بسم الله الرحمن الرحيم

Al-Quds Open University - Jericho Branch

Technology and Applied Sciences Program

Computer Information Systems

project Title:

Compare between traditional network and SDN Network

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This project provided to fulfill the requirements for obtaining a Bachelor's degree in the field of Computer Information Systems

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Chapter One

Introduction

1.1 Introduction

Rapid technological development is characteristic of the twenty-first century, and networks have witnessed a large number of innovations in devices, protocols, applications, tools, etc., but despite all this, the network infrastructure has stuck to its fundamentals and has not changed in it. The change is only made by adding Applications, devices, etc., and now in the technical revolution of networks, it is time for the revolution on networks with the SDN (support-defined-network) protocol and its application on the ground, where I did a study of the computer network at the OASIS hotel, and I represented it on simulator on regular networks and SDN networks. Whereas, the Controller is Software that is downloaded to the Server and connected to the Internet Service Provider, the Controller makes NAT for devices, as the devices already contain Private IP and the NAT process gives him Public IP that enables him to enter the cloud network and move to the server of each site.

1.2 History of SD01N

It is known that each technology has its history and SDN technology as an old idea from the nineties of the last century, but the history of its emergence in the world of networks in this integrated form and the uproar of no more than 10 years, specifically networks that work with SDN technology refer to an article written by a student of Martin Casado entitled "Ethane" Taking control of the Enterprise "in 2004, where he showed in his research the defects of network infrastructure, which depends on the principle of Management is Distributed, and Martin, founder of Nicira, presented a solution called Ethane, which depends on the separation of Control Layer and Data Layer, so that it becomes devices The router and switch are only responsible for the forwarding of data. After 5 years, a team in the Stanford group has completed its theory in all aspects, where SDN technology was previously tested on Stanford campus, not to be the 2009 year that marked the beginning of this technology and an article entitled:

"Open Flow: Enabling Innovation in Campus Networks" which has become the reference for everyone who wants to write in this field and in this broadcast defined a new protocol called Open Flow.

In addition, here you find the signal and the alert that IT professionals, especially networks, should realize that SDN technology as a general trend will overwhelm that eventually and the simplest evidence of this is that the real motive behind this approach is not as is common from simplifying infrastructure for networks and strengthening them. even though SDN technology will actually contribute greatly to this, but the motivation behind it is to reduce the cost of building networks as the cost of building infrastructure for networks has become a major burden on all large and large companies, since in 2011 it was established ONF Open Networking Foundation is the largest and not-for-profit organization Follow-up at all interested in technology SDN, because they develop and foster the development of open standards concerning everything related to technology SDN. with the participation of most of the large and medium-sized companies in the field of SDN..

1.3 Research problems

i. Difficulty moving around and changing the SDN's normal infrastructure with its design, thinking and management.
ii. . SDN Network needs time and effort.2
iii. . You need a controller with high specifications.3
iv. 4.If you work on a traditional network and want others to radically change to an SDN, it will cost you money.
v. 5.If it occurs or is cut off in one of the parts of the network or is malfunctioning, then the section is broken and does not continue to work.

1.4 Limitation

i. Needs a lot of time and effort.
ii. Difficulty in transferring the infrastructure, as the network workers must be prepared before starting the network transformation process.
iii. It may require more cost if you are using normal networks and want to move to SDN.
iv. The device I work on has weak specifications, which has led to great difficulty in completing the project.
v. Switch's in the network does not support Open Flow.

1.5 Data collection tools

i. Simulator Cisco Packet Tracer.
ii. VMware workstation.
iii. Mininet.
iv. HPE van Controller.

1.6 Targets

I am trying to apply SDN to Simulator, and I hope that it will be implemented on the ground because it is the future of networks, and awareness must be spread among users. Because we must keep pace with development gradually so that we can keep pace with this development and this technical revolution.

1.7 Beneficiaries of the research

i. Large companies that use a large number of Router's And Switch.
ii. Banks.
iii. Telecommunications companies.
iv. Companies that provide internet services and own more than one branch.

1.8 Steps to conduct a search

i. Definition of traditional networks.
ii. Definition -SDN networks.
iii. Study the traditional network of the Oasis Hotel.
iv. Collect data and information related to a study.
v. Use the Simulator Cisco packet tracer to represent a traditional network.
vi. Study the traditional grid you have made on Simulator.
vii. Implement Hotel network app on Simulator SDN.
viii. Study the SDN Network.
ix. Comparison of the Traditional Network & SDN Network.

Chapter Two

Preparatory Study Stage

2.1 Introduction

The network I am studying is the Oasis Hotel network, which ,consists of two networks, the Admin and the Guest networks the locations and quality of devices ,them where I have studied in the network and their representation on Simulator Cisco .packet tracer

2.2General scheme of the network

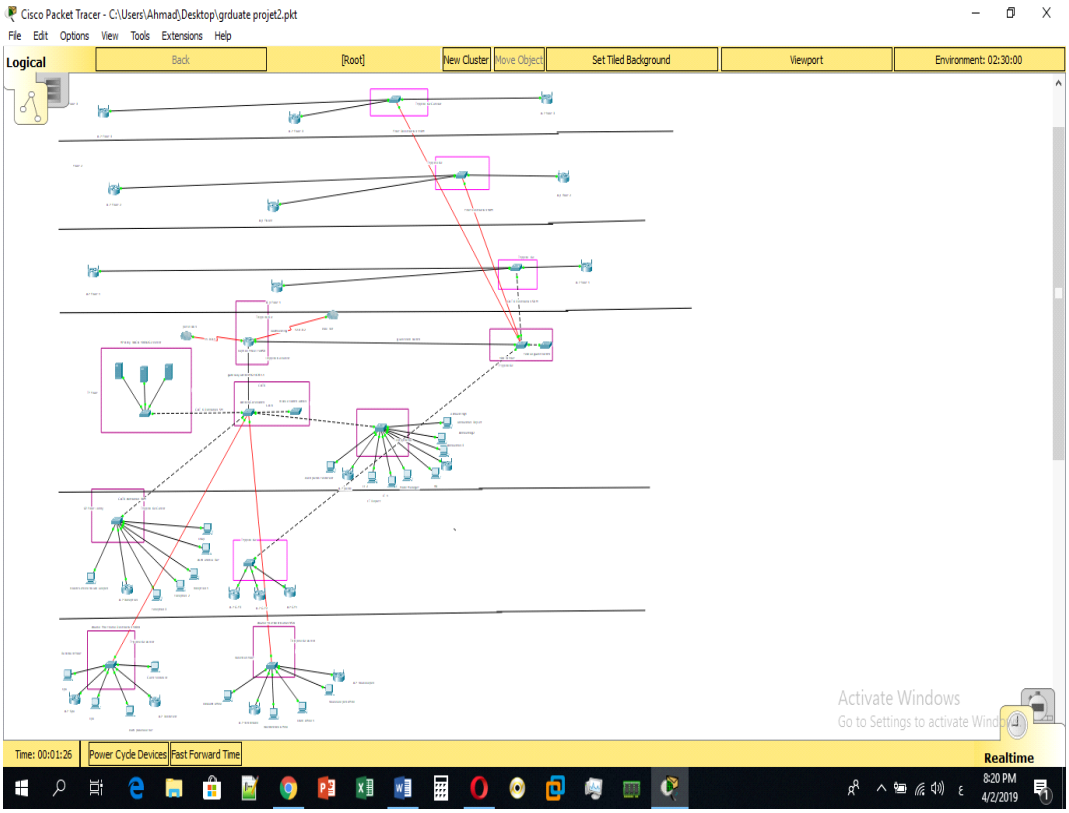


Figure1. General scheme of the network

2.3Traditional networking definition

Network: consists of computers and peripherals such as (fax, printer). Connected to two devices Switch and Router. Switch connect devices with, to configure a network and the router connects networks with each other.

Router and Switch consist of three layers:

- Management Layer (GUI/ILC) .
- Control Layer (Brain/Operating System O.S).
- Data Layer (Physical/ Forwarding).

2.4 Traditional networks

The traditional network mechanism is based on the layer controller that contains the Operating System that analysis the next packet for it. As it performs the analysis and process the data before giving the results. For example, switch contains the operating system; it compiles the Mac address and place it on a so-called Mac table. Switch works with this table via Flood for all the devices on it and registers it, and when each Switch addresses another Switch in the process, this called analysis process, then implementation process and not direct execution. This takes time, especially if the network is huge and when changing devices or adding a new protocol. Of course it will take time, because each router

and switch does not send the changes for all devices at the same time, it sends it for each router and switch individually as shown in figure2.

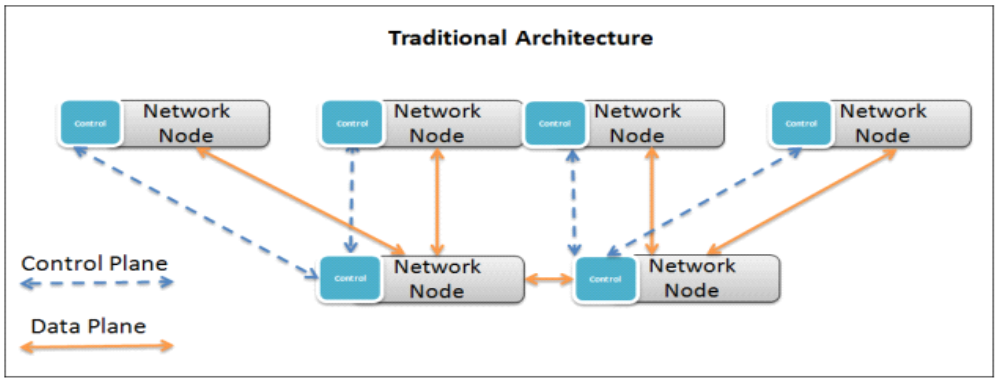


Figure2. How devices communicate in traditional network

5.2 The disadvantages of traditional network

- Lose time because every switch and router will think.
- Increasing time in the change process, in other words, adding, removing, or modifying a network change. It is known that the router will send the other router the modification that took place and if the network is large, it will take time.
- Limited mobility or registration.
- High cost of network development.
- Lack of flexibility.
- Inability to create and add programs, protocols or applications.

- Monopoly, in other words, some companies, when they manufacture a new protocol or a new feature with one of their devices, all devices must be from the same company because every company that seeks profit knows it.

6.2 What is SDN network

Technology: SDN is an abbreviation of the three words (Software -Defined - Network) and is a new technology in the world of networks, in which the Control Layer is separated from the Data link Layer (Forwarding Layer) function and placed in the Controller, but what is the result of this separation How is it different from the current situation ?! Networks currently combine these three functions with each device in the network, but remove Control Layer from all devices and focus them in one device.

Only the controller runs the network, this will lead to a network management transition from operating services on each of the network devices individually to just programming that service on the controller only or we can make some devices work normally within the network. which in turn, the controller will do those services and manage them It controls all devices for the required network automatically, as shown in Figure 3.

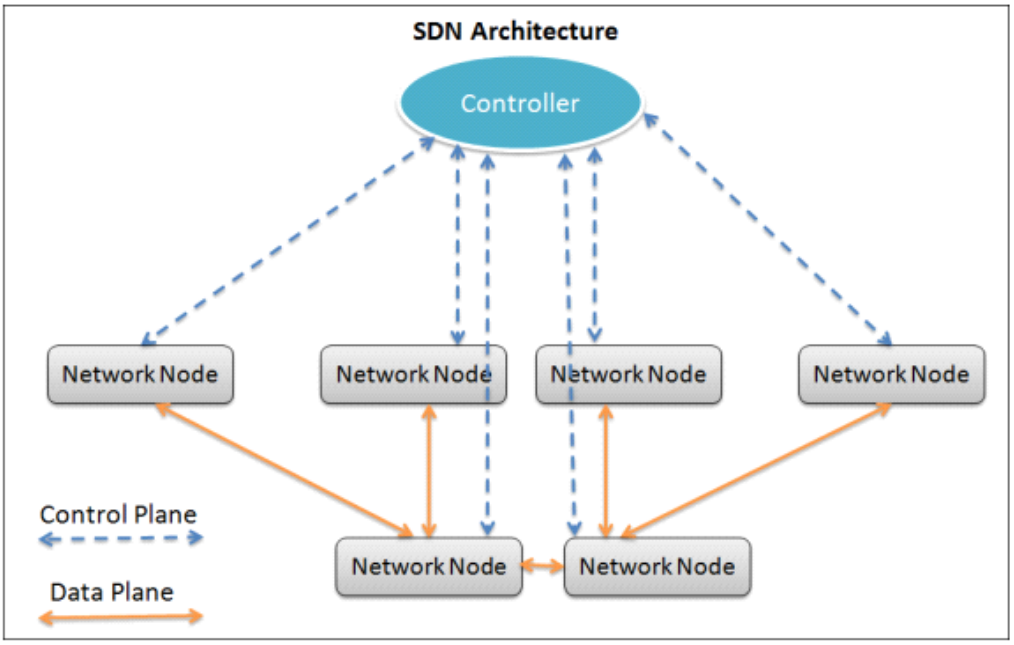


Figure3. SDN diagram for installation

2.7 SDN components

- Northbound
- Controller
- Southbound.

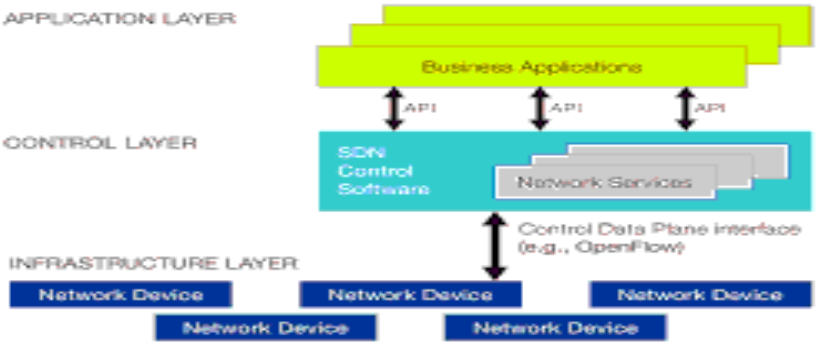


Figure4. SDN network component

2.7.1 Northbound

- GUI
- API

2.7.1.1 GUI

It is a Graphical User Interface, which is the interface that the controller user controls from modifying on the network or adding protocols, downloading applications, etc. as in Figure 4. Also from its advantages that it facilitates controlling the controller, and also you can write a program or code to apply it to the controller in either the Java or Python language or C ++ However, it is preferred to learn Python for ease of learning, and also you can download applications or programs through the site

https://community.arubanetworks.com/t5/SDN-Apps/ct-p/SDN-Apps this site shows you the applications and programs you want to download

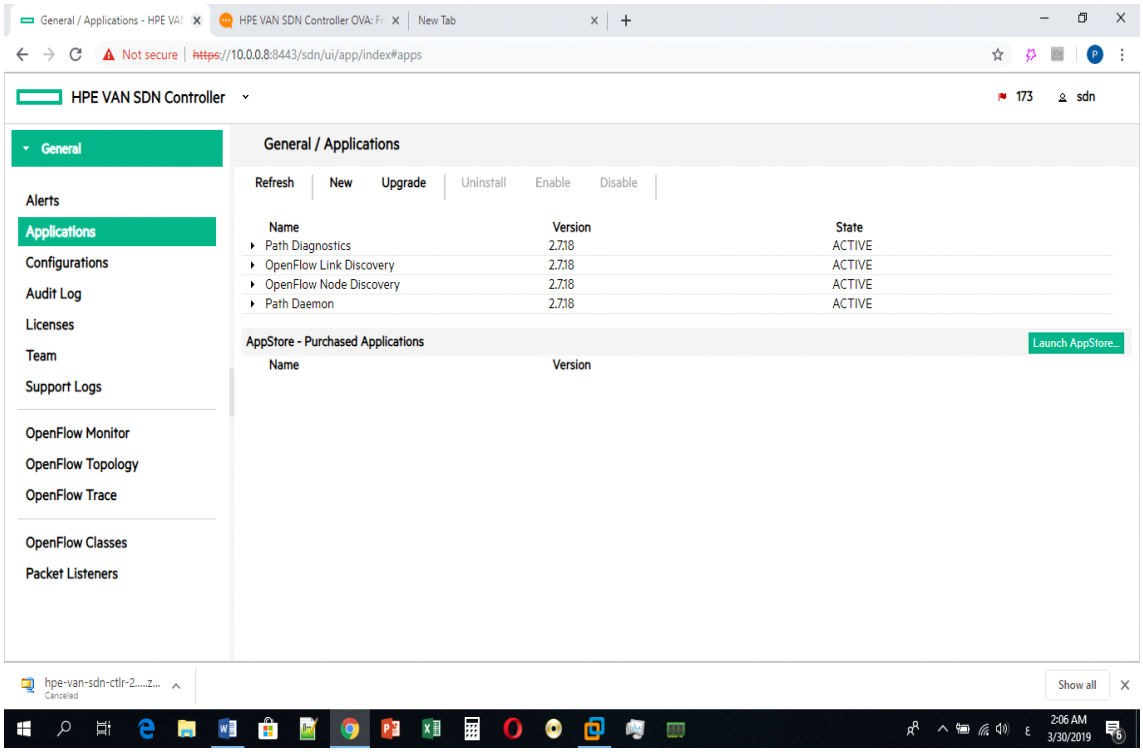


Figure5.GUI controller

2.7.1.2 API

Application programing interface, which is a Virtual Interface that translates commands, programs or code that the user writes to GUI to Controller so that the Controller can understand and read them as in Figure (5)

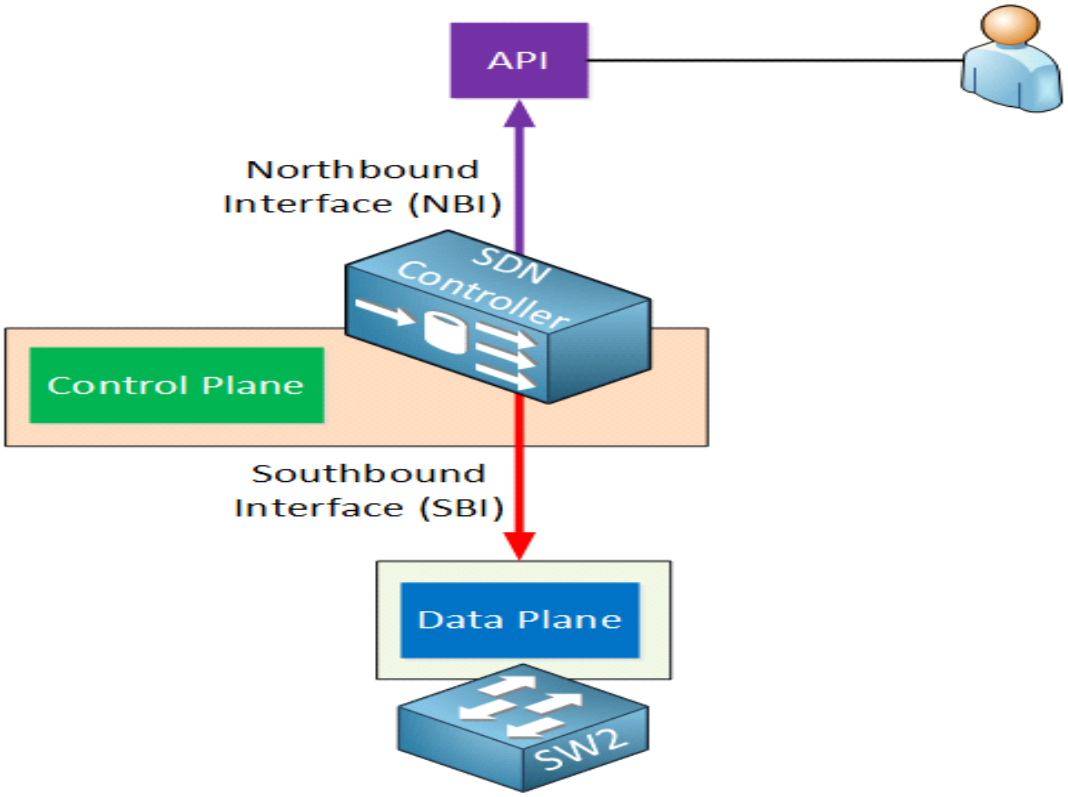


Figure6.API northbound

2.7.2 Controller northbound

It is a software download on (Sarver or PC) and needs a device with high specifications, but preferably on the server because it bears more than one Pc, the task of separating the Control layer in Southbound and put it in the controller. I downloaded the HPE VAN Controller to my personal device because it is open source and supports Open Flow protocol. Companies At present, each company makes its own controller, such as:

1. Huawei: Huawei Agile Controller.

2. Juniper network: juniper contrail Networking.

3. Open Day light.

4. Dell Active Fabric Manager.

5. HPE VAN

2.7.3 Southbound

Consisting of:

- A protocol between Switch and Controller
- Switch network infrastructure devices

2.7.3.1 Protocol between Switch and Controller

It is more like a switch between a switch and controller, where it will

There are several types of these protocols, such as:

1. NetConf

2. XMPP

3. BGP

4. OVSDB (Open V switch Data Base)

5. One PK (Open Network Environment Platform kit)

6. Open Flow

I used Open Flow, the manufacturer and developer of this protocol is the ONF open network foundation.

Why I use Open Flow?

- It can work on any switch that supports this protocol.
- Rapid response. In other words, if a change occurs in the network, the change is sent to the controller and the controller sends the changes to the Table via Open Flow.
- It can work on any switch that supports this protocol.
- It works on the process of completely separating the control layer and data layer present in the devices while keeping a small part of the O.S in case you were activating Hybrid Switch.
- It works automatically in other words, for example, that you want to apply a specific protocol first you apply it to a device that you first apply to the controller. It does an automatic work so that it applies to all devices in a network unlike other protocols that you must do this work By applying it to every device with network.

• Open Flow Protocol versions

- 1.0.
- 1.1.
- 1.2.
- 1.3.
- 1.4.
- 1.5.

2.7.3.2 Switch network infrastructure devices

Of course, there is no need for routers because the controller will do everything and you will need a switch that supports Open Flow protocol.

Examples of Switch's that support Open Flow

- HP3500.
- Hp3500 YL-.
- 4500R.
- 8200.

Switch Cases

- Pure O.S Switch has no Control Layer.
- Hybrid O.S Switch contains a control layer, but in a reduced form to apply some protocols to it if you want to.

Chapter3

Analysis and design stage

3.1 Introduction

The idea of the project work is to represent networks on Simulator, describe the traditional and SDN network, and explain the location of each device on the network, as the Hotel consists of several floors.

Floors:

i. Basement Floor
ii. GF Floor Admin / Guest
iii. TF Floor Admin / Guest
iv. Floor Guest 1/2/3/4/5/6/7/8/9

3.2 Traditional network topology

i.  Server.

ii. Ethernet Strength.

3.2 Uses Ethernet Strength

- Switch to Host.
- Switch to Router.
- Switch to server.

iii. 3. Cross cable Uses to connect Switch to Switch.

iv. 4. Fiber uses to connect switch to switch more than 100 meter.

v. 5.  Router.

vi. 6.  ISP.

vii. 7.  Serial Cable uses to connect Router to Router.

viii. 8.  Pc Host

ix. 9.  Access Point.

x. 10.  Cabinet.

3.3 Traditional Network

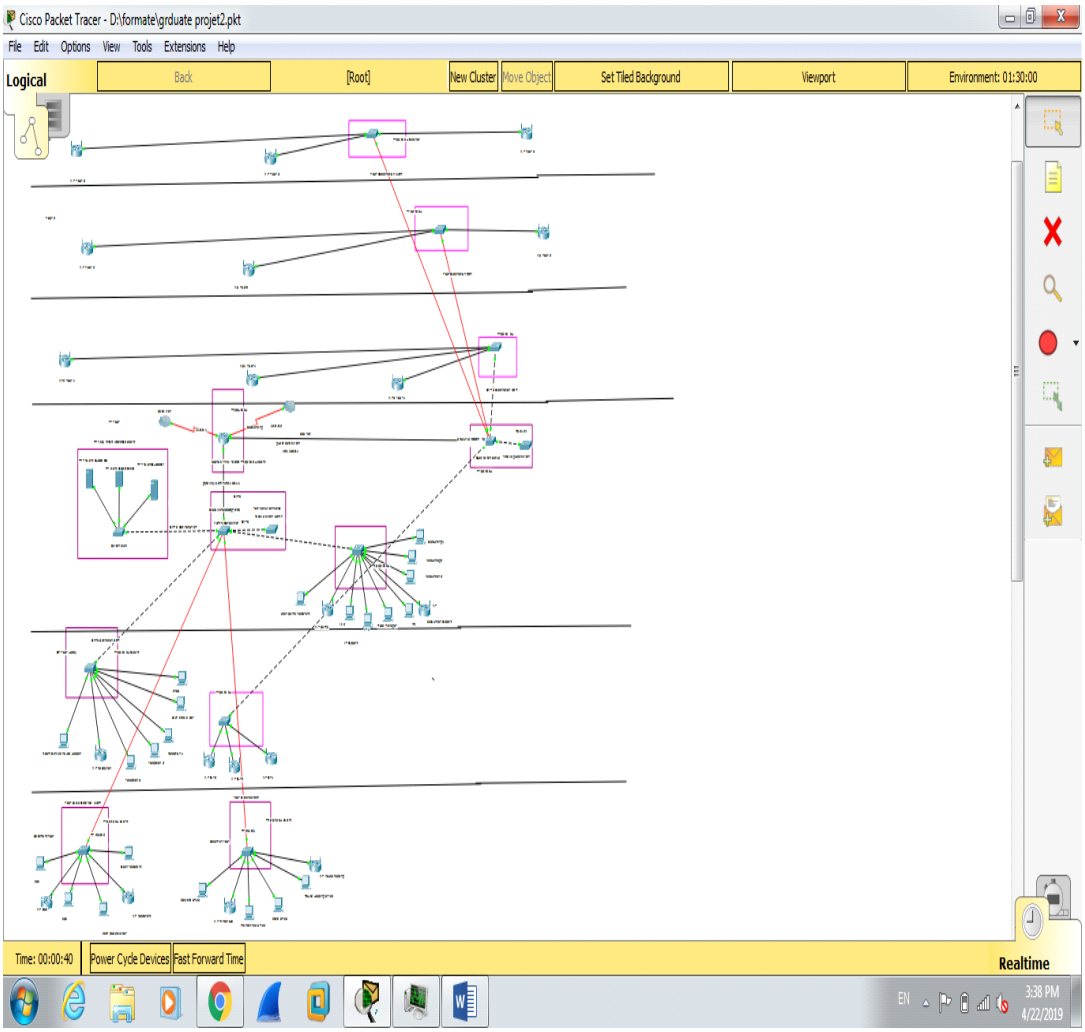


Figure7. Traditional Network

3.4 Network Parts

- Admin
- Guest

3.4.1 Admin

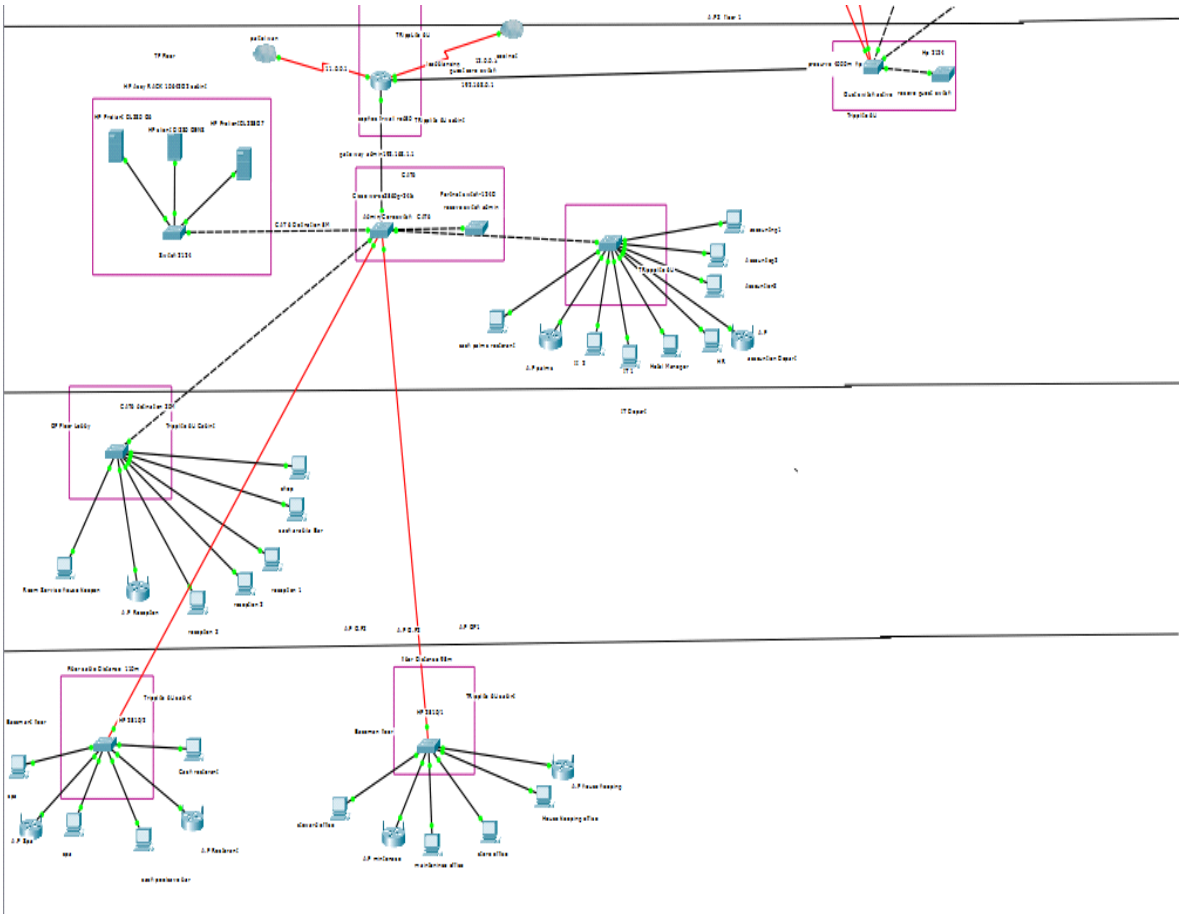


Figure8. Network Admin

This part just for Employers include IP Gateway 192.168.1.1 And I talked in detail about the fourth part (Appendix)

3.4.2 Guest

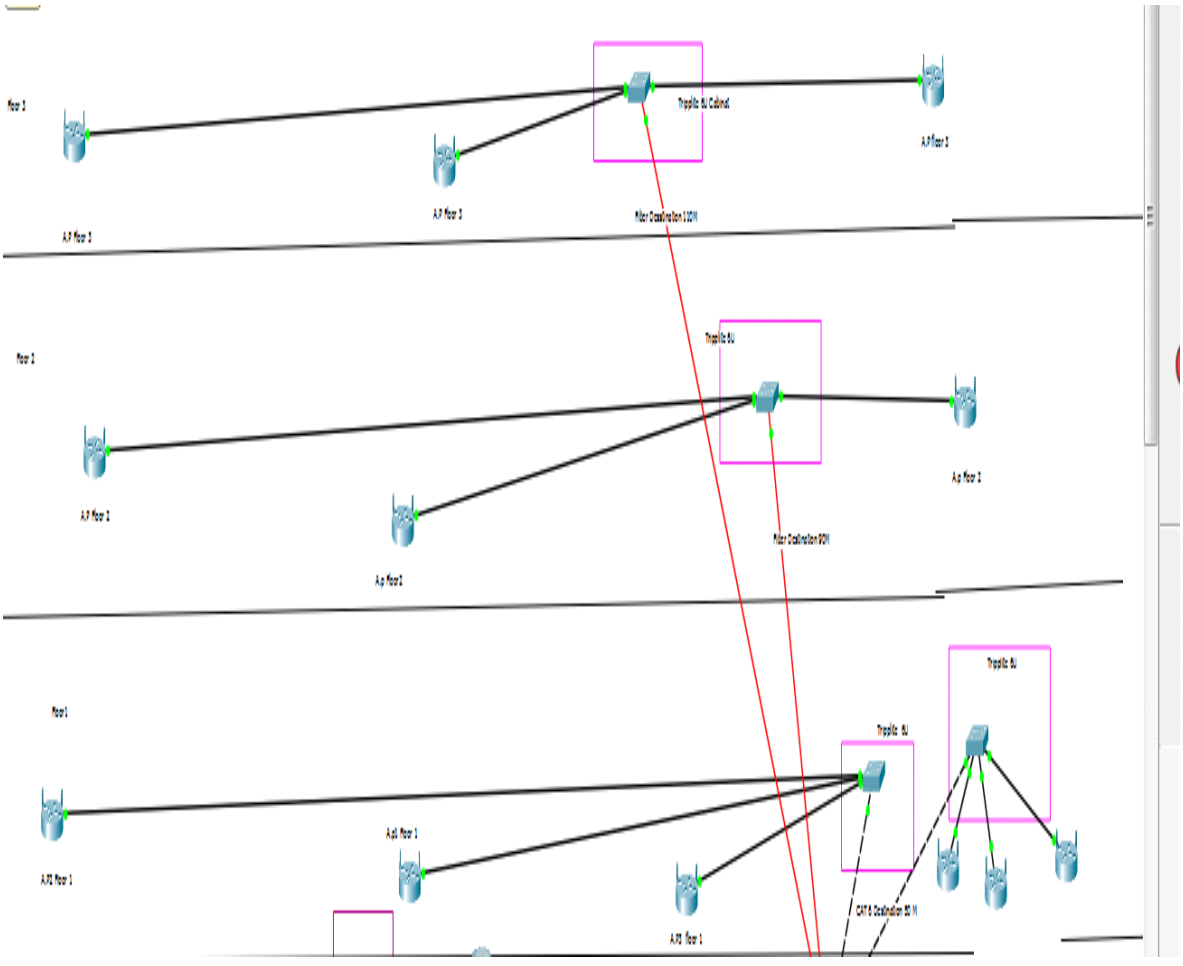
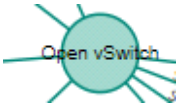


Figure9. Guest.

This part just for Guests, include IP Gateway 192.168.1.1 And I talked in detail about the fourth part (Appendix)

3.5 Implementation SDN on Traditional Network

Clarify symbols used

- . 

Switch Support Open flow protocols (OVS).

-  Ethernet Cable.

- 

Host.

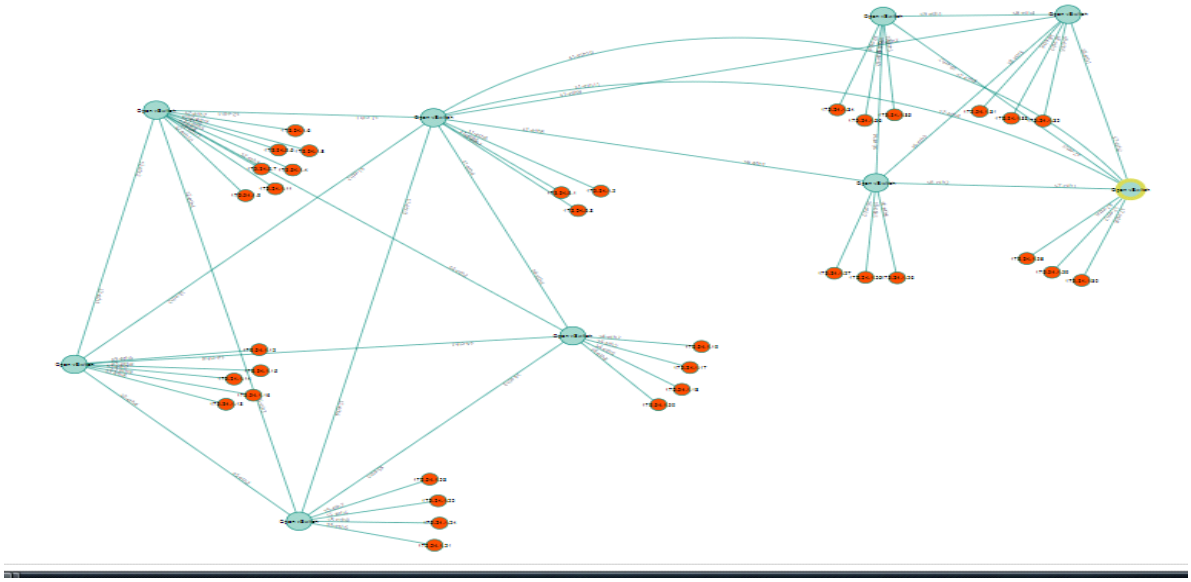


Figure10. SDN

I talked in detail about the fourth part (Appendix).

3.6 Economic feasibility study

• It is the specifications required for the best performance of the device or program. The specifications that I set are a minimum for excellent program work, and these specifications are specific to a computer (PC).

• Study the economic feasibility of the traditional network and the SDN network.

3.6.1 Costs of apps to build network on your device.

- HPE VAN Controller.
- Cisco packet tracer.

- Ubuntu Linux.

3.6.1.1 HPE VAN controller

Price	type	Component	NUM
520 $	Intel Core i7-8086K 5.0 GHz	CPU	1
120$	16G 1600 H DDR4	RAM	2
150$	500G SSD	Hard Disk	3
790$	Total		

3.6.1.2 Cisco packet tracer

Price	Type	Component	Numb
140$	Intel i3-2100	CPU	1
30$	2G 1600 H DDR4	RAM	2
10$	80G HDD	Hard Disk	3
180$	Total		

3.6.1.3 Ubuntu Linux

Price	Type	Component	NUM
140$	Intel i3-2100	CPU	1
120$	4G 1600 H DDR4	RAM	2
40$	100G SSD	Hard Disk	3
100-200$	Any GPU 2G	GPU	4
450$	Total		

3.6.2 Economic feasibility study

- The costs of implementing the project on the ground (Traditional Network).
- SDN Network.
- Other Costs.
- Periodic costs.

3.6.2.1 ا Traditional Network

Total	Price segment	Quantity	Component	NUM
5,950$	350$	17	HP3500 Switch	1
8,000$	8,000$	1	Sophos fire wall red 50	2
550$	550$	1	HP Server ProLiant DL380 G6	3
1,260$	1,260$	1	HP Server client Dl380 GEN8	4
1,600$	1,600$	1	HP Server ProliontDL385G7	5
1400$	100$	14	Cisco Linksys point WAP300N-Multi-Purpose2.4 H	6
1000$	200$	5	Ubiquiti UAP –AC-PRO 5H	7
1,600$	1,600$	1	Cisco ws-sc3560g-24ts	8
1,200$	1,200$	1	Fortinetswitch-124D/receive admin	10
1,000$	1,000$	1	procurve 4000m HP	11
400$	400$	1	Switch 2124 HP/Standby Gust switch	12
2,300$	2,300$	1	Fortinet fort gate 800/ Receive router	13

22,360$	Total not include standby
26,260	Total

3.6.2.2 SDN Network

Total	Price segment	Quantity	Component	NUM
5950$	350$	17	HP3500 Switch	1
1800$	1800$	1	Server Dell PowerEdge R710 Gen I	2
550$	550$	1	HP Server ProLiant DL380 G6	3
1260$	1260$	1	HP Server client Dl380 GEN8	4
1600$	1600$	1	HP Server ProliontDL385G7	5
1400$	100$	14	Cisco Linksys point WAP300N-Multi-Purpose2.4 H	6
1000$	200$	5	Ubiquiti UAP –AC-PRO 5H	7
10,090$			Total	

3.6.2.3 Other Costs

Price segment	Quantity	Component	NUM
20$	50M	Ethernet cable	1
65$	50M	Fiber double	2
85$	Total		

3.6.2.4 Running costs.

Price segment	Quantity	Component	NUM
2,500$	شهري	ISP Paltel	1
1,500$	شهري	ISP Cool Net	2
4,000$	Total		

3.6.2.5 Servers.

Total	Max Switches	Quantity	Component	NUM
1800$	17 OVS	CPU: 2 x 2.40Ghz E5645 Xeon Six Core Ram: 16 x 8GB H.D: 1t.B HDD	Server Dell PowerEdge R710 Gen I	1
2,300$	30 OVS	CPU: 2 x 2.80Ghz E5-	Dell PowerEdge R630	2

		2620 Xeon Six Core Ram: 24 x 8GB x16GB DDR4 H.D: 2t.B HDD		
6,000$	60 OVS	CPU: 2x Intel Xeon Silver 4110 (3.0GHz Turbo) RAM: 32GB (4 x 8GB)DDR4 H.D : 2T.B HDD	Titan X550	3

Chapter 4

Conclusion

4.1 Introduction

In this section, I will present my findings from the best in terms of performance and price between the traditional and SDN Network.

4.2Compare between Networks

Type of Networks

i. Traditional Network.
ii. SDN Network.

4.2.1 Traditional Network

In the hotel network, there were some disadvantages, which are.

- in admin and guest network have one primary switch And if there is any problem with it, the network will be down
- If I implement STP protocol, it will fix some of problem.

SDN Network will fix all problems and more data transfer between devices and high availability.

4.2.2 SDN Network

Benefits of SDN

i. Reducing the cost of building and developing networks.
ii. Increase in data transfer rate.
iii. Reducing the future development cost, which constitutes an obstacle for all companies and institutions.
iv. Make the network unconnected to the switch, as you can also make another (Server) for the main server if the server is down, the backup server runs automatically.

I did not used router Device because controller will do router jobs, as the cost of the router is high.

This came to technology to change the infrastructure of networks, improve their performance, and solve all traditional network problems, in addition to the increase in the rate of data transmission within the network and keep it running if a device malfunctions, so that it does not lead to the weakness or collapse of the network.

4.3 Compare

i. Speed and data transfer rate.
ii. High availability.
iii. Traditional Network.

4.3.1. Speed and data transfer rate

- Traditional Network/(Cisco Packet tracer)

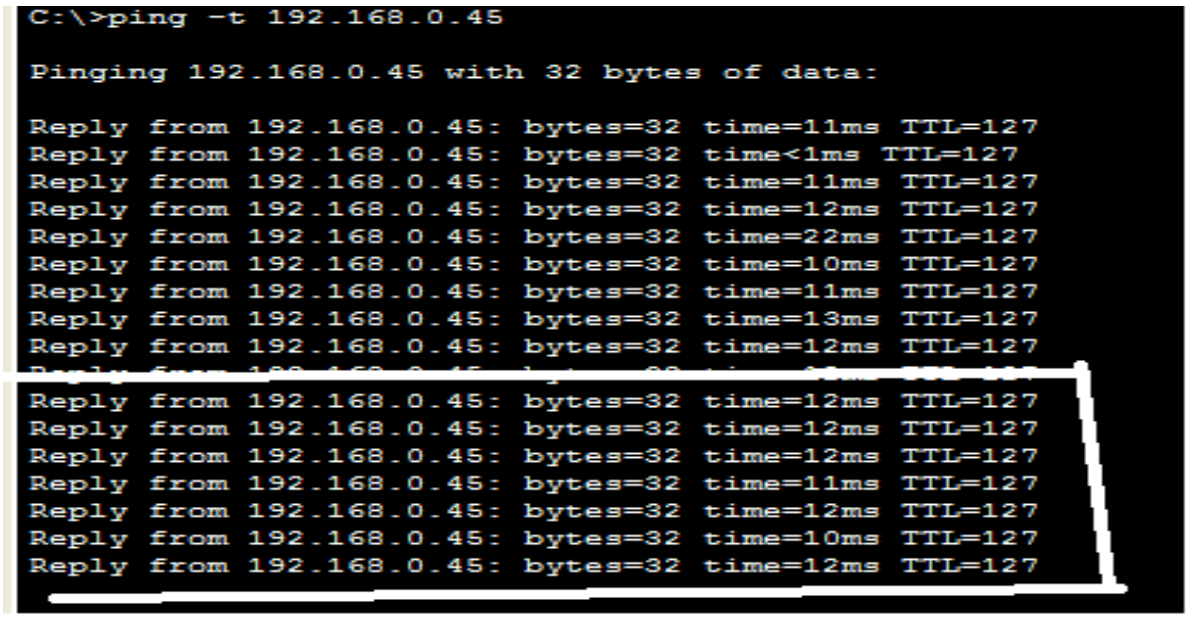


Figure 11. Data transmission rate in traditional networks.

- throughput network

Traditional Network AVG time =11ms.

TTL ANG = 127.

Packet size =32 bytes.

- SDN Network (Narmox Controller/Ubuntu terminal)

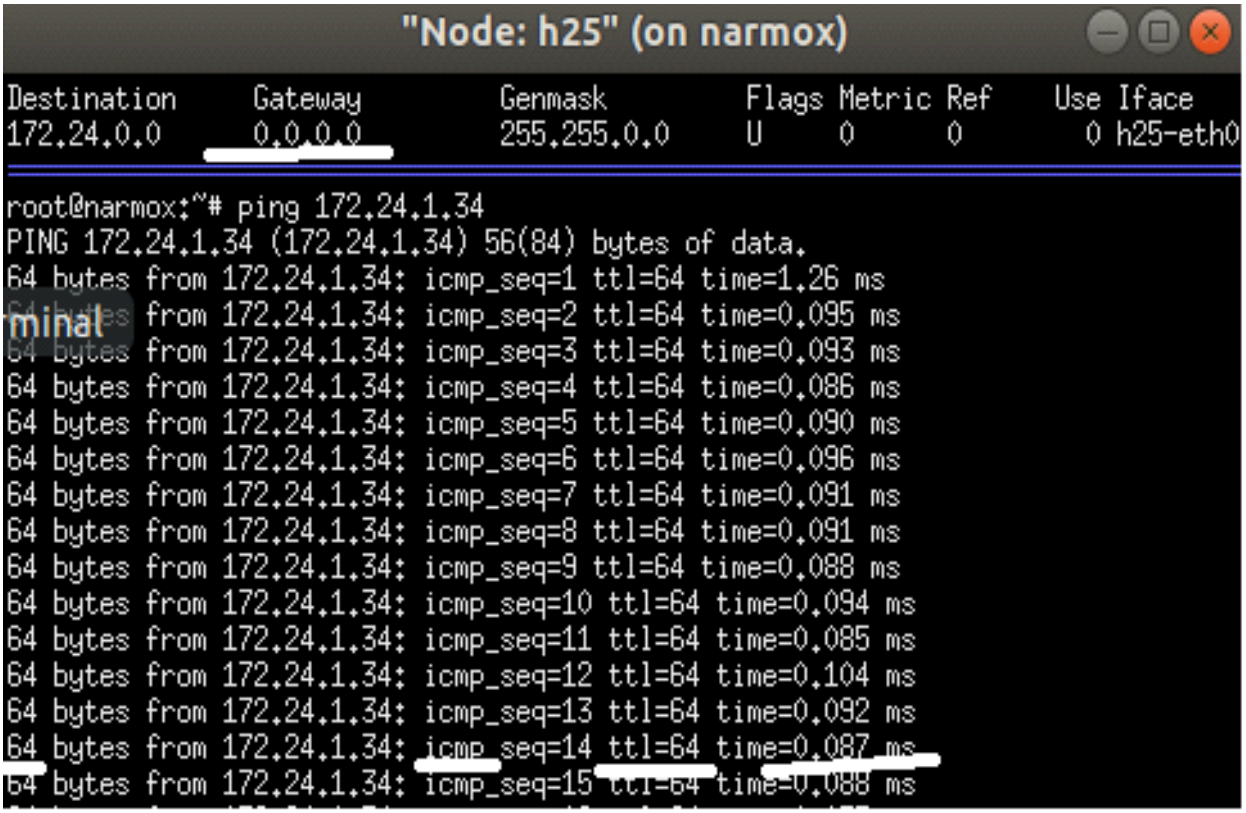


Figure12. Data transmission rate in SDN networks.

- Throughput network.

SDN Network AVG time =1ms.

TTL AVG = 64.

Packet size =64 bytes.

- Diagram I/O Graph

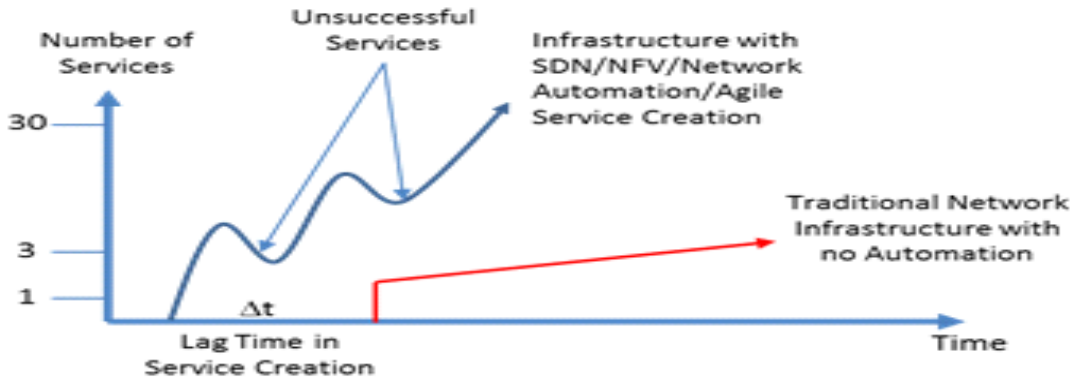


Figure 13. I/O Graph.

4.3.2 High availability

- Traditional Network.
- SDN Network.

4.3.2.1 Traditional Network

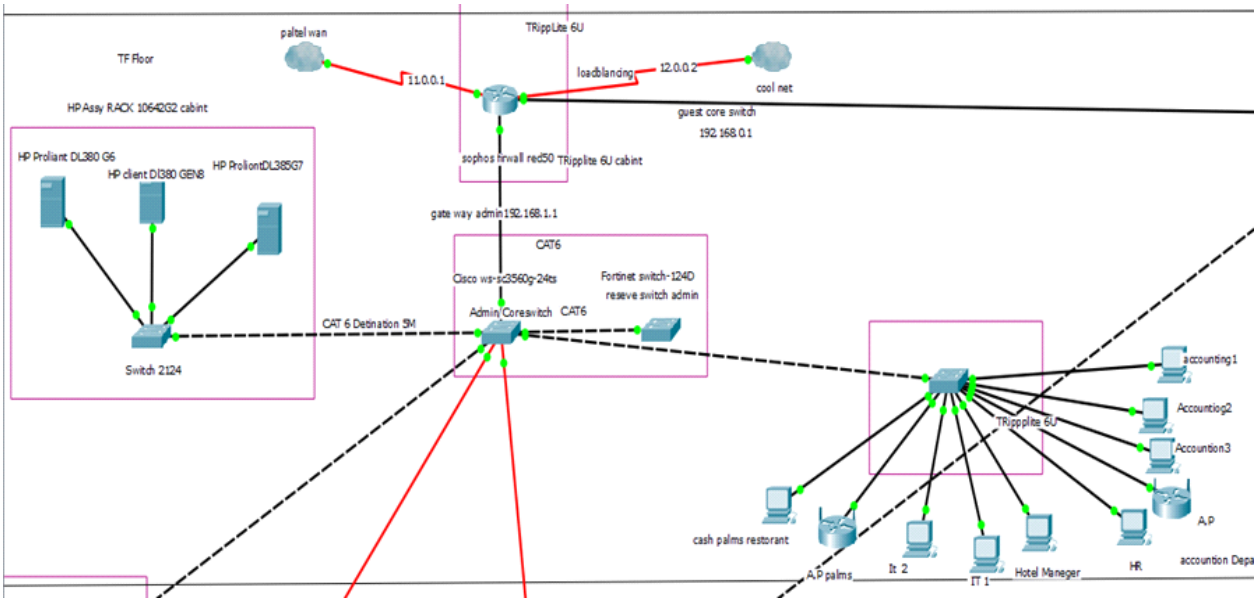


Figure13. Traditional Network.

If cut any cable of main switch or Breakdown will, collapse network and stop network running.

4.3.2.2 SDN Network

Before cut cable

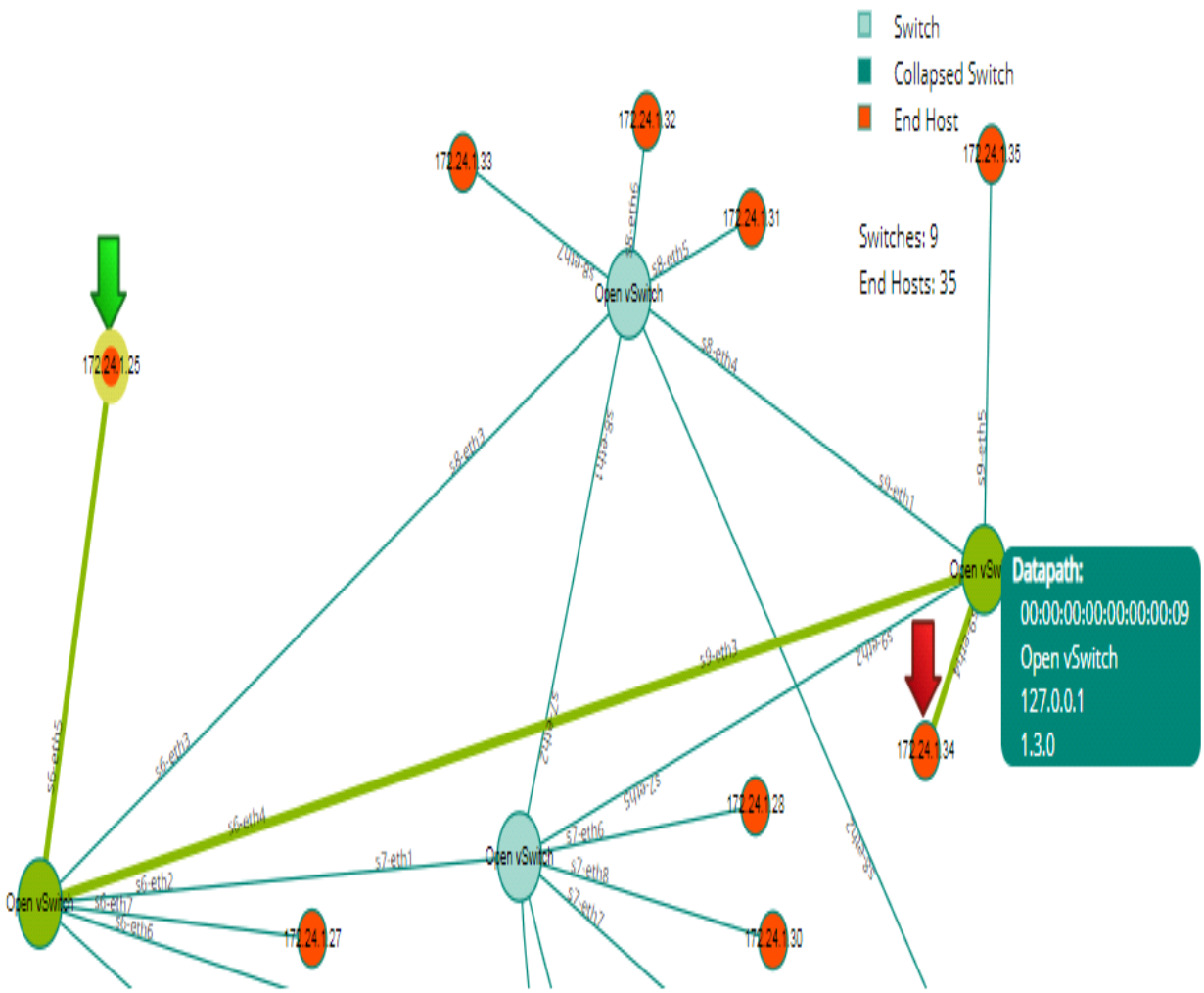
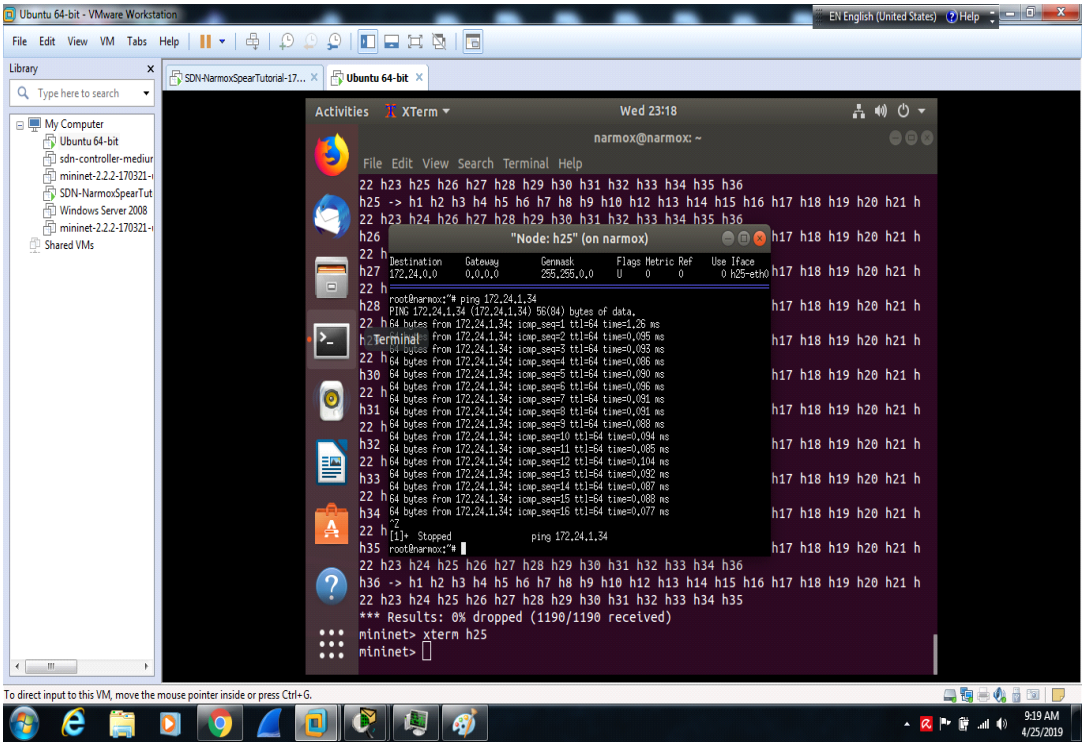


Figure15. Network before cut path



After Cut

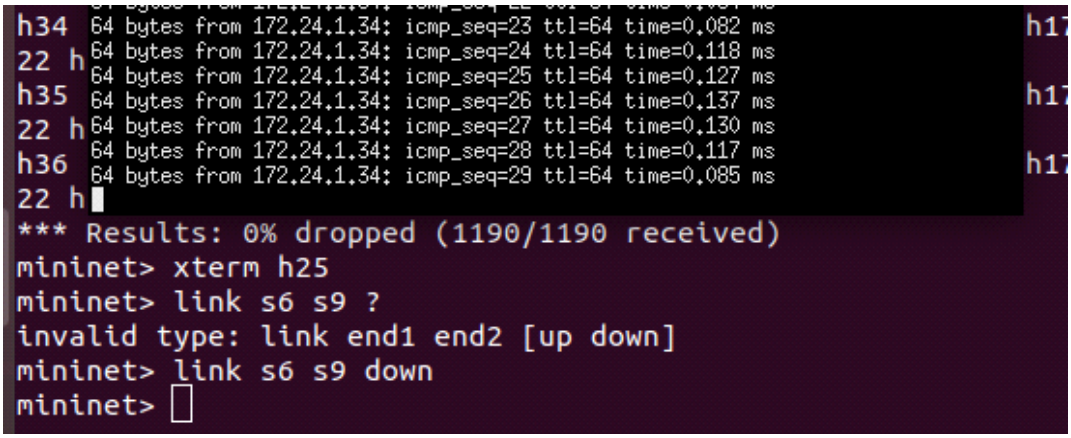


Figure16. Cut path between Switch

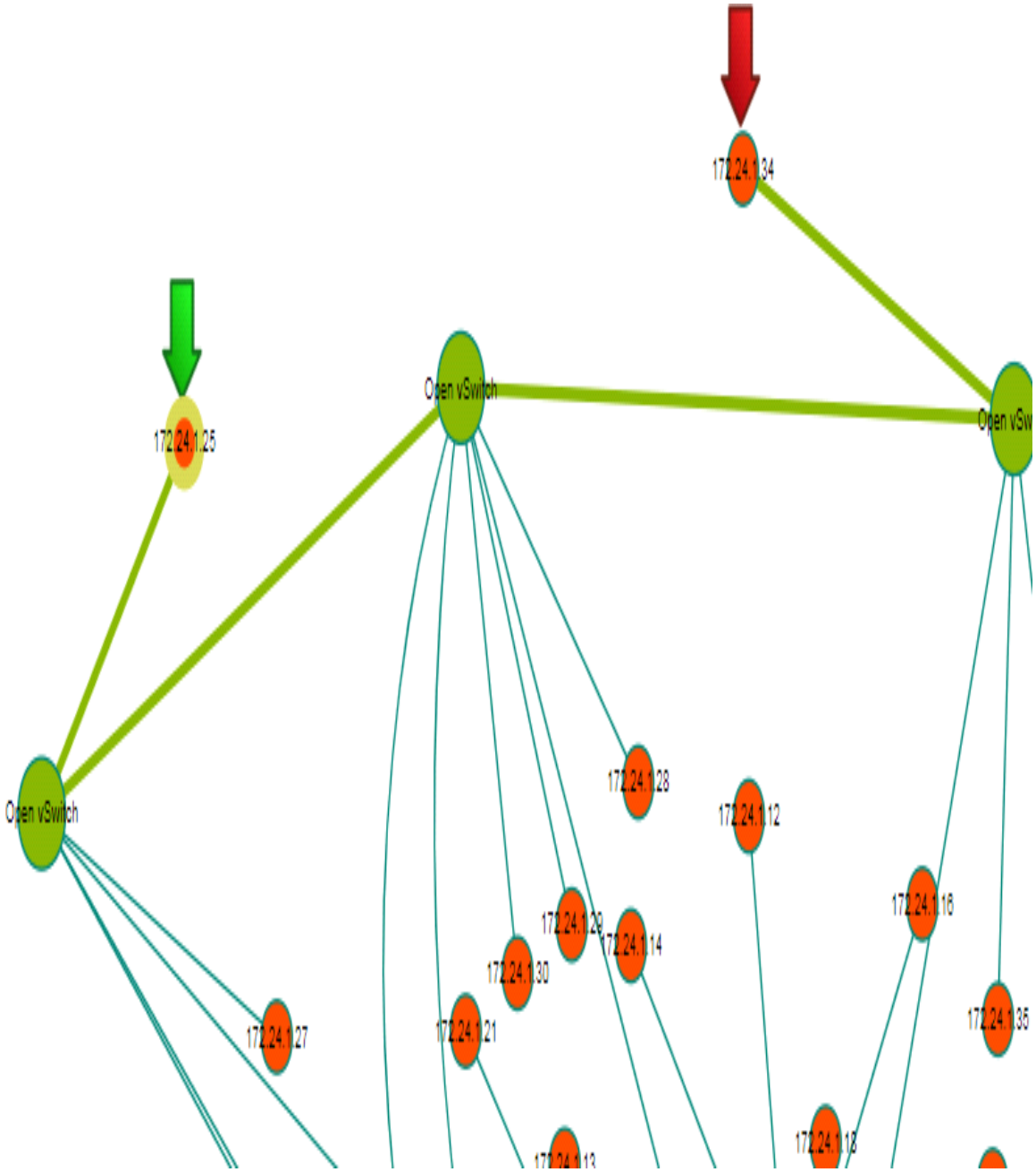


Figure17. The path change after cut automatically

After cut cable, traffic Conversion automatically without stopping to stay network high availability with low load and loop.

4.3.3 Networking costs

i. Traditional Network.
ii. SDN Network.

4.3.3.1 Traditional Network.

The cost of building the hotel network

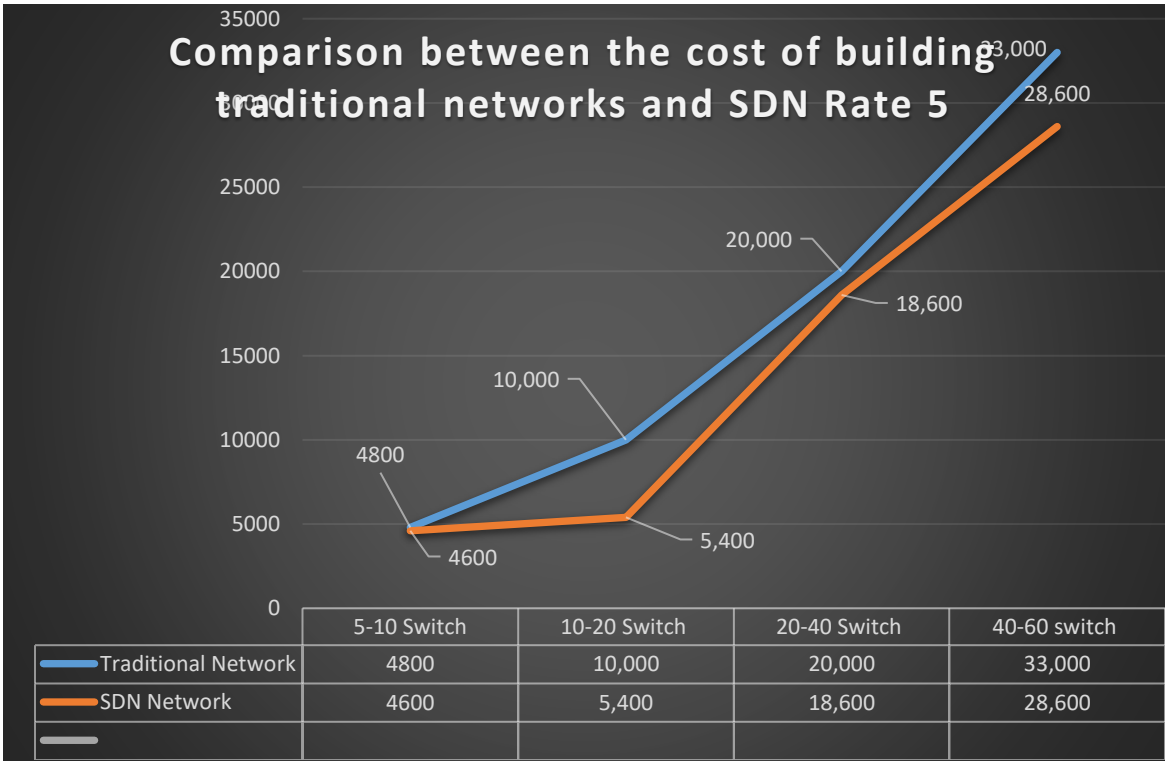
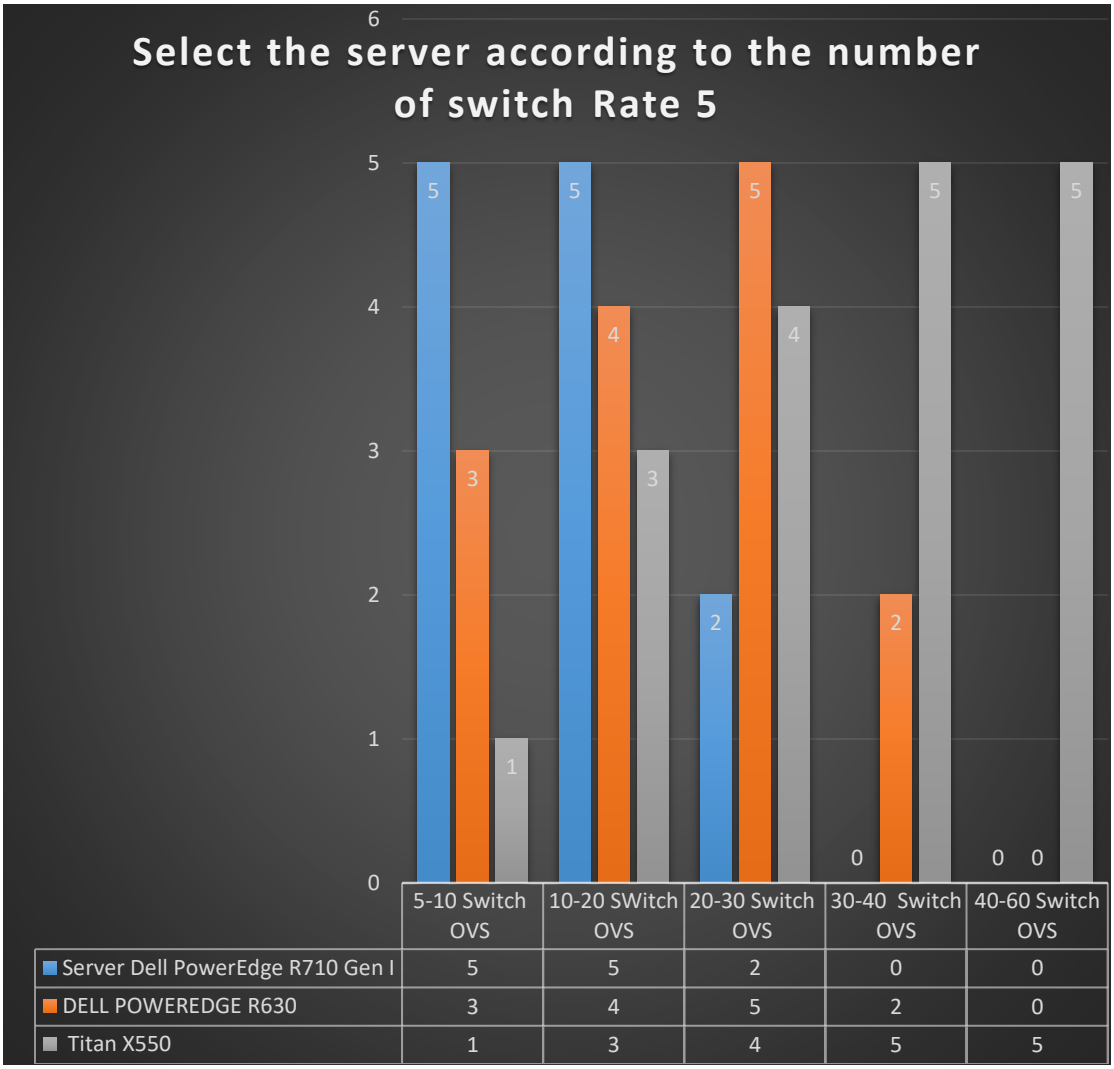


Fig18. Comparison between (Traditional / SDN Network) in terms of expected cost of building networks

.The cost of the server used in the SDN network



.Figu19. The choice and cost of (Server) based on (Network's) number

As we see, the cost of (Server) is on a direct relationship with the number of (Switch's) in the company or organization, and the reason is that it (Open Flow Protocol) separates (control Layer) from (Switch's) and put it in (Server), which requires specifications Powerful server to manage the network with the best performan.

4.4 Previous studies

4.4.1 Tiwari, Parekh and Patel 2014 (Software Defined Networking (SDN) empowers network operators with more flexibility to
Program their networks. SDN is the concept to break the traditional networks, where switch decides the action to be performed. SDN concept is based on defining a model where all switches move capacity of decision to a central element controller. A SDN/Openflow controller for networks is similar to an operating system of computer, which can control various task of network. In this paper we provide an overview on SDN/Openflow network by discussing different types of vulnerabilities in an Openflow network and its impact on SDN/Openflow controller. Then we debate on importance of Transport Layer Security (TLS) in Openflow network to resolve issues related to vulnerabilities.

Tiwari,V ,parkeh,R and patel,V.(2014). A Survey on Vulnerabilities of Openflow Network and its Impact
On SDN/Openflow Controller. World Academics Journal of Engineering Sciences.1 (2):17-34.

4.4.2 Jarraya, Madi, and Debbabi (2014) ***Abstract*—Software-defined** networking (SDN) has recently
gained unprecedented attention from industry and research communities, and it seems unlikely that this will be attenuated in the near future. The ideas brought by SDN, although often described as a "revolutionary paradigm shift" in networking, are not completely new since they have their foundations in programmable networks and control–data plane separation projects. SDN promises simplified network management by enabling network automation, fostering innovation through programmability, and decreasing CAPEX and OPEX by reducing costs and power consumption. In this paper, we aim at analyzing and categorizing a number of relevant research works toward realizing SDN promises. We first provide an overview on SDN roots and then describe the architecture underlying SDN and its main components. Thereafter, we present existing SDN-related taxonomies and propose a taxonomy that classifies the reviewed research works and brings relevant research directions into focus.We dedicate the second part of this paper to studying and comparing the current SDN-related research initiatives and describe the main issues that may arise due to the adoption of SDN. Furthermore, we review several

domains where the use of SDN shows promising results. We also summarize some foreseeable future research challenges.

Jarrya, Y, Madi, T and Debbabi, M (2014). A Survey and a Layered Taxonomy of Software-Defined Networking. IEEE COMMUNICATION SURVEYS & TUTORIALS.4(16):14-33.

4.4.3 Nugraha, M, Paramita,I AND Musa, A .(2014).

Software Defined Network (SDN) is a new technology in computer network area, which enables user to centralize control plane. The security issue is important in computer network to protect system from attackers. SYN flooding attack is one of Distributed Denial of Service attack methods, which are popular to degrade availability of targeted service on Internet. There are many methods to protect system from attackers, i.e. firewall and IDS. Even though firewall is designed to protect network system, but it cannot mitigate DDoS attack well because it is not designed to do so. To improve performance of DDOS mitigation we utilize another mechanism by using SDN technology such as OpenFlow and SFlow. The methodology of SFlow to detect attacker is by capturing and sum cumulative traffic from each agent to send to sFlow collector to analyse. When SFlow collector detect some traffics as attacker, OpenFlow controller will modify the rule in OpenFlow table to mitigate attacks by blocking attack traffic. Hence, by combining sum cumulative traffic use sFlow and blocking traffic use OpenFlow we can detect and mitigate SYN flooding attack quickly and cheaply.

Nugraha, Paramita AND Musa. (2014). Utilizing OpenFlow and sFlow to Detect and Mitigate SYN Flooding Attack. Journal of Korea Multimedia Society. 17(8): 988-994

4.5 Recommendations

After the comparison between the networks, it was found that the SDN is better than the traditional network, with the rate of data transmission between devices inside the network and the cost, and that it remains in .operation despite a network malfunction

I recommend all large companies to do a study of their network when developing or building a network; Because it is the future of networks despite its late arrival to the West Bank due to lack of awareness. lack of experience in the field, poor marketing and lack of interest due to sufficiency and fear of change, and [when starting to implement them in your company or organization, you must follow the following steps]

i. Qualification of employees with awareness of this technology and a preliminary study of the existing network for cost calculator and to avoid economic problems.
ii. Give employees network lessons to understand the infrastructure.
iii. Learn a specific programming language and the best Python language.
iv. Work on simulation programs before applying them for ease of use and flexibility.
v. Download the programs we need on the server and do what we did on the simulation software

4.5 References:

1. (2019) to using controller and learn concept. [Online] https://www.youtube.com/watch?v=zwTZ6oYHKUI&list=PLsYGHuNuBZcZIso_OSGv_CjaMQREMHpIA&index=5 last Visit 20/4/2019.
2. (2019) Network set SDN. [Online] .http://www.networkset.net last visit 12/3/2019.
3. (2019) what is SDN. [Online]. https://www.sdxcentral.com last Visit 5/4/2019
4. (2019) learn SDN. [Online]. https://www.youtube.com/watch?v=vd7o6rhkhes&list=PLoP_aS_FoPQe9jxzBtgGQ7J9WwGCLZ26s last Visit 20/4/2019.
5. DR Adal hamidy, ENG.Foad bnamrn, SDN 60page.
6. Gary King horn, Software definded Network for Dummies, 52 page.
7. Willian stealing, Foundation for modern Networking SDN, 538 Page.

4.6 Appendix

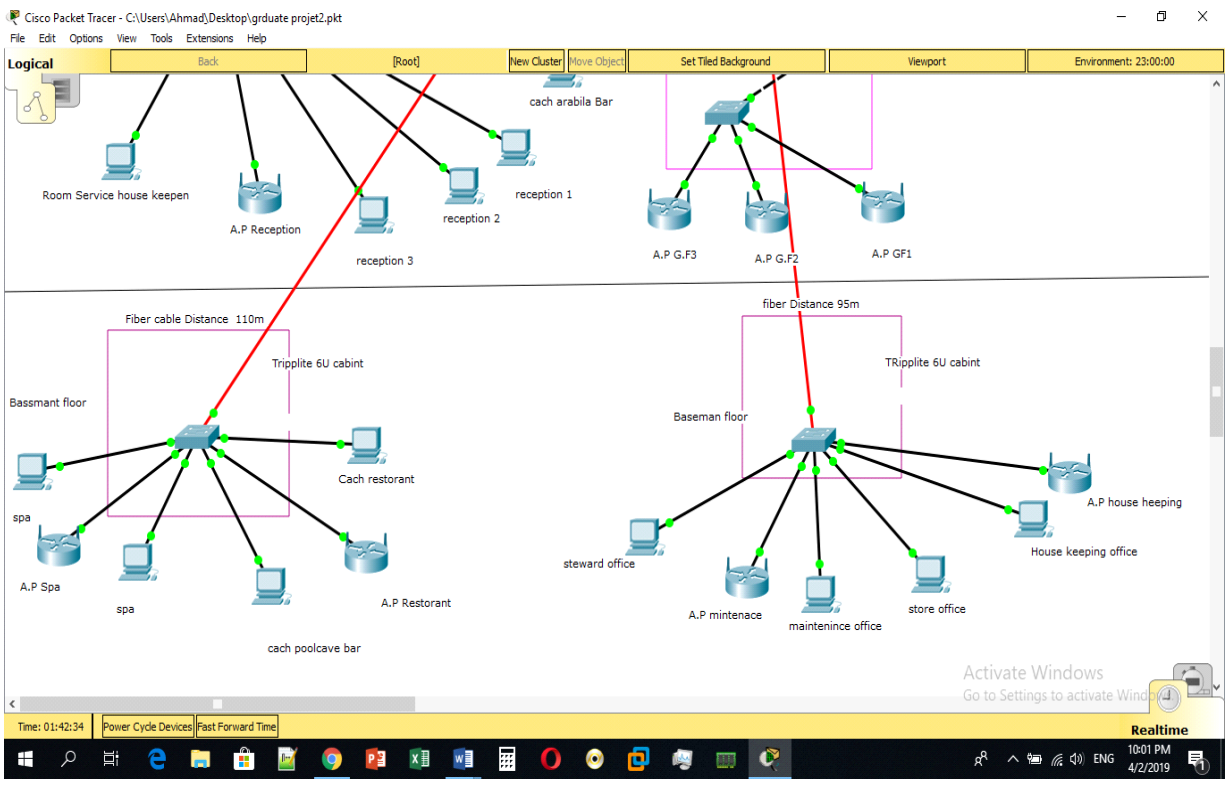
Traditional Network

The hotel network consists of two main parts

- Admin
- Gust

1. Admin

Basement floor •



Figu20. Basement Admin Floor

Device name	Career	Switch Port no.	Application	MAX user/port	IP ADD
SPA 1	Booking orders	HP 2510/2 Port F 1/1	FOS System	3	192.168.1.18
A.P SPA	Internet provider	HP 2510/2 Port F0/1	-	35	192.168.1.0
Cash pool cave bar	Input orders	HP 2510/2 port f3/1	Point of sale	2	192.168.1.20
A.P Restaurant	Internet provider	HP 2510/2 Port f7/1	-	70	192.168.1.0
Cash Restaurant	Input orders	HP 2510/2 Port F8/1	Point of sale	5	192.168.1.21
Tripp lite 6U	Cabinet switch 2510	-	-	-	-
HP 2510/2	تجميع أجهزة في سويتش	24-Ethernet 1-Console	-	24	-

Fiber	Contact switch admin more than 90 meters	Cisco ws-sc3560g-24ts F4/1	-	-	-
Steward office	Input jobs and schedule	HP 2510/1 F2/1	Bayan club	2	192.168.1.25
A.P maintenance	Internet provider	HP 2510/1 F3/1	-	35	192.168.1.0
Maintenance office	Input tasks	HP 2510/1 F9/1	Bayan club	2	192.168.1.27
Store office	Input jobs and schedule	HP 2510/1 F8/1	FBM Food beverage material	3	192.168.1.28
Housekeeping office	Input jobs and schedule	HP 2510/1 F7/1	Bayan club	2	192.168.1.29
A.P House keeping	Internet provider	HP 2510/1 F6/1	-	35	192.168.1.0
Tripp lite 6U	Cabinet switch 2510	-	-	-	-
Fiber	Contact switch admin more than 90 meters	Cisco ws-sc3560g-24ts F5/1	-	-	-

- GF Floor

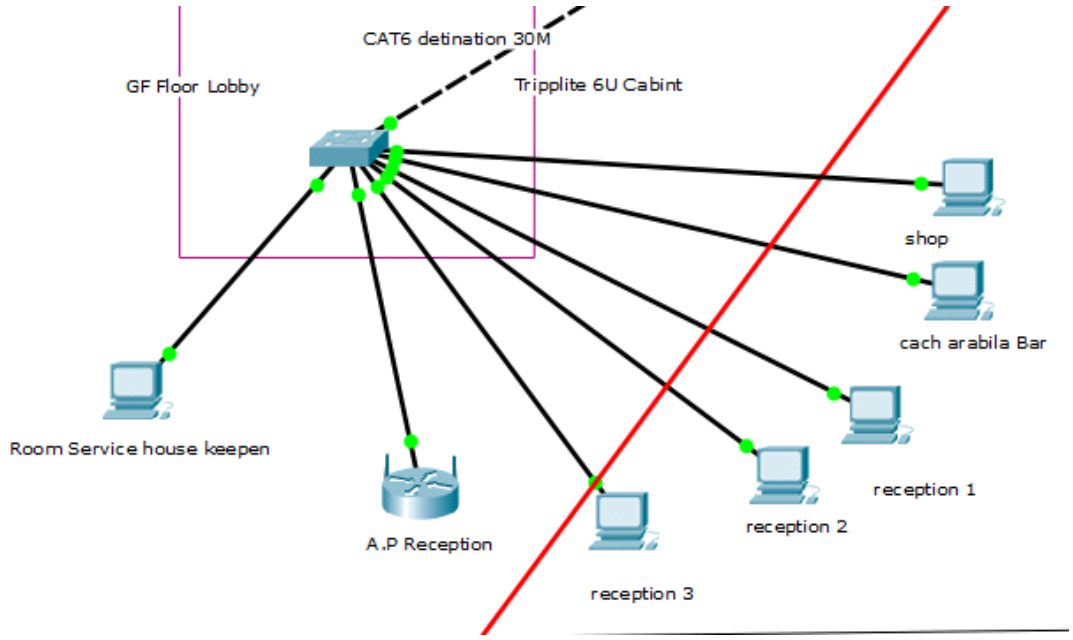


Figure 21. GF Admin Floor

Device name	Career	Switch Port No.	Application	Max user/port	IP Add
Room Service House keeping	Booking orders for Gusts	HP2510 portF0/9	FOS System	2	192.168.1.16
A.P Reception	Internet provider	HP2510 portF0/8	-	35	192.168.0.1
Reception 3	-	HP2510 portF0/3	FOS System	7	192.168.1.12

Reseption2	Rome service	HP2510 portF0/6	FOS System	7	192.168.1.6
Reception 1	Room service	HP2510 portF0/2	FOS System	7	192.168.1.11
Cached Arbela bar	Booking orders	HP2510 portF0/4	Point of sale	5	192.168.1.13
Shop	Booking orders	HP2510 portF0/5	Point of sale	3	192.168.1.14

- TF Floor

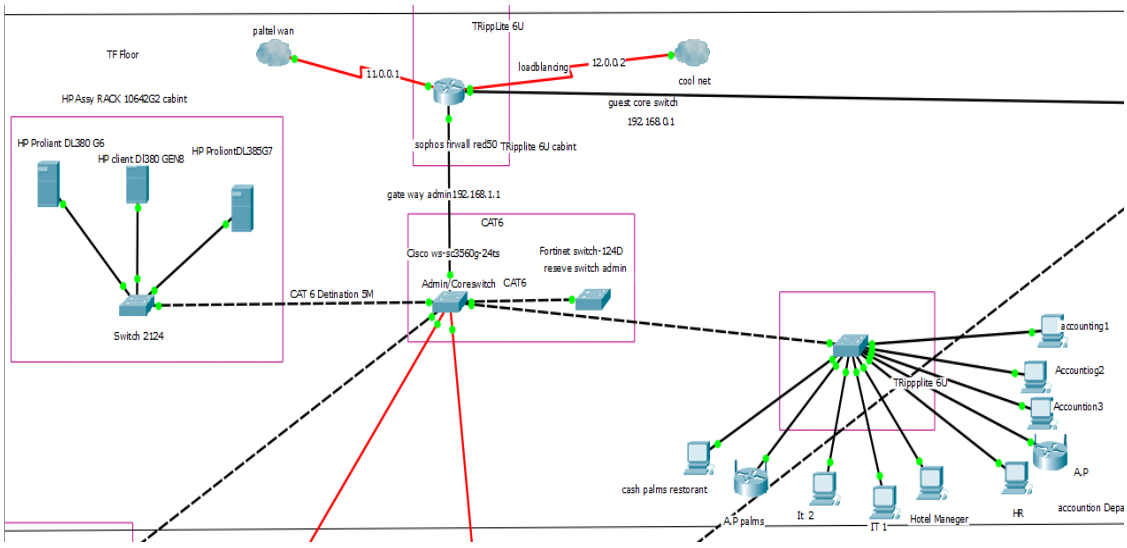


Figure22. TF Floor Admin

Name	Career	Switch Port no.	Application	Number user/port	IP address

HP ProLiant DL380 G6	Mange and storage applicatio n	HP 2124 portF0/3	1.FOS System 2. Cash gazebo	1	192.168.1 .2
HP client Dl380 GEN8	Mange and storage applicatio n	HP 2124 portF0/1	1.Flash back FBN 2. FBM Food beverage 3.Bayan club	1	192.168.1 .3
HP ProliontDL385 G7	Data base	HP 2124 portF0/2	1. Vin card infer face 2. Attendanc e magnet 3. domain controller	1	192.168.1 .4
Name	Career	Switch Port no.	Applicati on	Number user/por t	IP address
Switch 2124 HP	Collectio n devices	24- port Ethernet 1- port console	-	-	-
Cisco ws-sc3560g-24ts	Admin switch network	24- port Ethernet 1- port console	-	-	-

Fortinet switch-124D	Reserve switch admin	24- port Ethernet 1- port console	-	-	-
Sophos firewall red50	Routing And load balancing And fire wall	4- port Ethernet 1- port console	-	-	1.Gate way Admin G0/0 192.168.1 .1 2.Gate way Guest G0/1 192.168.0 .1
Name	Career	Switch Port no.	Applicati on	Number user/por t	IP address
Paltel	ISP	-	-	-	11.0.0.1
Cool Net	ISP	-	-	-	12.0.0.2
Tripp lite 6U	Cabinet Sophos firewall red 50	-	-	-	-

Cash palms Restaurant	Input orders	HP2510 portF0/9	Point of sale	5	192.168.1.24
A.P Palms	Internet provider	HP2510 portF0/10	-	70	192.168.1.0

IT2	Check service application and backup	HP2510 portF0/2	Master	1	192.168.1.10
IT1	Check service application and backup	HP2510 portF0/8	Master	1	192.168.1.50
Hotel manager	مراقبة عمل الموظفين	HP2510 portF0/7	Master	1	192.168.1.51
HR	Monitor employee time and vacation times	HP2510 portF0/3	Bayan club	1	192.168.1.9
A.P TF	Internet provider	HP2510 portF0/11	-	35	192.168.0.1
Accounting 2	Inventory of goods and audits	HP2510 portF0/4	1.FOS system 2. Flash back FBN	6	192.168.1.8
Accounting 3	Inventory of goods and audits	HP2510 portF0/5	1.FOS system 2. Flash back FBN	6	192.168.1.7

Guest

- GF Floor

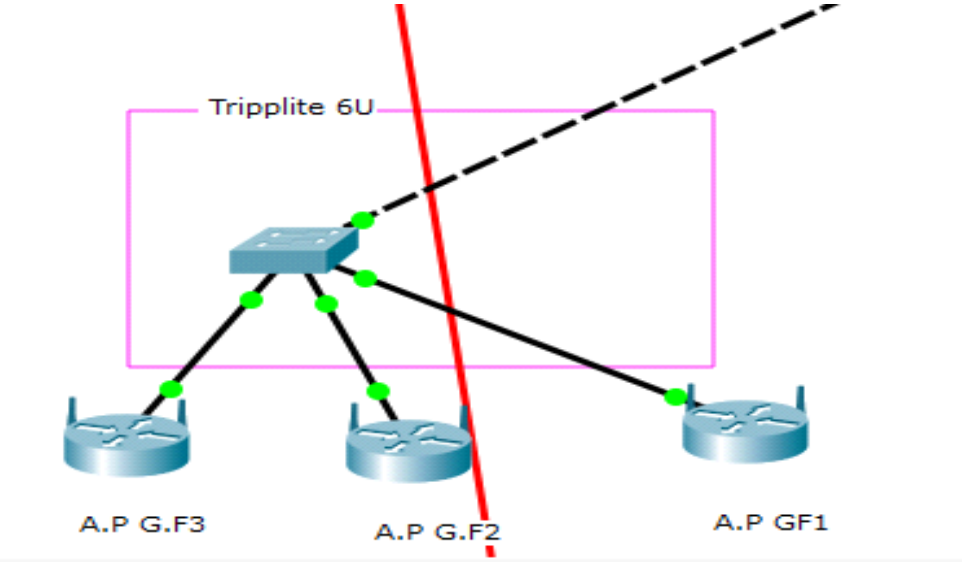


Fig23. Gust GF Floor

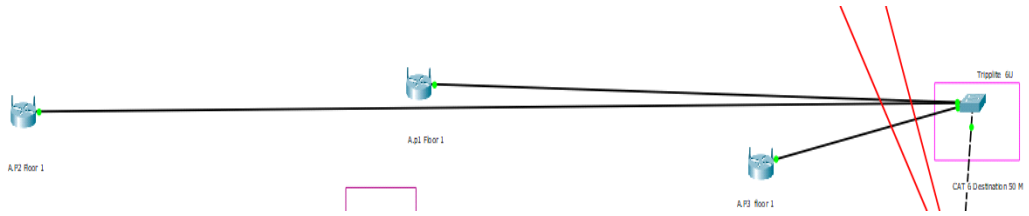
Name	Career	Switch Port no.	Application	Number user/port	IP address
A.P GF1	Internet provider	HP 2510 Port F0/1	-	70	192.168.0.100
A.P GF2	Internet provider	HP 2510 Port F0/4	-	70	192.168.0.1
A.P GF3	Internet provider	HP 2510 Port F0/3	-	70	192.168.0.1

2.TF Floor

Figure(24): TF Guest Floor

Name	Career	Switch Port no.	Application	Number user/port	IP address
Gust switch active	Reserve Switch	Sophos fire wall red 50 port G0/1	-	45	-
Receive Gust switch	Reserve Switch	Port f0/1 Poursouve 4000m HP	-	24	-

Floor1 Guest 3.



Figure(25): Floor 1 Gust

Name	Career	Switch Port no.	Application	Number user/port	IP address
A.P3 Floor1	Internet provider	HP2510 Port F2/1	-	35	192.168.1.0
A.P2 Floor1	Internet provider	HP2510 Port F1/1	-	35	192.168.1.0

A.P1 Floor1	Internet provider	HP2510 Port F0/1	-	35	192.168.1.0

3.3type of Access point and servers

1. Access Point

1. Cisco Linksys wireless- N Access point WAP300N-Multi-Purpose2.4 H

1.1floors include

- A.P SPA Basement floor.
- A.P Maintence Basement Floor.
- A.P House Keeping.
- A.P Reception GF Floor.
- A.P Accounting TF Floor.
- A.P Floor 1/2/3/4/5/6/7/8/9

2. Ubiquiti UAP –AC-PRO 5H

Internet provider for 70 users

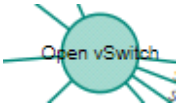
1.2 floor include

- A.P Restaurant Basement Floor.
- A.P 1 /2/3 GF Floor.
- A.P Palms TF Floor

2. Servers and application

- HP ProLiant DL380 G6 include FOS system, Point of sale, FBM Food beverage FBN Flash back.
- Client Dl380 GEN8 include Bayan Club /HR.
- HP ProliontDL385G7 include interface server, VIN card interface, Attendance magnet, Bayan Club HR.

SDN Network

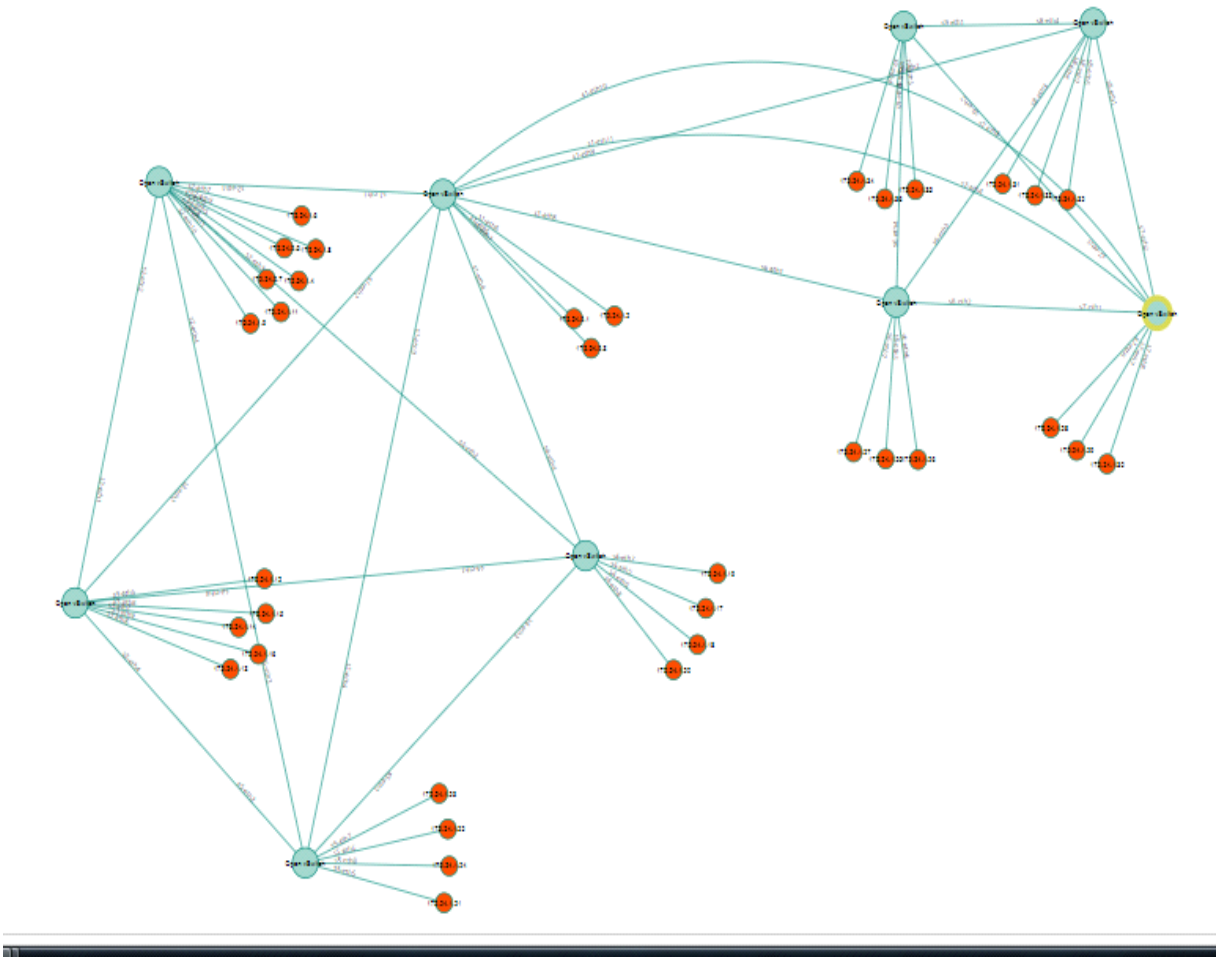
1. 

Switch Support open Flow (OVS).

2. 
Ethernet.

3. 

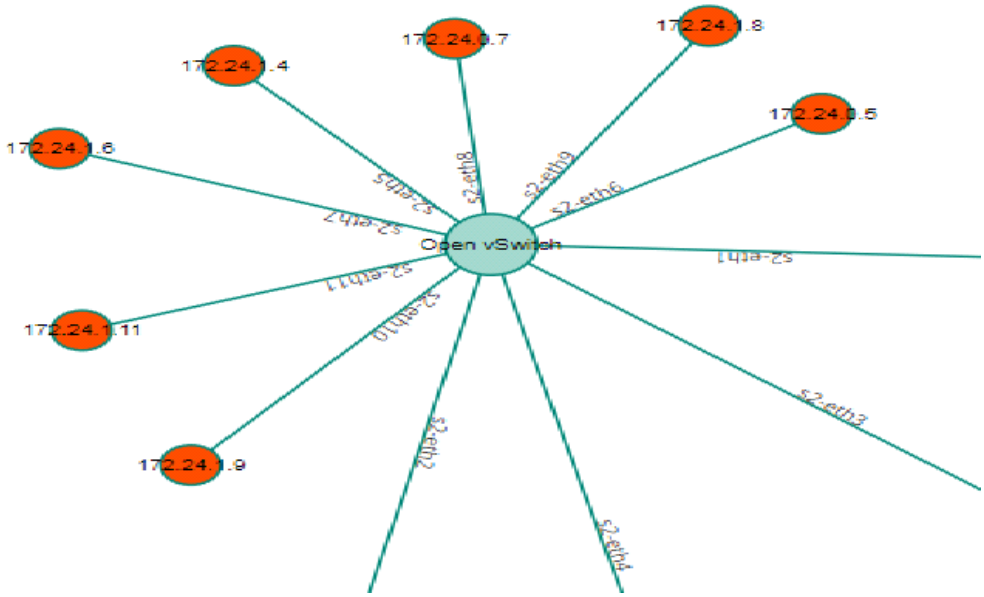
Host.



Basement Admin Floor

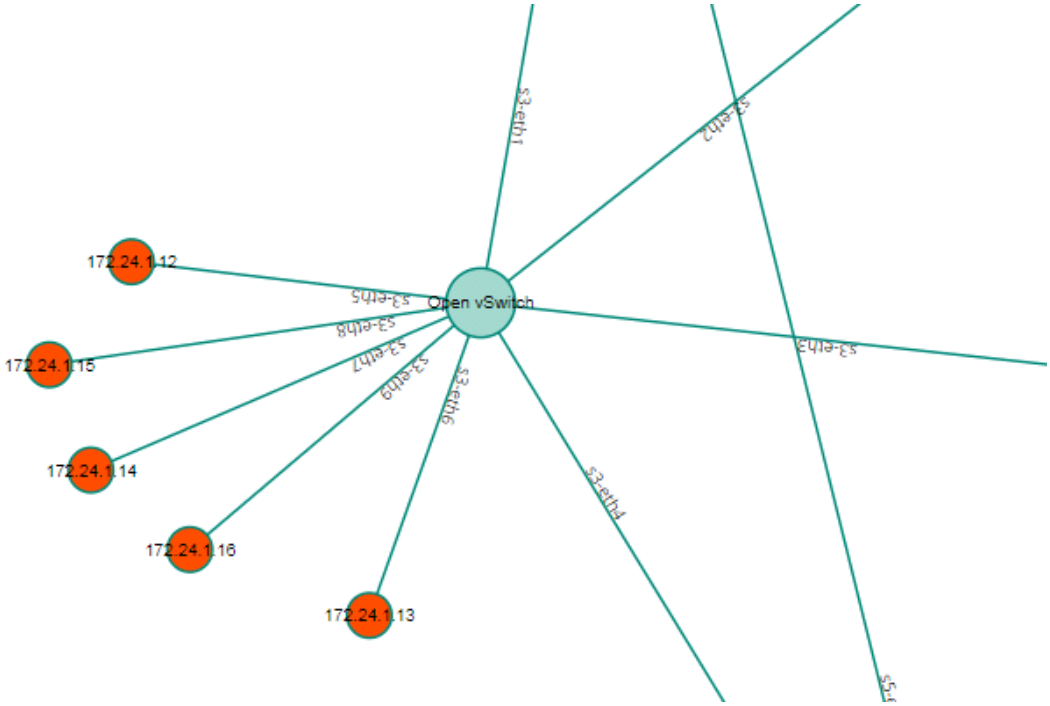
IP Device	Switch port	Switch S1 connect	Floor
172.24.0.1	S1 port eth-5	S2-eth1 TF Floor S7-etho Floor1 S6-eth8 GF Floor S4-eth4 Gf Floor S3-eth2 Basement S5-eth3 Basement	TF Floor
172.24.0.3	S1 port eth-7		
172.24.1.2	S1 port eth6		

- TF Switch (S2) admin



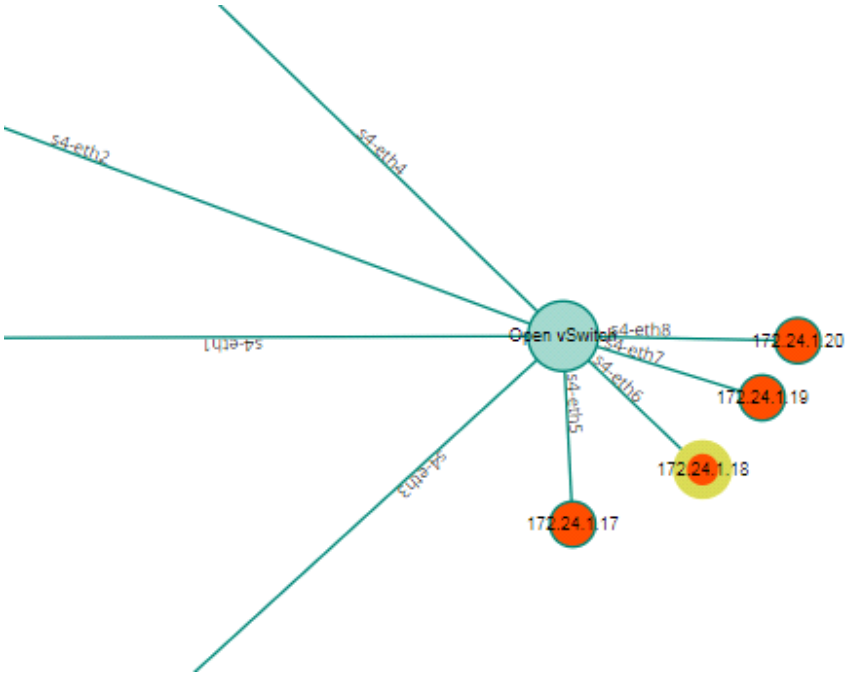
IP Device	Switch port	Switch S2 connect	Floor
172.24.1.9	S2-port eth10	S1 –eth0 S2 –eth1 S4-eth3 S5-eth4	TF Floor
172.24.1.11	S2-port eth11		
172.24.1.6	S2-port eth7		
172.24.1.4	S2-port eth5		
172.24.0.7	S2-port eth8		
172.24.1.8	S2-port eth9		
172.24.0.5	S2-port eth6		

- GF Floor (S3)



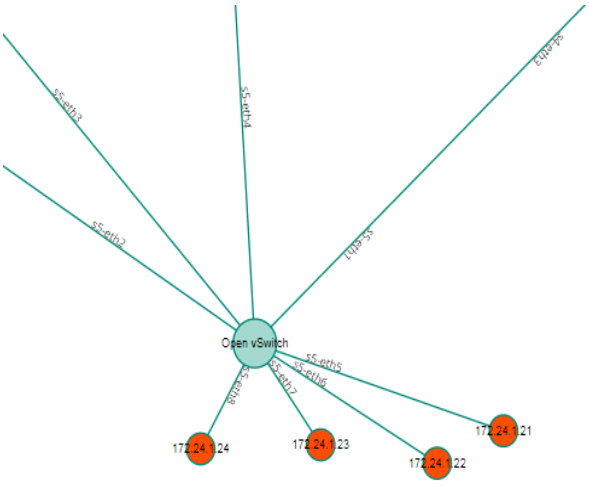
IP Device	Switch S3 port	Switch S2 connect	Floor
172.24.1.13	S3-port eth6	S1 –eth2 S2 –eth3 S3-eth2 S5-eth4	GF Floor
172.24.1.16	S2-port eth9		
172.24.1.14	S2-port eth7		
172.24.1.15	S2-port eth8		
172.24.1.12	S2-port eth5		

Basement Floor(S4) •



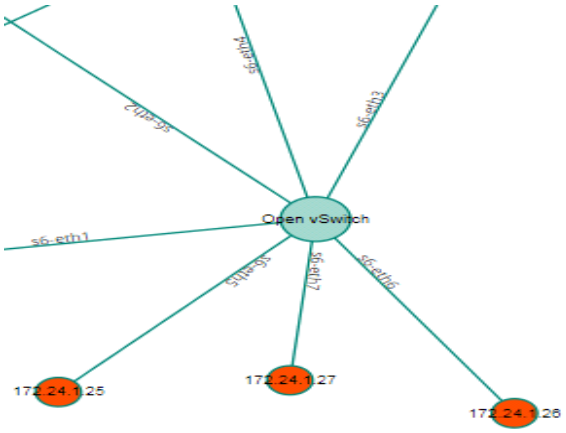
IP Device	Switch S3 port	Switch S2 connect	Floor
172.24.1.17	S4-port eth5	S1 –eth4 S2 –eth2 S3-eth1 S5-eth3	Basement Floor
172.24.1.18	S4-port eth6		
172.24.1.19	S4-port eth7		
172.24.1.20	S4-port eth8		

- Switch basement (S5)



IP Device	Switch S5 port	Switch S5 connect	Floor
172.24.1.21	S5-port eth5	S1 –eth4 S2 –eth3 S3-eth2 S4-eth1	Basement Floor
172.24.1.22	S5-port eth6		
172.24.1.23	S5-port eth7		
172.24.1.24	S5-port eth5		

- Switch GF Floor(S6)Access Point guest

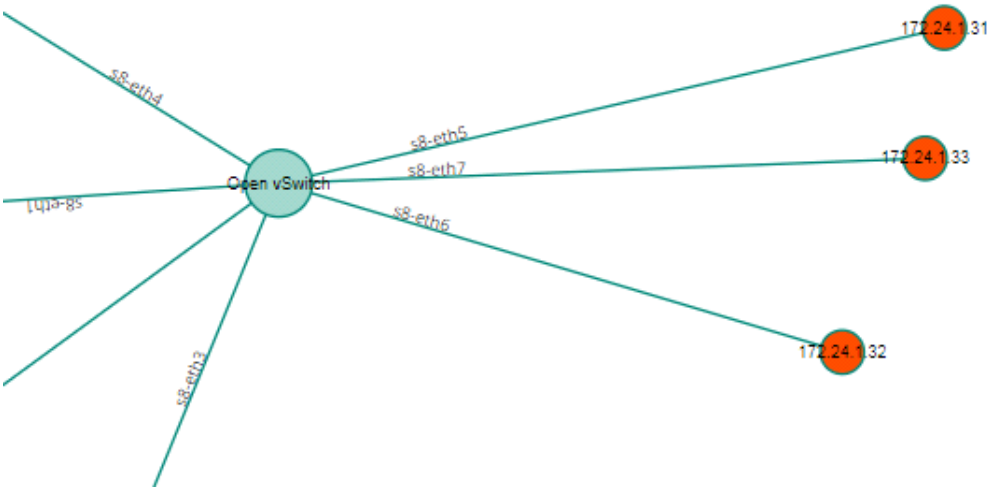


IP Device	Switch S6 port	Switch S6 connect	Floor
172.24.1.25	S6-port eth5	S1 –eth1 S7 –eth2 S8-eth3 S9-eth4	GF Floor
172.24.1.26	S2-port eth6		
172.24.1.27	S2-port eth7		

- Switch Floor1 Floor(S7) Access Point guest

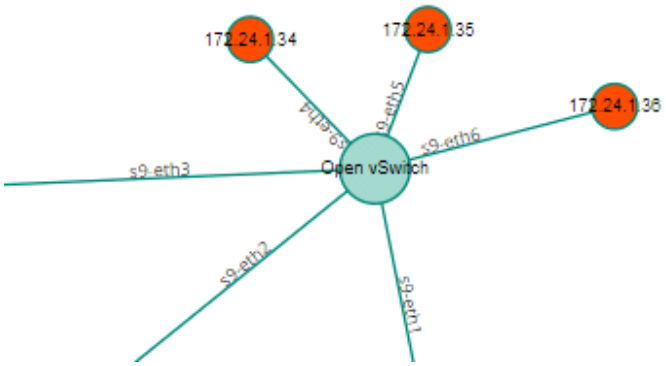
IP Device	Switch S7 port	Switch S7 connect	Floor
172.24.1.28	S7-port eth6	S1 –eth3 S6 –eth1 S8-eth2 S9-eth5	Floor 1
172.24.1.29	S7-port eth7		
172.24.1.30	S7-port eth8		

- Switch Floor2 Floor(S8) Access Point guest



IP Device	Switch S8 port	Switch S8 connect	Floor
172.24.1.31	S8-port eth5	S1 –eth2 S6 –eth3 S7-eth1 S9-eth4	Floor 2
172.24.1.32	S8-port eth6		
172.24.1.33	S8-port eth7		

- Switch Floor3 Floor(S9) Access Point guest



IP Device	Switch S9 port	Switch S9 connect	Floor
172.24.1.34	S9-port eth4	S6 –eth4	Floor 3
172.24.1.35	S9-port eth5	S7-eth2	
172.24.1.36	S9-port eth6	S8-eth1	

Floor 4/5/6/7/8/9 like 1/2/3