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Industrial Training Report

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NIMBUS CLOUD SDN.BHD

25 JULY 2022 – 14 OCTOBER 2022

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DECLARATION

I declare that this report entitled *"Industrial Training 2022"* is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature	:	.....
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ABSTRACT

An internship can provide a student with professional work experience in a safe and structural environment with guidance from experts. Internship help students to master professional skills such as communication, responsibility and technical skills that might be useful in future career. This report provides the details of the 12 weeks internship at Nimbus Cloud Sdn. Bhd Q-Sentral, Kuala Lumpur. I was assigned as an internship trainee at Support team under the company supervisor, Miss Archanaa Visvalingam and my faculty supervisor Dr Zool Hilmi. During the industrial training, the assignments include various kind of job tasks related to cloud computing and electronic engineering. One of the most vital tasks given is creating aa single Front- End installation and Host installation. The software used was Ubuntu 20.04 version. Since the CLI version was used, I needed another software called MobaXterm to SSH into the servers The other major task that was given to me was to create the documentation of the guide to provision a virtual machine and resource management. The completed user manual will then be given to the customers of Nimbus Cloud. The significance of this user manual is to reduce the dependency of the customers on Nimbus regarding basic task such as provisioning VMs and manging their resources. This project required a good understanding of the front-end cloud management platform. Also, specifications of each and every module and subsection of the interface.

ABSTRAK

Latihan amali boleh memberikan pelajar pengalaman kerja profesional dalam persekitaran yang selamat dan berstruktur dengan bimbingan daripada pakar. Internship membantu pelajar untuk menguasai kemahiran profesional seperti komunikasi, tanggungjawab dan kemahiran teknikal yang mungkin berguna dalam kerjaya masa depan. Laporan ini menyediakan butiran latihan 12 minggu di Nimbus Cloud Sdn. Bhd Q-Sentral, Kuala Lumpur. Saya telah ditugaskan sebagai pelatih latihan di pasukan Sokongan di bawah penyelia syarikat, Cik Archanaa Visvalingam dan penyelia fakulti saya Dr Zool Hilmi. Semasa latihan industri, tugasan termasuk pelbagai jenis tugas kerja yang berkaitan dengan pengkomputeran awan dan kejuruteraan elektronik. Salah satu tugas paling penting yang diberikan ialah mencipta satu pemasangan Front- End dan pemasangan Hos. Perisian yang digunakan ialah versi Ubuntu 20.04. Memandangkan versi CLI digunakan, saya memerlukan perisian lain yang dipanggil MobaXterm untuk SSH ke dalam pelayan Tugas utama lain yang diberikan kepada saya ialah mencipta dokumentasi panduan untuk menyediakan mesin maya dan pengurusan sumber. Manual pengguna yang lengkap kemudiannya akan diberikan kepada pelanggan Nimbus Cloud. Kepentingan manual pengguna ini adalah untuk mengurangkan pergantungan pelanggan pada Nimbus mengenai tugas asas seperti menyediakan VM dan menguruskan sumber mereka. Projek ini memerlukan pemahaman yang baik tentang platform pengurusan awan bahagian hadapan. Juga, spesifikasi setiap modul dan subseksyen.

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CHAPTER 1

INTRODUCTION

In order to complete supervised practical training in the industry sector before receiving a bachelor's degree, students are placed in an organisation for industrial training. The training is based on the notion that you learn best by applying the theories and academic ideas you've studied to actual work scenarios. This way students can gain practical work experience which is capable in improving their employability as some recruiters are reluctant to accept students for placement interviews unless they have some internship experience [1]

In University Teknologi Malaysia (UTM), the term "Industrial Training" (IT) refers to a placement of students for 12 weeks in an industry or outside organisation (locally or overseas). The term "industry" used here refers to any engineering-related operations, including consulting, R&D, production, etc. The industry might be domestic or international. The training prepares the student for their future job as a professional engineer by providing them with exposure to the real work environment so they can link the ideas they have learnt in class and apply them in the industry. [1]

Not just Malaysia but practically every country in the world has discussed and shown the value of industrial training. In many nations, undergraduate students must complete industrial training before graduation. Engineering students must participate in industry training in industrialised nations like the United States of America (USA), for instance, to guarantee that they learn skills that are ingrained in the Accreditation Board for Engineering and Technology (ABET) [1]

On March 11, 2020, the World Health Organization (WHO) proclaimed the Covid-19 infection to be a pandemic. Since then, a lot has changed. The global pandemic has had a severe negative effect on a variety of businesses, including higher education. In 2020 and 2021, the quantity of research on the pandemic's impact on tertiary education considerably surged. It's noteworthy to note that many researchers have begun to look into how students feel about the change in the university's preferred learning style, which is Online Distance Learning (ODL), in 2021. (Rahiem, 2021,

Saidi et al., 2021, Saidalvi et al., 2021). According to research, the pandemic caused a significant degree of anxiety in university students around the globe (Jiang et al., 2021, Wong et al., 2021, Sundarasen et al., 2020). [1]

Fortunately, the year 2022 has been different for students when it comes to education and Industrial Training. It is truly a blessing that everything is reverting back to how it was pre-COVID-19. Due to this, students are able to experience what it is like to have a be a part of a proper working environment and the office culture. [1]

CHAPTER 2

COMPANY PROFILE

2.1 Company background

Nimbus Cloud Sdn. Bhd. was established in the year 2014 by Mr Kumaran Singaram, the founder of Nimbus Cloud, Clout IOT and Metora. Nimbus Cloud is a total cloud solutions provider for businesses, organisations, and public sector organisations that guides on every step of their journey towards digital transformation. It is located at Unit 21-12, Q Sentral, Jalan Stesen Sentral 2, Kuala Lumpur Sentral, 50470 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur. [2]

With Nimbus custom infrastructure, businesses of all sizes can quickly migrate to the cloud without needing to make large investments in soon-to-be-outdated hardware, resulting in cost savings as well as the possibility of scaling and growing at a rate never before imaginable. The company's strategic planning aims to provide the greatest service at the most affordable rate. Nimbus is product-driven, therefore there is no longer a cap on how quickly companies can expand or scale.The company’s objective is to accommodate regions of ASEAN countries and Malaysia's expanding need for cloud solutions. [2]

Nimbus team consists of highly experienced cloud professionals that have decades of exposure to global IT infrastructure and supported by certified cloud engineers and partners. Nimbus Cloud Services is currently assisting organisations, companies, and governmental organisations in the migration from legacy IT to a contemporary, streamlined IT platform that is highly scalable and reduces overall total cost of ownership by millions of dollars. To guarantee that the best technologies are supporting your workloads, NIMBUS collaborates with industry leaders such as Asigra, Carbonite, IBM, DELL, Hewlett Packered Enterprise, Cisco, Veeam, CloudFare, Azure and many more. [2]

Figure 1.1: Nimbus logo

2.2 Company services

Nimbus provides with various cloud solutions to its customers and all play vital roles in the betterment of the customer's cloud.

One of the cloud solution Nimbus Cloud has to offer is the customizable, scalable and resilient infrastructure of the Cloud Core. The company offers 4 types of cloud environment which include Public cloud, Hybrid Cloud, Dedicated Private cloud and Virtual Private cloud. Versatility and connectivity are what Nimbus Cloud given to its customers. [2]

Second, is the Cloud Preserve solution provided to the customers. This solution plan acts as a safety measure taken against disasters such as cloud corruption. In the case of a disaster or outage, this cloud solution will help reduce downtime. There are a total of 3 services that Nimbus provide their customers and those are Disaster Recovery as a service (DRaaS), Backup as a Service (BaaS), Business Continuity Plan (BCP). [2]

Next solution plan that Nimbus offers is Cloud Secure. This solution's main purpose is to protect against malware threats and system hacking. For every cloud infrastructure, workload, and data, Nimbus offers total security. There are 5 manner of protection given to the customers which consist of Assessment, Authentication, Protection, Cognitive Security Operations Centre, and Governance & Compliance [2]

2.3 Brief Description of the department/unit attached:

The support team assists customers when issues with various cloud-based applications arise. Support team deals with challenging task and handle efficient administrations of the customer's cloud-based software with which Nimbus CLoud's knowledgeable consultant will assist.

CHAPTER 3

TRAINING WORK & TASK GIVEN

3.1 Introduction

The nature of the job assigned was leaning more towards cloud computing, electronic work, and support management work. The job scope of the work mainly revolved around creating a single front-end cloud management platform test-pod (OpenNebula Sunstone Host) and using it for the betterment of the solution service of NIMBUS in every way possible.

3.2 Cloud Marketplace

The first task assigned was do research on private cloud marketplace of the cloud management platform that is being utilized. The purpose of this task was:

1. To understand the differences between private and public cloud marketplace
2. To find out the advantages of using private cloud marketplace over public cloud marketplace.
3. To identify the necessary requirement to change from public cloud to private cloud marketplace.

To know the limitations of private cloud marketplace.

A cloud service provider's online shop is known as a cloud marketplace. Customers have access to software applications and services through a cloud marketplace that are based on, integrate with, or extend the offerings of the cloud provider. Customers are often given access to both native cloud applications and authorised apps made by third-party developers through a marketplace. Applications created controlled by external developers assist the cloud provider fill in unconventional market gaps in its service and serve additional customers, but they also guarantee the customer loyalty in the seamless integration of all purchases made through the vendor's marketplace. [3]

The CMP used by Nimbus Cloud is OpenNebula and the OpenNebula Public Marketplace provides images and templates from which VM-based apps may be built, but users can also design their own and share them with the cloud administrator through a private corporate marketplace. [3]

3.3 OpenNebula as a Cloud Management Platform (CMP)

Nimbus Cloud uses an open-source cloud management platform called OpenNebula. It integrates virtualization and container technologies with multi-tenancy, autonomous provisioning, and elasticity in its platform.

The administration of IT infrastructure and applications is unified by OpenNebula's single, feature-rich, and adaptable platform, eliminating vendor lock-in and lowering complexity, resource use, and operating expenses.

The reason why Nimbus uses OpenNebula as their CMP is because OpenNebula is an efficient open-source platform. OpenNebula was created with the goal of flexibility to make it easier for anyone to customise it to meet the actual demands of the business, not the other way around. One of the fundamental use cases and application models that OpenNebula supports is System Containers, Micro-VMs and Virtualized Application. Nimbus uses OpenNebula to deploy virtual machines (VM) with a KVM hypervisor. [4]

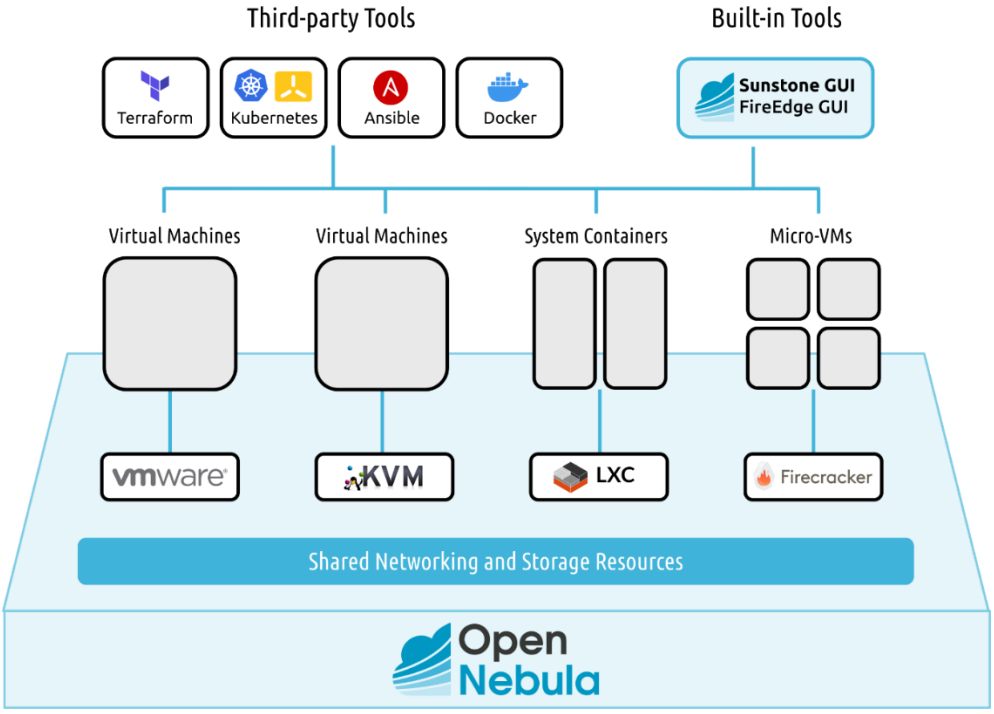


Figure 1.2: Shared networking and storage resources in OpenNebula [4]

3.3 Hardware/software environment used

Hardware	Dell PowerEdge R740 Rack Server, 2 Firewall 1: DellEMC PowerEdge R440), Firewall 2: DellEMC PowerEdge R440), Controller 1: DellEMC PowerEdge R440), Controller 2: DellEMC PowerEdge R440), Switch 1: Dell EMC S4148T-ON Switch 2: Dell EMC S4148T-ON Compute 1: Dell PowerEdge R730 Compute 2: Dell PowerEdge R730 Compute 3: Dell PowerEdge R730 Backup: Dell PowerEdge R710 *(To see the network diagram and port cable mapping, refer to Apendix B)*
Software	Ubuntu 20.04, Ubuntu 22.04, Grafana Zabbix, Ansible, Raspberry Pi, MobaXterm, Draw.io, Linux, Microsoft Word, Excel, Share point, Teams, Canva, PowerDirector.

Table 1.1: Hardware and software used in the environment

3.4 Software tools used

Among the software tools used during internship in Nimbus, is MobaXterm, Ubuntu (22.04 and 20.04 version), Microsoft Word, Excel, SharePoint, and Teams.

Microsoft Word is a software made to assist users in producing documents of the finest quality. One can organize and create documents more effectively using Word. Microsoft Word was used as the main software to prepare documentation such as the user manual for provisioning a virtual machine and resource management, creating and cloning virtual machine in VMWare ESXi host and plenty more. [5]

Microsoft Excel is a spreadsheet software which is a part of the Microsoft Office package. To store and arrange data in a tabular fashion, worksheets (also known as spreadsheets) are created using MS Excel. MS Excel was used to document the BRF cable mapping and port connection, and all the ticket counts and classification from the helpdesk system. [6]

SharePoint is a software that fosters teamwork, with dynamic and effective team sites for every project team, department, and division. Share documents, information, news, and resources. SharePoint was the medium used to share the documentation done by the support team and all the other teams so that everyone could view it. Although it is used as a medium to share documentation and the work done, not all the staffs have the permission to access all the files and groups in the SharePoint. The access permission is limited. [7]

Teams is a software part of the Microsoft 365 which is used to stay connected and access shared resources whenever you want as well as study, plan, and invent together. For work related communication and chatting among Nimbus staffs, Teams was the official software used. It has the feature of scheduling meetings in calendar as well. [8]

MobaXterm is a software used for remote computing. It offers a large number of features specialised for programmers, webmasters, IT managers, and pretty much all users who need to handle their remote work in a more straightforward manner in a single Windows application. MobaXterm was used to SSH into servers to create virtual machines by getting into “virt-manager”. [9]

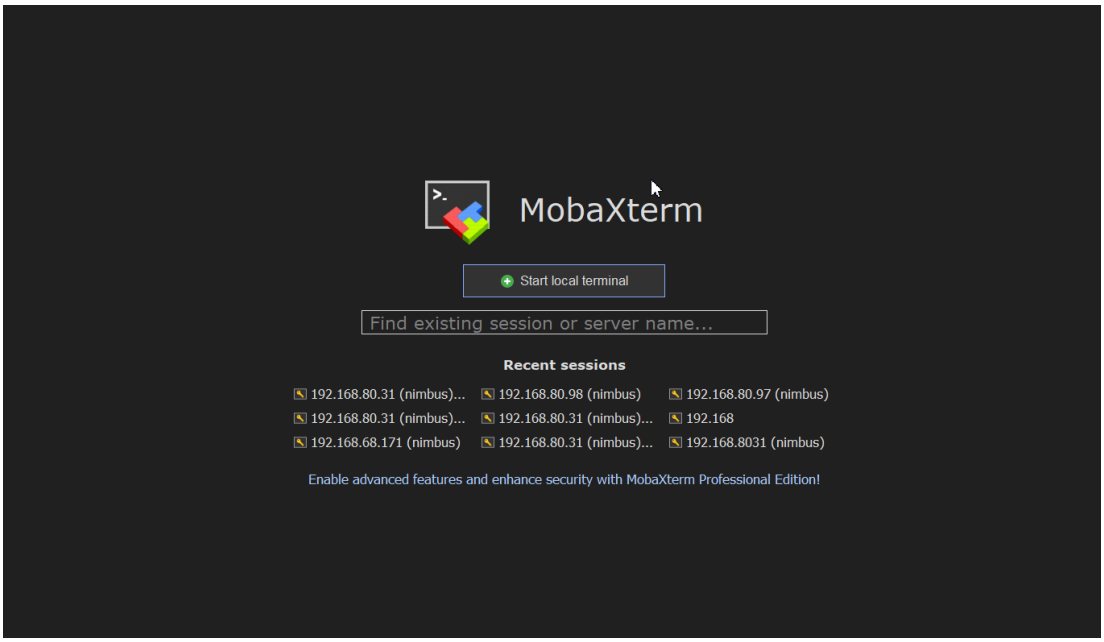


Figure 1.4: MobaXterm terminal

Ubuntu is a software that comes with everything one needs to manage a business, school, family, or organisation. Ubuntu 20.04 and 22.04 versions were used in the office environment. It was the first software installed in the MobaXterm. [10]

Figure 1.5: Ubuntu logo [10]

3.5 Single Front-End Installation

One of the major tasks completed during my internship was to deploy a front-end (FE) test pod using OpenNebula 6.4 version. The previous FE test pod uses OpenNebula 6.2 version. The newer version of OpenNebula was installed in order to find the differences between the two versions. [11]

The Front-end must be deployed first since it is the most essential element of an OpenNebula installation (or upgraded). It usually refers to a host that contains the OpenNebula server-side components and is in charge of maintaining a full virtualization stack. As long as it satisfies the requirements, it can be either a real host or a virtual machine (the choice is up to the cloud administrator). [11]

I was assigned to complete this task in a span of a week. In order to complete a single front-end installation using OpenNebula 6.4 version, an extensive procedure had to be performed. [11]

Before the installation was conducted, I had to deploy a virtual machine. Using the command "`sudo virt-manager`", I was able to access the virt-manager GUI and directed the path to the Ubuntu ISO image file. The name provided to the virtual machine was, "FE-Office-tespod" with a 8GB RAM and 4 CPUs. [11]

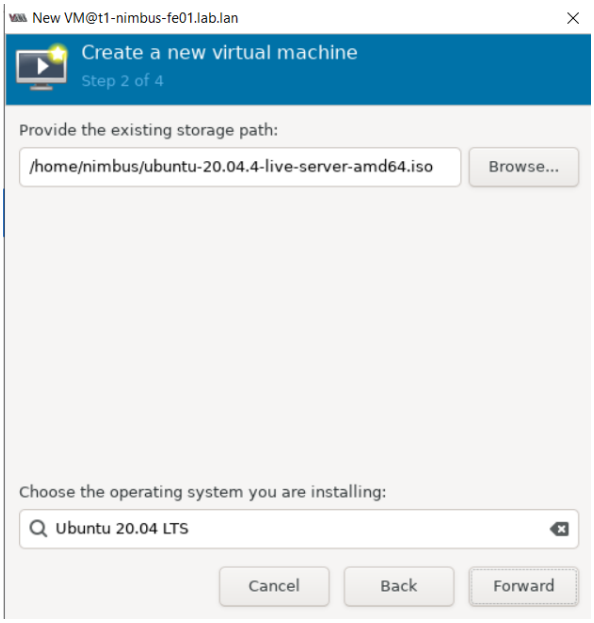


Figure 1.6: ubuntu iso image directory

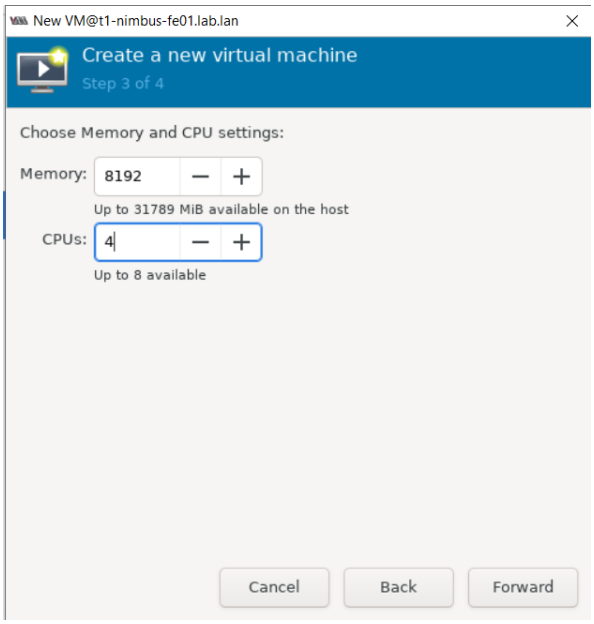


Figure1.7: CPU and Memory

Then, I manually assigned an IPV4 address to it. The reason why IPv4 is being used instead of IPv6 is because although IPv4 is restricted to 4.3 billion IP addresses, IPv6 utilises a 128-bit address and may generate 340 undecillion IP addresses, the implementation of IPv6 by ISPs and/or network administrators may result in a number of leaks and security problems. Company's personal information may be stolen in this way.

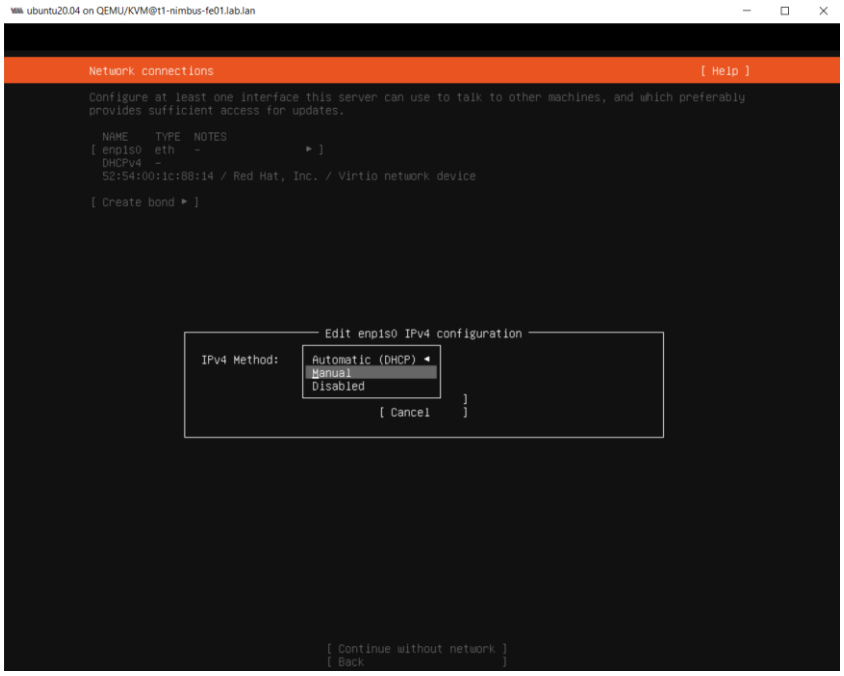


Figure 1.8: IPv4 manually assign

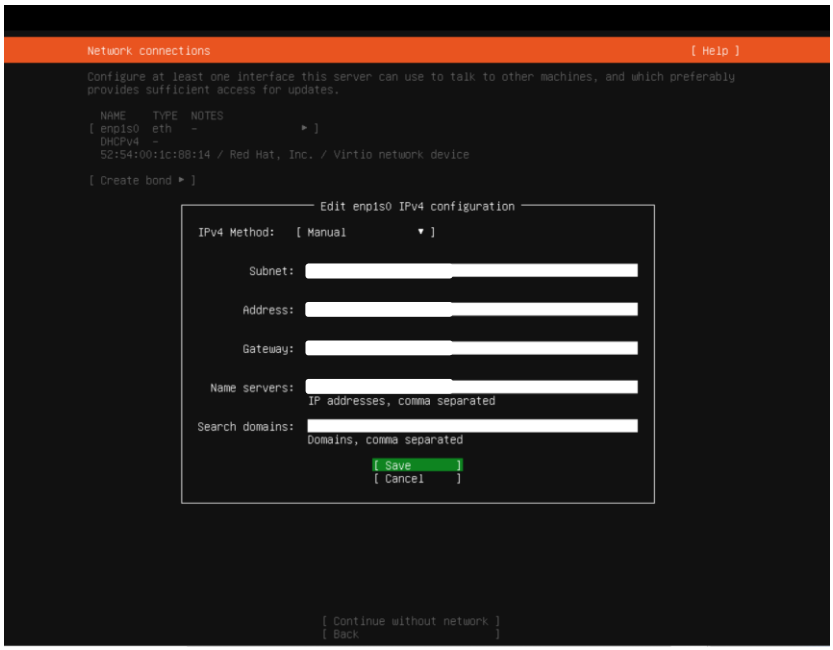


Figure 1.9: Manually assigning IPv4 to the virtual machine

Once the IP address was assigned, the 4 LVM partitions, excluding root, were created in the virtual machine. These partitions were boot, temp, var-log, var-temp. The total memory allocated to the virtual machine was 50 GB. Each of them was allocated with 5GB memory and the remaining was allocated to the root partition. The figure below shows the mounting point and the size allocated to all the 5 partitions.

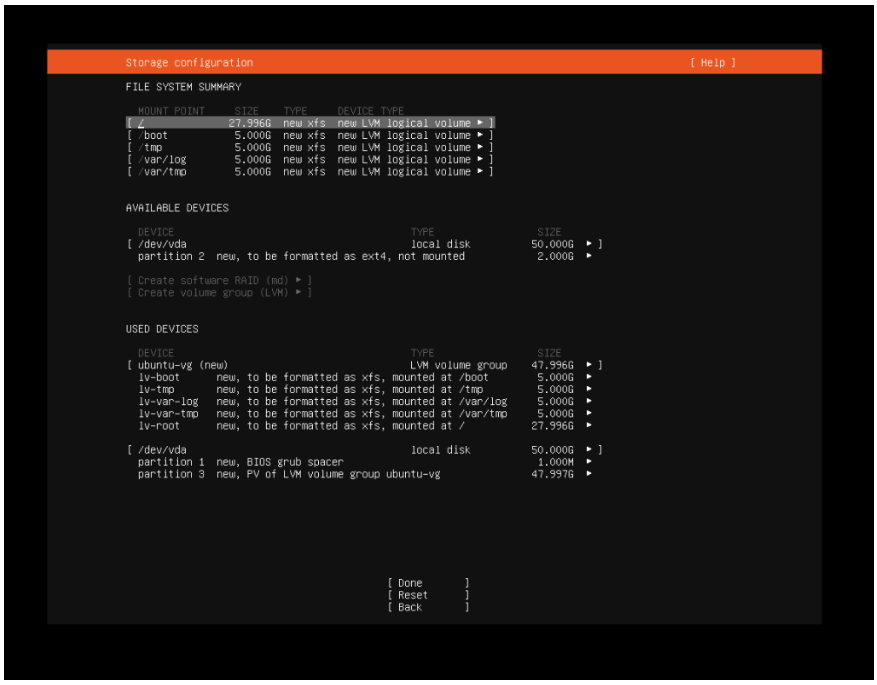


Figure 2.1: LVM partitions and their sizes

Once the LVM partitions were created, next was to just click done and the process of installing ubuntu in the virtual machine was successful. After this, I started on the procedure of single Front-End installation of OpenNebula 6.4 in the virtual machine. [5]

I. Configured OpenNebula Repositories

I had to configure the packaging tools on the Front-end host to include the OpenNebula repositories before I could start the installation. There are 2 types of repositories in OpenNebula, Enterprise edition and Community edition. The main difference between these two repositories is that Enterprise edition provides a hardened configuration to the users whereas Community edition provides free public builds to the users. The detailed differences between these two repositories are shown in the table below.

Difference between Community & Enterprise

Community		**Enterprise**
Individual & non-commercial	Commercial	
. CE migration package for the latest ones is distributed with Non-commercial use. . In order to upgrade to minor/major versions and download CE migration package, you need to **submit a simple online form** and accept the license	Need to subscribe to elemental package. Comes with access to the basic Enterprise Edition Unlimited CPUs, Cores, VMs	Binary packages are distributed under a commercial license governed by the OpenNebula Subscription Agreement. Consist of exclusive tools for simplified updates and maintenance. Enterprise packages to build and manage a cloud infrastructure on a total number of hosts for which subscription fees have been paid. source code of the Enterprise Edition of OpenNebula is

		distributed under the Apache License 2.0 evolving into the central control, maintenance and monitoring point of the installation.
Similarities (a) Both editions are fully compatible and any driver or extension developed and certified with the Community Edition will work with the Enterprise Edition. (b) the community and enterprise editions of major and minor releases are the same.		

Table 1.2: Differences between enterprise and community edition

Nimbus uses the Community edition OpenNebula repositories since it has many experienced and professional engineers to manage, configure and update the CMP. Both repositories have different commands when it comes to configuring. Since I was to configure the Community edition repository, first I had to get into root.

```
# sudo su
```

Then, in order to add the repository signing GPG key on the Front-end, I executed

```
#  wget-q -O- https://downloads.opennebula.io/repo/repo.key
   apt-key add
```

Next, I executed the command for Ubuntu 20.04

```
# echo "deb
https://downloads.opennebula.io/repo/6.4/Ubuntu/20.04 stable
opennebula" > /etc/apt/sources.list.d/opennebula.list
# apt-get update
```

II. Added 3rd party repositories

The reason why I had to add 3rd party repositories is because dependencies for OpenNebula are not entirely included in base distribution repositories. Since I was using Ubuntu platform I had to to enable 3rd party repositories by running the following commands:

```
# wget -q -O-
  https://deb.nodesource.com/gpgkey/nodesource.gpg.key | apt-
  key add -
# source /etc/os-release
# echo "deb https://deb.nodesource.com/node_12.x
  ${VERSION_CODENAME}
  main">/etc/apt/sources.list.d/nodesource.list
# apt-get update
```

III. Software installed

The following command was used to install all components of the OpenNebula Front-end.

```
# apt-get update
# apt-get -y install opennebula opennebula-sunstone
  opennebula-fireedge opennebula-gate opennebula-flow
  opennebula-provision
```

IV. Configured OpenNebula

When OpenNebula is first deployed, its initial deployment produces the user oneadmin (not to be confused with the system user oneadmin in the Front-end operating system!) using a password that was generated at random and read from

/var/lib/one/.one/one auth. Before launching the operations, I carried out the following procedure to create and enter Nimbus user password.

```
# sudo -u oneadmin /bin/sh
# echo 'oneadmin:changeme123' > /var/lib/one/.one/one_auth
```

V. Logged in to OpenNebula Sunstone

After successfully completing the procedure of installation, I checked if I can log in to OpenNebula Sunstone.

Figure 2.2: OpenNebula Sunstone login page [11]

There were quite a few errors that occurred during the process of installation but in the end, I had successfully completed the Installation of the FE cloud management interface.

3.6 KVM node installation in Compute 1 and 2

Compute Host is used to store data for the front-end cloud management platform interface. Initially I only created compute 1 but compute 1 was running out of storage since the backup team were also using Compute 1 to their testing in the FE interface.

The installation process for computes is different compare to single front-end. This is because, instead of installing OpenNebula packages, I had to install KVM node packages.

KVM node packages is the abbreviation for Kernel-based Virtual Machine. It is a full virtualization solution for Linux on x86 hardware containing virtualization extensions (Intel VT or AMD-V). It consists of a loadable kernel module, kvm. ko, that provides the core virtualization infrastructure and a processor specific module, kvm-intel. ko or kvm-amd. [12]

In order to install KVM node packages in Compute 1, I had to follow this procedure:

I. Configured and add the OpenNebula repositories

The process was the same as how I did for single FE installation.[13]

II. Software installed

In order to install the OpenNebula KVM Node package and restart libvirt to use the OpenNebula-provided configuration file I had to execute this command [13]:

```
# yum -y install opennebula-node-kvm
# systemctl restart libvirtd
```

Next, since I was using the ubuntu platform, I had to execute the following commands:

```
# apt-get update
# apt-get -y install opennebula-node-kvm
# systemctl restart libvirtd
```

III. Configured Passwordless SSH

The OpenNebula Front-end connects to the hypervisor Nodes using SSH. Following connection types are being established:

- from Front-end to Front-end,
- from Front-end to hypervisor Node,
- from Front-end to hypervisor Node with another connection within to another Node (for migration operations),
- from Front-end to hypervisor Node with another connection within back to Front-end (for data copy back).

This is important because it is necessary to ensure that Front-end and all Nodes can connect to each other over SSH without intervention and permission. [13]

- Populated the Host SSH Keys

I was logged on the Fron-end and ran the command below to get into oneadmin user

```
# su – oneadmin
```

Then, I created the known_host file by executing the command shown below by stating the MAC address of the compute and FE in the line of command. [13]

```
# ssh-keyscan <frontend> <node1> <node2> <node3> ... >>
  /var/lib/one/.ssh/known_hosts
```

- Distribute Authentication Configuration

For me to SSH into the Compute1 through FE and vice versa, I had to distribute the authentication configuration to both, FE and Compute 1.

```
# su - oneadmin
```

I enabled passwordless logins by executing the following commands for each of the Node. The <node1> and <node2> were replaced with the IP address of the FE and Compute 1. [13]:

```
# ssh-copy-id -i /var/lib/one/.ssh/id_rsa.pub <node1>
# ssh-copy-id -i /var/lib/one/.ssh/id_rsa.pub <node2>
```

- Validate Connections

I checked if I could SSH into the FE through Compute 1 and vice versa without being asked for password. There was a minor problem when copying the pub key into both servers so at first it didn’t work but after giving it another try it worked.

IV. NFS client package installed (Storage Configuration)

The distributed file system protocol known as NFS, or "Network File System," enables users to mount distant folders on the server. This enables the user to control storage space at a different place and enable many clients to write to that space. NFS offers a standardised and effective method for connecting to remote systems across a network, and it performs well when shared resources need to be used often.

- I had to find the path to the NFS storage and which directory it was located in the FE . Then I entered to the fstab directory of the Compute 1 to copy-paste and lead it to that directory in order to find the NFS package.

```
# cat /etc/fstab
```

- Then I used the mount command:

```
# sudo mount storage_ip_address:/path/to/the/directory/
```

V. Adding Host to OpenNebula

I entered the OpenNebula FE platform and added the Compute 1 to the host. Go to Infrastructure and click on Hosts.

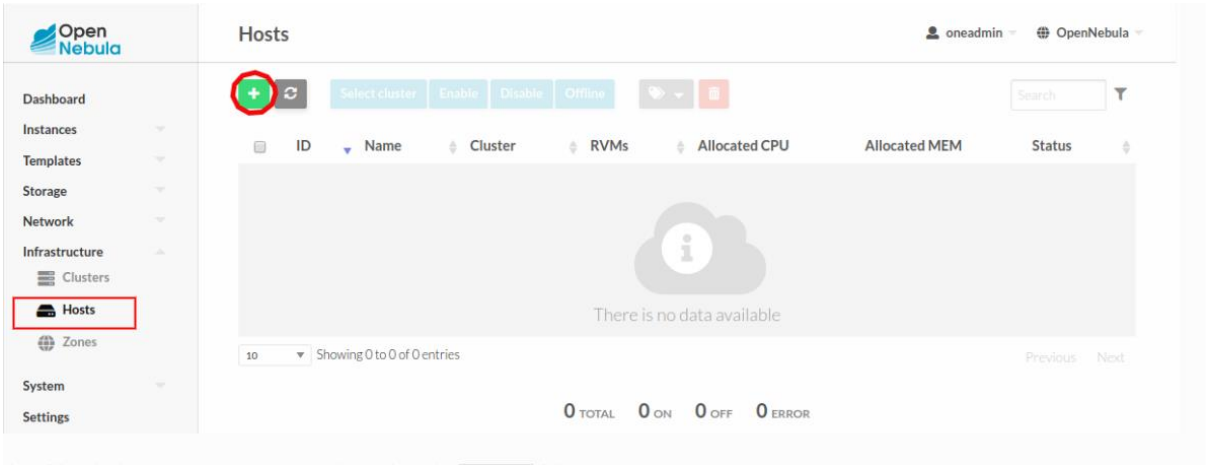


Figure 2.3: add host in infrastructure [13]

3.7 User manual for provisioning a virtual machine and Resource Management in the Front-End

I was assigned to do testing and documentation of the method to provision a virtual machine and also managing resources. This task was something new that was added to the CEC of NIMBUS a week before I joined. Mr. Sarveen, the operation manager of Nimbus Cloud, wanted to expand the authority of the customers by giving them access to the Front-End cloud interface. With the access to the FE cloud platform, they will be able to manage their cloud independently to a certain extent.

This user manual will assist the customer on VM creation and provide a step-by-step guide to make adjustment to the VMs independently. There are a total of 8 modules which are VM creation using template, network attach and detach (Linux and Windows), creation of VM images, attaching and detaching a disk to the VM (Linux and Windows), resizing disk attached to the VM (Linux and Windows), resizing the RAM, Physical CPU and vCPU, and finally the procedure to raise a ticket in the helpdesk system.

Each module delves into different topics and scenarios based on the situation the customer might encounter. Since the user manual is over 50 pages long, I would not be able to show I but the introduction to the user manual will be part of the Appendix A. The introduction is made in way that the customers would be able to see examples of scenarios, in the form of tickets. These scenarios depict the tickets made by a customer in the helpdesk system. This is to have a better understanding of the modules shown.

3.8 Managing the tickets in the helpdesk system

One of the main tasks the Support team handles is managing the helpdesk system. With the use of a cloud-hosted application, a customer support staff may use a cloud help desk to address issues and requests from customers across channels. With the use of a cloud-based help desk, customer service representatives can keep track of all of their interactions with clients across various channels, including chat, phone, email, and social media, in one central area, making it simpler to give relevant responses. [14]

The cloud helpdesk system application that Nimbus Cloud uses is Spiceworks. The cloud helpdesk system is also known as a ticketing system. Without the hassles or expenses of putting up a whole support staff, Spiceworks Cloud Help Desk lets you to track, prioritise, and manage your daily tasks and user requests in one location. The term “ticket” is used to indicate the case or issue that a customer would raise. [13]

I was tasked to close the automated tickets and classify the open tickets into 3 categories which are Internal, External and On-Behalf. The internal tickets are tickets raised by Nimbus Engineers. The external tickets are tickets raised by customers and finally the on-behalf tickets are tickets raised by Nimbus Engineers on-behalf of customers.

After classifying, the excel sheet will be sent to Miss Archanaa. Later I would have to e-mail all the Nimbus engineers as follow up on the open tickets which they have been made assignee of.

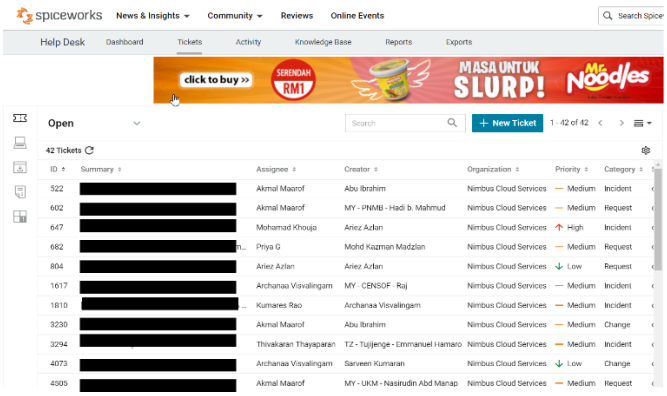


Figure 2.3: Spiceworks Helpdesk System

CHAPTER 4

CONCLUSION

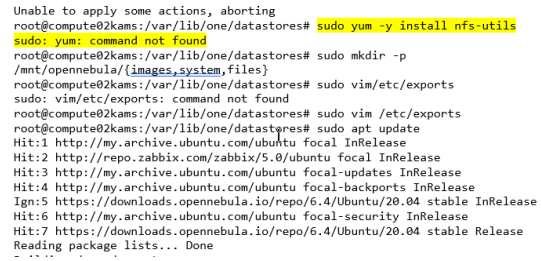
In conclusion, the internship programme has given me a wide range of information and practical skills while also giving me job experience. In addition, this industrial training programme helped me develop as an engineer and acquire work ethics. Nimbus Cloud Sdn.Bhd provided a three-month internship that was both instructive and motivating. For university students, this programme is crucial since it will equip them to deal with genuine issues and situations when they start working after graduation. Over the course of three months, I expanded my knowledge, accomplishments, and skill set.

Troubleshooting and management related work was the core of my internship. Understanding the uses of virtual machines and containers and how it is implemented in NIMBUS was something very new to me. I was fortunate to learn advanced programming language such as Ubuntu. I had gotten a better understanding of what virtualization is and the basics of cloud computing. This internship not only widen my knowledge in sense of education but also helped me experience the ethics at workplace and such.

Since it is a rather newly established company, they are willing to explore everything outside their comfort zone to improve services at Nimbus. Despite being from the Support Team I was assigned to many other tasks from other teams as well. I got to delve into a bit of everything at Nimbus Cloud

CHAPTER 5

Problems Occurred and Suggestions

Error	Solution
Passwordless SSH error: I couldn't access Compute 1 thorugh FE even after doing passwordless SSH. Reason: I had spelled the directory "authorized key" as "*autherize key*". Since the spelling was wrong, new directory was creaseted and the id_rsa.pubkey was stored in that directory.	I deleted the wrongly created directory and added the pub key to the right directory which is "authorized key".  Figure 2.4: Passwordless SSH error
I could install NFS client Reason: Ubuntu does not support yum command.	Used another command instead.  Figure 2.5: NFS installation error

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Appendix A

INTRODUCTION

This user manual will assist you on VM creation and provide a step-by-step guide to make adjustment to your VMs independently. There are a total of 8 modules. Each module delves into different topics and scenarios based on the situation you might encounter.

To have a better understanding of these modules, examples of scenarios, in the form of tickets, are shown below. These scenarios depict the tickets made by a customer in the helpdesk system.

#123: VM REQUEST

Hi Support,

Please **create a new VM** with a Windows template and name it *TEST-VM*. Set the **RAM**: **4 GB** and the **CPU: 4**, and **Storage: 50 GB.**

*This ticket's request is to **create a new VM** and **attach a network** to it.*

*Refer to **Error! Reference source not found.***

*Create a new VM: **Error! Reference source not found.***

*Attach network (Windows): **Error! Reference source not found.**.*

*Attach network (Linux): **Error! Reference source not found.***

#124: ADD NEW DISK

Hi Support,

Please **add a 50 GB D-drive disk** to *TEST-VM* created in ticket *#123*.

*This ticket's request is to add a new disk to the previously created VM. In order to do this, one should **create VM image** and **attach a VM disk.***

*Refer to **Error! Reference source not found.***

*Create VM image: **Error! Reference source not found.***

*Add a disk (Windows): **Error! Reference source not found.***

*Add a disk (Linux): **Error! Reference source not found.***

#125: INCREASE THE DISK SIZE

Hi Support,

Please **increase the disk size of D-drive** from **50 GB** to **100 GB**.

*This ticket's request is to **increase the disk size** of the previously attached disk.*

*Refer to **Error! Reference source not found.***

*Increase the disk size (Windows): **Error! Reference source not found.***

Increase the disk size (Linux): **Error! Reference source not found.**

#126: INCREASE RAM

Hi Support,

Please **increase the RAM** of the VM created in ticket *#123* to **16 GB**.

*This ticket's request is to **increase RAM** of the VM.*

*Refer to **Error! Reference source not found.***

#127: INCREASE CPU

Hi Support,

Please **increase the CPU** of D-drive disk to **8** created in ticket #123.

*This ticket's request is to **increase CPU** of the VM.*

*Refer to **Error! Reference source not found.***

#128: ADD & EXTEND DISK

Hi Support,

Please **add a new disk** and **extend D-drive** for the VM.

*This ticket's request is to **add and extend disk**.*

*Refer **Error! Reference source not found.***

*To add disk: **Error! Reference source not found.***

*Refer to **Error! Reference source not found.***

*To extend VM disk: **Error! Reference source not found.***

#129: INCREASE CPU & RAM

Hi Support,

Please **increase the RAM and CPU** of the VM to **RAM: 16 GB** and **CPU: 8** respectively.

*This ticket's request is to **increase RAM & CPU***

*Refer to **Error! Reference source not found.***

*To increase RAM: **Error! Reference source not found.***

*Refer to **Error! Reference source not found.***

*To increase CPU: **Error! Reference source not found.***

Appendix B Network Cable diagram

Cable Mapping- Testpod						
Type (L1/L2)	Source		Destination		VLAN Details	Port Channel Details
	Device Hostname	Port/NIC	Device Hostname	Port/NIC(LtoR)		
RJ45/Ethernet		eth1/1/1				
RJ45/Ethernet	SW	Gi0/18	Server-VMWare-R730	port-1		
RJ45/Ethernet	SW	Gi0/19	Server-VMWare-R730	port-2		
RJ45/Ethernet	SW	Gi0/17	Server-VMWare-R730	port-3		
RJ45/Ethernet	TP-Link	port-2	Server-VMWare-R730	port-4		
RJ45/Ethernet	SW	Gi0/6	Server- NFS - Synology	LAN1		
RJ45/Ethernet	SW	Gi0/7	Server- NFS - Synology	LAN2		port channel 1
RJ45/Ethernet	SW	Gi0/8	Server- NFS - Synology	LAN3		
RJ45/Ethernet	SW	Gi09	Server- NFS - Synology	LAN4		
RJ45/Ethernet	SW	Gi0/12	Server- NFS - Synology	PCIe1		
RJ45/Ethernet	SW	Gi0/11	Server- NFS - Synology	PCIe2		port channel 2
RJ45/Ethernet	SW	Gi0/5	FW-4p-minipc	LAN4		
RJ45/Ethernet	SW	Gi0/4	FW-4p-minipc	LAN3		
RJ45/Ethernet	TP-Link	PORT 1	FW-4p-minipc	LAN2		

Figure 2.6: Cable mapping

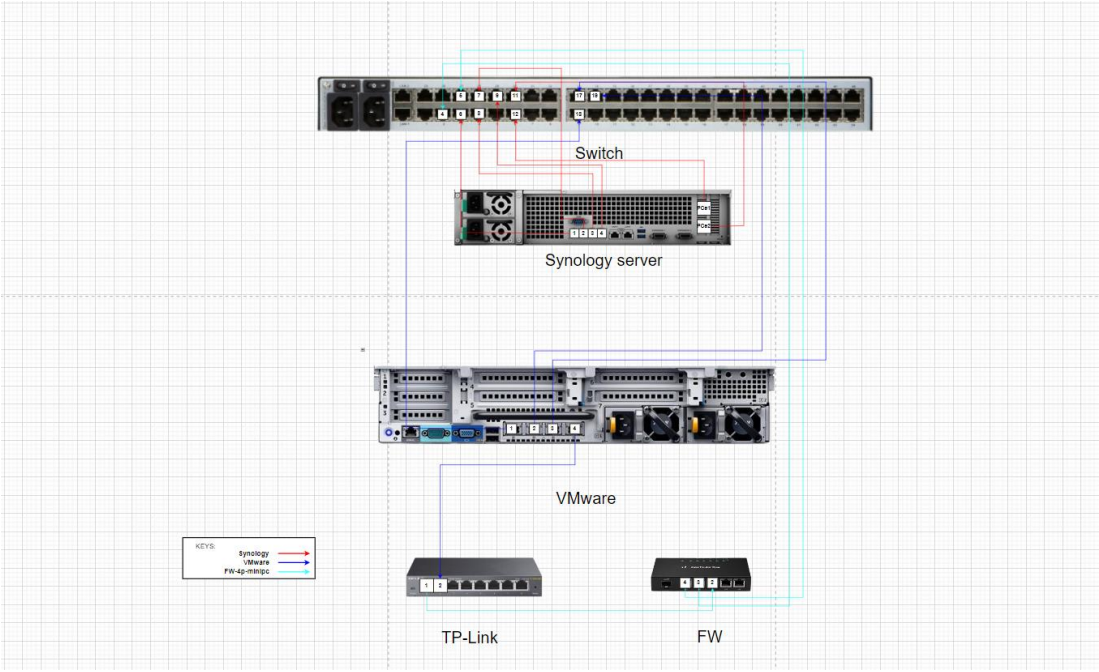

Figure2.7: Network cable diagram