MBARARA UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF COMPUTING AND INFORMATICS

INDUSTRIAL TRAINING REPORT

By

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Carried Out At
Pandora Networks (EA) Limited

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January to February *(2021).*

DECLARATION

I **ISIIKO IVAN MPONGO JOSEPH**, hereby declare that this report written in partial fulfillment of the requirements of the award of a Bachelor of Computer Science degree at Mbarara University of Science and Technology. This is my very own work documenting my internship (Industrial Training) at PANDORA NETWORKS (EA) LIMITED during the recess term of January to February, Academic year 2021

Signature ……………………………………………. Date …………………………..

APPROVAL

This industrial training has been submitted for examination with the approval of the following supervisors.

Sign…………………………………. Date…………………………

TWINEAMATSIKO EVANS KAMAU
PANDORA NETWORKS (EA) LIMITED

Sign……………………………………… Date……………………………….

Ms. AMONGI MARY
Mbarara University of Science and Technology

DEDICATION

I wish to dedicate this work to my loving parents, Mbarara living community church, my supervisor Ms. Amongi Mary, classmates, and friends for their unconditional support plus their tireless efforts, inspirational courage and being my pillars of strength.

ACKNOWLEDGEMENT

This report is greatly indebted to a number of people, whose cooperation, guidance, and encouragement have enabled/ made it possible to accomplishment.

Humbled, my sincere gratitude goes to my Company supervisor Mr. TWINEAMATSIKO EVANS KALAU for his time, exposure in the field of work in my internship/industrial training. I appreciate the efforts of my friends namely Bidhampola Brian, Tweheyo Benjamin Martin plus my parents who have given me the push to work hard in this internship period and others whose unconditional support has been limitless.

Abstract

Networking is such a wide topic with sub sections of setting up and connecting different network devices to accomplish a required network which is LAN or WLAN and also understanding implementation of every network in a given topography which also defines the network that is required for a given place. This includes configuring and interacting with different networking devices plus there required connectivity among them to share or communicate with each other while using routers, ubiquity dishes etc. Networking surveys make it simplified to lay out a network from a tower which is a major access point working with the principle of line of site and also use of cabled linking using optical fiber layers laid underground and accessed through man holes and optical strands are shared to different bodies for internet connections and also shared aerially on polls. In addition every device requires a given a specified voltage quantity.

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CHAPTER ONE

1.0 Background of Pandora Networks (EA) Limited

This chapter constitutes of the history of the Pandora Networks (EA), the structural organization of Pandora Networks (EA), title and position of the officer responsible for the industrial training at Pandora Networks and other information that is necessary

Pandora Networks (EA) Limited is company located at Markhan Singh Street with the aim of providing technological solutions and excellence to customers support. It has several products on market for example Pandora bulky sms, Pando cash, cloud tunes and provides networking services i.e. installing and configuring WLANS, LANS, WANS from a given service provider e.g. Roke telecom.

1.1 History

Pandora Networks (EA) Limited was started in 2016 with the vision to be the leading Centre of solutions for East Africa's problems, riding on integrity, loyalty, customer support and a mission to enrich people's lives by paving their way to success and financial freedom, anytime, anywhere. Having excellent customer care, integrity, loyalty and success as their core values.

1.2 Structural Organization of Pandora Networks (EA) Limited

Figure 1

CEO

Sales manager

Technical manager

Sales Executives

Brand Ambassadors

Software design head

Telecom support head

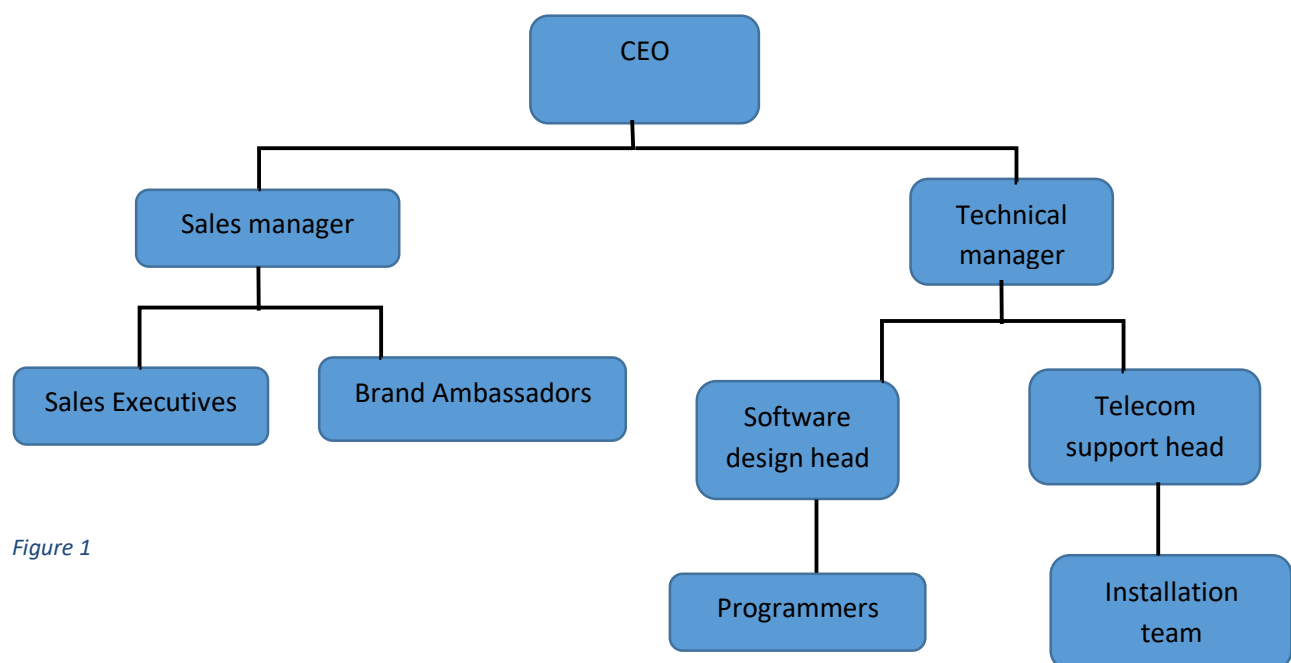Programmers

Installation team

10

1.3 Title and Position of the officer responsible

Twineamatsiko Evans Kamau

CEO and Solutions Architect Company.

CHAPTER TWO

2.0 Summary of Duties

My training is scheduled for 4hrs from 3:00pm to 6:00pm in evening. This chapter includes how the training was scheduled with the different break down of activities in the given weeks

2.1 Schedule of the training

Schedule of Training

Week Number	Activity	Break Down Of Activities
ONE	Network Setup and Configuration	Introduction and mastering color code of Ethernet cables. Terminating Ethernet cables. Day three: configuring router (mickrotik) and dish (ubiquity) Extending cables network. Extending wireless network (point to point). Surveying fiber layout (underground and aerial)
TWO	Generating vouchers	Generating internet voucher with a given time duration. Field work. Marketing /selling IT products
THREE	Web designing	Installing xampp, Atom and visual studio editors. Setting up a server on xampp.

		Structuring project using CSS frame work. Camera installation.

CHAPTER THREE

3.0 Working Experience

This chapter constitutes of the working experience, projects carried out, supervisory works done, problems encountered and the problems solved.

Under this section I have carried out different projects, supervisory works and problems encountered during this internship / industrial training plus their solutions respectively.

3.1 Projects carried out

Several projects have been accomplished as shown below:-
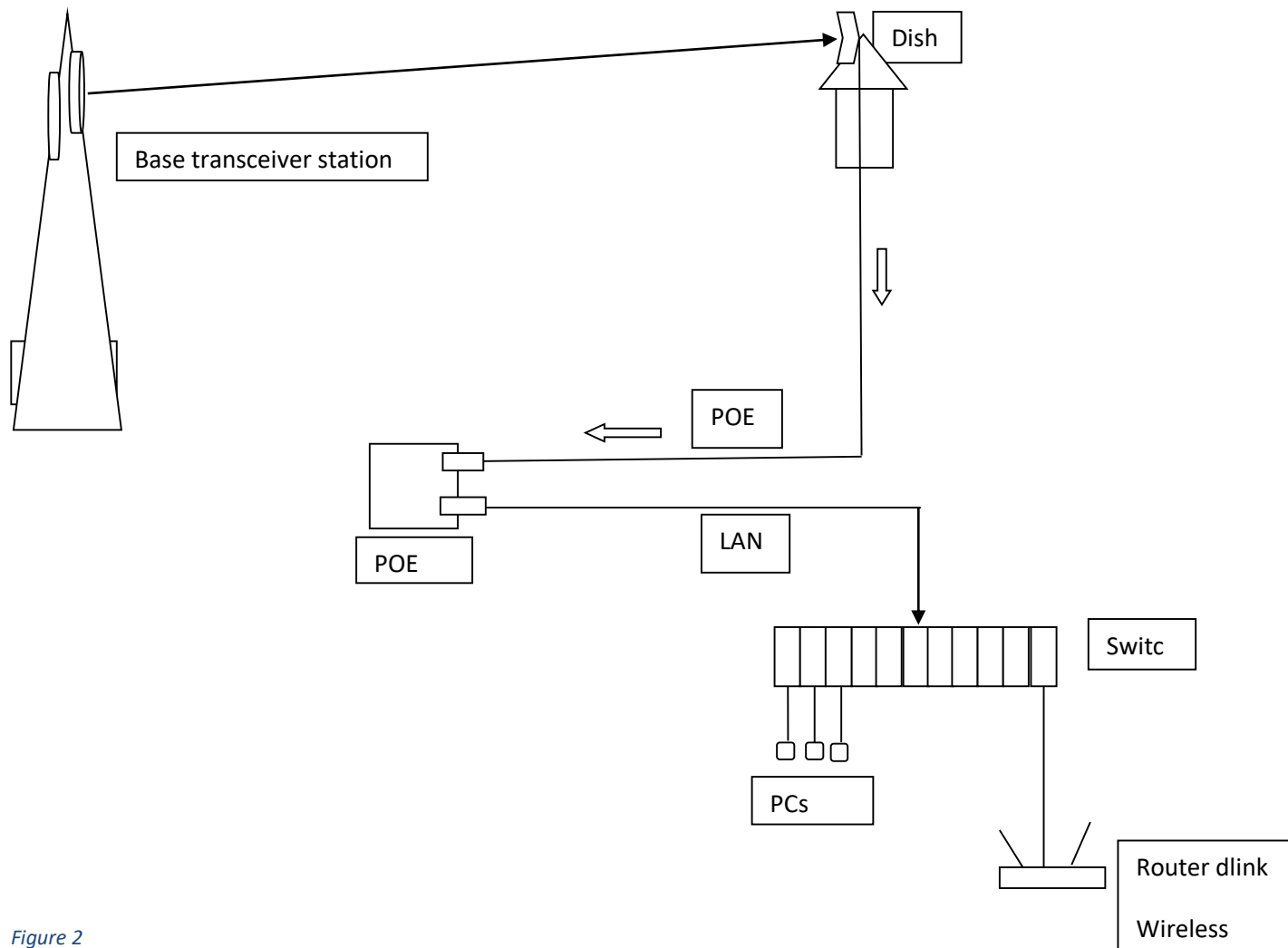
3.1.1 Network topology

Figure 2

14

Network topology is the systematic order throughout the flow of internet from tower to use. Internet can be transferred through several ways i.e. fiber, microwave and also GSM, therefore for the structure

Tower / Base Transceiver Station

This is locally called "mulongooti". Its contains sectors which act as Access Points to provide internet through microwave form (wirelessly) to the dish i.e. in line of site.

Dish

This is placed on top of a house to face the tower in line of site to the sectors to which its (dish) it's configured as a station to receive internet/traffic from the sectors on the tower. The dish is powered using the Power Over Ethernet (POE).

POE

This is an adapter having two ports one for POE and the other one LAN to transfer traffic/data from the dish to router/switch or a network device.

Switch/router

This is a device to which traffic or data is redistributed when it's received from the dish. It's also has several ports to extend received traffics/data/internet to connected devices for example computers (PCs) and also extend network using another router

PCs

This are the computers connected or networked to the switch /router to share resources which is the best core for networking as shown above.

Ethernet Cables

This is the connection cable used to power the dish and also get data/traffic from the dish, from POE through the LAN port to the router or switch this cable is terminated at the edges and topped up or terminated with the RJ45 using the clipping tool.

Recap: dish is placed in line of site with the base transceiver station or tower (sector) which is the Access points on which the dish is powered through the POE (power over Ethernet) port. Data / traffic (internet) is fed into the switch using a LAN port to which computers or PCs are connected and also extend the network to the router which is to provide wireless (Dlink).

Cisco provides with manageable routers i.e. Ports can be configured.

Note: indoor routers use 24volts, outdoor routers use 48volts

3.1.2 Ethernet termination and testing

Under this section we work with the following gadgets:

RJ45

I consider this to be a cable head after termination of the Ethernet cable.

Figure 3

CLIPPING TOOL

This is used to concatenate the RJ45 with the Ethernet cable wires and also to clip off the cable shield

Figure 4

Ethernet cable

It's a cable used transfer traffic or data between to devices.

Figure 5

Figure 6

Terminating steps.

Cut cable of a required length and use the clipping tool to open or clip off cable shield.

Then straighten exposed inner wires and arrange them in the required alignment.

Hold a RJ45 in an appropriate form for both ends, push the aligned wires into the RJ45 for both ends.

Place the interlocked cable and RJ45 into the clipping tool port for termination or permanent binding.

Finally test the cable functionality, continually this *involves also terminating different cable types for example; we terminated a straight through Ethernet cable which is used to connect devices of different types such as connecting a computer to a switch, connecting a lite beam dish to a router. The color code arrangement for a straight through is as below;*

Brown, white brown, green white, blue, blue, white green, orange, white orange.

We also terminated a crossover Ethernet cable which is used to connecting the same devices for example a laptop and a laptop.

We installed a router at the office as a group where everybody actively participated. The router was placed outside the office which serves internet to nearby people. This involved terminating a cable (straight through Ethernet cable) which we used to connect the switch (which is in the office) to the router (which is outside the office). We configured the router and the internet was availed.

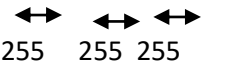### 3.1.3 Calculating Subnet mask
This can be used in panning, router configuration and also VLAN configuration.

When given a network block from service provider for example 411.77.79.24/30 we obtain the Gateway, Ip and mask.

Block: 411.77.79.24/30

Gateway=411.77.79.25

IP=411.77.79.26

Subnet mask: IIIIII1   IIIIII1 IIIIII1 IIIIII00

              255   255 255 _____

      11111100 to binary

Powered from 0 to7

(1*2)^7+ (1*2)^6+ (1*2)^5+ (1*2)^4+ (1*2)^3+ (1*2)^2+ (0*2)^1+ (0*2)^0

128+64+32+16+8+4

252

Subnet mask= 255.225.225.252

3.1.4 Resetting ubiquity dish and routers.

Dishes and Routers have or poses default IP address For example Ubiquity dish/ light beam has a default IP address of 192.168.1:20 so For a dish and router having a unknown IP address I pressed the button on the POE adapter, also for the routers have a button to reset them there for press the button for some seconds which resets the IP address of the device. Some devices provide signal of being reset for example mikrotik router beeps when reset is successful, uni-fi indoor router lights blue when not configured and white when configured

For Devices who's POE adapters have no button and also verifying whether a device is configured or reset to default IP address. We installed I installed the ubiquity discovery software to be able to get there IP address in order to be able to configure them directly by logging into them directly with the available IP address.
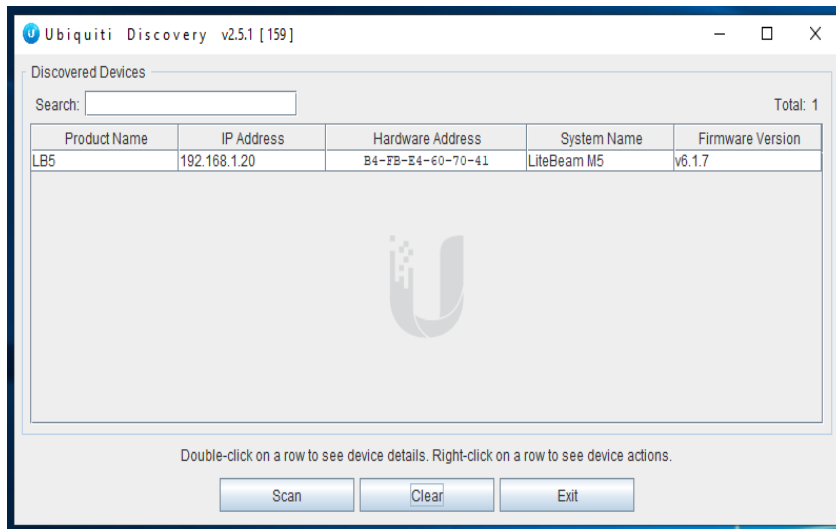
Figure 7

NB the discovery software finds IP address for a connected device.

3.1.5 Configuring ubiquity dish/light beams and routers.
With ubiquity dish / routers which are already reset to default IP address or whose IP address are known. Connect them to the computer through the POE for the dishes and routers can be both wireless and cabled using an Ethernet cable.

- For the computer: set its IP to be static but in range to that device to be configured.(blinking lights when booting and stable white when on)

  Go to:

  Control Panel to Network and Internet to Network Connections
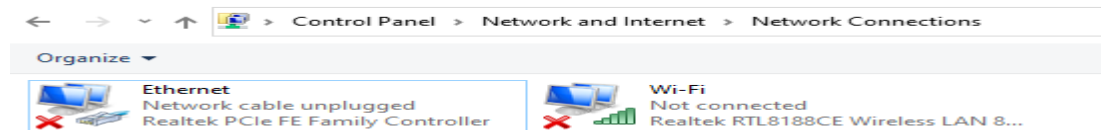

Figure 8

  Right click Ethernet then tap properties.

  Double click Internet protocol version 4(TCP/IPv4)

Figure 9

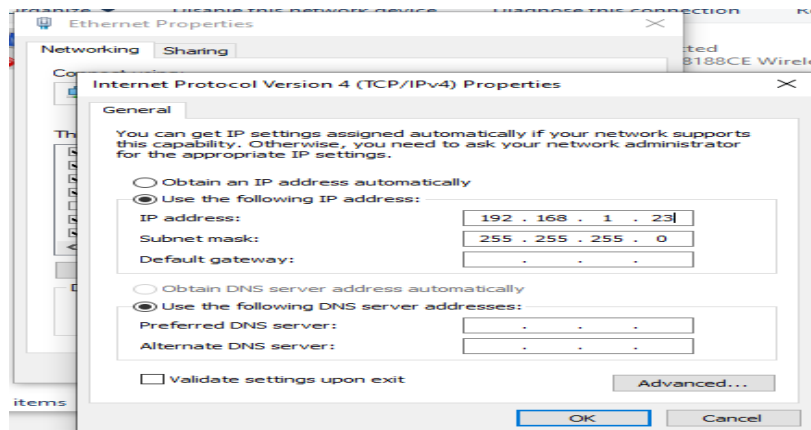> *Choose Use the following Ip Address, type in static Ip address then click ok.*

Figure 10

- *For ubiquity dish: Should be powered and connected to the computer through the POE.*

- *For router:*

➢ *Wireless: The computer must be connected to the same network with the router.*

➢ *Cabled: Connect to the POE port on the router to the computer using the Ethernet cable.*

> *For uni-fi router install uni-fi software to grant easy log into the router easily through the browser.*

Open the browser, input IP address of a given device to configure the required (this is logging into the device) dashboard is displayed for that specific device you're dealing with it.
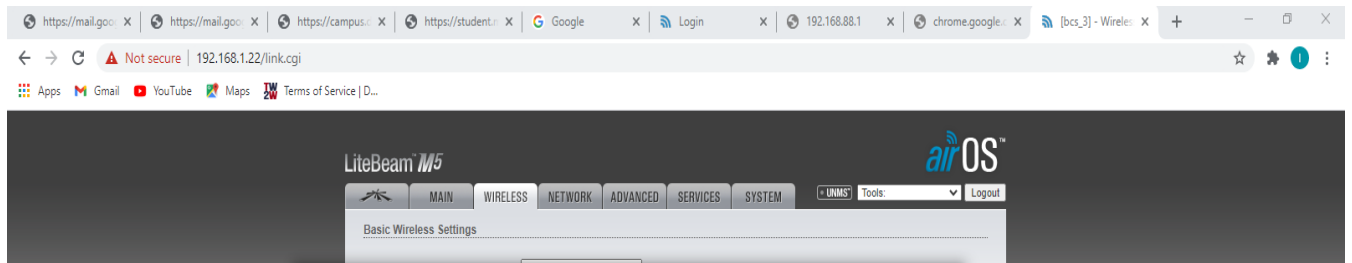
Figure 11

After logging into the device you can change its SSID, IP address, importance/use and Password i.e. all setting are available for a given device.

Finally when done with making required configurations to a given device disable the static IP set in the computer in order to test traffic or data transfer mostly known as internet.
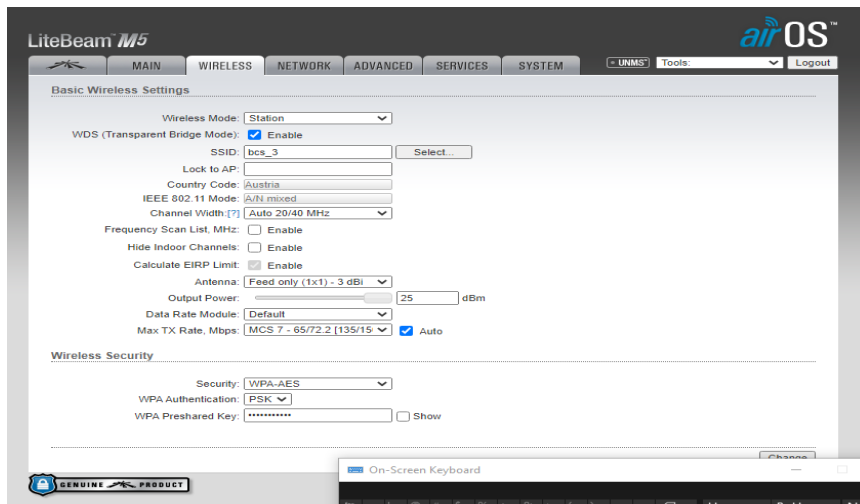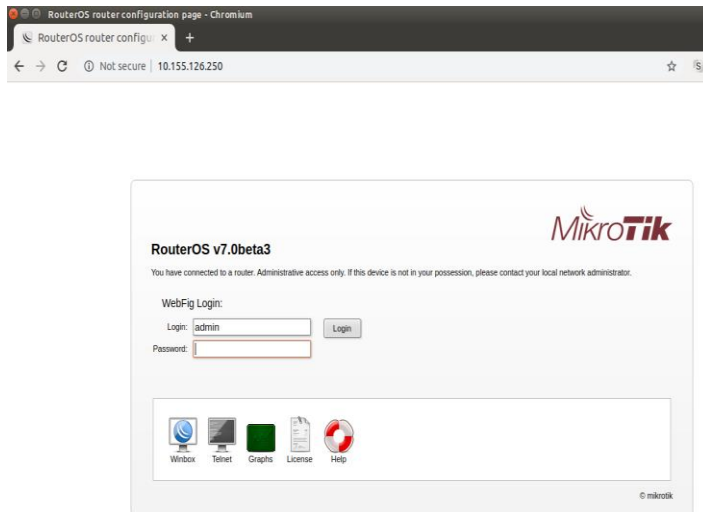
For dish:

Figure 12

For router:

Figure 13

For d-link:

Figure 14

3.1.6 Setting up a mini-lab.

A mini-lab is setup that extends to a few number of devices i.e. router and computers.

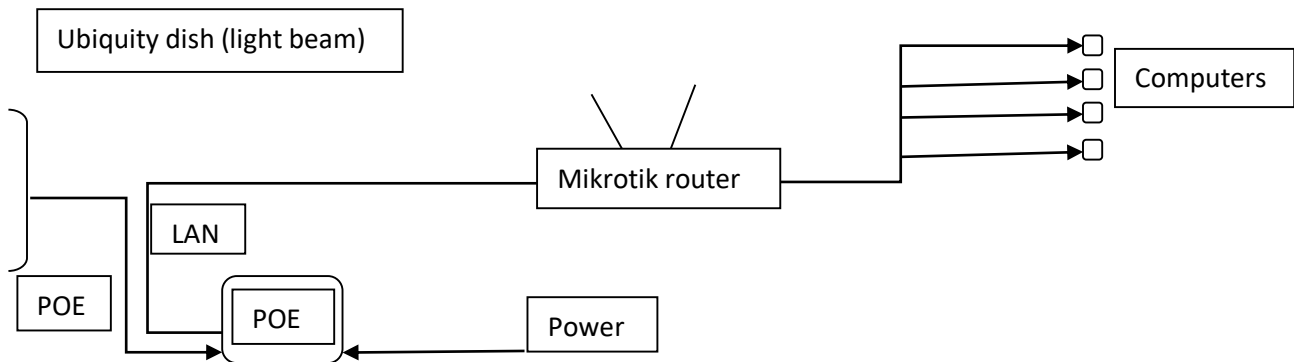*For our mini-lab the following below are the requirements:*

Router.

Ubiquity dish.

POE.

Setup (mini-lab)

Figure 15

   Ubiquity dish (light beam): faces the tower like it's described in LAN topology above. It transfers both power and traffic or data through the power over Ethernet cable to power the dish and also transfer data to the POE the through the LAN port on the PoE to the mikrotik port on the mikrotik router.

Port the LAN cable from computer to the router after configuration.

On the dashboard configured the dish to a station and its DCHP in order to provide dynamic IP address to devices connected to it. Release the static IP of the compute to test the supply internet

Mikrotik Router: The mikrotik router is multipurpose it can provide both wireless and cabled network extension therefore can be configured wirelessly or by use of a cable.

In the mikrotik dash board you also can change its SSID, IP address and Password.

Deactivate the DCHP on it to give the opportunity to dish to do it.

After configuration-Traffic or data from the dish is distributed to the ports on the mikrotik router then extended to computers as shown above.
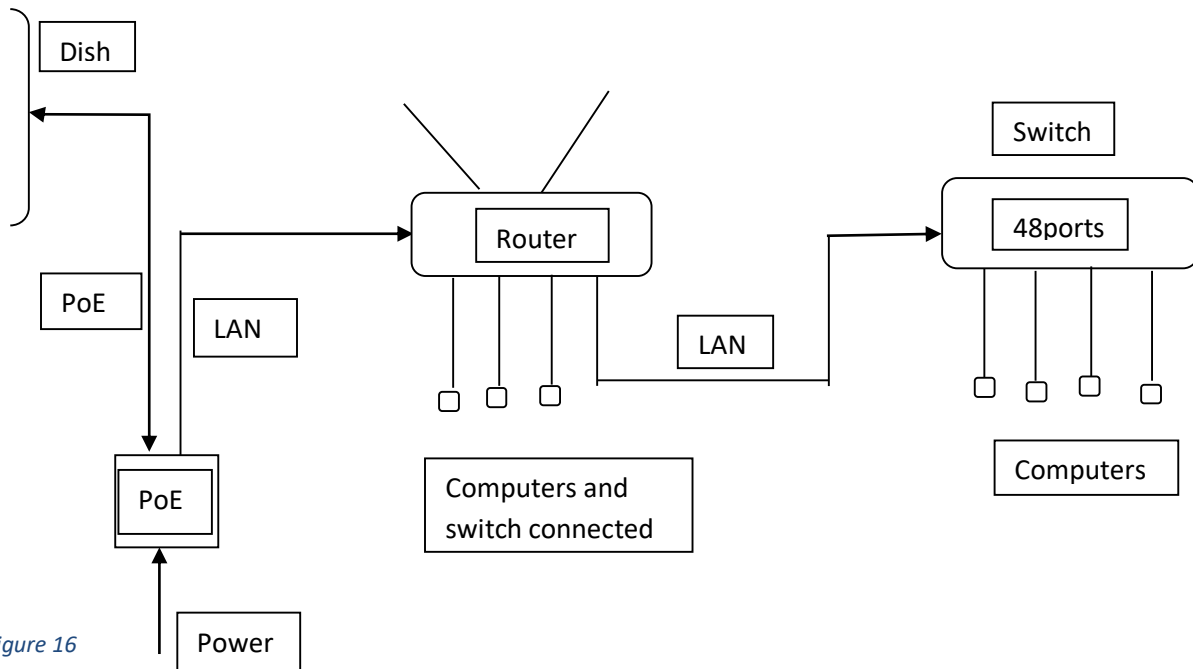
3.1.7 Extending cabled network

Figure 16

Cable extended means a network is extended to several users using cables to be able to share the same network and resources.

From the dish traffic or data or internet is transferred to the PoE then to the router through the LAN port on the PoE and to computers on its LAN ports.

Finally extended to another network device (switch) through the LAN from the router in order to be distributed to several ports to which computers are connected using cables.
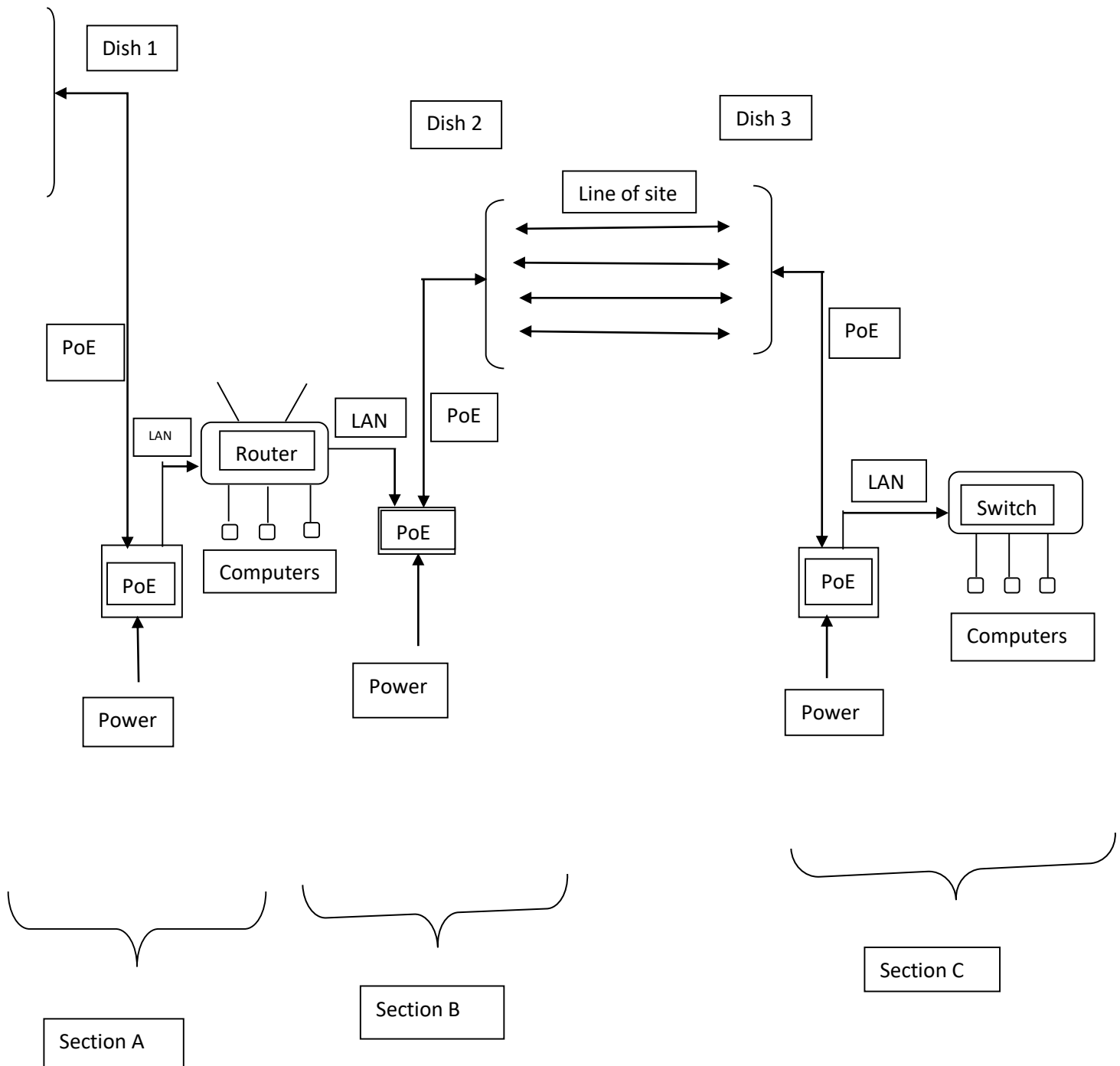
3.1.8 Extending wireless network

Figure 17

Dishes are powered through the PoE adapters while routers and switches have their own adapters although not included in the diagrams.

The set up consists of several collections of network equipment's which include:-

3 dishes: One facing the tower and the other two face each other in line of site.

Router.

Switch and Computers.

Wireless covers a wide arrange of distance compared to the cabled extended network. For establishment of an extended wireless network bases on the principle of point to point and also more devices are involved as noted above.

In section A: This is a setup that gets traffic or data from the tower into initial LAN flow to the router.

Below is the key to our heading which says "wireless extension of a network"

In section B:

Log into the dish.

Configure the dish as an Access Point to broadcast its microwaves to the dish in section C.

Provide it with an SSID, password for its safety, shared key/parshared key and provide a unique IP address.

Log out of the dish

In section C:

Log into the dish and configure it as a station to receive traffic or data from the access point.
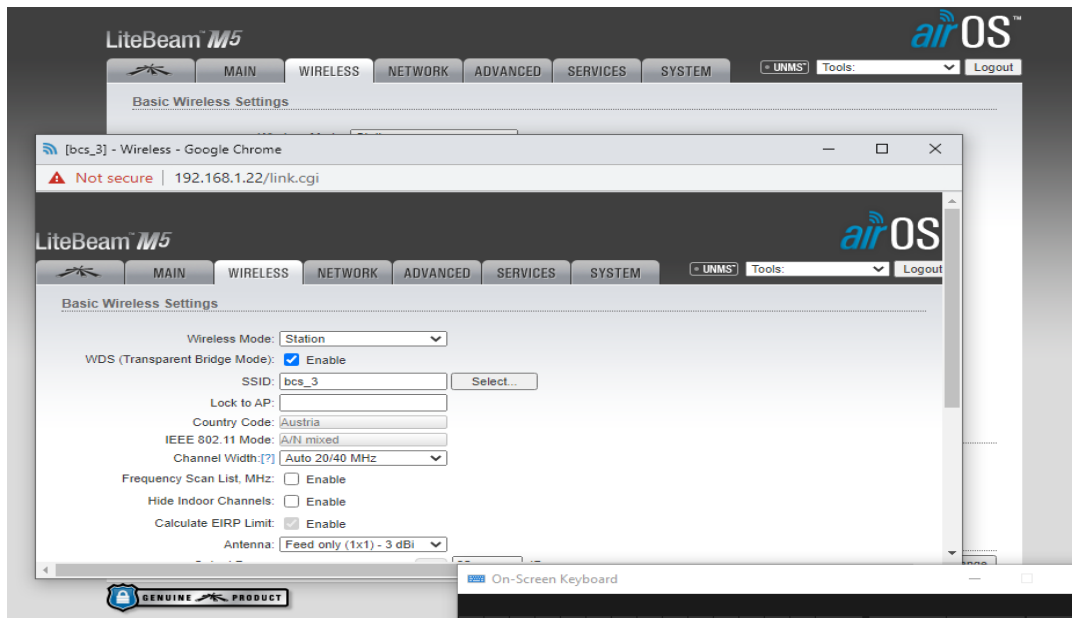
Figure 18

Also provide it with an SSID, password for its safety and provide a unique IP address.

Check signal level of the dish in B while on control panel of dish in C. if it's in Negatives for example

-48>-90 therefore -48 is a good signal.

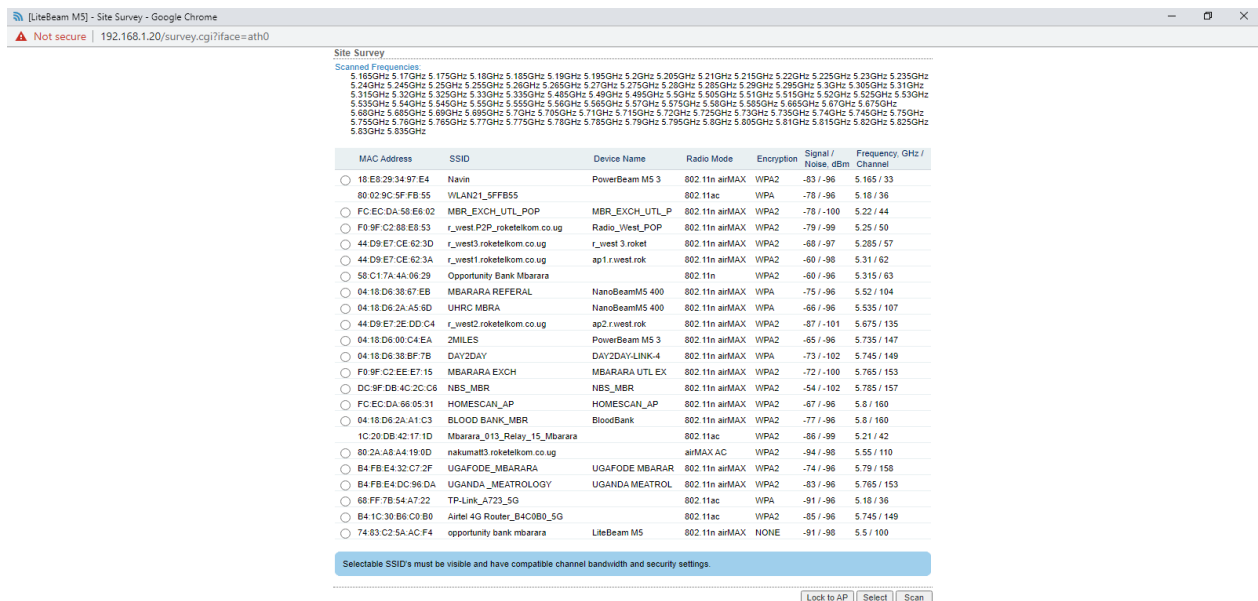Analyze/ scan available access points or frequencies and allocated the required one.

Figure 19

27

Then bind with the shared key.

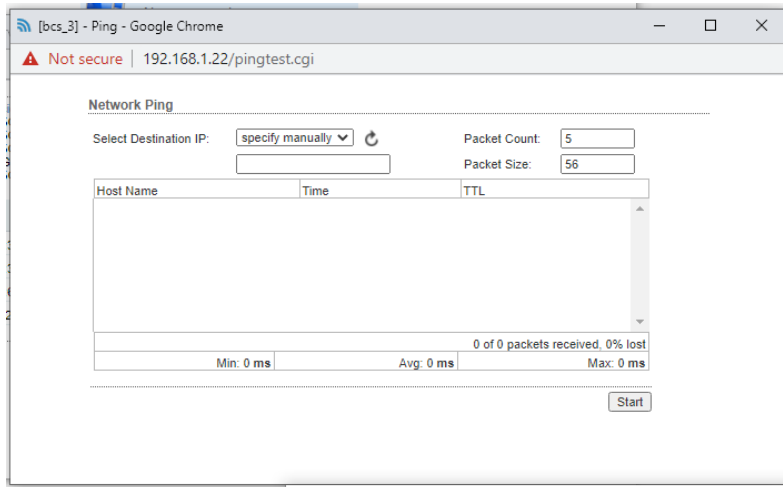In case there is failure to allocate access point ping it to find out the activity or status taking place.
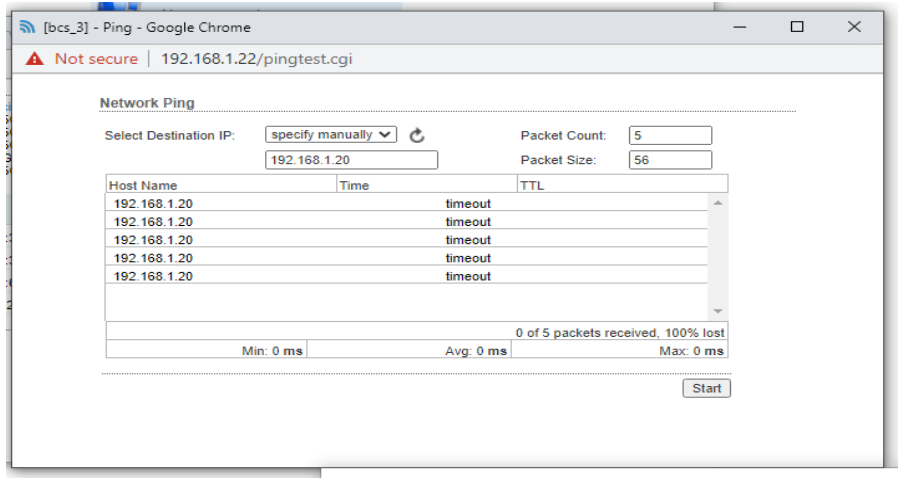

Figure 20

Figure 21

Log out and test connection or traffic transfer.

NB: shared key remains the same for both dishes in B and C.

3.1.9 Fiber.

FIBER: This is traffic / data transmission passage where refraction is its mode of transmission .i.e. its glass /optical fiber. Fiber cable is composed of strands where the optical or glass is heavily shielded to be safe.

This can be laid in a network through two ways namely:-

1) *Underground Cabling*

Under underground cabling optical fiber is passed through the ground(buried under the surface) not nakedly but placed in HDPE pipes and terminated and connected using the Joint Box (JBs) within the Man Holes .i.e. In the HDPE pipes extending of cables is done using the push rod

2) *Aerial fiber*

For Aerial fiber optical fiber is passed onto poles, join or connect optical fiber in the joint box and optical fiber is maintained from unnecessary movement using the J-HOOKs

Optical fiber is spliced not terminated we use a splicing machine. For traffic / data through optical fiber it's spliced into the ONU ( ) which converts optical signals to electrical signals then into the Router.

For an optical fiber failure the OTDR is used to determine continuity of fiber.

Ethernet cable weakness compared to optical fiber is to the length of 100m the Ethernet cable begins to lose packets while for optical fiber a strand is composed of a full force even if subdivided into other optical cable of 48 strands.

I am able to determine which form of network is required for a given site , locating service provider towers, choose a suitable network for a client, minimizing expenses by use of point to point networking, differentiating when to use outdoor and indoor routers with their different voltage levels, specifying devices for a required extension of a network i.e. getting data from optical fiber to electrical signals from a strand and calculating subnets from a given network block which is provided by the service provider.

3.1.10 Generation of vouchers.
Vouchers: these are timely formats of tickets that grant a device access to internet for a given period of time when used.

While using a mikrotik router to setup a voucher management system can be done in two ways wirelessly or through a cable.

Below the intern used the wireless method through connecting to logging into the router through the browser. The following are the steps taken when setting the router to produce vouchers.

Legacy mode -> quickset

Ip -> hotspot -> servers and hotspot then configure as a bridge

Keep DNS as default

Then to server profile.

NB: can use virtual box software

3.1.11 Money lending app.

This is a system that enable a money lender to view his or her customers or borrowers.
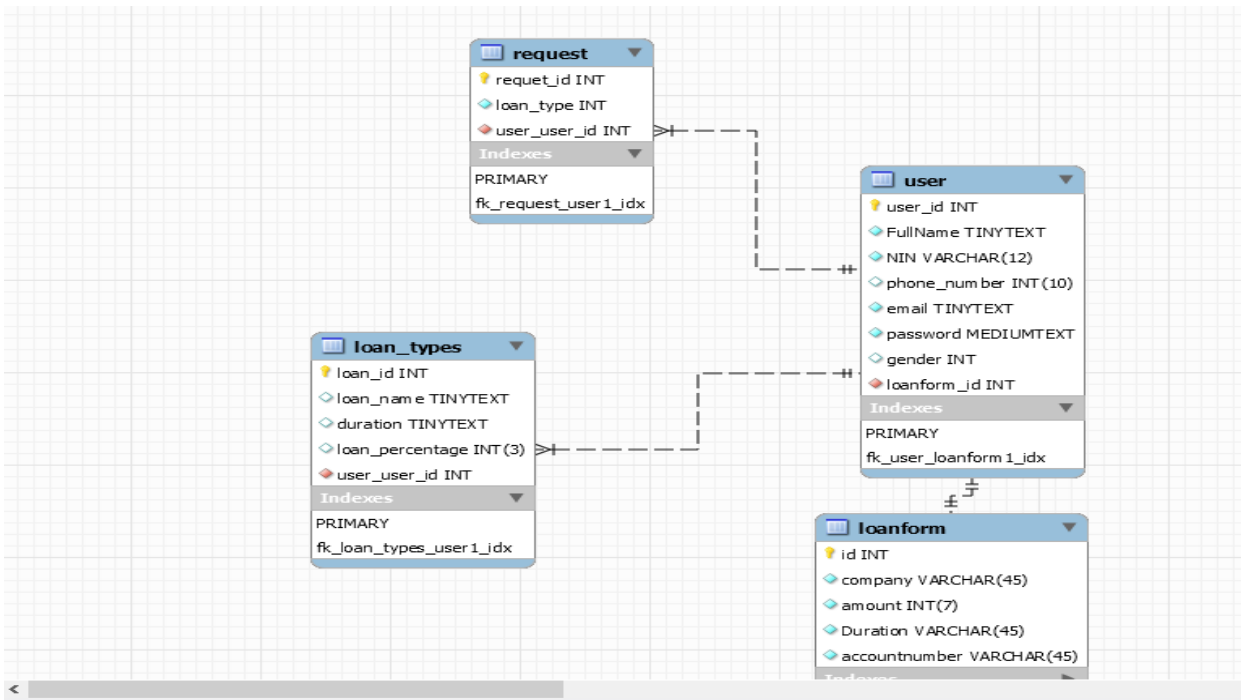
User requirements.

To create a database to store system information.

Register customers and money lender login.

Monitors transaction made.

Database structure.

 The database structure:

Creating account:

Login Form

3.1.12 camera installation.

CAMERA INSTALLATION

Devices needed:

- ✓ CCTV cameras.
- ✓ BNC (Bayonet Neil-Concelman)
- ✓ DCP (Digital Camera Package)
- ✓ Camera cable (data and power)
- ✓ DVR (Digital Video Recorder) or NVR (Network Video Recorder)
- ✓ Computer/ mobile phone.
- ✓ Ethernet cables
- ✓ Crimping tool
- ✓ Router

Termination of camera cable.

This involves having a camera cable, BNC, DCP and a crimping tool.

A camera cable has two blocks where one block is for power (powering the camera) and the other block is for data (transfers data or images from the camera to the DVR which are eventually seen on the computer or phone).

Figure 22

BNC. This is a device where one of the cable blocks (a block that transfers data/images) of the camera cable is connected.

Figure 23

DCP. This is a device where one of the cable blocks (a block that transfers power to the camera) of the camera cable is connected.

Figure 24

DVR (Digital Video Recorder).

This is a device that acts as a middle man between the camera and the computer.

DVR contains a hard disk which keeps data for anything that the camera sees.

Figure 25

NB.

- The camera only works when its powered. Thus, the DVR doesn't keep track of images when the power is off the cameras.
- Generally, for everything to work, there should be power. Or every device should be powered.

CCTV camera.

These are of different types. And they vary depending on the prices, number in one set.

CCTV cameras are sold in sets that is to say; sets of 4,8,16 and extra.

Examples of CCTV cameras include;

Figure 26

The process of camera installation.

With every thing in place as listed above, the camera cable is terminated using a crimping tool and then BNC and the DCP are connected to the cable. Which are finally connected to the CCTV camera in the right ports. That is BNC is connected to the data port of the camera and the DCP is connected to the power port on the CCTV. The cable (with two blocks) is ran and the data block is fed into the DVR while the power block is plugged in power source (12v).

NB. There is use of an AC-DC converter that converts alternating current to direct current. This is because the camera needs direct current of 12v.

Another cable is then ran from the DVR to the computer to initiate communication between the two devices.

With all devices powered and connection being ok, the images appear on the computer.

Use of a mobile phone to view the place where cctv cameras are installed.

Mobile phones are used to view what is happening in homes or places where cctv cameras are installed from anywhere.

Process of configuring a mobile phone to view images in the place where CCTV cameras are installed.

Download the application e.g. Xprotect Mobile, Optical Mobile and extra, and install on the mobile device (smart phone).

Login the CCTV camera system in the place where cameras were installed. Having logged in, under system choose Network then platform access. After that scan the QR code on the screen using the mobile phone. After scanning, save the changes on the mobile phone. And finally, with the internet supplied to phone and the DVR, images will automatically be viewed on the mobile phone.

Router. This supplies the DVR with internet. So as to enable see what is taking place in the place where CCTV cameras are installed from a distance through use of a mobile phone (smart phone).

3.2 Supervisory works done.
Elaborating what other student missed due to coming late.

3.3 Problems encountered
   a.   Poor cable termination.

   b.   Color code mismatch.

   c.   Inappropriate connection of devices.

   d.   Network failure.

   e.   Configuration failure.

   f.   Poor connection of Ethernet cables.

   g.   No power in the dish.

   h.   Point to point failure.

   i.   Time wasting.

   j.   And inappropriate connection in the POE ports.

   k.   Internet failure

3.4 Problems solved
Clip gently not to cut or injure cables inside the shell.

 Mastering code alignments from brown to white-brown, to green, to white-blue, to blue, to white-green, to orange then finally to white orange.

 Troubleshoot connection of devices.

The intern reconfigured the devices.

The intern trouble shoot for this and noted some cable was out, the intern just inserted it back.

 The intern switched to a properly working POE.

The intern powered the second dish then aligned it point to point to each other then feeding the access point dish with internet.

Labelling of the POE ports.

Swapped cables in it to power the dish and also to feed it with internet from router.

CHAPTER FOUR

4.0 Summary

This chapter consists of a summary of the works done, types of experiences gained, new skills and knowledge learnt, correlation with university taught courses.

Due to several interactions ,surveys with our instructors and on the great efforts on hands on work most probably in networking I have gained different working experiences, new skills and knowledge and it has enlightened me about the network course unit in my third year. All in all I have benefited mentally, in skills and understood the need to work as a team due to several challenges that arose during my internship or industrial training.

4.1 Types of experiences gained

1. Decision making experience for a suitable network to a customer.

2. Field / survey experience.

3. Trouble shooting general problems on a network.

4. Setting up a network and configuring networking devices.

4.2 New Skills and Knowledge learnt

I am able to determine targets for surveying in order to install a network, understand topology of a network from tower to switch/in a facility, coming to the knowledge of default IPs in networking devices and configuring them and how fiber is terminated, linked or nested in the underground and aerial format.

Getting to know devices required when dealing with fiber and Ethernet network extension.

Importance of a network engineer of a given area, advantages of fiber over Ethernet and wireless.

Network devices have default IP addresses depending on the producers of a given product for example:-

Ubiquity dish having 192.168.1.20

Cambium dish having 169.254.1.1

D-link router having 192.168.0.1

TP LINK having 192.168.1.1

Mikrotik Router having 192.168.88.1

4.3 Correlation with University Taught Courses

System Analysis is one of a course that provided theoretical knowledge about networking in general to me but during internship I have been able to experience hands on and implementation or establishment of a network and trouble shooting skills. I.e. facing the problem practically and in service than obtaining the theoretical knowledge whose experience is fear to fail.

4.4 Benefits derived from the Industrial Training Program

So far now I able to implement, setup a network, extend it wirelessly or by use of cables, trouble shoot a network when it fails

Working in a team

4.5 Challenges Faced

Limited Time i.e. when networking in a client's office its better off in the afternoon.

Topography i.e. failure to locate service provider tower.

In accessible   Base transceiver stations since they are locked.

Unfair Financial state i.e. less finances

Inaccessible devices to practice from home.

4.6 Views and recommendation

Indeed this period has been beneficial to me in networking since mostly hands on sessions are carried out to which it has enhanced my approach of networking problems, requirements, importance of team work in order to save time and I happily recommend everyone interested in networking to apply at Pandora Networks (EA) Limited.

4.7 Conclusion

In conclusion am vast with networking knowledge on how to handle different networking devices, defining requirements of a network and how to go over certain challenges in networking. Under Pandora Networks (EA) Limited I have understood the need for networking and importance plus its impact to real life experiences i.e. networking in general. With their strong vision I hope to hap on till the end.

REFERENCES

[1]Innocent

APPENDICES

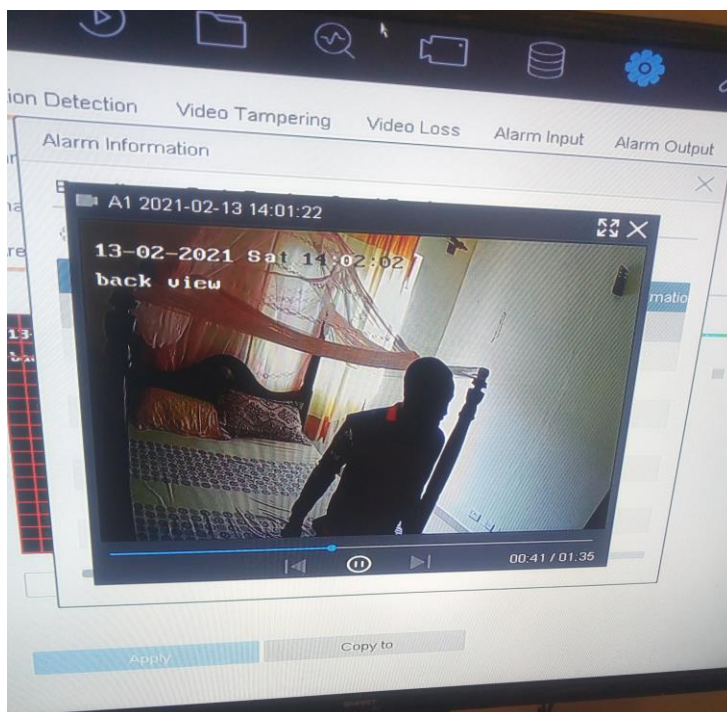Industrial training acceptance Letter

Figure 27

Figure 28

Figure 29

Figure 30

Figure 31