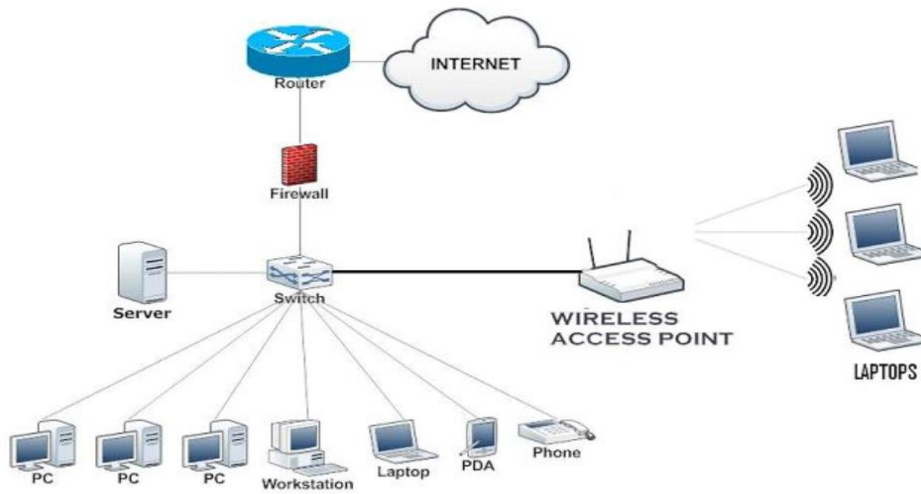


Figure 3.4: Switch investigating.

3.3.1 IP address & class range

Internet Protocol Address is referred to as IP Address. It is a code that can be used to identify a specific computer or computer network. PCs may send and receive data when they are connected to the internet thanks to IP addresses. Computers may send and receive data thanks to an Internet Protocol (IP) address. IPv4 and IPv6 are two of the four types of IP addresses. There are only 2^{32} addresses that the IPv4 protocol supports, and they are 32-bit binary values. The 2^{128} addresses allowed by the IPv6 protocol. [2]

3.3.2 Networking

In networking, two computer systems are linked together via a cable or wireless connection. It is the data transfer between devices that share information. [3]

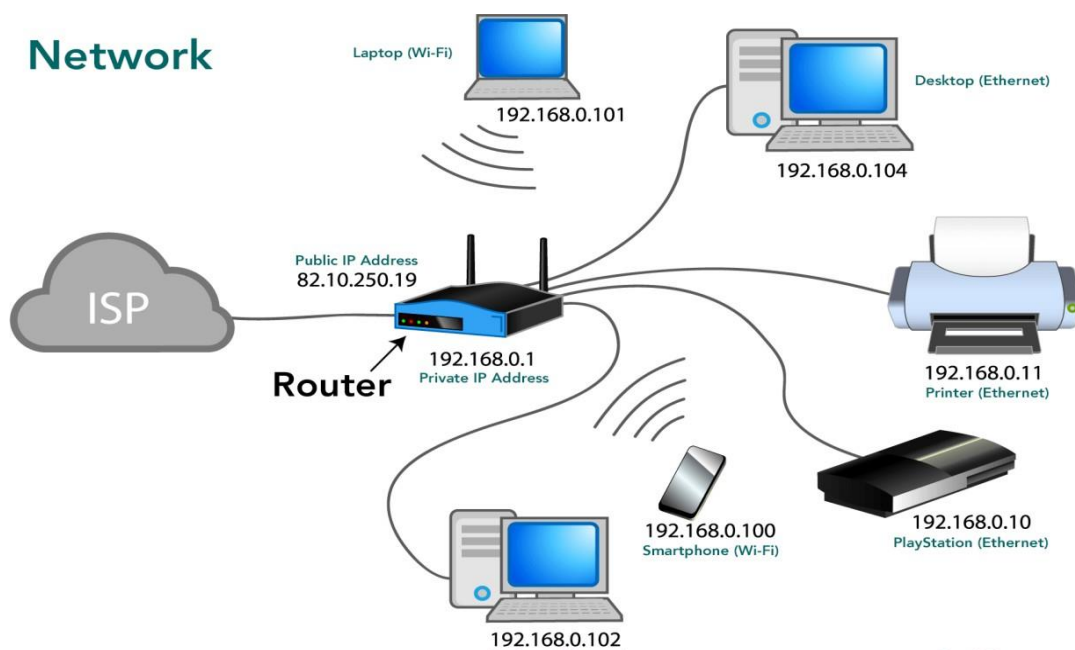


Figure 3.6: Networking

LAN (Local area network)

A **Local Area Network (LAN)** is a collection of computers and unrelated devices that are linked together in a constrained space, such as a school, a research facility, a residence, or a place of business. It is a well-known organization that allows users to share resources like documents, printers, games, and other software. An interface PC and a printer in one's house or place of business make up the simplest LAN network configuration. LAN will often be utilized as a form of transmission medium.

Characteristic of LAN

- It is a private network. So, an external administrative body never controls it.
- LAN works at a moderately higher speed contrasted with other WAN frameworks.
- There are different sorts of media access control strategies like symbolic ring and Ethernet.
- High speed connectivity
- Noise and bit error are less
- Fast data transmission

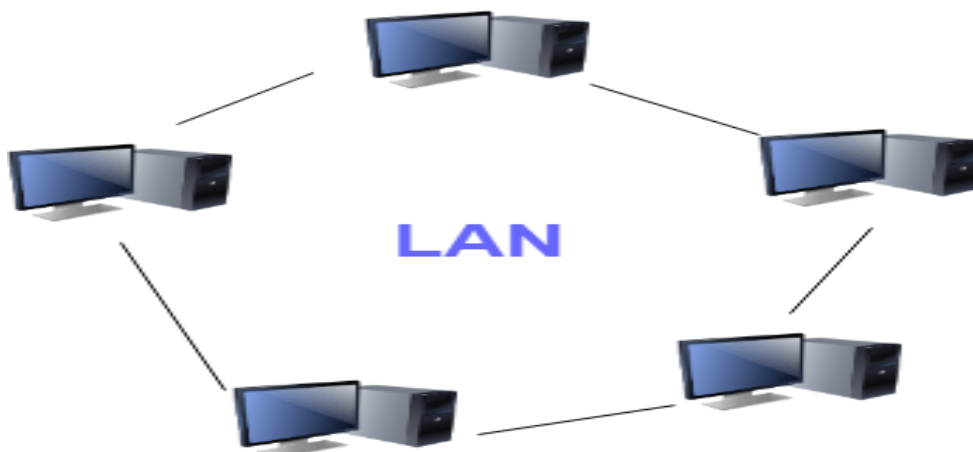


Figure 3.7: Local area network.

WAN (Wide area network)

Another significant computer network that covers a considerable geographic area is the WAN (Wide Area Network). A WAN organization structure might consist of a group of LANs that communicate with one another using radio waves and phone lines. Usually, it is restricted to a project or an organization.

Characteristics of WAN

- The underlying arrangement cost of speculation is extremely high.
- Rapid and costly
- Support and plan of WAN are troublesome
- Information rate is moderate
- Adaptation to internal failure of WAN is less

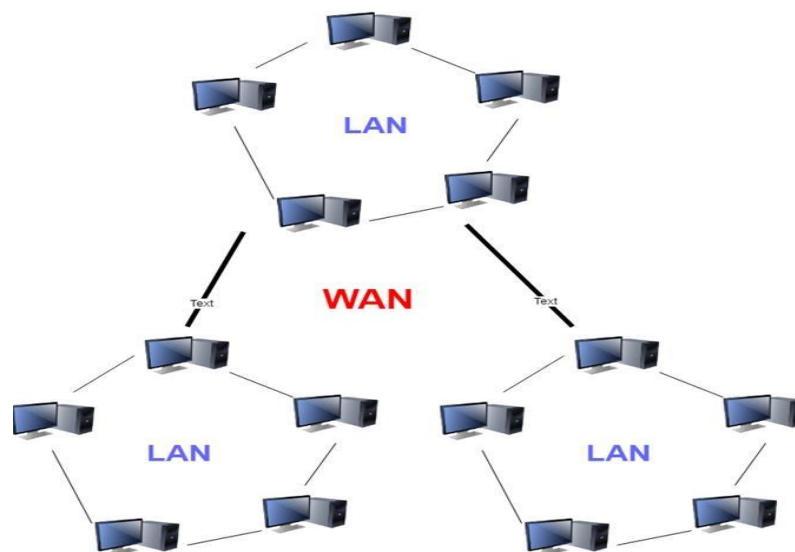


Figure 3.8: Wide area network.

MAN (Metro area network)

A computer network that spans a whole city, a school, or a small area is known as a metropolitan area network, or MAN. This kind of organization is bigger than a LAN, which is often restricted to a single building or location. This form of organization enables you to cover a range of areas, from a few miles to many miles, depending on the layout.

Characteristics of MAN

- High-speed availability
- Design and upkeep hard
- Serve as an ISP
- Data move rate and spread defer rate is moderate

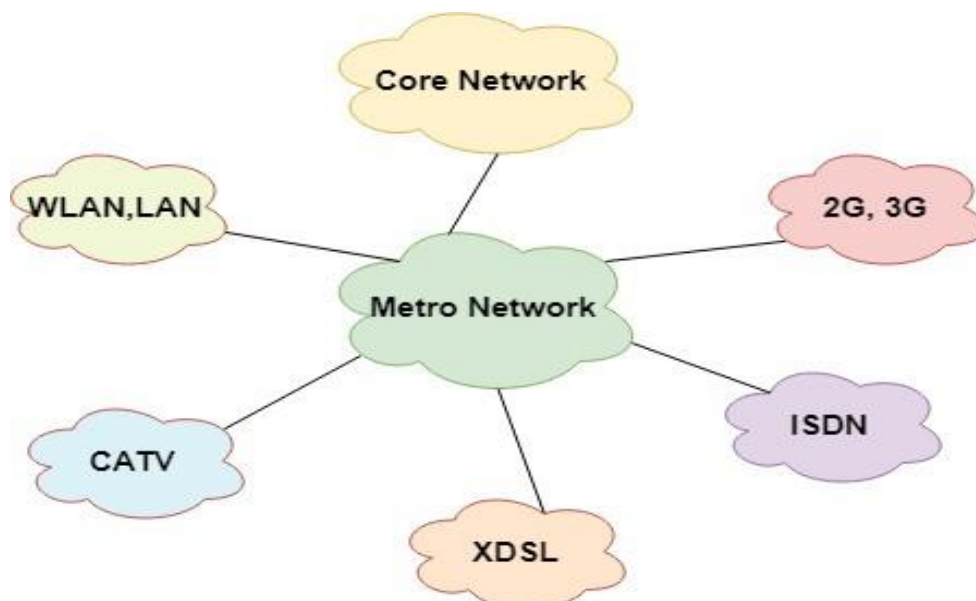


Figure 3.9: Metro area network.

3.3.3 Introduction of MikroTik

Popular network equipment maker MikroTik Ltd. produces MikroTik. A Latvian firm named MikroTik was established in 1996 to create routers and wireless ISP systems. In the majority of nations worldwide, MikroTik currently offers hardware and software for internet connectivity. [3]

3.3.4 MikroTik Configuration & Winbox Installation

The MikroTik OS is a functional platform. The MikroTik OS working arrangement has a permission level range of 0 to 6, with 0 being a trial form for 24 hours. All of the features of Switch OS are available for free preliminary testing. Here, the permissible values vary from one another and are not strictly fixed.

Introducing switch OS is much easier. We introduce the switch OS in two distinct strategies.

1. Download the ISO picture then, at that point, copy it to CD and boot from it.
 - Install from net the router OS to any secondary drive in our windows PC. Then our router PC using the drive and its boot. Both installations are added upgrade files and more on below [<https://mikrotik.com/>]

3.3.5 Basic Configuration of MikroTik

The Switch board is a piece of equipment from MikroTik that consists of a series of switches that run the Switch OS operating system.

A Latvian firm delivers a breakthrough in integrated circuit sheets. For delivering broadband remote entrance in rural areas, multiple switch board options for various application scenarios are encouraged using the MikroTik switch of the ISP 750G series for short and medium distances. This is a little, pre-assembled switch for a small office or workspace (SoHo). The memory PCI express remote connectors are scaled for switch board lines, and the PCI slots are smaller than usual.



Figure 3.1.1: MikroTik Router Board

3.3.6 Router login

To Configure a MikroTik first time you need to orchestrate the beneath Setup:

- Interface your Laptop/PC with MikroTik by means of Ethernet Cable
- It ought to be associated with any one port of MikroTik from ether2 to ether5 (ether1 is PoE port – keep away from it)
- Investigate Winbox
- To Login into MikroTik through MAC Address you need to tap on "Neighbors" Button for looking through Router's MAC Address.
- Then, at that point, click Connect Button to Login
- Then, at that point, Plugins will load and you ready to Login into MikroTik.

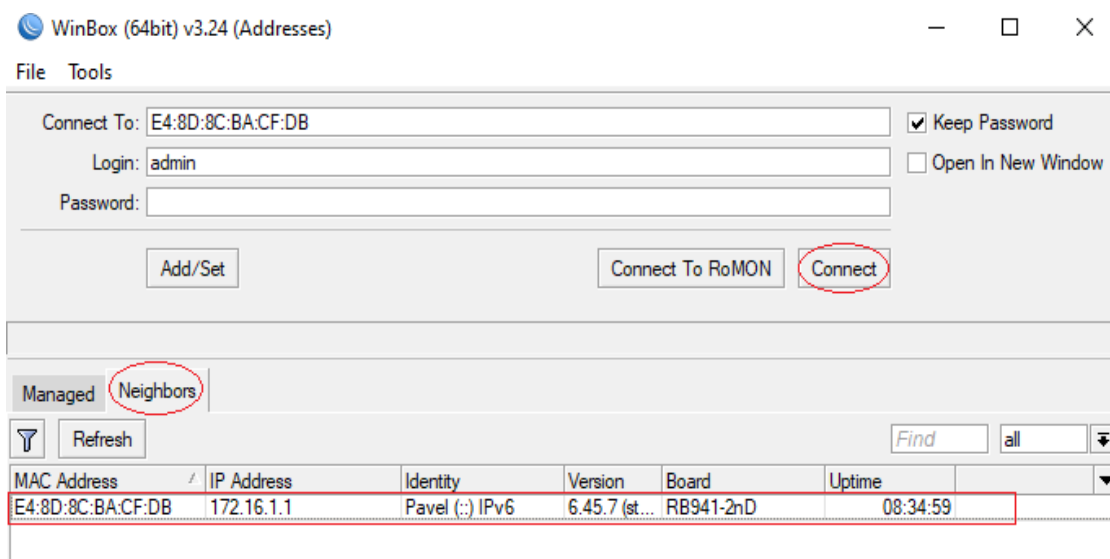
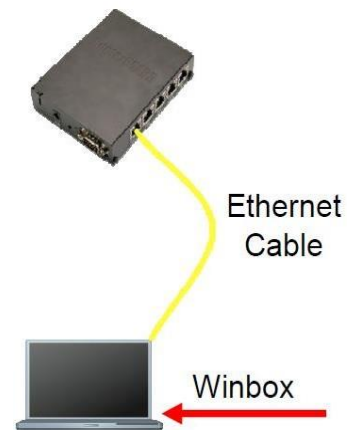


Figure 3.1.2: MikroTik Router Login 1



Figure 3.1.3: MikroTik Router Login 2

3.3.7 Network Address Translation (NAT)

A traffic routing device can be used to change the network address information in Internet Protocol (IP) datagram packet headers as they pass through it in order to map one IP address space to another.

In essence, NAT enables a single device, such as a router, to function as an intermediary between a Local Network and a Public Network, requiring only a singular public IP address to identify it. To everything outside their network, a full computer network (local network).

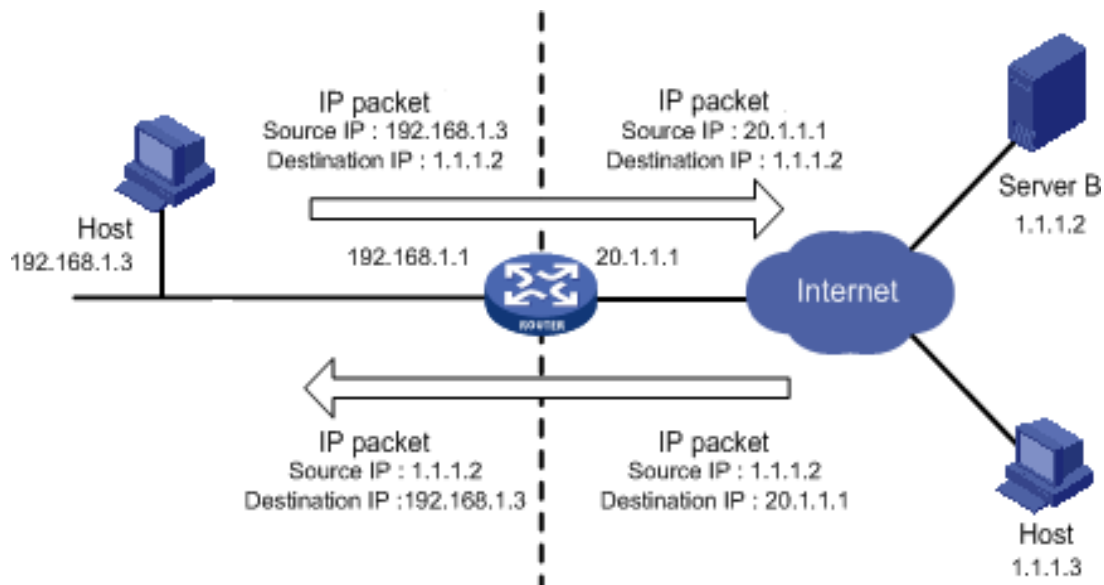


Figure 3.1.4: How NAT works

3.3.8 DHCP Management

A client/server protocol called Dynamic Host Configuration Protocol (DHCP) is used to provide an Internet Protocol (IP) host its IP address as well as many configuration details including the subnet mask, default gateway, and DNS. With DHCP, hosts can get crucial TCP/IP setup data from a DHCP server.

3.3.9 DHCP Server Configuration

The LAN subnet with the proper mask, the DHCP interface from the DHCP server option, and other information like the default gateway and DNS address will all be acquired by the router. The router is informed of the DHCP interface, which is typically the LAN, and the IP pool using the DHCP option on the DHCP server.

There is additional setting in the DHCP server that the router can use to obtain information about the LAN subnet, including the default gateway, network mask, and DNS address, enabling the router to supply IP information to the DHCP client in accordance with the setting.

To Configure

DHCP

Server the

steps are:

1. Go to IP Menu
2. Then DHCP Server
3. Then DHCP
4. Add a DHCP Server
 - Set a Name of Server
 - Select the DHCP interface
 - Introduce DHCP Pool

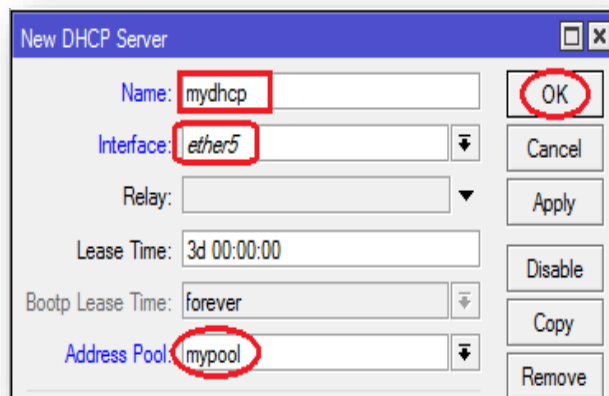


Figure 3.1.5: DHCP server configuration

To Configure
DHCP-Networks the
steps are:

- Go to IP Menu
- Then DHCP Server
- Then go to Networks Option
- Set the Parameters
- Then Press OK.

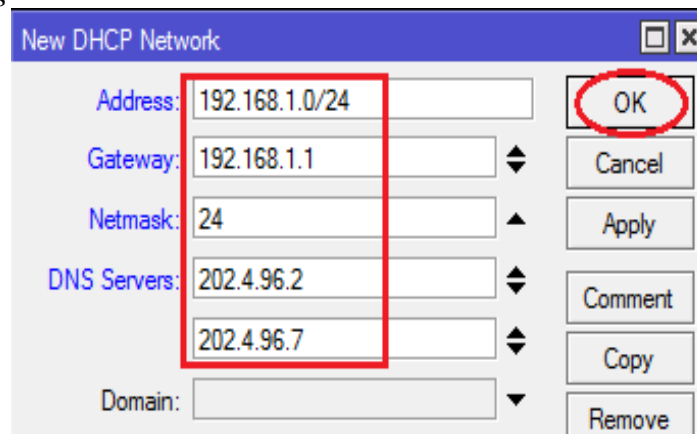


Figure 3.1.6: DHCP server configuration

3.3.2 Configuring a PC/Laptop as a DHCP Client

The steps are:

5. Click on Start Menu
6. Click on Open Network and Sharing Center
7. Click on Change adapter settings, located on the left-side menu
8. Click on Local Area Connection or Wireless Network Connection
9. Click on Properties
10. Double Click on Internet Protocol Version 4 (TCP/IPv4)
11. Then select:
 - Obtain an IP address automatically
 - Obtain DNS server address automatically

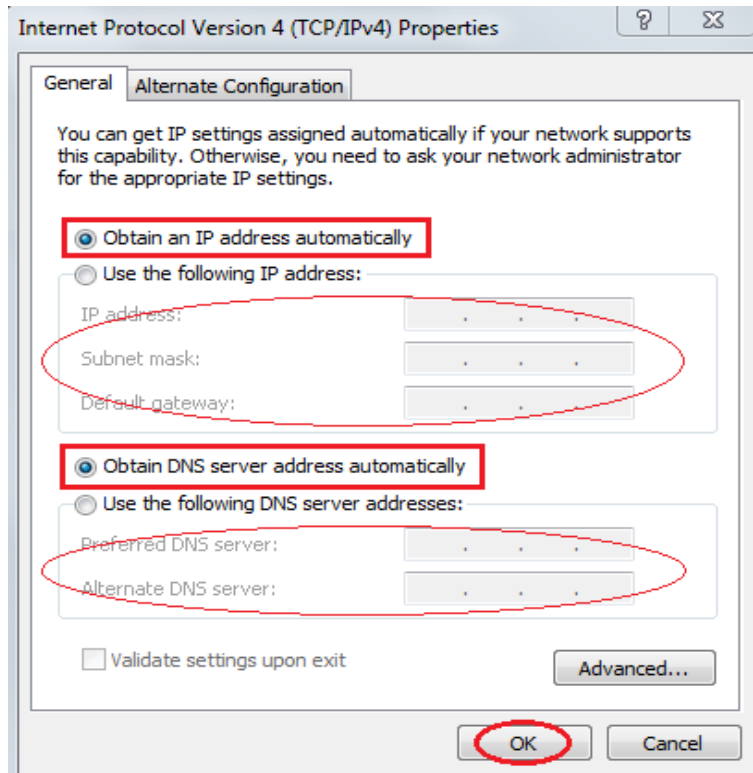


Figure 3.1.7: Configure DHCP in a LAPTOP/PC

3.3.2 PPPOE

1. A Network Protocol called Point-to-Point Protocol over Ethernet (PPPOE) is used to illustrate PPP outlines inside Ethernet outlines. ISPs and network administrators can profit greatly from the PPPOE (Point-to-Point Protocol over Ethernet) protocol in terms of user management, network management, and accounting.
2. PPPOE is a Network Protocol and provide:
 - a. Authentication
 - b. Encryption
 - c. Compression.

3.3.3 PPPoE Server

Configure a PPPoE Server, we have to set the Service Name with appropriate Interface in which the PPPoE Clients are connected.

To configure PPPoE Server the steps are:

Go to PPP

Then PPPoE Servers

Then click to add a PPPoE Server

Set the Service Name

Select the PPPoE Interface

Tick – One Session Per Host

Set the Authentication Parameters

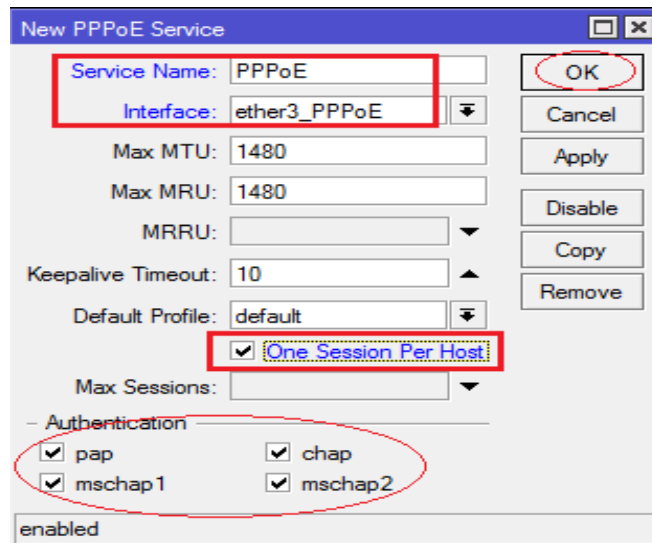


Figure 3.1.8: Configure DHCP in a LAPTOP/PC

3.3.5 Bandwidth Management

The rate at which data may be carried from a website or internet service to your computer in a specific amount of time is referred to as bandwidth. Therefore, the amount of bandwidth you have access to (also known as bandwidth power) influences how quickly and effectively you can open websites, download files, etc. Typically, bandwidth is expressed in "bits/second" or "bytes/second".

In order to avoid overfilling or totally filling a network link, which causes network congestion and subpar network performance, transfer speed management is the most popular method of calculating and controlling interchanges (traffic, packets) on a network link.

3.3.6 VLAN in MikroTik

Regardless of their physical locations, a Virtual Local Area Network (VLAN) is a logical collection of Network Devices, Workstations, and Servers that all behave as though they are connected to the same LAN. A layer 2 technology called a virtual local area network enables effective LAN separation by allowing several virtual LANs on a single physical interface (such as Ethernet, remote, and so on). To set up a VLAN:

- Go to Interface
- Then go to VLAN
- Click to add a VLAN name=name of VLAN VLAN ID=ID of VLAN interface
= Router-to-switch

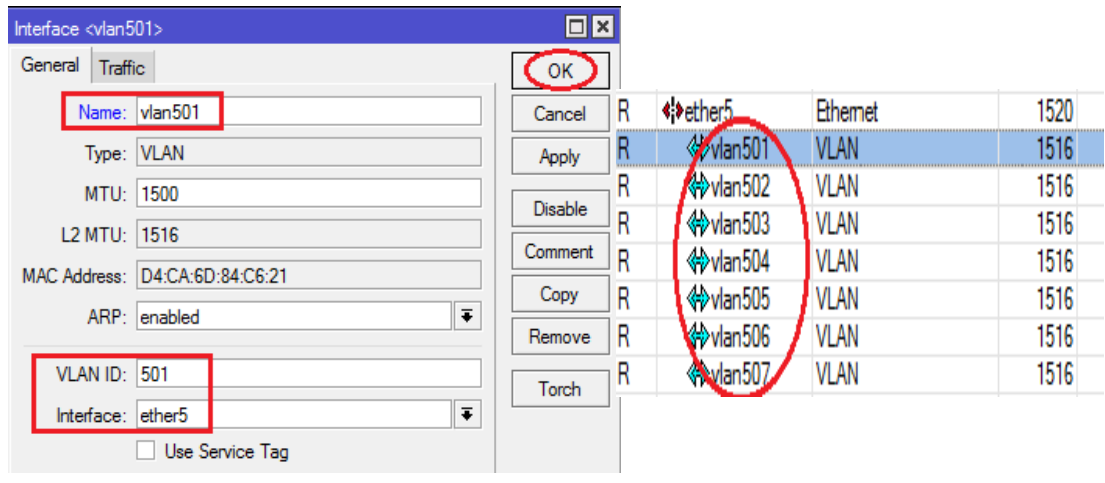


Figure 3.1.9: Configure VLAN in MikroTik

3.3.7 Firewall

A firewall is a network security system that can be hardware- or software-based and regulates network traffic by enforcing a set of rules. A firewall creates a barrier between an internal network that is presumed to be secure and reliable and another network (the Internet) that is not.

MikroTik Router OS has very powerful Firewall with features including:

1. Stateful Packet Inspection
2. Layer-7 Protocol Filtering
3. Peer-to-Peer Protocols Filtering [5]

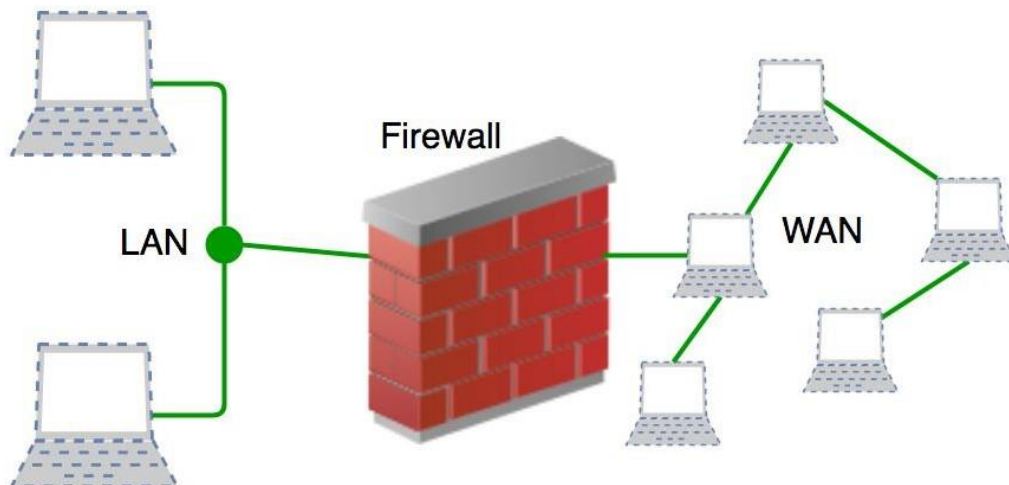


Figure 3.2.1: Firewall

3.3.15 VPN

Virtual Private Network (VPN) is a method of accessing two or more private Network over Internet. VPN extends a private Network across a Public Network, such as the Internet.

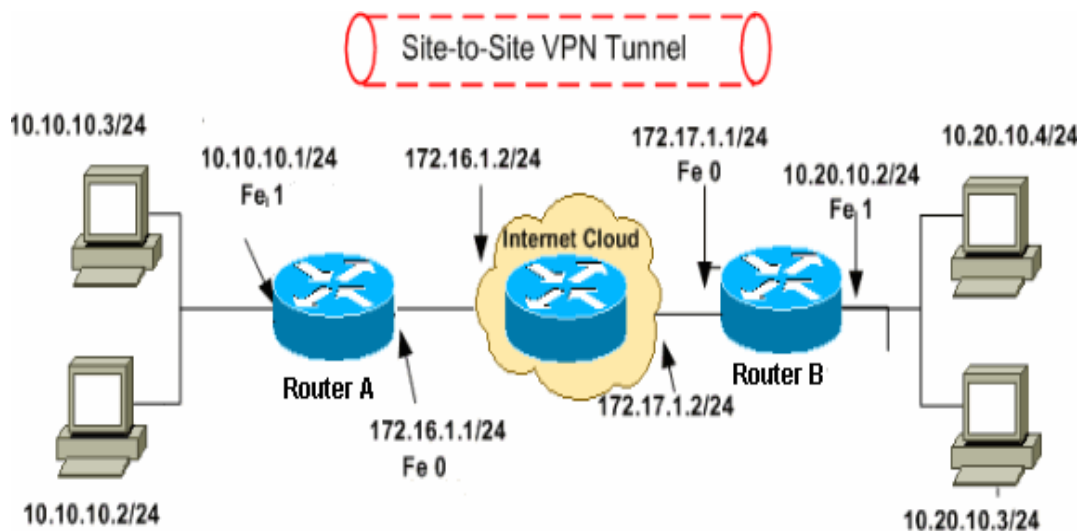


Figure 3.2.2: VPN

3.3.16 MikroTik User Administration

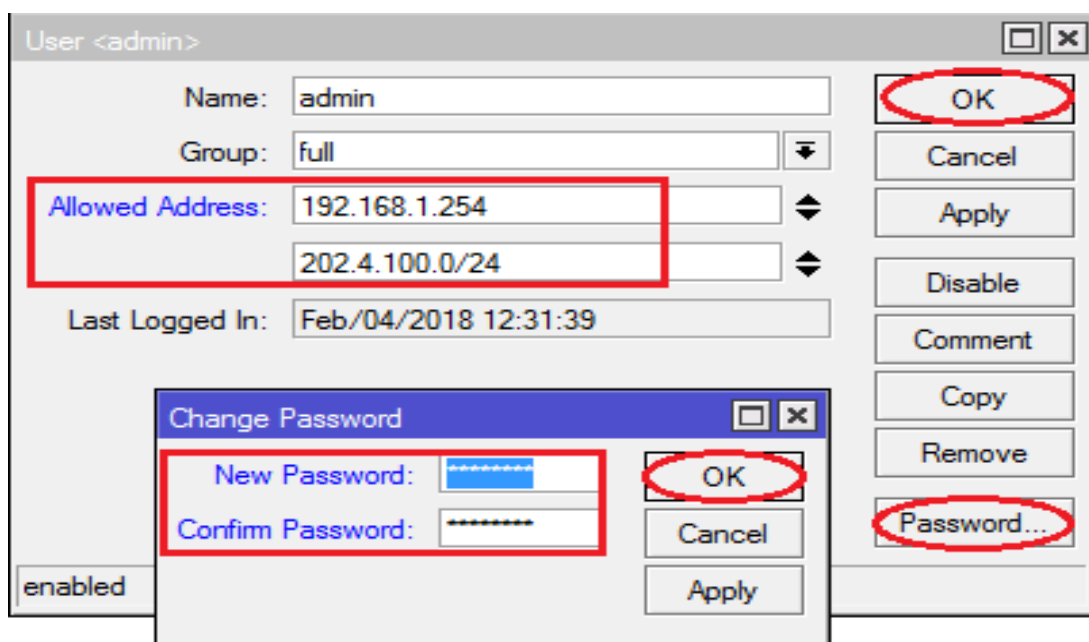
A neighborhood client data set in MikroTik Router OS describes how to create Login Users and how to grant them authorization. Due to the fact that a major percentage of MikroTik router cases will operate on public networks and that many hackers on public networks will attempt to destroy your MikroTik router configuration, it is challenging to maintain MikroTik organization level without proper user management. In light of this, your initial responsibility as a MikroTik router network administrator is to comprehend how to manage MikroTik Router OS users.

Setting up the “admin” Password in Router

The default username and password for a MikroTik device are "admin." You should set the "admin" Password for your personal security after your initial login to MikroTik. For a specific IP address or subnet, Router Access can be enabled. Additionally, it is possible to allow multiple subnets or router access for a very long time.

To set the “admin” Password the steps are:

- Go to System Menu
- Then Users
- Then Double Click on User admin
- Set the Password



3.4 Challenges

Each project has its challenges. There is never any labor that is easy. I've experienced a few of the similar challenges. But after talking to my other study partners from a different institution, I found I had more experience than them. The following list of my temporary job's main challenges is provided:

1. Impermanent
2. Neglected
3. Challenge

I had several challenges while working in my temporary role. In addition, I would try to address each complaint.

1. The orders were very case intriguing – so I was extremely cautious during execution.
2. MikroTik switch design issue
3. MikroTik switch win box rectification issue
4. A part of issues of secret phrase the board during working with Linux server
5. Cached organization framework issue and addressed them
6. Cached programming issue and addressed them

Chapter 4

COMPETENCIES AND REFLECTIONS

4.1 Reflections

Atova Innovation serves as a bridge between my personal life and the workplace. I can learn a lot from this association to fuel my professional zeal. My workflow is organized, and I keep track of open correspondence. Every person in this association continuously needs relationships with other people.

Atova Technology advises me on sorting and improving skills when arrangements are high here. It is necessary for any association to keep up with nearby changes another part for any association is support without due diligence, especially if an issue is difficult to track and deal with appropriately. Support is fundamentally a function of character.

4.2 Competencies

After completing the institution's short-term placement program. I have several representations of various issues or tasks that I have to explore. A few of the qualifications I needed during the duration of my entry-level work are listed. I made a concerted effort to complete the ones I had gathered.

Those Competencies Earned are given:

- ✓ Monitoring and supervision the activity
- ✓ Track down destinations for first-level difficulties
- ✓ Progress my dynamic information for main problem faces
- ✓ Increment my public individual together
- ✓ Genuine experience of Monitoring station
- ✓ Present MikroTik switch OS
- ✓ Understanding transfer speed of the organization
- ✓ Support MikroTik switch
- ✓ MikroTik Security

Chapter 5

Conclusion

This training class has taught me a lot of useful information about configuring MikroTik routers and setting up ISPs on the Linux operating system. The board-based startup with the Linux operating system and MikroTik is dependable, stable and effective structure. Aside from other things, all framework organizations model DNS, FTP, SS, capabilities, and web servers. From this interim configuration, anyone can work on the most recent framework and server security. Programming office components, features, adjustments, or transitions are visible. The beauty of the web today has a profound impact on most associations, which use it as their oxygen. Expert managerial oversight is impossible in the absence of a sound organizational strategy. A reliable network design can be used to create organizations and assist them in achieving their objectives. Consequently, a key component of this entry-level position is network configuration.

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APPENDICES

Appendix: About the company



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