

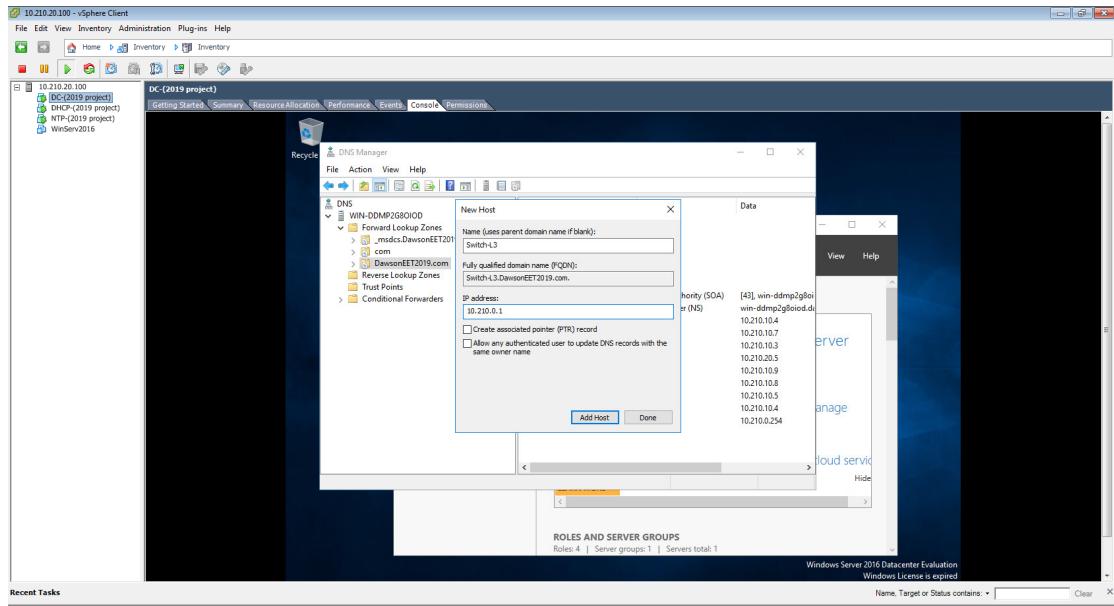
Dawson College – Electronics Engineering Technology
243-698-DW Computer Network Project

Project Report#3

Configuring and Monitoring System for Server Room

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Date created: March 29, 2018
Date submitted: April 26, 2019
Submitted to: Nick Markou

STATEMENT OF ORIGINAL WORK: I HEREBY ATTEST THAT THIS REPORT IS
ENTIRELY MY OWN ORIGINAL WORK, EXCEPT FOR EXCERPTS THAT HAVE BEEN
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Objective

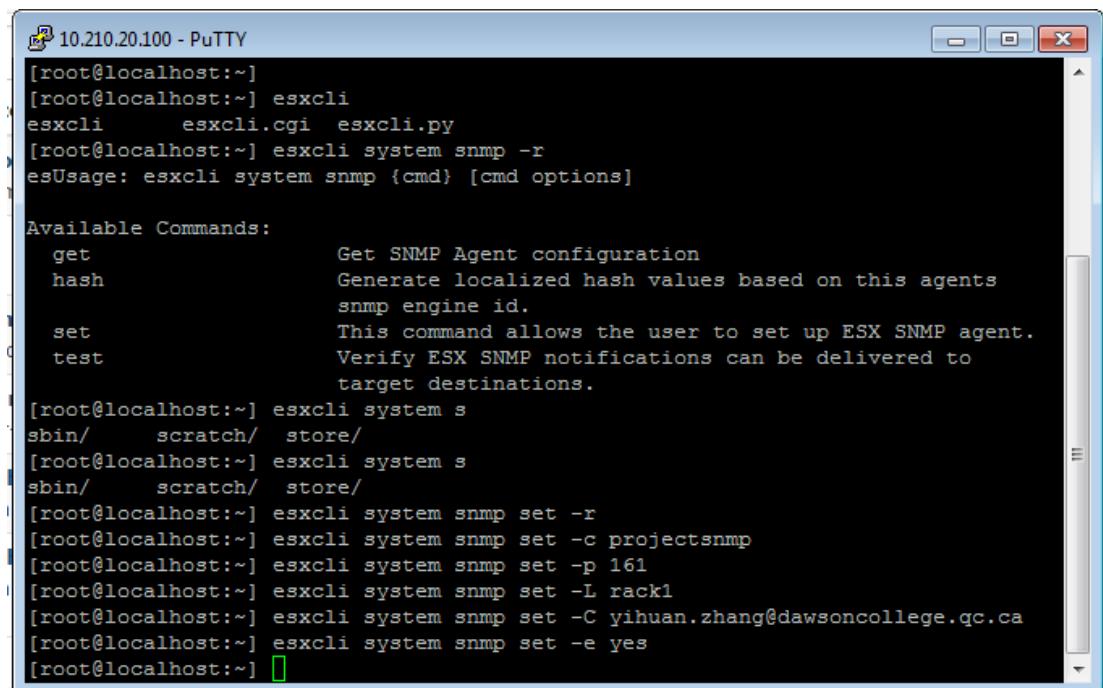
- To configure the ESXi hypervisor
- To implement the network topology
- To configure the Cisco networking devices
- To implementing Servers in both VMware and VirtualBox
- To finish the navigation web page
- To start the Python Scripts (SDN)

Results

Server block

ESXi installation

On the server Dell R720, the VMware ESXi is installed as the hypervisor. There are three virtual machines on it and all of them are running Windows server 2016 (desktop experience). The ESXi has been assigned with an IPv4 address 10.210.20.100/16, and with SSH and SNMP enabled.



```
[root@localhost:~]
[root@localhost:~] esxcli
esxcli esxcli.cgi esxcli.py
[root@localhost:~] esxcli system snmp -r
esUsage: esxcli system snmp {cmd} [cmd options]

Available Commands:
  get           Get SNMP Agent configuration
  hash          Generate localized hash values based on this agents
                snmp engine id.
  set           This command allows the user to set up ESX SNMP agent.
  test          Verify ESX SNMP notifications can be delivered to
                target destinations.

[root@localhost:~] esxcli system s
sbin/ scratch/ store/
[root@localhost:~] esxcli system s
sbin/ scratch/ store/
[root@localhost:~] esxcli system snmp set -r
[root@localhost:~] esxcli system snmp set -c projectsnmp
[root@localhost:~] esxcli system snmp set -p 161
[root@localhost:~] esxcli system snmp set -L rack1
[root@localhost:~] esxcli system snmp set -C yihuan.zhang@dawsoncollege.qc.ca
[root@localhost:~] esxcli system snmp set -e yes
[root@localhost:~]
```

(ESXi SNMP configuration)

Since most of the functions on ESXi can only be configured through command line, administrators can access with it through terminal (Linux) or emulator (Putty). On ESXi 6.0 version, the command “#esxcli system snmp set –[options]” is used to configure the SNMP options.

Domain Controller, DNS and Radius installation

The domain controller runs on the Dell R720 server, this server has AD DS, DNS, Radius and SNMP installed. As the core of the domain “DawsonEET2019.com”, this server stores the data including user information and DNS lookup table. Users “technician1” and “technician2” with administrative permission are created and has the Radius service enabled.

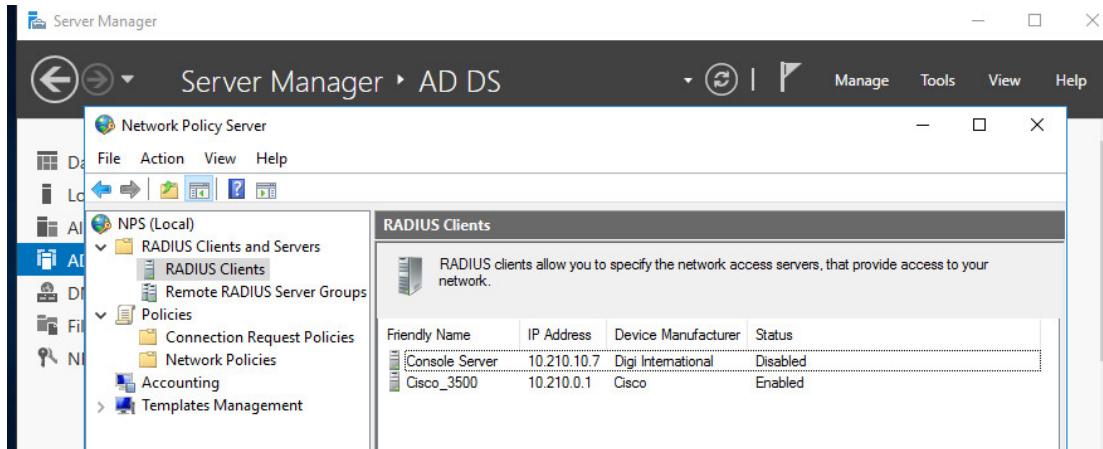
This screenshot shows the Active Directory Administrative Center (ADAC) interface. The left navigation pane is under the 'AD DS' category, showing 'DNS', 'File and Storage', and 'NPAS'. The main pane displays the 'DawsonEET2019 (local)' container with a list of objects. The table includes columns for Name, Type, and Description. Objects listed include Managed Service Accounts, NTDS Quotas, Program Data, Radius, SSH PASS, System, and several users ('tech1 ER', 'tech2 ER', 'Tech3 ER'). A context menu is open on the 'Radius' object, showing options like 'New', 'Delete', 'Properties', and 'Change domain c...'. At the bottom, it shows 'Object class: builtinDomain' and 'Modified: 2019-04-11 10:24 AM'.

(The users and groups on Domain Controller)

This screenshot shows the Server Manager interface under the 'AD DS' category, specifically the 'DNS Manager' section. The left navigation pane shows 'DNS', 'File and Storage', and 'NPAS'. The main pane displays the 'WIN-DDMP2G8OID' zone with a tree view of zones and forwarders. To the right is a detailed table of DNS records. The table has columns for Name, Type, Data, and Timestamp. Records listed include '_msdc', '_sites', '_tcp', '_udp', 'DomainDnsZones', 'ForestDnsZones', 'console', 'DC', 'DHCP', 'ESXi', 'Gary-Client', 'Pi', 'rack1', 'Router-core', 'SNMP', 'Switch-L2', 'Switch-L3', and 'win-ddmp2g8oid'. Most records are of type 'Host (A)' with static data and timestamps ranging from 2019-04-25 to 2019-04-26.

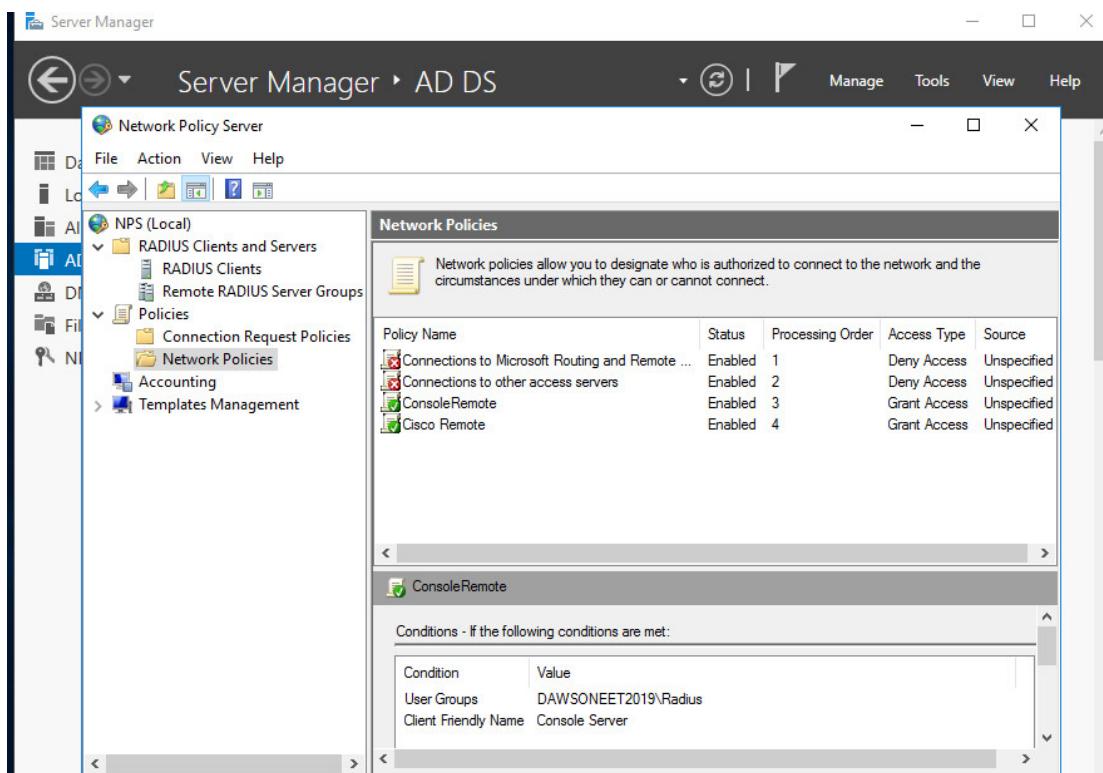
(The DNS database)

On windows server, the Radius service uses local accounts and shared secret “Class!23” to perform authentication and encryption. To allow users being authenticated through the network, create a user group (Radius). Then in “Networking Policy Server” register server in Active Directory and create new RADIUS Clients and Policies.



(The RADIUS Clients list)

The basic logic on windows server is that we add the devices that require to be authenticated through an external AAA server (with “Friendly name”, “Address”, and “shared secret” specified), and in Policies we configure the access permission, authentication methods, and manufacturer (vendor).



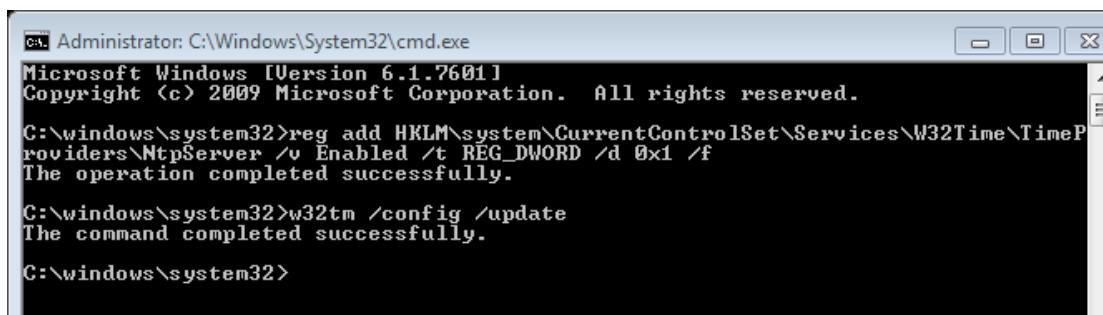
(The Network Policies list)

DHCP server installation

DHCP server is a windows 2016 server runs on Dell R720 server. After the DHCP role has been installed, the DHCP server is assigned in the domain with a static IP address 10.210.10.3/16, a new scope under IPv4 is configured with range 10.210.10.100~200.

NTP server installation

The NTP server provides a universal time stamp for network devices that has external syslog and SNMP services enabled. To configure the NTP server/client on a windows, we have to change the flag in OS registry.



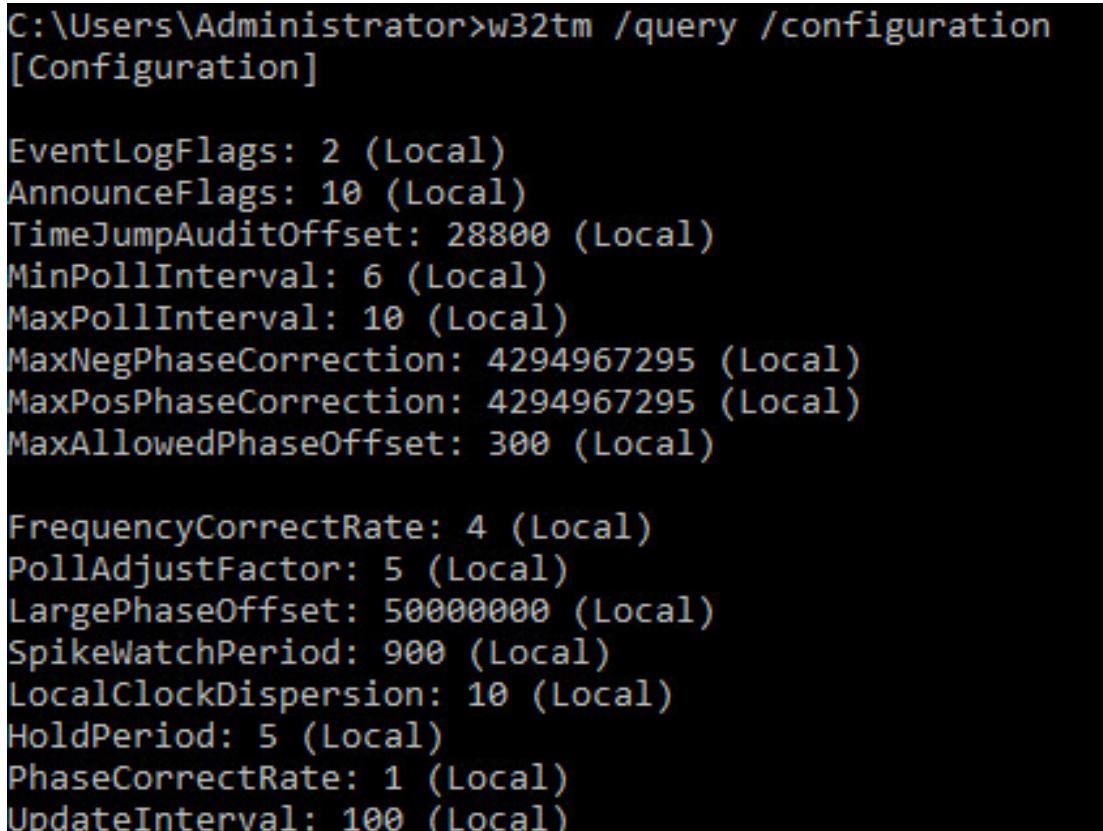
```
Administrator: C:\Windows\System32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright <c> 2009 Microsoft Corporation. All rights reserved.

C:\windows\system32>reg add HKLM\SYSTEM\CurrentControlSet\Services\W32Time\TimeProviders\NtpServer /v Enabled /t REG_DWORD /d 0x1 /f
The operation completed successfully.

C:\windows\system32>w32tm /config /update
The command completed successfully.

C:\windows\system32>
```

(The command line of turning on NTP server)



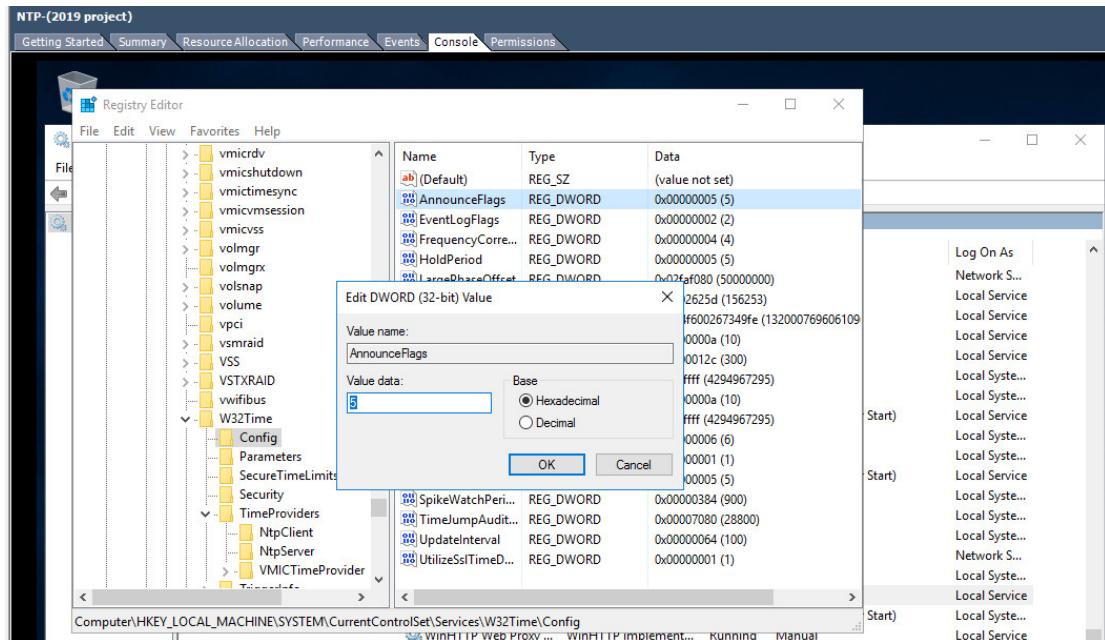
```
C:\Users\Administrator>w32tm /query /configuration
[Configuration]

EventLogFlags: 2 (Local)
AnnounceFlags: 10 (Local)
TimeJumpAuditOffset: 28800 (Local)
MinPollInterval: 6 (Local)
MaxPollInterval: 10 (Local)
MaxNegPhaseCorrection: 4294967295 (Local)
MaxPosPhaseCorrection: 4294967295 (Local)
MaxAllowedPhaseOffset: 300 (Local)

FrequencyCorrectRate: 4 (Local)
PollAdjustFactor: 5 (Local)
LargePhaseOffset: 50000000 (Local)
SpikeWatchPeriod: 900 (Local)
LocalClockDispersion: 10 (Local)
HoldPeriod: 5 (Local)
PhaseCorrectRate: 1 (Local)
UpdateInterval: 100 (Local)
```

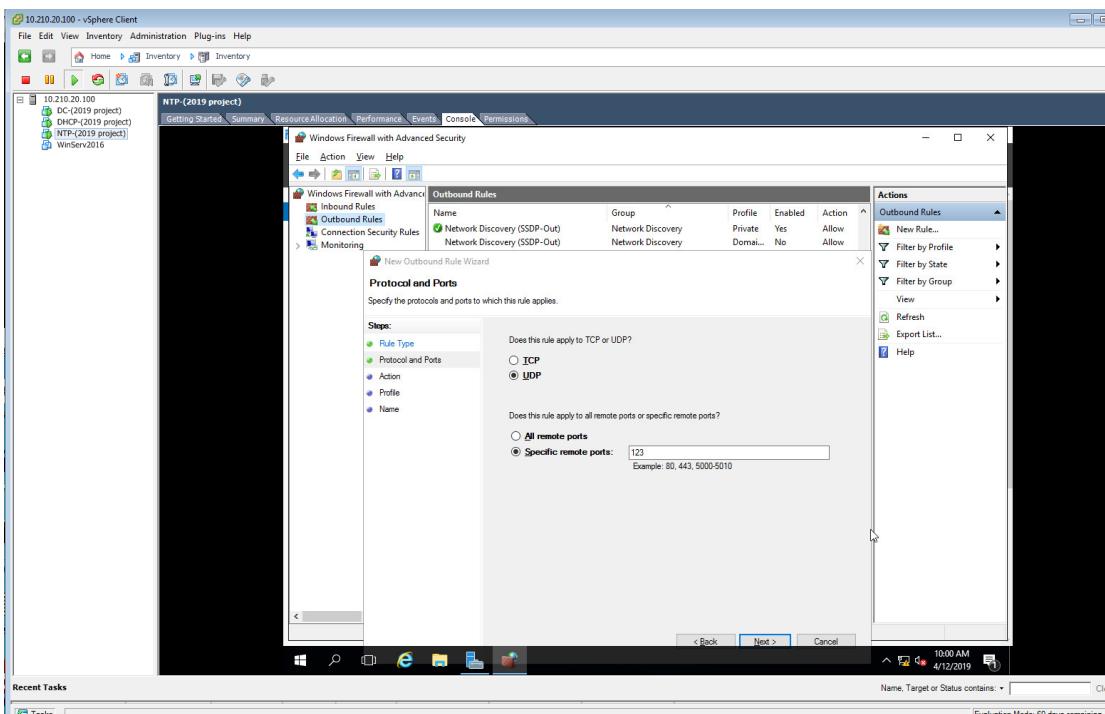
(Using "#w32tm" to check the configuration)

Consequently, the W32Time parameters can also be configured in the Registry Editor. The absolute directory address is “Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Config”:



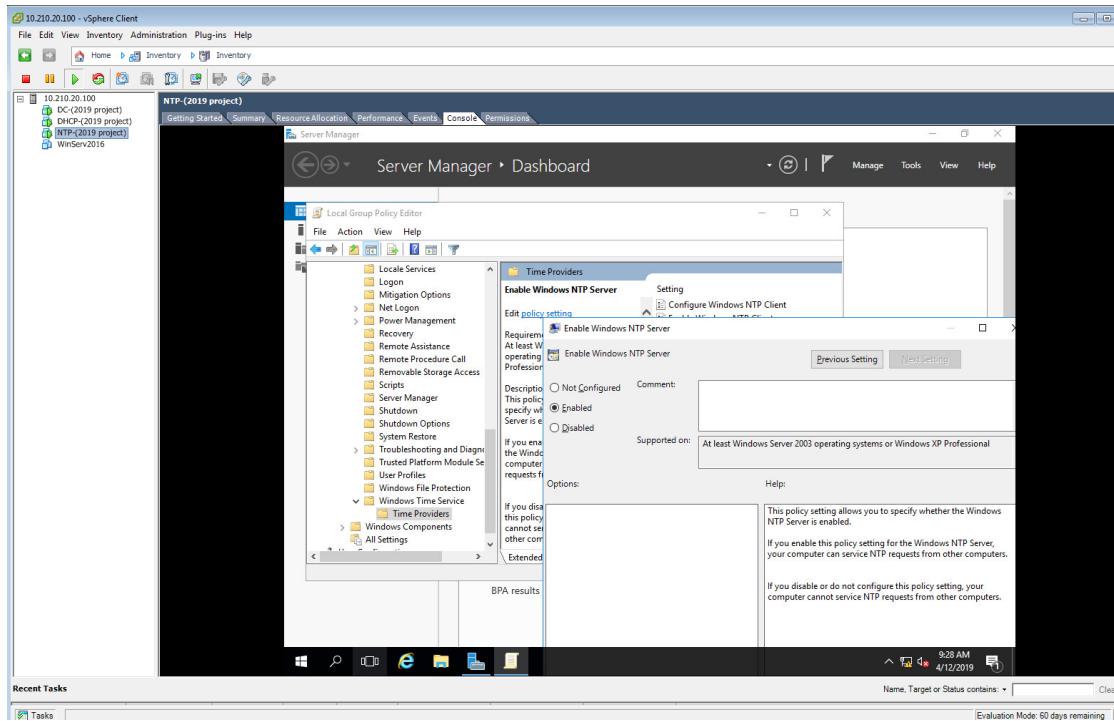
(configuring the NTP flag in registry editor)

The Network Time Protocol uses port 123, and by default the windows firewall blocks it for security reasons. This is configured under both Inbound and Outbound Rules.

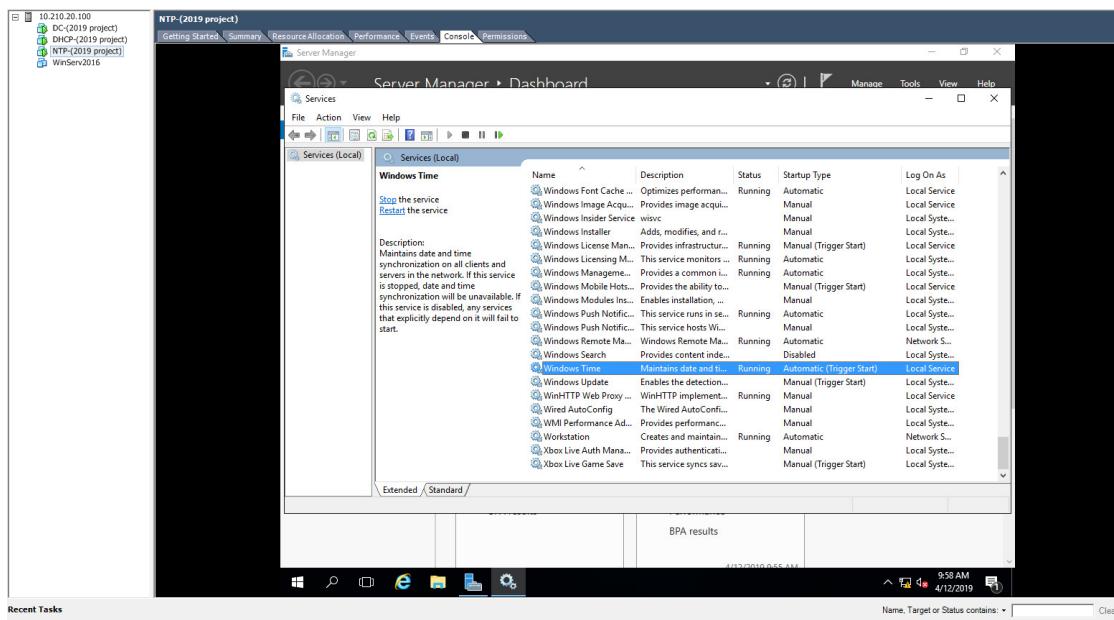


(adding new rule to allow for NTP)

After allowing UDP port 123 in windows firewall, Enable or restart the server under “Local Group Policy Editor” to start the NTP service:



(Enabling the NTP server)

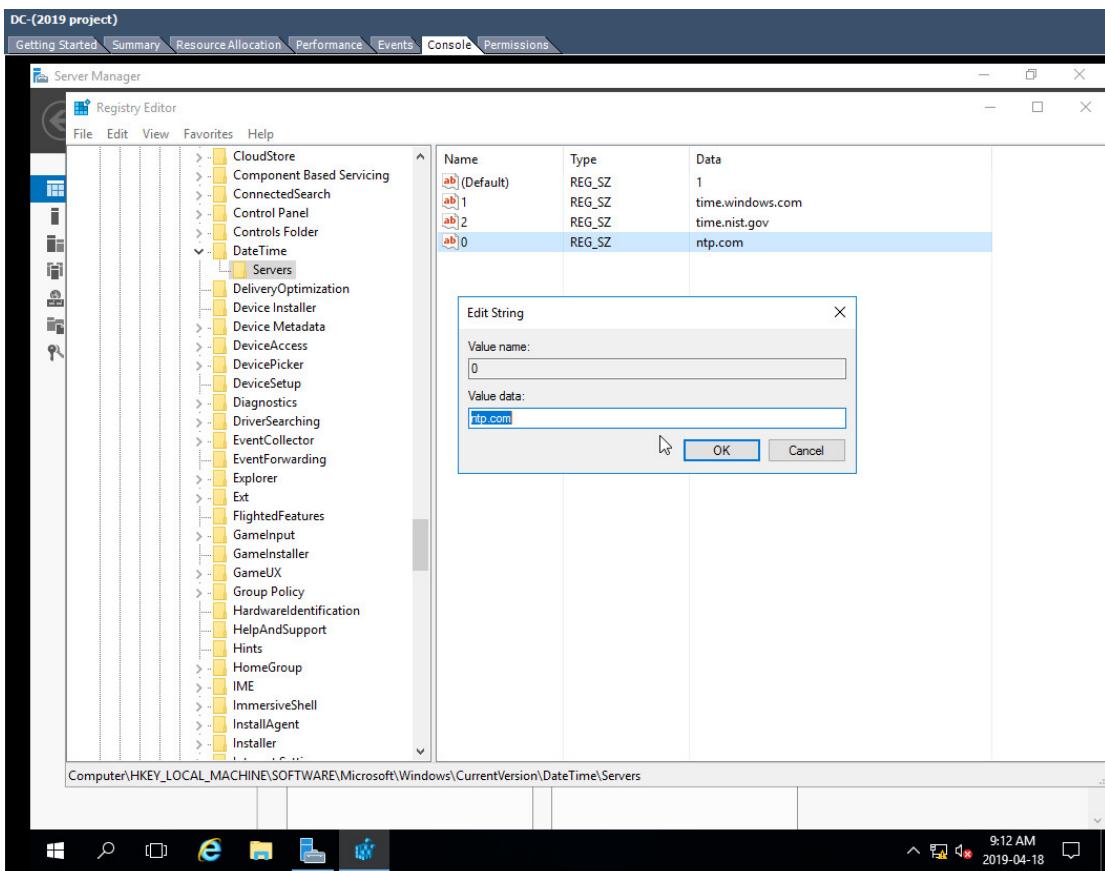


(Checking if the NTP service is running)

The NTP service can also be activated by installing the software, the one I have tested is called “Meinberg NTP”, it configures the NTP flag and is compatible with Cisco IOS devices.

(All the IOS devices are synchronized)

To see more detail about the SNMP configuration on Cisco IOS devices, please check the IOS configuration part. The windows servers (NTP clients) are configured as below:



SNMP server installation

The SNMP manager uses an open source software LibreNMS (<https://www.librenms.org>) based on CentOS platform. The LibreNMS is a network administrator software that provides various administrative tools, it supports all SNMP version 1, 2c and 3, has advantages in terms of compatibility, authentication (supports active directory, Radius, HTTP and local database), and graphical tools (web UI and mobile application).

To install a SNMP server, I implemented a CentOS 7 server in VirtualBox, configured NIC as bridged adapter and 10.210.10.5/16 network address. Then use the command below to install required packages after adding EPEL repository and update:

```
#yum install [nginx, php72w, php72w-cli, php72w-common, php72w-curl, php72w-fpm, php72w-gd, php72w-mbstring, php72w-mysqlnd, php72w-process, php72w-snmp, php72w-xml, php72w-zip, mariadb-server, mariadb, git, ImageMagick, iwhois, cronie, composer, mysql-python, net-snmp, python-memcached} -y
```

Then download the software LibreNMS:

```
#yum composer create-project --no-dev --keep-vcs librenms/librenms librenms dev-master
```

Creating a user for the SNMP manager:

```
#useradd librenms -d /opt/librenms -M -r  
#usermod -a -G librenms nginx
```

Starting and configuring the local database MySQL:

```
#systemctl start mariadb  
#mysql -u root
```

adding “innodb_file_per_table=1” and “lower_case_table_names=0” in /etc/my.conf file. And restart mariadb.

configure the “/etc/php-fpm.d/www.conf” as below and restart php-fpm:

configure the Nginx file “/etc/nginx/conf.d/librenms.comf” as below and restart it:

Configuring the SNMP server by simply replacing “/etc/snmp/snmpd.conf” with “/librenms/snmpd/snmpd.conf” and restart it.

forwarding the port number 80 and 443 and allowing access through firewall:

```
#firewall-cmd --zone public --add-service http  
#firewall-cmd --permanent --zone public --add-service http  
#firewall-cmd --zone public --add-service https  
#firewall-cmd --permanent --zone public --add-service https
```

On Cisco network devices like router and switch, issue the commands below to add the SNMP server:

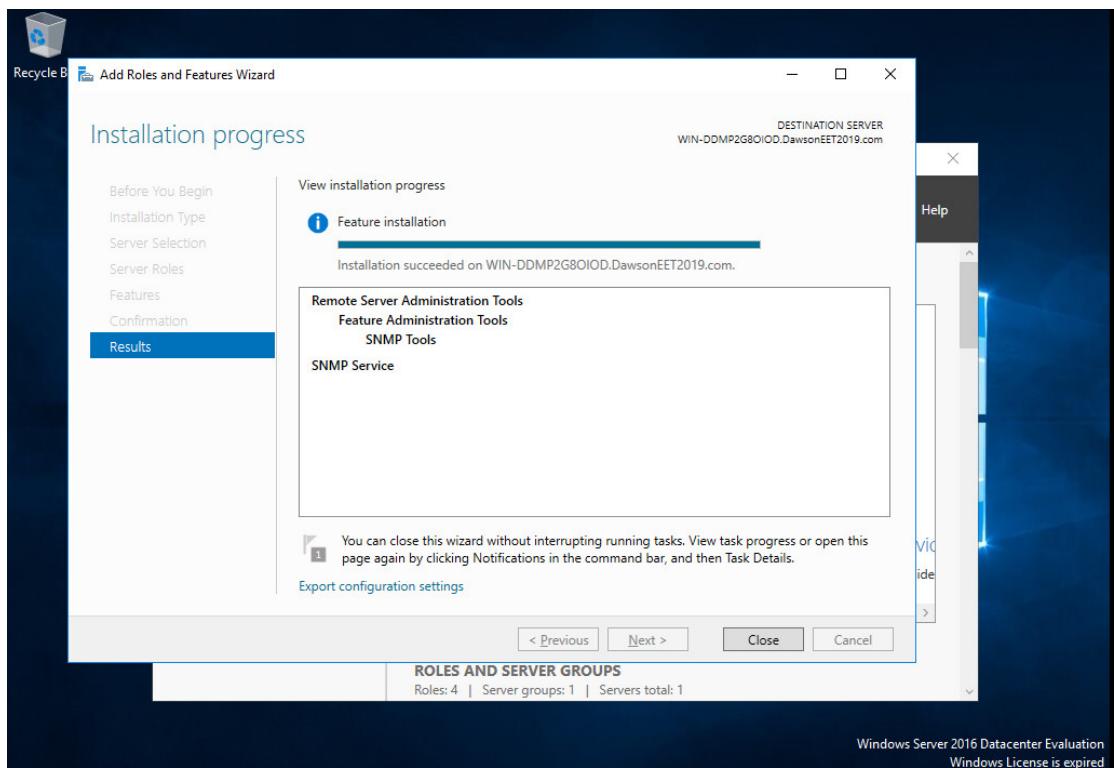
```
Router-core(config)#snmp-server community projectsnmp ro SNMP_ACL  
Router-core(config)#snmp-server location rack1  
Router-core(config)#snmp-server contact yihuan.zhang@dawsoncollege.qc.ca  
Router-core(config)#snmp-server host 10.210.10.5 version 2c projectsnmp  
Router-core(config)#snmp-server enable traps  
Router-core(config)#ip access-list standard SNMP_ACL  
Router-core(config-std-nacl)#permit 10.210.10.5  
Router-core(config-std-nacl)#do show snmp  
Chassis: FHK1446F14K  
Contact: yihuan.zhang@dawsoncollege.qc.ca  
Location: rack1  
0 SNMP packets input  
    0 Bad SNMP version errors  
    0 Unknown community name  
    0 Illegal operation for community name supplied  
    0 Encoding errors  
    0 Number of requested variables  
    0 Number of altered variables  
    0 Get-request PDUs  
    0 Get-next PDUs  
    0 Set-request PDUs  
    0 Input queue packet drops (Maximum queue size 1000)
```

```

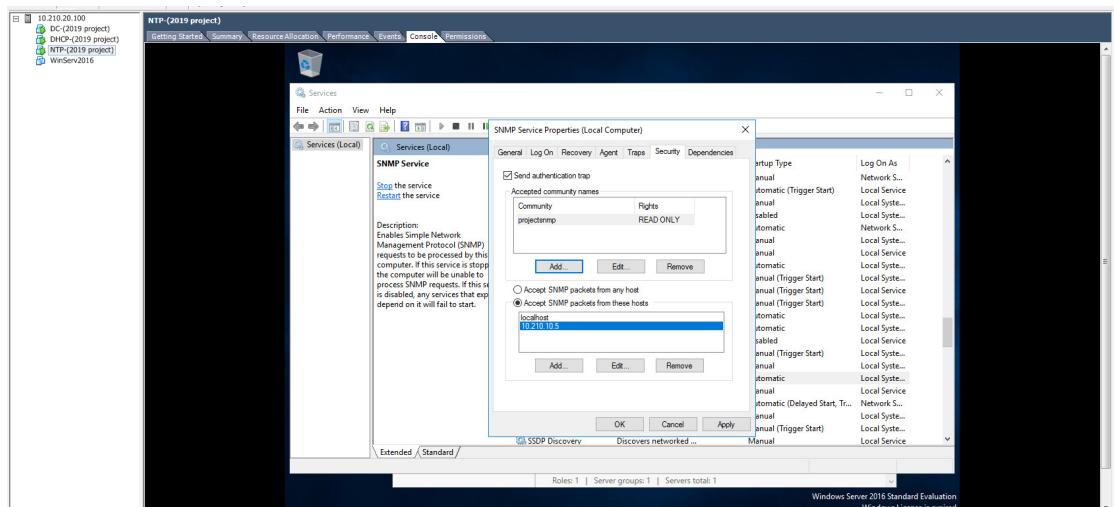
0 SNMP packets output
  0 Too big errors (Maximum packet size 1500)
  0 No such name errors
  0 Bad values errors
  0 General errors
  0 Response PDUs
  0 Trap PDUs
SNMP Dispatcher:
  queue 0/75 (current/max), 0 dropped
SNMP Engine:
  queue 0/1000 (current/max), 0 dropped
SNMP logging: enabled
  Logging to 10.210.10.5.162, 0/10, 0 sent, 0 dropped.

```

On windows servers, add the SNMP feature:



Configure the community string, host address in “Services”:



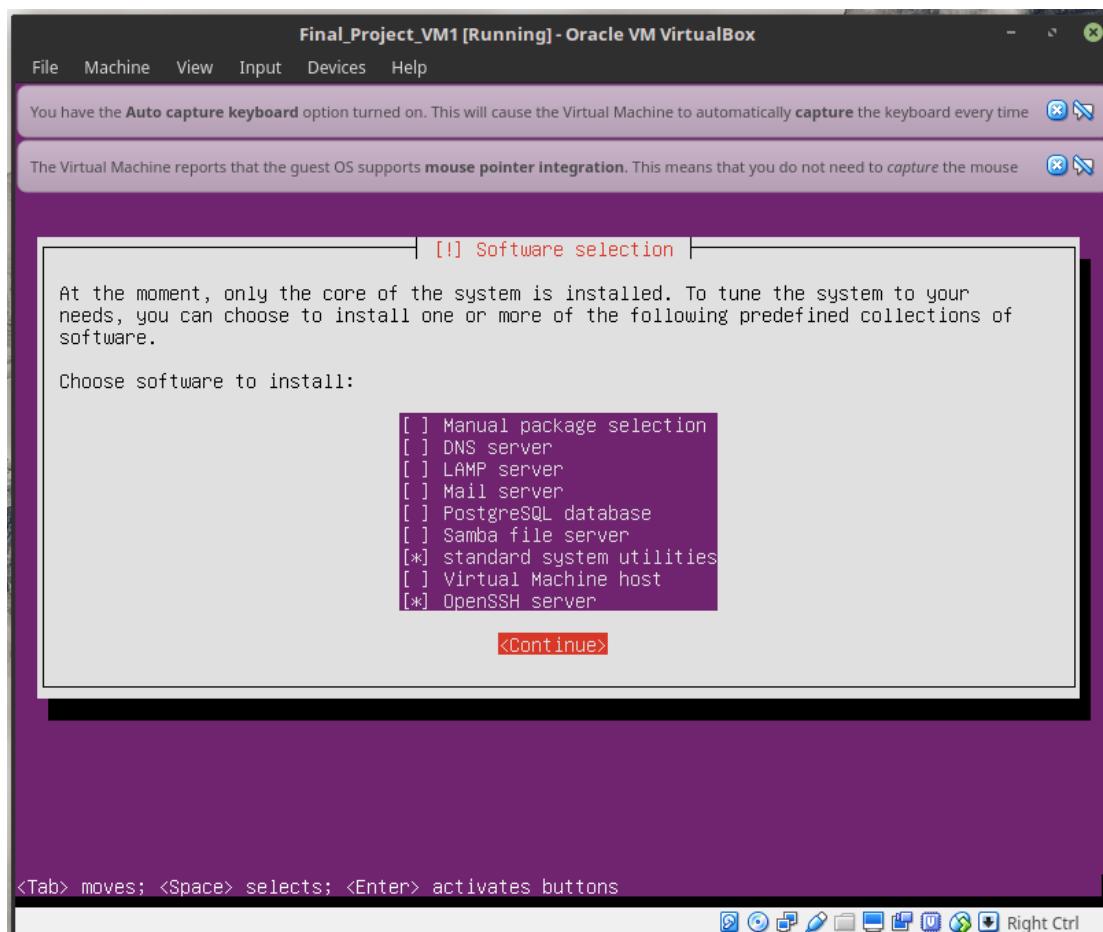
To add the SNMP nodes, login into the website and click “[add new server](#)” from “Devices” on top, filling the parameters (device hostname, version 2c, port 161, community string “projectsnmp”). After the SNMP configured devices has been added, the SNMP manager starts polling the SNMP traps and other informations from agents’ MIB.

I decided to uses SNMP v2c in this scenario for compatibility reasons since. The project contains different OS and legacy network devices and some of them are not able to configure the SNMP version (windows 2016).

Web servers installation

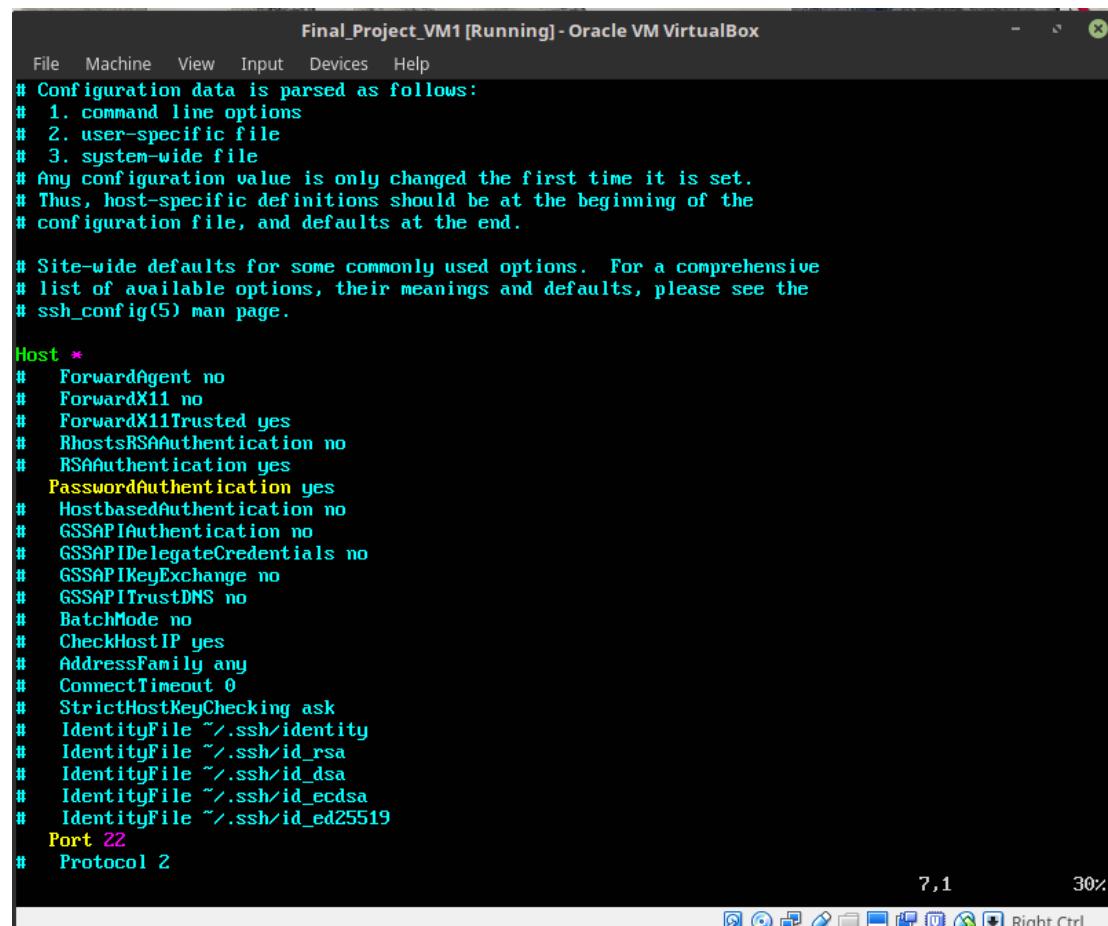
Besides the SNMP server, there are two more web servers that are implemented in this project: the main web server (Nginx) contains a navigation page and redirect users to different places (resources, tools, references); the web server on RPi (Apache) that contains both front-end (HTML) and back-end (PHP) to display the environmental data on the rack as well as trigger the alarm.

The main web server is also responsible for displaying the documentation (IP address, network topology), redirecting pages to different servers, and executing the program to check the network connectivity. A host OS based on Linux that has LAMP, NFS (SAMBA) and python installed needs to be created, these services and tools contribute to the administrative framework of the network devices.



(Ubuntu 16.04 installation wizard)

A VM with 4GB memory and 10GB disk space has been created. I choose to use Ubuntu as the host OS mainly because of its compatibility, accessibility and IDE. Moreover, as I am planning to deploy the applications under the containers of the docker, applications are limited by the fundamental architecture of the guest OS. Therefore, the guest OS only requires minimum tools to operate and softwares will be deployed onto their respective container later. After the installation, a restore point (VM clone) is created for back up purpose.



```
Final_Project_VM1 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
# Configuration data is parsed as follows:
# 1. command line options
# 2. user-specific file
# 3. system-wide file
# Any configuration value is only changed the first time it is set.
# Thus, host-specific definitions should be at the beginning of the
# configuration file, and defaults at the end.

# Site-wide defaults for some commonly used options. For a comprehensive
# list of available options, their meanings and defaults, please see the
# ssh_config(5) man page.

Host *
# ForwardAgent no
# ForwardX11 no
# ForwardX11Trusted yes
# RhostsRSAAuthentication no
# RSAAuthentication yes
# PasswordAuthentication yes
# HostbasedAuthentication no
# GSSAPIAuthentication no
# GSSAPIDelegateCredentials no
# GSSAPIKeyExchange no
# GSSAPITrustDNS no
# BatchMode no
# CheckhostIP yes
# AddressFamily any
# ConnectTimeout 0
# StrictHostKeyChecking ask
# IdentityFile ~/.ssh/identity
# IdentityFile ~/.ssh/id_rsa
# IdentityFile ~/.ssh/id_dsa
# IdentityFile ~/.ssh/id_ecdsa
# IdentityFile ~/.ssh/id_ed25519
Port 22
# Protocol 2
```

(Modification of the ssh_config file)

As the ssh has been installed in previous step, the second thing is to configure and enable the ssh service in order to activate the remote login. I simply uncomment the two lines above (with root permission) and checked the interface IP address to test the connectivity.

(Adding the repository for docker-ce)

Through the SSH connection, a repository from docker.com is added preparing for the docker installation.

```
gary@ubuntu:~  
File Edit View Search Terminal Help  
17.03.0-ce-0-ubuntu-xenial 500  
500 https://download.docker.com/linux/ubuntu xenial/stable amd64 Packages  
gary@ubuntu:~$ sudo apt-get install -y docker-ce && sudo systemctl status docker  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following additional packages will be installed:  
  aufs-tools cgroupfs-mount containerd.io docker-ce-cli libltdl7 pigz  
Suggested packages:  
  mountall  
The following NEW packages will be installed:  
  aufs-tools cgroupfs-mount containerd.io docker-ce docker-ce-cli libltdl7 pigz  
0 upgraded, 7 newly installed, 0 to remove and 6 not upgraded.  
Need to get 50.4 MB of archives.  
After this operation, 243 MB of additional disk space will be used.  
Get:1 https://download.docker.com/linux/ubuntu xenial/stable amd64 containerd.io amd64 1.2.0-1 [19.9 MB]  
Get:2 http://ca.archive.ubuntu.com/ubuntu xenial/universe amd64 pigz amd64 2.3.1-2 [61.1 kB]  
Get:3 http://ca.archive.ubuntu.com/ubuntu xenial/universe amd64 aufs-tools amd64 1:3.2+20130722-1.1ubuntu1 [92.9 kB]  
Get:4 http://ca.archive.ubuntu.com/ubuntu xenial/universe amd64 cgroupfs-mount all 1.2 [4,970 B]  
Get:5 http://ca.archive.ubuntu.com/ubuntu xenial/main amd64 libltdl7 amd64 2.4.6-0.1 [38.3 kB]  
Get:6 https://download.docker.com/linux/ubuntu xenial/stable amd64 docker-ce-cli amd64 5:18.09.0-3~ubuntu-xenial [13.0 MB]  
Get:7 https://download.docker.com/linux/ubuntu xenial/stable amd64 docker-ce amd64 5:18.09.0-3~ubuntu-xenial [17.4 MB]  
Fetched 50.4 MB in 3s (14.4 MB/s)  
Selecting previously unselected package pigz.  
(Reading database ... 60162 files and directories currently installed.)  
Preparing to unpack .../pigz_2.3.1-2_amd64.deb ...  
Unpacking pigz (2.3.1-2) ...  
Selecting previously unselected package aufs-tools.  
Preparing to unpack .../aufs-tools_1%3a3.2+20130722-1.1ubuntu1_amd64.deb ...  
Unpacking aufs-tools (1:3.2+20130722-1.1ubuntu1) ...  
Selecting previously unselected package cgroupfs-mount.  
Preparing to unpack .../cgroupfs-mount_1.2_all.deb ...  
Unpacking cgroupfs-mount (1.2) ...  
Selecting previously unselected package containerd.io.  
Preparing to unpack .../containerd.io_1.2.0-1_amd64.deb ...  
Unpacking containerd.io (1.2.0-1) ...  
Selecting previously unselected package libltdl7:amd64.  
Preparing to unpack .../libltdl7_2.4.6-0.1_amd64.deb ...  
Unpacking libltdl7:amd64 (2.4.6-0.1) ...  
Selecting previously unselected package docker-ce-cli.
```

(Installing docker engine)

From the repository we just added in previous step, the docker-ce is able to be installed using apt-get command.

```

gary@ubuntu:~ 
File Edit View Search Terminal Help
Unpacking libltdl7:amd64 (2.4.6-0.1) ...
Selecting previously unselected package docker-ce-cli.
Preparing to unpack .../docker-ce-cli_5%3a18.09.0-3-0~ubuntu-xenial_amd64.deb ...
Unpacking docker-ce-cli (5:18.09.0-3-0~ubuntu-xenial) ...
Selecting previously unselected package docker-ce.
Preparing to unpack .../docker-ce_5%3a18.09.0-3-0~ubuntu-xenial_amd64.deb ...
Unpacking docker-ce (5:18.09.0-3-0~ubuntu-xenial) ...
Processing triggers for man-db (2.7.5-1) ...
Processing triggers for libc-bin (2.23-0ubuntu10) ...
Processing triggers for ureadahead (0.100.0-19) ...
Processing triggers for systemd (229-4ubuntu21.10) ...
Setting up pigz (2.3.1-2) ...
Setting up aufs-tools (1:3.2+20130722-1.lubuntu1) ...
Setting up cgroupfs-mount (1.2) ...
Setting up containerd.io (1.2.0-1) ...
Setting up libltdl7:amd64 (2.4.6-0.1) ...
Setting up docker-ce-cli (5:18.09.0-3-0~ubuntu-xenial) ...
Setting up docker-ce (5:18.09.0-3-0~ubuntu-xenial) ...
update-alternatives: using /usr/bin/dockerd-ce to provide /usr/bin/dockerd (dockerd) in auto mode
Processing triggers for libc-bin (2.23-0ubuntu10) ...
Processing triggers for systemd (229-4ubuntu21.10) ...
Processing triggers for ureadahead (0.100.0-19) ...
● docker.service - Docker Application Container Engine
   Loaded: loaded (/lib/systemd/system/docker.service; enabled; vendor preset: enabled)
     Active: active (running) since Mon 2019-01-07 22:39:35 AST; 1s ago
       Docs: https://docs.docker.com
      Main PID: 3553 (dockerd)
        CGroup: /system.slice/docker.service
               └─3553 /usr/bin/dockerd -H unix://

Jan 07 22:39:35 ubuntu dockerd[3553]: time="2019-01-07T22:39:35.745252855-04:00" level=warning msg="Your kernel does not supp
Jan 07 22:39:35 ubuntu dockerd[3553]: time="2019-01-07T22:39:35.745469267-04:00" level=warning msg="Your kernel does not supp
Jan 07 22:39:35 ubuntu dockerd[3553]: time="2019-01-07T22:39:35.745616582-04:00" level=warning msg="Your kernel does not supp
Jan 07 22:39:35 ubuntu dockerd[3553]: time="2019-01-07T22:39:35.746099591-04:00" level=info msg="Loading containers: start."
Jan 07 22:39:35 ubuntu dockerd[3553]: time="2019-01-07T22:39:35.861035253-04:00" level=info msg="Default bridge (docker0) is
Jan 07 22:39:35 ubuntu dockerd[3553]: time="2019-01-07T22:39:35.900610238-04:00" level=info msg="Loading containers: done."
Jan 07 22:39:35 ubuntu dockerd[3553]: time="2019-01-07T22:39:35.921007222-04:00" level=info msg="Docker daemon" commit=4d60db
Jan 07 22:39:35 ubuntu dockerd[3553]: time="2019-01-07T22:39:35.921369069-04:00" level=info msg="Daemon has completed initial
Jan 07 22:39:35 ubuntu systemd[1]: Started Docker Application Container Engine.
Jan 07 22:39:35 ubuntu dockerd[3553]: time="2019-01-07T22:39:35.951442522-04:00" level=info msg="API listen on /var/run/docker
[lines 1-18/18 (END)]
```

(checking the docker service)

Thus far, we can see that the docker engine has been installed and the docker daemon is in active status. Inside the docker, we are going to implement a web server using Nginx. The tutorial I referred is from DigitalOcean (<https://www.digitalocean.com/community/tutorials/how-to-install-and-use-docker-on-ubuntu-16-04>), and there 5 steps in general to configure a Nginx based web server in a docker.

Step 1: creating a new container called “navweb” with its 80 port binds to the 80 port on host:

```
#docker run -p 80:80 --name navweb -i -t ubuntu /bin/bash
```

Step 2: install Nginx, vim (if necessary):

```
#apt-get install -y nginx vim
```

Step 3: create a static tested web page using HTML:

```
#vi /var/www/html/index.html
```

Step 4: modify Nginx configuration file and enable it:

```
#vi /etc/nginx/sites-enabled/default
```

```
#nginx
```

Step 5: binding container port to the host (host port : container port):

```
#docker ps //show container
```

```
#docker port navweb //show container port number
```

```
#docker top navweb //show container process
```

Python scripts

Install python on Ubuntu server:

```
#sudo apt-get install python
```

Download the python script to install pip:

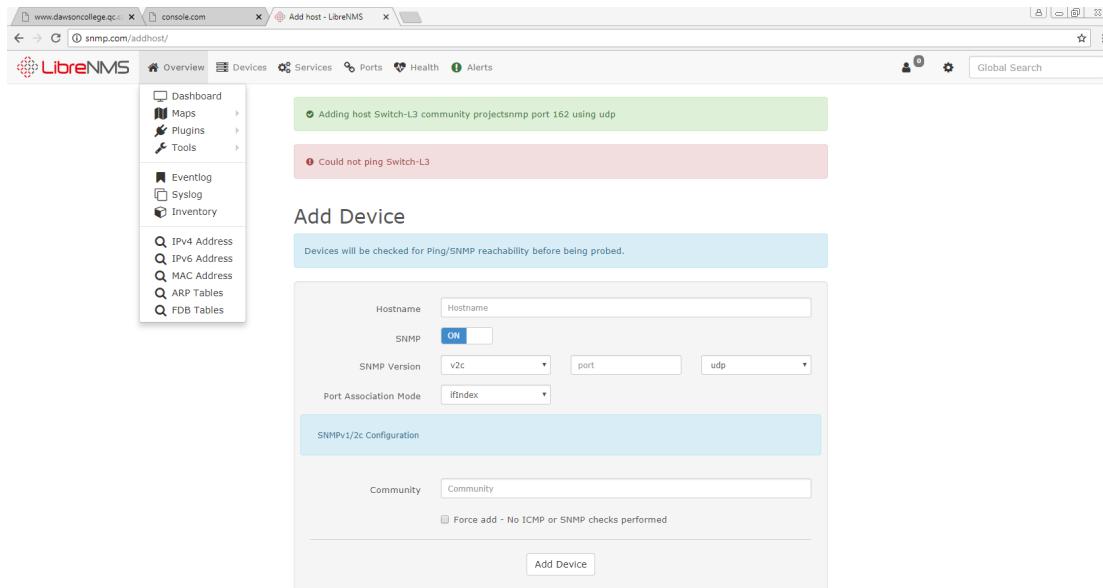
```
#curl "https://bootstrap.pypa.io/get-pip.py" -o "get-pip.py"
#python get-pip.py
```

Install python library paramiko:

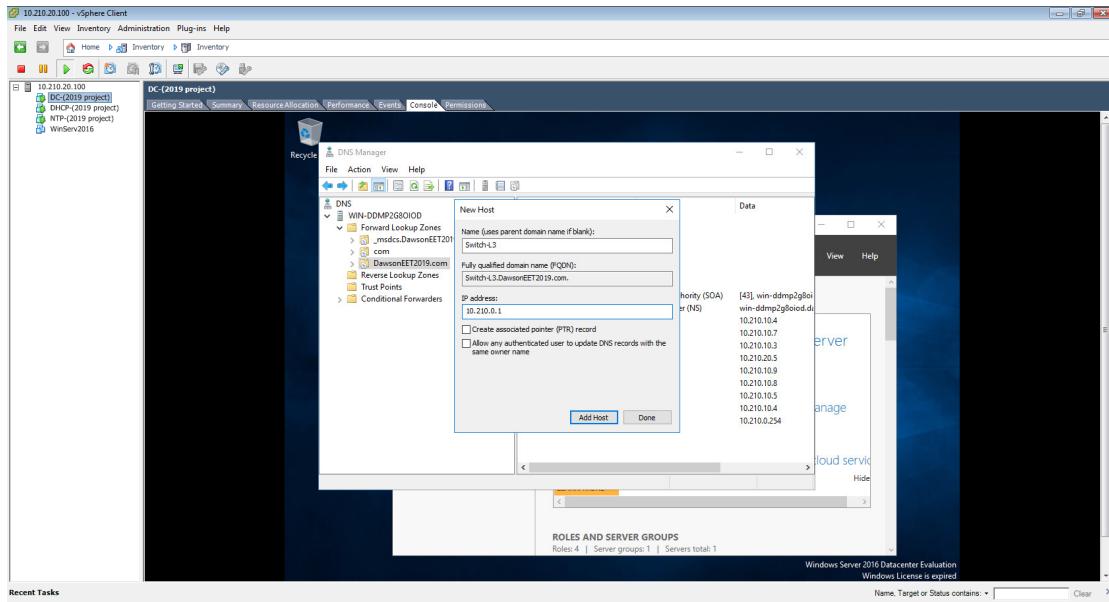
```
#pip install paramiko
```

Troubleshooting

In SNMP implementing, the server could not poll the MIB information from nodes even if all devices are enabled. I started troubleshooting from networking connectivity, from the SNMP manager the ICMP packets reached all the SNMP agents including console server, windows servers (DC/DNS, DHCP, NTP), and network devices up to the core router. Secondly, known that SNMP on Cisco devices are surely enabled from the running configuration, I checked the port number (161/162) and remote accessibility to the devices (SSH), all worked, but only the console server was discovered. I noticed the problem that in LibreNMS there is no IP address required, the only parameters that help locate the SNMP agents are the hostname and the community string. And the hostnames of the networking devices (router and switches) are not forwarded or recognized by the DNS server.



The solution is to add the network devices on each SNMP agents on DNS server and test them hostnames in SNMP server.



After binding all the IP address (including router interfaces, switch SVI) with the hostname and successfully joining the SNMP server with the domain, the SNMP agents are all added on LibreNMS platform.

Network Configurations

Basic configuration

(On layer-3 switch)

- Created administrative VLAN10 and assigned the SVI as default gateway (10.210.0.1)
- No switch port on F0/24 and assign the IP address 10.1.1.1/30 (to router)
- Configured the inter-VLAN routing using trunk on F0/23, 802.1q encapsulation (router-on-stick)

(On layer0-2 switch)

- Trunk mode on G0/1
- Interface range f0/13-24 are all in switch port access mode (VLAN 10)

All devices:

- NTP server 10.210.10.9
- IP domain-name [DawsonEET2019.com](#)
- IP name-server 10.210.10.4
- Line vty 0 4
- Login local
- Transport input ssh
- RSA key 1024

Local user

- Username: admin
- Password: Class!23

SNMP configuration:

```
Router-core(config)#snmp-server community projectsnmp ro
SNMP_ACL
Router-core(config)#snmp-server location rack1
```

```

Router-core(config)#snmp-server contact
yihuan.zhang@dawsoncollege.qc.ca
Router-core(config)#snmp-server host 10.210.10.5 version 2c
projectsnmp
Router-core(config)#snmp-server enable traps
Router-core(config)#ip access-list standard SNMP_ACL
Router-core(config-std-nacl)#permit 10.210.10.5
Router-core(config-std-nacl)#do show snmp
Chassis: FHK1446F14K
Contact: yihuan.zhang@dawsoncollege.qc.ca
Location: rack1
0 SNMP packets input
    0 Bad SNMP version errors
    0 Unknown community name
    0 Illegal operation for community name supplied
    0 Encoding errors
    0 Number of requested variables
    0 Number of altered variables
    0 Get-request PDUs
    0 Get-next PDUs
    0 Set-request PDUs
    0 Input queue packet drops (Maximum queue size 1000)
0 SNMP packets output
    0 Too big errors (Maximum packet size 1500)
    0 No such name errors
    0 Bad values errors
    0 General errors
    0 Response PDUs
    0 Trap PDUs
SNMP Dispatcher:
    queue 0/75 (current/max), 0 dropped
SNMP Engine:
    queue 0/1000 (current/max), 0 dropped

SNMP logging: enabled
    Logging to 10.210.10.5.162, 0/10, 0 sent, 0 dropped.

```

NAT configuration:

(On router)

```

Router-core(config)#ip route 0.0.0.0 0.0.0.0 192.168.1.2
Router-core(config)#$ natpool 192.168.1.1 192.168.1.1 prefix-
length 24
.Apr 26 15:51:32.768: %LINEPROT0-5-UPDOWN: Line protocol on
Interface NVI0, chan-
ged state to upacc
Router-core(config)#access-list 1 permit 10.0.0.0
0.255.255.255
Router-core(config)#ip nat inside source list 1 pool natpool
overload
Router-core(config)#int f0/1
Router-core(config-if)#ip nat inside
Router-core(config-if)#int f0/0
Router-core(config-if)#ip nat outside

```

```

Router-core(config-if)#do ping 8.8.4.4
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.4.4, timeout is 2
seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max =
1/2/4 ms

```

```

(On ASA)
description PC-A
object network NETWORK_OBJ_10.10.11.0_27
subnet 10.10.11.0 255.255.255.224
object network NETWORK_OBJ_192.168.1.0_24
subnet 192.168.1.0 255.255.255.0
object-group service DM_INLINE_SERVICE_0
service-object icmp echo
service-object icmp echo-reply
service-object tcp destination eq ftp
service-object tcp destination eq www
object-group service DM_INLINE_SERVICE_1
service-object icmp echo
service-object icmp echo-reply
service-object tcp destination eq ftp
service-object tcp destination eq www
access-list inside_authentication extended permit tcp any any
access-list SSL-ACL standard permit 192.168.1.0 255.255.255.0
access-list outside_access extended permit object-group DM_INLINE_SERVICE_1
any object DMZ-Server
access-list outside_access extended permit object-group DM_INLINE_SERVICE_0
any 200.1.1.0 255.255.255.0
pager lines 24
mtu inside 1500
mtu outside 1500
mtu dmz 1500
ip local pool SSL-POOL 10.10.11.1-10.10.11.20 mask 255.255.255.0
icmp unreachable rate-limit 1 burst-size 1
no asdm history enable
arp timeout 14400
no arp permit-nonconnected
nat (inside,outside) source static NETWORK_OBJ_192.168.1.0_24
NETWORK_OBJ_192.168.1.0_24 destination static NETWORK_OBJ_10.10.11.0_27
NETWORK_OBJ_10.10.11.0_27 no-proxy-arp route-lookup
!
object network obj-172.16.1.10
nat (dmz,outside) static 200.1.1.10
object network DMZ-Server
nat (dmz,outside) static 200.1.1.1
!
nat (inside,outside) after-auto source dynamic any interface
access-group outside_access in interface outside

```