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Tutorial: 1-04 9:00-11:00 Friday
Tutor Name: Yingying Yang
Due Date: 10/9/21

31338 Network Servers

Learning Journal Part 1

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Table of Contents

General Description

In this learning journal, my aim is to note-take my journey to develop a solid understand of networking and improve my skills to manage network servers in both CentOS/Linux and Windows. The purpose of this journal is to keep a log/record of all my system administration tasks, efforts and methods when learning this subject.

Intent

My intention in this subject is to learn the new methods of administrating these operating systems and update my configuration skills. I had some issues with VMware Fusion on my MAC due to some networking issues so I had to use my old PC for the VM lab work instead. Using the learning materials were very rewarding and I learnt a lot from doing the labs and figuring out what to do by myself. Supplementary materials of the lecture slides were also helpful while I was progressing.

Week 1

Week 1 Topic: System Start-up

Lecture 1

The lecture discusses POST, linux kernel, BIOS and UEFI differences, GRUB2 and the boot process as well as log files.

Lab 1a

Task 1: Navigate through the VMware Lab

In this task, since we are in lockdown we are downloading the two VM's 'centos64' and 'Windows Server' online. Due to some technical issues on my MAC using VMware Fusion, where ethernet1 is disabled and I could not enable it even when I tried configuring a new network adapter, I installed the two VM's on my old PC via ***VMware workstation 16*** instead and it seems to be working fine after this.

In this task, I also changed my centos vmx configuration file to add the following line:
mks.win32.useInjectedMagic = "FALSE"

The Configuration of my VM for centos:

- 2GB of Memory, 2 Processors, 20GB Hard Disk, NAT network adapter and VMNet2 network adapter

The Configuration of my VM for Windows Server:

- 4GB of Memory, 2 Processors, 60GB Hard Disk, NAT network adapter and VMNet2 network adapter

Task 2: Logging in as root and shutting down your Linux image

We are already superuser as root so we don't need to do the command '**su**'.

Ifconfig command shows ens33 and ens37, providing the configurations of the network interface. The **ls command** shows the contents of a directory.

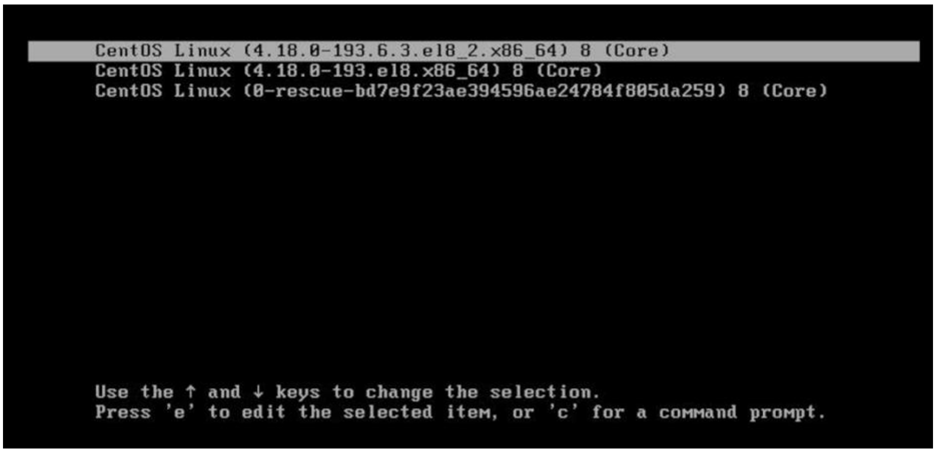
shutdown -h now - It is important to know this command as in the real world, a system administrator would use this command to power off a linux server or machine in a safe and secure manner.

Lab 1b

Task 1: Boot single-user shell only, using boot loader

In this task, we want to edit the GRUB2 boot loader to enter the single user mode. To do this we can use the following steps:

1. Boot up the centos machine
2. Wait till the grub menu screen appears
3. The grub menu should show multiple kernels and a timer. Once the timer ends which should be around 5 seconds, the kernel highlighted will be booted. We should get something like this:



```
      CentOS Linux (4.18.0-193.6.3.el8_2.x86_64) 8 (Core)
      CentOS Linux (4.18.0-193.el8.x86_64) 8 (Core)
      CentOS Linux (0-rescue-bd7e9f23ae394596ae24784f805da259) 8 (Core)


      Use the ↑ and ↓ keys to change the selection.
      Press 'e' to edit the selected item, or 'c' for a command prompt.
```

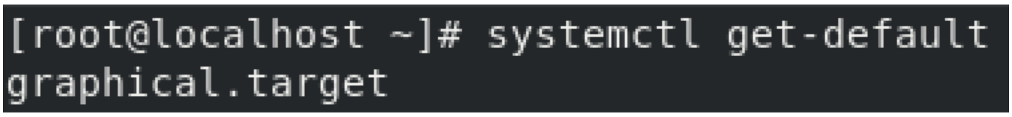
4. We want to edit the centos linux kernel (1st option) so press e to edit
5. Replace `ro` with the line: `rw init=/sysroot/bin/sh`
6. After editing the line, press **Ctrl-X** to boot machine with new parameters

Remember that single-user mode is usually for maintenance and can be used for password recovery of the root password if lost or forgotten.

Task 2: Explore and modify system start-up scripts

In task 2 we learn about targets or run levels.

We can use the command **systemctl get-default** to verify the current default target:



```
[root@localhost ~]# systemctl get-default
graphical.target
```

As seen above, the output shows *graphical.target* is the default. Using **runlevel**, we can see *graphical.target* is in **level 5** [Full Multi-User Graphical Mode]. However, we can edit this via the **systemctl isolate** command. There are four main targets we can change to:

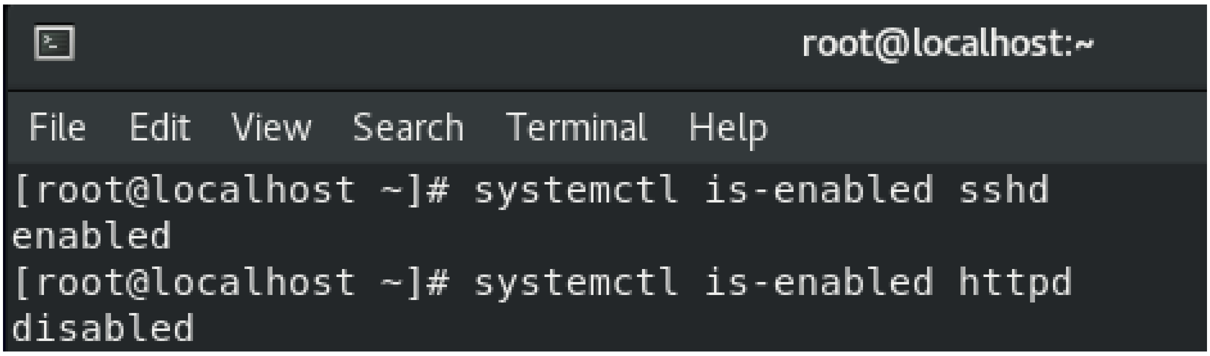
- **emergency.target** – used for emergency system recovery
- **rescue.target** – Used for system recovery but requires root password
- **multi-user.target** – multi-user mode with no graphical login
- **graphical.target** – full graphical mode

From my lab results changing the others yield:

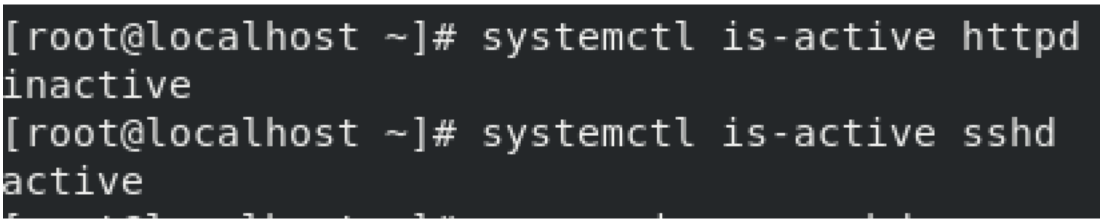
- **systemctl isolate multi-user.target** – Changes runlevel to 5 and 3. Full multi-user graphical mode and full multi-user text mode.
- **systemctl isolate rescue.target –** Changes runlevel to 3 and 1. Full multi-user text mode and single-user mode.
- **systemctl isolate emergency.target –** Changes runlevel to N and N. I am guessing this means 'Not used' but I am not sure.

systemctl list-unit-files command shows targets and services known as units. Some examples include `cups.path` [**Enabled**], `anaconda.service` [**static**], `arp-ethers.service` [**disabled**] and many more.

SSHD is enabled by default and httpd is disabled by default by using the command **syststemctl is-enabled** as seen below. We can also check if a service is active (started) or inactive (stopped) via the command **systemctl is-active.**



```
[root@localhost ~]# systemctl is-enabled sshd
enabled
[root@localhost ~]# systemctl is-enabled httpd
disabled
```



```
[root@localhost ~]# systemctl is-active httpd
inactive
[root@localhost ~]# systemctl is-active sshd
active
```

We can also use these commands to interact and stop/start services:

- `systemctl start <servicename>`
- `systemctl stop <servicename>`
- `systemctl enable <servicename>`
- `systemctl disable <servicename>`

For example, after disabling and stopping httpd by using some of these commands we should get the following:

```
[root@localhost ~]# systemctl stop httpd
[root@localhost ~]# systemctl disable httpd
[root@localhost ~]# systemctl is-enabled httpd
disabled
[root@localhost ~]# systemctl is-active httpd
inactive
```

Task 3: Examine system log information

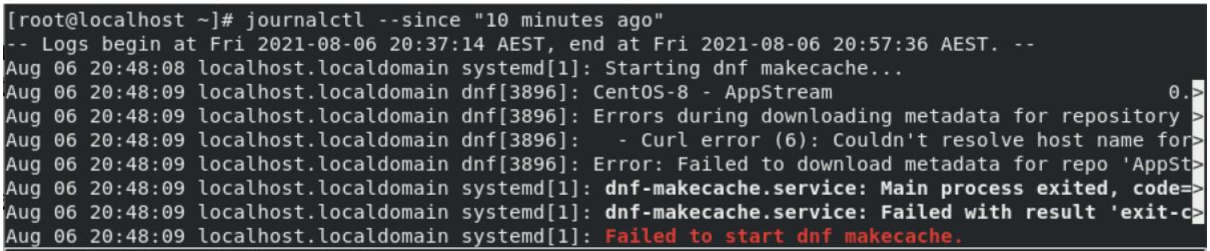
The **dmesg** command shows network protocols and driver information in the kernel ring buffer. Using **journalctl --dmesg** shows kernel message logs from boot.

The file **`/var/log/messages`** shows general system message logs.

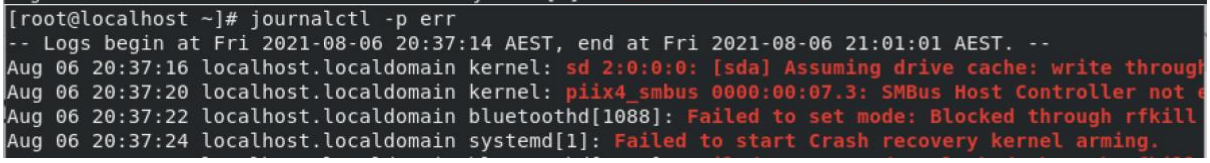
The file **`/var/log/secure`** logs information on successful/unsuccessful login attempts and authentication failures. Tracks SSH logins, sudo logins and much more. This could be useful for tracking activity of valid users as well as successful logins.

The commands below are usually used for filtering logs to look for specific information such as time, service and log type.

```
journalctl --since “10 minutes ago”
journalctl --since “2020-01-01” --until “yesterday”
journalctl -u multi-user.target
journalctl -u sshd.service
journalctl -u sshd.service --since “10 minutes ago”
journalctl -p err
journalctl -p warning
journalctl -p err --since “1 hour ago”
```



```
[root@localhost ~]# journalctl --since "10 minutes ago"
-- Logs begin at Fri 2021-08-06 20:37:14 AEST, end at Fri 2021-08-06 20:57:36 AEST. --
Aug 06 20:48:08 localhost.localdomain systemd[1]: Starting dnf makecache...
Aug 06 20:48:09 localhost.localdomain dnf[3896]: CentOS-8 - AppStream                         0.>
Aug 06 20:48:09 localhost.localdomain dnf[3896]: Errors during downloading metadata for repository >
Aug 06 20:48:09 localhost.localdomain dnf[3896]:   - Curl error (6): Couldn't resolve host name for>
Aug 06 20:48:09 localhost.localdomain dnf[3896]: Error: Failed to download metadata for repo 'AppSt>
Aug 06 20:48:09 localhost.localdomain systemd[1]: dnf-makecache.service: Main process exited, code=>
Aug 06 20:48:09 localhost.localdomain systemd[1]: dnf-makecache.service: Failed with result 'exit-c>
Aug 06 20:48:09 localhost.localdomain systemd[1]: Failed to start dnf makecache.
```

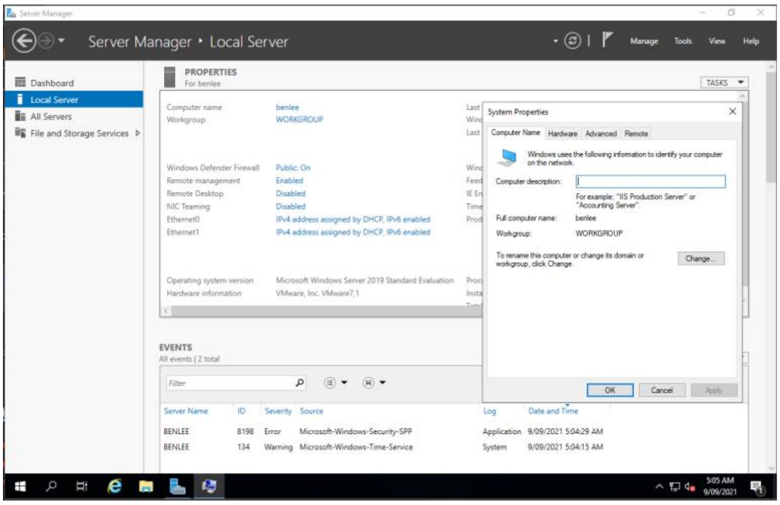


```
[root@localhost ~]# journalctl -p err
-- Logs begin at Fri 2021-08-06 20:37:14 AEST, end at Fri 2021-08-06 21:01:01 AEST. --
Aug 06 20:37:16 localhost.localdomain kernel: sd 2:0:0:0: [sda] Assuming drive cache: write through
Aug 06 20:37:20 localhost.localdomain kernel: piix4_smbus 0000:00:07.3: SMBus Host Controller not e
Aug 06 20:37:22 localhost.localdomain bluetoothd[1088]: Failed to set mode: Blocked through rfkill
Aug 06 20:37:24 localhost.localdomain systemd[1]: Failed to start Crash recovery kernel arming.
```

Lab 1c

Task 1: Startup

Changed the hostname in Windows using Server Manager to benlee as you can see below after reboot. Also checked time zone, updates and network settings which seemed fine on my PC. When I did this on my MAC via VMware Fusion I couldn't connect Ethernet1, and DHCP couldn't be enabled no matter what I tried. I switched to my old PC and installed my VM's on there and that fixed the problem.



PROPERTIES
For benlee

Computer name: benlee
Workgroup: WORKGROUP

Windows Defender Firewall: Public: On
Remote management: Enabled
Remote Desktop: Disabled
NIC Teaming: Disabled
Ethernet0: IPv4 address assigned by DHCP, IPv6 enabled
Ethernet1: IPv4 address assigned by DHCP, IPv6 enabled

Operating system version: Microsoft Windows Server 2019 Standard Evaluation
Hardware information: VMware, Inc. VMware7,1

System Properties

Computer Name | Hardware | Advanced | Remote

Windows uses the following information to identify your computer on the network.

Computer description:

For example: "IIS Production Server" or "Accounting Server".

Full computer name: benlee

Workgroup: WORKGROUP

To rename this computer or change its domain or workgroup, click Change.

EVENTS
All events | 2 total

Server Name	ID	Severity	Source	Log	Date and Time
BENLEE	8198	Error	Microsoft-Windows-Security-SPP	Application	9/09/2021 5:04:29 AM
BENLEE	134	Warning	Microsoft-Windows-Time-Service	System	9/09/2021 5:04:15 AM

5:05 AM
9/09/2021

Task 2: Server Management

Device manager can be found in **Tools → Computer Management → Device Manager**. We can find various things in here such as Monitors, graphics cards, ports, processors, disk drives, network adapters and much more. This is different to linux as windows has the ability to show hardware. Linux cannot do that.

IP Address Windows: 192.168.192.129

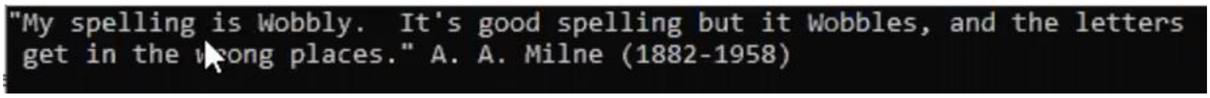
IP Address Linux: 192.168.192.128

Gateway is 192.168.192.2 and the subnet mask is 255.255.255.0

To add Telnet Client and Simple TCP/IP Services: **Server Manager → Manage → Add Roles and Features → Skip Installation Type, Server selection, Server roles → In features tick Simple TCP/IP Services and Telnet → Install.**

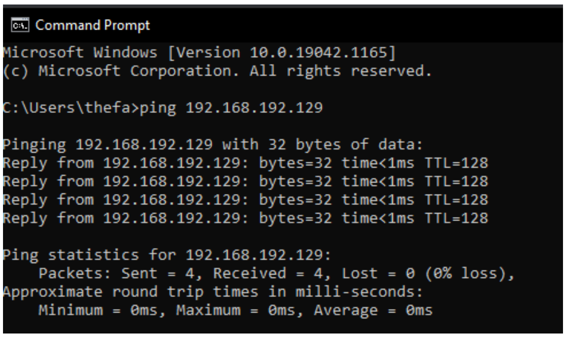
Make sure Simple TCIP/IP Services is enabled by going to Tools → Services → Enabling Simple TCP/IP Services. Check Status is 'running'.

Typing **telnet localhost 13** shows time and date and if telnet is working, **telnet localhost 17** shows some random quotes.



```
"My spelling is Wobbly.  It's good spelling but it Wobbles, and the letters
 get in the wrong places." A. A. Milne (1882-1958)
```

I tried to telnet and ping to the Windows virtual machine but it didn't work. Was a firewall issue, after disabling the firewall I was able to telnet and ping.



```
Microsoft Windows [Version 10.0.19042.1165]
(c) Microsoft Corporation. All rights reserved.

C:\Users\thefa>ping 192.168.192.129

Pinging 192.168.192.129 with 32 bytes of data:
Reply from 192.168.192.129: bytes=32 time<1ms TTL=128
Reply from 192.168.192.129: bytes=32 time<1ms TTL=128
Reply from 192.168.192.129: bytes=32 time<1ms TTL=128
Reply from 192.168.192.129: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.192.129:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Task 3: Command line

net start command provides a list of started services such as DHCP Client, DNS Client, COM+ Event System etc.

Using **net stop "Simple TCP/IP Services"** I got the following output:

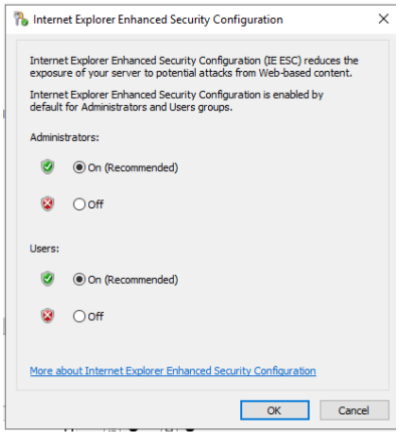
```
The Simple TCP/IP Services service is stopping.
The Simple TCP/IP Services service was stopped successfully.
```

After stopping the service telnet doesn't work anymore as the service has been stopped.

Adding the one rule: `netsh advfirewall firewall add rule name="TCP Port 17" dir=inaction=allow protocol=TCP localport=17`, and I was able to telnet from my host station.

Task 4: Documentation

We can disable IE Enhanced Security Configuration by going to **Server Manager → Local Server → IE Enhanced Security Configuration**



Internet Explorer Enhanced Security Configuration

Internet Explorer Enhanced Security Configuration (IE ESC) reduces the exposure of your server to potential attacks from Web-based content.

Internet Explorer Enhanced Security Configuration is enabled by default for Administrators and Users groups.

Administrators:

● On (Recommended)

○ Off

Users:

● On (Recommended)

○ Off

More about Internet Explorer Enhanced Security Configuration

It should be on for both administrators and users. We can disable the Security configuration by clicking 'Off' for both administrators and users.

Week 2

Week 2 topic: System Documentation, Hardware and kernel configuration System installation and management

Lecture 2

This lecture discusses documentation for windows and linux, kernel modules, hardware configuration, understanding filesystems, software packages and contains useful information on viewing processes

Lab 2a

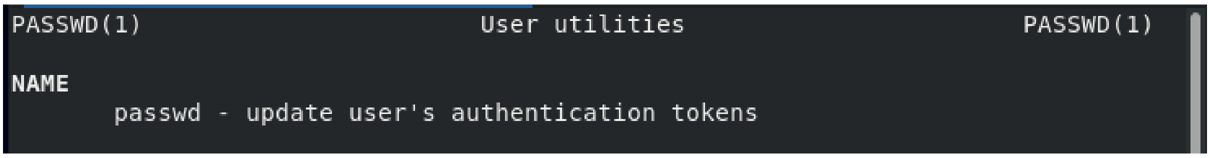
Task 1: Using and configuring man pages

Entering **mandb -cqs &** in terminal we get this:

```
[root@benjamin ~]# mandb -cqs &
[1] 3018
```

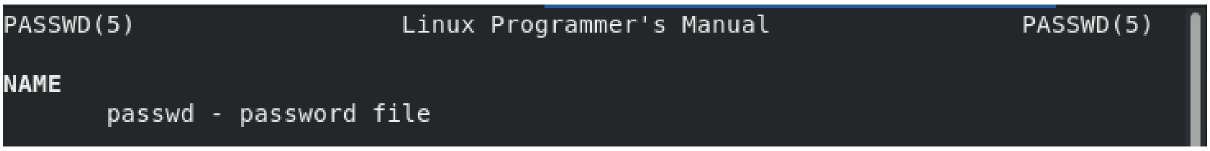
Running **man 1 passwd** and **man 5 passwd** we can see the difference is that:

- **man 1 passwd –** Shows 1st section of **passwd** man pages: 'User Utilities'



```
PASSWD(1)                    User utilities                    PASSWD(1)

NAME
       passwd - update user's authentication tokens
```

- **man 5 passwd –** Shows 5th section of **passwd** man pages: 'Password file' and is part of the Linux Programmer's Manual'



```
PASSWD(5)                Linux Programmer's Manual                PASSWD(5)

NAME
       passwd - password file
```

man grep and **info grep** are similar as they both display man pages of **grep**, however they both have there own differences.

- **man grep** displays how grep can be used with a description and various options, outputs and prefixes.
- **info grep** displays interactive man pages, showing how to use grep and includes a **menu** of different sections that the user can navigate towards on various commands.

whatis passwd

```
[root@benjamin ~]# whatis passwd
openssl-passwd (1ssl) - compute password hashes
passwd (1)           - update user's authentication tokens
passwd (5)           - password file
```

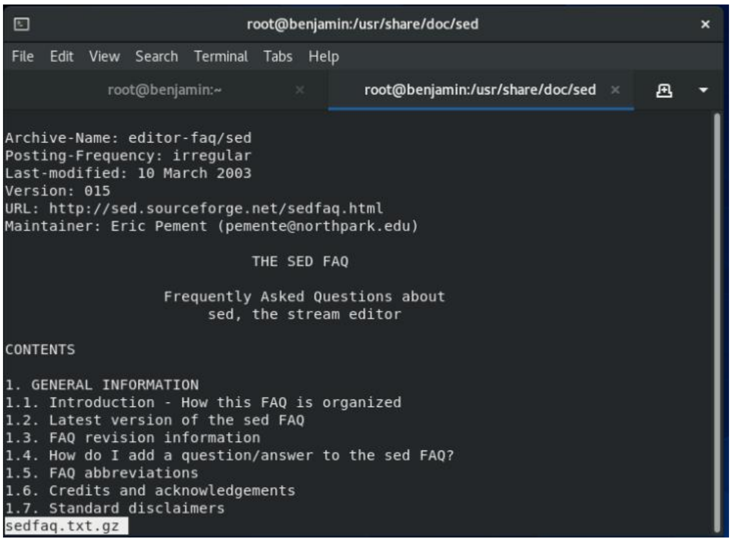
apropos passwd

```
[root@benjamin ~]# apropos passwd
chgpasswd (8)        - update group passwords in batch mode
chpasswd (8)         - update passwords in batch mode
fgetpwent_r (3)      - get passwd file entry reentrantly
getpwent_r (3)       - get passwd file entry reentrantly
gpasswd (1)          - administer /etc/group and /etc/gshadow
grub2-mkpasswd-pbkdf2 (1) - Generate a PBKDF2 password hash.
htpasswd (1)         - Manage user files for basic authentication
ldappasswd (1)       - change the password of an LDAP entry
lpasswd (1)          - Change group or user password
openssl-passwd (1ssl) - compute password hashes
```

- **whatis** displays ONLY *man page descriptions*
- **apropos** ***returns more results*** as it provides and searches the *names and descriptions* in man pages

Task 2: Finding installed package documentation

- Going into directory `/usr/share/doc/sed*/` we can view the contents of the FAQ file via the command `zless sedfaq.txt.gz`



root@benjamin:/usr/share/doc/sed
File Edit View Search Terminal Tabs Help
root@benjamin:~
root@benjamin:/usr/share/doc/sed

```
Archive-Name: editor-faq/sed
Posting-Frequency: irregular
Last-modified: 10 March 2003
Version: 015
URL: http://sed.sourceforge.net/sedfaq.html
Maintainer: Eric Pement (pemente@northpark.edu)

                            THE SED FAQ

                  Frequently Asked Questions about
                       sed, the stream editor

CONTENTS

1. GENERAL INFORMATION
1.1. Introduction - How this FAQ is organized
1.2. Latest version of the sed FAQ
1.3. FAQ revision information
1.4. How do I add a question/answer to the sed FAQ?
1.5. FAQ abbreviations
1.6. Credits and acknowledgements
1.7. Standard disclaimers
sedfaq.txt.gz
```

Task 3: Finding installed package documentation

- HowtoDocument Linux Clock: http://tldp.org/HOWTO/Clock.html
- Main Linux FAQ: https://tldp.org/HOWTO/META-FAQ.html
- Linux Sys Admin Guide: https://tldp.org/LDP/sag/html/index.html

Lab 2b

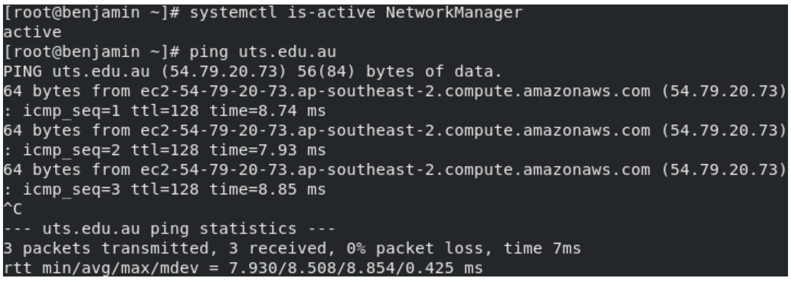
Task 1: Enable Linux networking

To enable the NetworkManager service use command **systemctl enable NetworkManager**

To start the service use command **systemctl start NetworkManager**

You can check if NetworkManager service is active via the command **systemctl is-active NetworkManager. It should state – 'active'**

Pinging uts.edu.au shows that the network is working



```
[root@benjamin ~]# systemctl is-active NetworkManager
active
[root@benjamin ~]# ping uts.edu.au
PING uts.edu.au (54.79.20.73) 56(84) bytes of data.
64 bytes from ec2-54-79-20-73.ap-southeast-2.compute.amazonaws.com (54.79.20.73)
: icmp_seq=1 ttl=128 time=8.74 ms
64 bytes from ec2-54-79-20-73.ap-southeast-2.compute.amazonaws.com (54.79.20.73)
: icmp_seq=2 ttl=128 time=7.93 ms
64 bytes from ec2-54-79-20-73.ap-southeast-2.compute.amazonaws.com (54.79.20.73)
: icmp_seq=3 ttl=128 time=8.85 ms
^C
--- uts.edu.au ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 7ms
rtt min/avg/max/mdev = 7.930/8.508/8.854/0.425 ms
```

Task 2: Updates for Linux

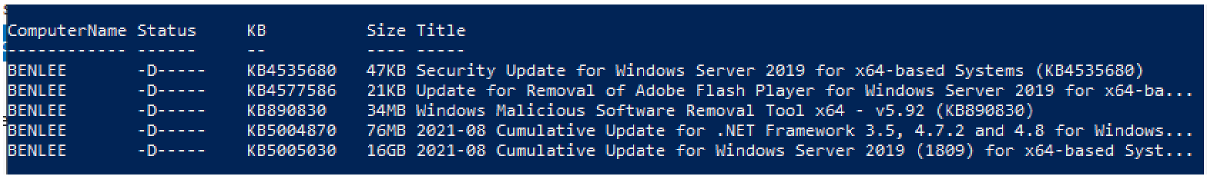
We can use the command **gnome-software** to start the Gnome Software Manager. All my packages seem up to date. Updates of packages can also be fetched and installed using yum. XXXXX can be a package name of our choice such as 'dhcp-server' (yum install dhcp-server)

```
yum check-update
yum search XXXXX
yum install XXXXX
yum update XXXXX
yum remove XXXXX
```

Task 3: Updates for Windows

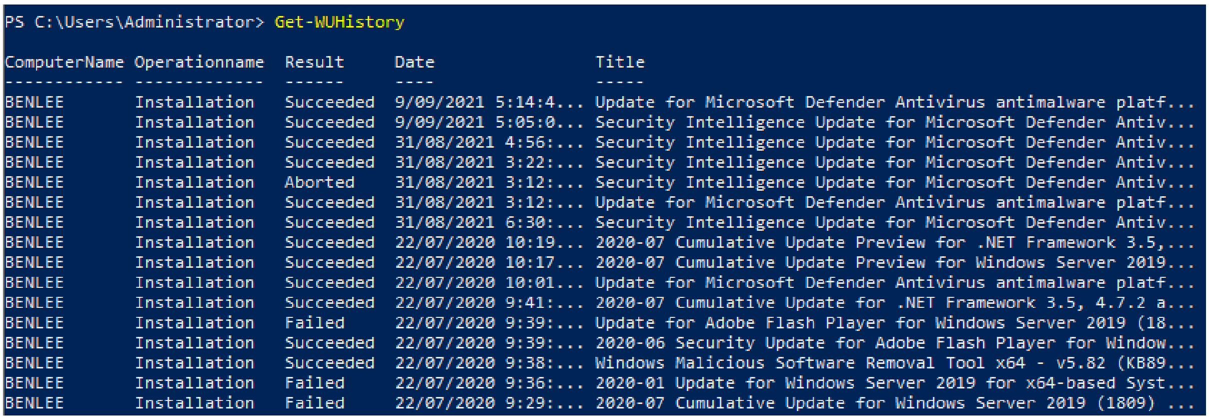
My results from using the commands in powershell:

- **Get-WindowsUpdate** – Shows 5 updates to be installed



```
ComputerName Status     KB          Size Title
------------ ------     --          ---- -----
BENLEE       -D-----    KB4535680   47KB Security Update for Windows Server 2019 for x64-based Systems (KB4535680)
BENLEE       -D-----    KB4577586   21KB Update for Removal of Adobe Flash Player for Windows Server 2019 for x64-ba...
BENLEE       -D-----    KB890830    34MB Windows Malicious Software Removal Tool x64 - v5.92 (KB890830)
BENLEE       -D-----    KB5004870   76MB 2021-08 Cumulative Update for .NET Framework 3.5, 4.7.2 and 4.8 for Windows...
BENLEE       -D-----    KB5005030   16GB 2021-08 Cumulative Update for Windows Server 2019 (1809) for x64-based Syst...
```

- **Get-WULastResults** – Shows last time updates were checked. Also shows Installation success date: 22/7/20 12:04am and last search success date: 8/9/21 7:51pm
- **Get-WUHistory** – Shows my history of updates. Updates that have been installed and some that failed



```
PS C:\Users\Administrator> Get-WUHistory

ComputerName Operationname  Result     Date                 Title
------------ -------------  ------     ----                 -----
BENLEE       Installation   Succeeded  9/09/2021 5:14:4... Update for Microsoft Defender Antivirus antimalware platf...
BENLEE       Installation   Succeeded  9/09/2021 5:05:0... Security Intelligence Update for Microsoft Defender Antiv...
BENLEE       Installation   Succeeded  31/08/2021 4:56:... Security Intelligence Update for Microsoft Defender Antiv...
BENLEE       Installation   Succeeded  31/08/2021 3:22:... Security Intelligence Update for Microsoft Defender Antiv...
BENLEE       Installation   Aborted    31/08/2021 3:12:... Security Intelligence Update for Microsoft Defender Antiv...
BENLEE       Installation   Succeeded  31/08/2021 3:12:... Update for Microsoft Defender Antivirus antimalware platf...
BENLEE       Installation   Succeeded  31/08/2021 6:30:... Security Intelligence Update for Microsoft Defender Antiv...
BENLEE       Installation   Succeeded  22/07/2020 10:19... 2020-07 Cumulative Update Preview for .NET Framework 3.5,...
BENLEE       Installation   Succeeded  22/07/2020 10:17... 2020-07 Cumulative Update Preview for Windows Server 2019...
BENLEE       Installation   Succeeded  22/07/2020 10:01... Update for Microsoft Defender Antivirus antimalware platf...
BENLEE       Installation   Succeeded  22/07/2020 9:41:... 2020-07 Cumulative Update for .NET Framework 3.5, 4.7.2 a...
BENLEE       Installation   Failed     22/07/2020 9:39:... Update for Adobe Flash Player for Windows Server 2019 (18...
BENLEE       Installation   Succeeded  22/07/2020 9:39:... 2020-06 Security Update for Adobe Flash Player for Window...
BENLEE       Installation   Succeeded  22/07/2020 9:38:... Windows Malicious Software Removal Tool x64 - v5.82 (KB89...
BENLEE       Installation   Failed     22/07/2020 9:36:... 2020-01 Update for Windows Server 2019 for x64-based Syst...
BENLEE       Installation   Failed     22/07/2020 9:29:... 2020-07 Cumulative Update for Windows Server 2019 (1809) ...
```

- **Get-WURebootStatus** – Shows reboot status to install newer updates. In this case no, the rebootrequired says ‘false’

Lab 2c

Task 1: Viewing process information in Linux

The **ps** command shows running processes.

```
[root@benjamin ~]# ps
    PID TTY          TIME CMD
   3032 pts/0    00:00:00 bash
   3335 pts/0    00:00:00 ps
```

- **ps -ef** shows every process running in the current shell of our linux system
- **ps -ef --forest** shows every running process with another column that displays a process tree. The tree shows parent and child processes as well as the locations of commands/services within the file system.
- Processes near the top of the list when using the **top** command are gnome-shell and sssd_kcm. Since I am not at UTS I use the VM for the next 2 parts for memory and swap.
  - There is 1960.1 MiB of physical memory installed where 255 MiB of it is free
  - There is 2048 MiB of Swap installed and 1931MiB of it free

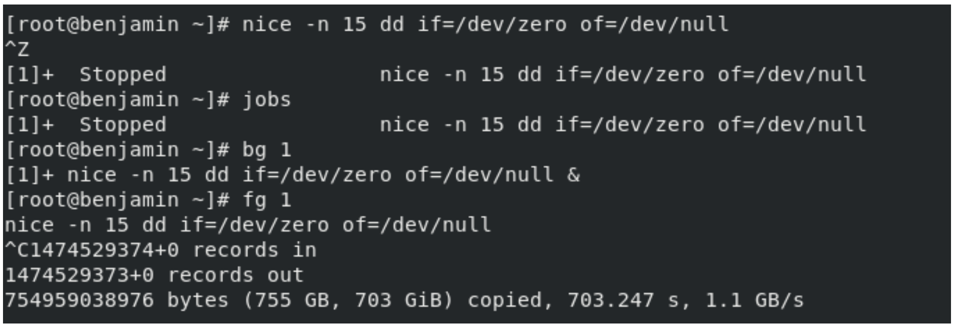
Task 2: Viewing and changing process priorities in Linux

From dd, PID is 3674 and has a default nice value of 0 and priority of 20.

- After killing the **dd** process via the command **kill 3674,** going back to the first terminal shows ‘terminated’.
- Entering the command **nice –n 15 dd if=/dev/zero of=/dev/null**, using **top** shows dd now has a nice value of 15. The new PID is 3818.
- Running the command **renice -20 3818** makes **dd** the **highest priority**. Nice value of -20 and priority of 0.
- **top** while using command **rpm -qa** allowed me to get a nice value of 0 and priority of 20
- **renice 19 35064** makes dd have a new priority of 39 and a nice value of 19.

Task 3: Job control in Linux

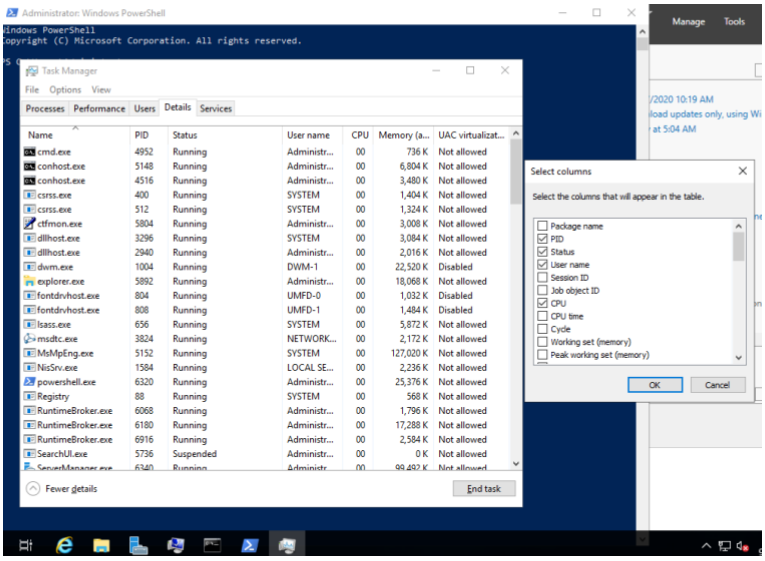
- Pressing **Ctrl-Z** in the first console window tells me that **dd** has ‘**stopped**’.
- **bg 1** makes **dd** run in the background. ‘1’ is the job number. To bring **dd** back to the foreground use **fg 1**. After using **fg 1,** we can see anything we input is echoed to the screen. We can use **Ctrl-C** to kill the process



```
[root@benjamin ~]# nice -n 15 dd if=/dev/zero of=/dev/null
^Z
[1]+  Stopped                 nice -n 15 dd if=/dev/zero of=/dev/null
[root@benjamin ~]# jobs
[1]+  Stopped                 nice -n 15 dd if=/dev/zero of=/dev/null
[root@benjamin ~]# bg 1
[1]+ nice -n 15 dd if=/dev/zero of=/dev/null &
[root@benjamin ~]# fg 1
nice -n 15 dd if=/dev/zero of=/dev/null
^C1474529374+0 records in
1474529373+0 records out
754959038976 bytes (755 GB, 703 GiB) copied, 703.247 s, 1.1 GB/s
```

Task 4: Viewing processes in Windows

To view processes in Windows we can use the Task Manager. Going to the details tab, we can select various columns that we want to appear in the table by right clicking the column heading and selecting '**Select Columns**' as seen in the picture below:



```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.
```

Name	PID	Status	User name	CPU	Memory (a...	UAC virtualizat...
cmd.exe	4952	Running	Administr...	00	736 K	Not allowed
conhost.exe	5148	Running	Administr...	00	6,804 K	Not allowed
conhost.exe	4516	Running	Administr...	00	3,480 K	Not allowed
csrss.exe	400	Running	SYSTEM	00	1,404 K	Not allowed
csrss.exe	512	Running	SYSTEM	00	1,324 K	Not allowed
ctfmon.exe	5804	Running	Administr...	00	3,008 K	Not allowed
dllhost.exe	3296	Running	SYSTEM	00	3,084 K	Not allowed
dllhost.exe	2940	Running	Administr...	00	2,016 K	Not allowed
dwm.exe	1004	Running	DWM-1	00	22,520 K	Disabled
explorer.exe	5892	Running	Administr...	00	18,068 K	Not allowed
fontdrvhost.exe	804	Running	UMFD-0	00	1,032 K	Disabled
fontdrvhost.exe	808	Running	UMFD-1	00	1,484 K	Disabled
lsass.exe	656	Running	SYSTEM	00	5,872 K	Not allowed
msdtc.exe	3824	Running	NETWORK...	00	2,172 K	Not allowed
MsMpEng.exe	5152	Running	SYSTEM	00	127,020 K	Not allowed
NisSrv.exe	1584	Running	LOCAL SE...	00	2,236 K	Not allowed
powershell.exe	6320	Running	Administr...	00	25,376 K	Not allowed
Registry	88	Running	SYSTEM	00	568 K	Not allowed
RuntimeBroker.exe	6068	Running	Administr...	00	1,796 K	Not allowed
RuntimeBroker.exe	6180	Running	Administr...	00	17,288 K	Not allowed
RuntimeBroker.exe	6916	Running	Administr...	00	2,584 K	Not allowed
SearchUI.exe	5736	Suspended	Administr...	00	0 K	Not allowed
ServerManager.exe	6340	Running	Administr...	00	99,492 K	Not allowed

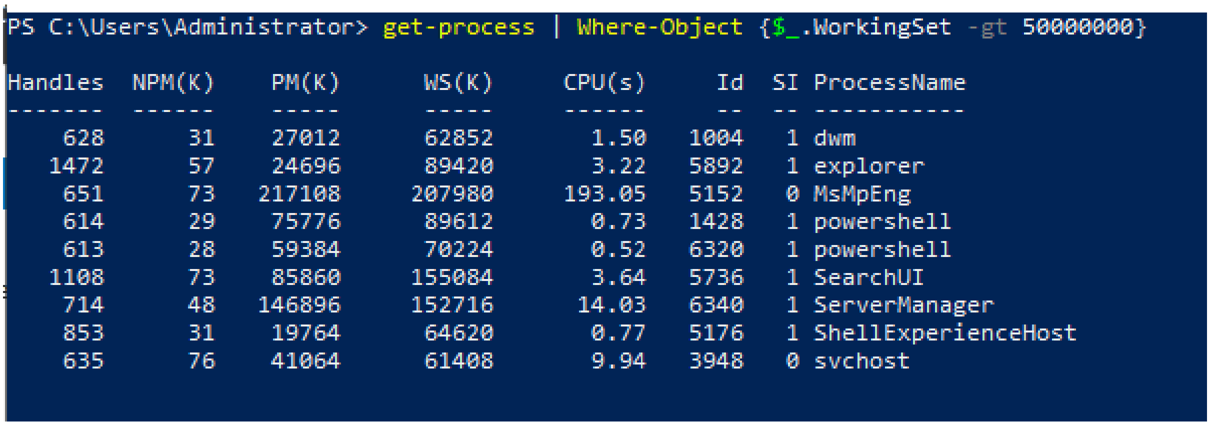
Select columns

Select the columns that will appear in the table.

- □ Package name
- ☑ PID
- ☑ Status
- ☑ User name
- □ Session ID
- □ Job object ID
- ☑ CPU
- □ CPU time
- □ Cycle
- □ Working set (memory)
- □ Peak working set (memory)

/2020 10:19 AM
load updates only, using Wi
at 5:04 AM

Get-Process command in PowerShell shows running processes, however, the processes aren't updated in real time unlike Task Manager. To show all Window processes 50MB or greater in size use command: **Get-Process | Where-Object {$_.WorkingSet -gt 50000000}**



```
PS C:\Users\Administrator> get-process | Where-Object {$_.WorkingSet -gt 50000000}

Handles  NPM(K)    PM(K)      WS(K)     CPU(s)     Id  SI ProcessName
-------  ------    -----      -----     ------     --  -- -----------
    628      31    27012      62852       1.50   1004   1 dwm
   1472      57    24696      89420       3.22   5892   1 explorer
    651      73   217108     207980     193.05   5152   0 MsMpEng
    614      29    75776      89612       0.73   1428   1 powershell
    613      28    59384      70224       0.52   6320   1 powershell
   1108      73    85860     155084       3.64   5736   1 SearchUI
    714      48   146896     152716      14.03   6340   1 ServerManager
    853      31    19764      64620       0.77   5176   1 ShellExperienceHost
    635      76    41064      61408       9.94   3948   0 svchost
```

Task 5: Killing a process in Windows

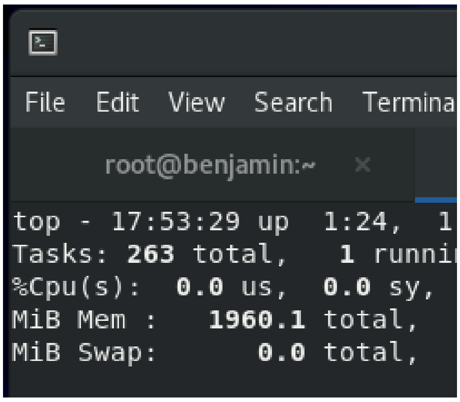
In this exercise we try to kill **cmd.exe**. Killing **cmd.exe** in Task Manager makes **cmd.exe** disappear. Using commands **Stop-Process –ID 4804** and **taskkill /PID 4726** in PowerShell have the same effect.

Lab 2d

Task 1: Linux disk partitioning

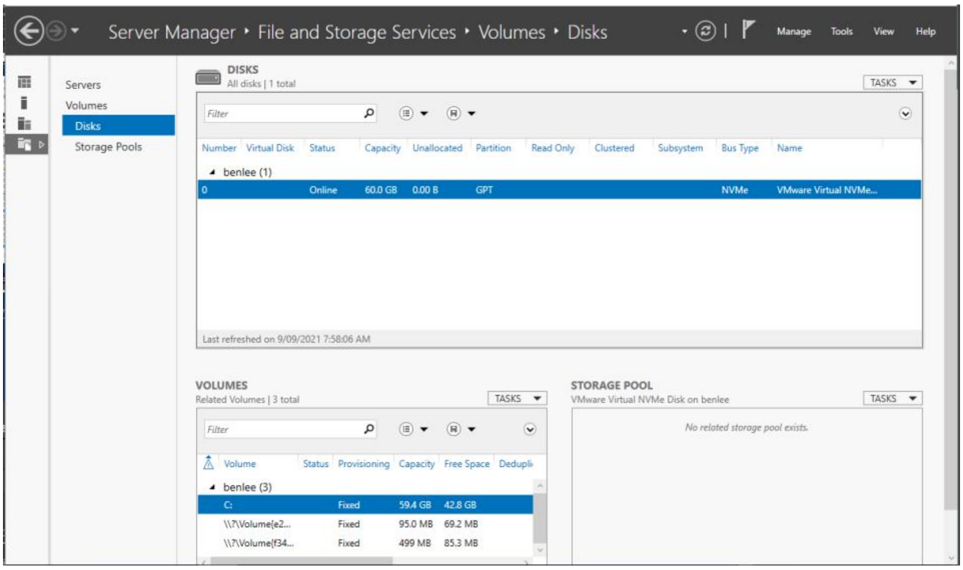
The `/boot` device is not managed by LVM. LVM doesn't manage `/boot` as it would make the OS unbootable.

Running **swapoff -a,** we can see via the **top** command that the Swap MiB goes to 0 as we close the partition. Running **swapon -a** returns it back to 2048 MiB due to us reopening the partition.



```
top - 17:53:29 up  1:24,  1
Tasks: 263 total,   1 runni
%Cpu(s):  0.0 us,  0.0 sy,
MiB Mem :   1960.1 total,
MiB Swap:      0.0 total,
```

Task 3: Windows Server Disk Management



DISKS
All disks | 1 total

Number	Virtual Disk	Status	Capacity	Unallocated	Partition	Read Only	Clustered	Subsystem	Bus Type	Name
benlee (1)										
0		Online	60.0 GB	0.00 B	GPT				NVMe	VMware Virtual NVMe...

Last refreshed on 9/09/2021 7:58:06 AM

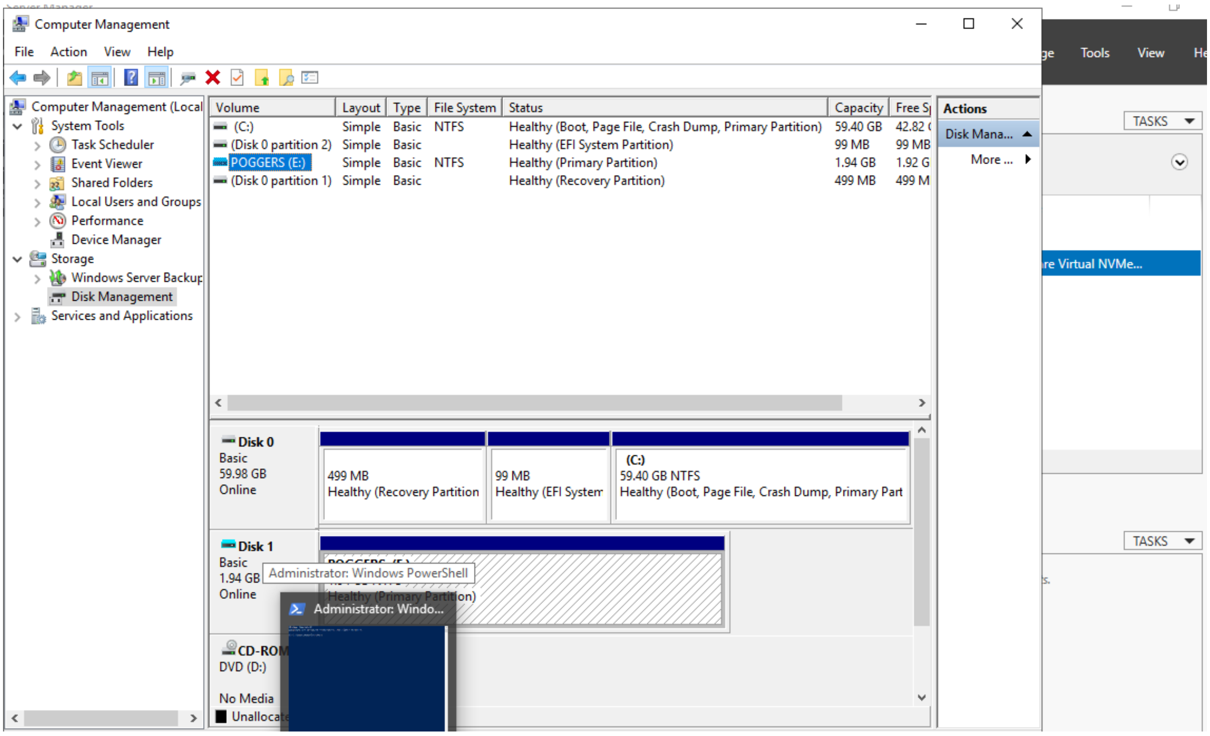
VOLUMES
Related Volumes | 3 total

Volume	Status	Provisioning	Capacity	Free Space	Dedupli
benlee (3)					
C:		Fixed	59.4 GB	42.8 GB	
\\?\Volume{e2...		Fixed	95.0 MB	69.2 MB	
\\?\Volume{f34...		Fixed	499 MB	85.3 MB	

STORAGE POOL
VMware Virtual NVMe Disk on benlee

No related storage pool exists.

- As seen in the picture above, I have 3 fixed partitions/volumes. I found this by going through **Server Manager→ File and Storage Devices → Volumes → Disks**. The main volume is 59.4GB with 42.8GB free space remaining which is our main OS hard drive. Unfortunately, I don't have any spare USB's. My last one corrupted doing my digital forensics assignment.
- To Manage disks we can create and format disk partitions by going into **Computer Management→ Storage → Disk Management.** In my case, I created a new VHD called 'POGGERS' with NTFS file system and 2GB in size. You can check image below. To create a new VHD right click disk Management and select create VHD.



Volume	Layout	Type	File System	Status	Capacity	Free Sp
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	59.40 GB	42.82 (
(Disk 0 partition 2)	Simple	Basic		Healthy (EFI System Partition)	99 MB	99 MB
POGGERS (E:)	Simple	Basic	NTFS	Healthy (Primary Partition)	1.94 GB	1.92 G
(Disk 0 partition 1)	Simple	Basic		Healthy (Recovery Partition)	499 MB	499 M

Disk 0
Basic
59.98 GB
Online

499 MB
Healthy (Recovery Partition

99 MB
Healthy (EFI System

(C:)
59.40 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Part

Disk 1
Basic
1.94 GB
Online

Healthy (Primary Partition)

CD-ROM
DVD (D:)

No Media

Unallocat

Week 3

Week 3 Topic: Networking and services

Lecture 3

Lecture discusses Network layers and addresses, how to configure networks on Windows and Linux, security via firewalls and iptables and NTP troubleshooting.

Lab 3a

Task 1: Querying your network configuration

- **Ifconfig (Linux) and ipconfig (Windows):** Used to display network configuration information such as IP, Default Gateway, netmask, broadcast address etc.
- **route -n (Linux):** Shows Kernel IP routing table
- **route print -4 (Windows):** Shows IPv4 routing table
- We can also find DNS Suffix for linux using the command **cat /etc/resolv.conf**

Using the commands above to fill table below:

Linux: ens33		Windows: Ethernet0	
DNS Suffix	192.168.192.2	**DNS Suffix**	192.168.192.2
IP Address	192.168.192.128	**IP Address**	192.168.192.129
Subnet Mask	255.255.255.0	**Subnet Mask**	255.255.255.0
Default Gateway	192.168.192.2	**Default Gateway**	192.168.192.2

Task 2: Designing the network

Linux: ens37		Windows: Ethernet1	
DNS Suffix	10.0.2.1	**DNS Suffix**	10.0.2.1
IP Address	10.0.2.1	**IP Address**	10.0.2.2
Subnet Mask	255.255.255.0	**Subnet Mask**	255.255.255.0
Default Gateway	10.0.2.1	**Default Gateway**	10.0.2.1

Task 3: Command-line configuration

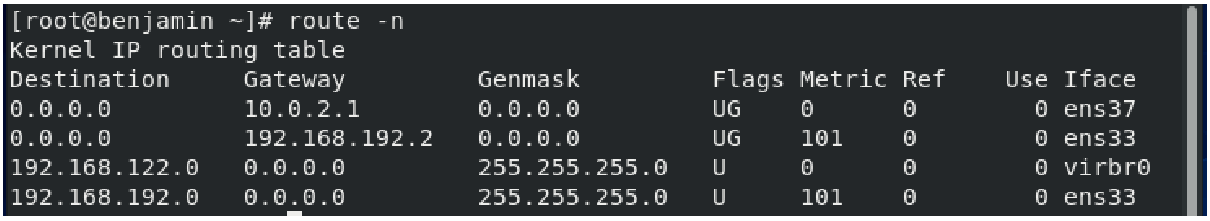
In this task, DHCP should be configured for the VM's. My tasks is to configure ens37 in centos and Ethernet1 in Windows Server to setup our own private network.

3a: Linux server

ifconfig is used to configure a temporary IP address of 10.0.2.1. Default gateway is configured via **route** command to 10.0.2.1

```
[root@benjamin ~]# ifconfig ens37 10.0.2.1 netmask 255.255.255.0
[root@benjamin ~]# route add default gw 10.0.2.1
```

Viewing the routing table with **route -n.**



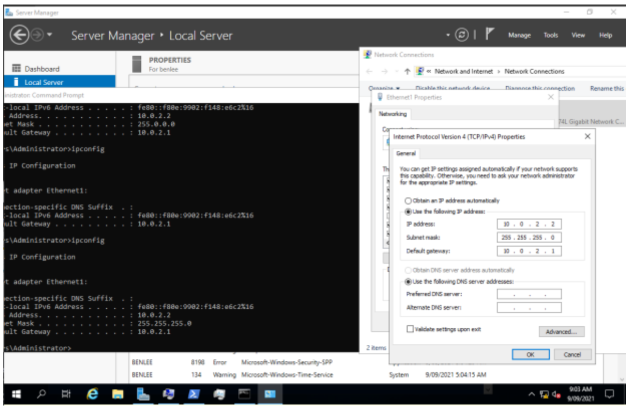
```
[root@benjamin ~]# route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         10.0.2.1        0.0.0.0         UG    0      0        0 ens37
0.0.0.0         192.168.192.2   0.0.0.0         UG    101    0        0 ens33
192.168.122.0   0.0.0.0         255.255.255.0   U     0      0        0 virbr0
192.168.192.0   0.0.0.0         255.255.255.0   U     101    0        0 ens33
```

Pinging ens33 works but ens37 no, probably due to multiple default gateways. We should keep the ens33 default gateway for internet.

3b: Windows server

We should Disable Ethernet 0 and enable Ethernet1. To configure a static IP on Windows, navigate to **Server Manager → Local Server → Ethernet1**

Right click **Ethernet1 → Properties → Internet Protocol Version 4 (TCP/IPv4) → Properties** and configure the interface to have IP 10.0.2.2, sub netmask 255.255.255.0 and Default gateway of 10.0.2.1. We can check if everything is correct via ipconfig and pinging 10.0.2.1 which is pingable.



```
-local IPv6 Address . . . . . : fe80::f80e:9902:f148:e6c2%16
 Address. . . . . . . . . . . : 10.0.2.2
et Mask . . . . . . . . . . . : 255.0.0.0
ult Gateway . . . . . . . . . : 10.0.2.1

s\Administrator>ipconfig

 IP Configuration


t adapter Ethernet1:

ection-specific DNS Suffix  . :
-local IPv6 Address . . . . . : fe80::f80e:9902:f148:e6c2%16
ult Gateway . . . . . . . . . : 10.0.2.1

s\Administrator>ipconfig

 IP Configuration


t adapter Ethernet1:

ection-specific DNS Suffix  . :
-local IPv6 Address . . . . . : fe80::f80e:9902:f148:e6c2%16
 Address. . . . . . . . . . . : 10.0.2.2
et Mask . . . . . . . . . . . : 255.255.255.0
ult Gateway . . . . . . . . . : 10.0.2.1

s\Administrator>
```

Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically
● Use the following IP address:
IP address: 10 . 0 . 2 . 2
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 10 . 0 . 2 . 1

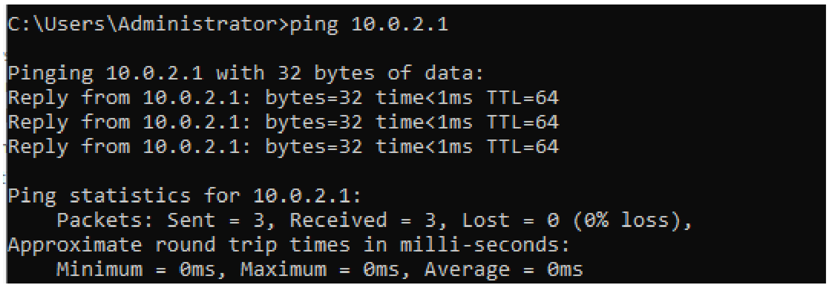
○ Obtain DNS server address automatically
● Use the following DNS server addresses:
Preferred DNS server: . . .
Alternate DNS server: . . .

□ Validate settings upon exit

Advanced... OK Cancel

BENLEE 8198 Error Microsoft-Windows-Security-SPP
BENLEE 134 Warning Microsoft-Windows-Time-Service System 9/09/2021 5:04:15 AM

9:03 AM 9/09/2021



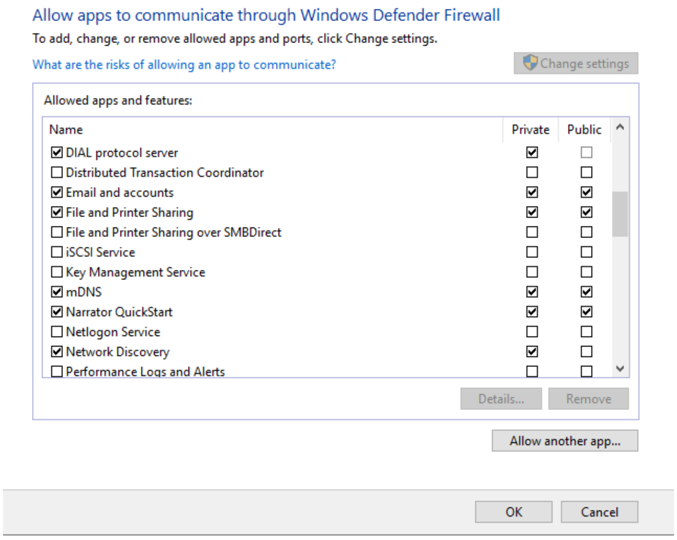
```
C:\Users\Administrator>ping 10.0.2.1

Pinging 10.0.2.1 with 32 bytes of data:
Reply from 10.0.2.1: bytes=32 time<1ms TTL=64
Reply from 10.0.2.1: bytes=32 time<1ms TTL=64
Reply from 10.0.2.1: bytes=32 time<1ms TTL=64

Ping statistics for 10.0.2.1:
    Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Task 4: Setting up the firewall

4a: Windows server

In this task, we must disable the firewall as it might be blocking ICMP requests. To do this we must navigate to **Control Panel → Systems and Security→ Windows Defender Firewall → Allow apps to communicate through Windows Firewall → Make sure file and printer sharing is selected for both private and public**

10.0.2.2 should now be pingable



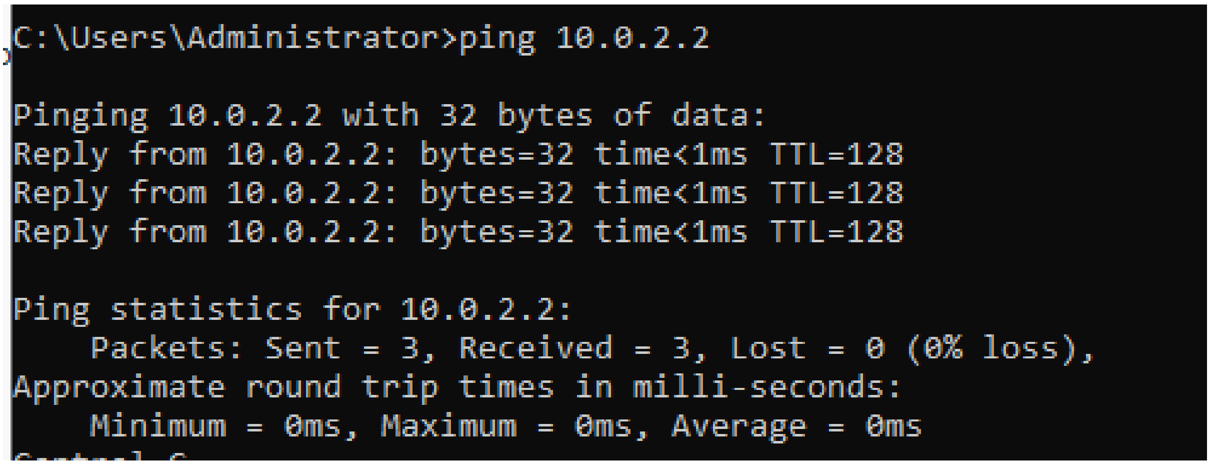
Allow apps to communicate through Windows Defender Firewall

To add, change, or remove allowed apps and ports, click Change settings.

What are the risks of allowing an app to communicate?

Allowed apps and features:

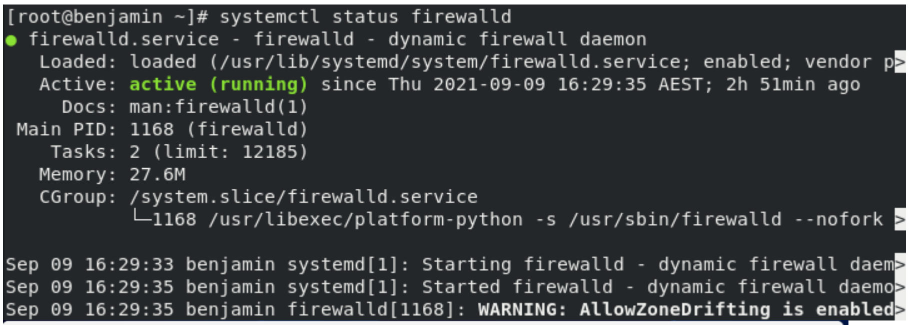
Name	Private	Public
☑ DIAL protocol server	☑	☐
☐ Distributed Transaction Coordinator	☐	☐
☑ Email and accounts	☑	☑
☑ File and Printer Sharing	☑	☑
☐ File and Printer Sharing over SMBDirect	☐	☐
☐ iSCSI Service	☐	☐
☐ Key Management Service	☐	☐
☑ mDNS	☑	☑
☑ Narrator QuickStart	☑	☑
☐ Netlogon Service	☐	☐
☑ Network Discovery	☑	☐
☐ Performance Logs and Alerts	☐	☐



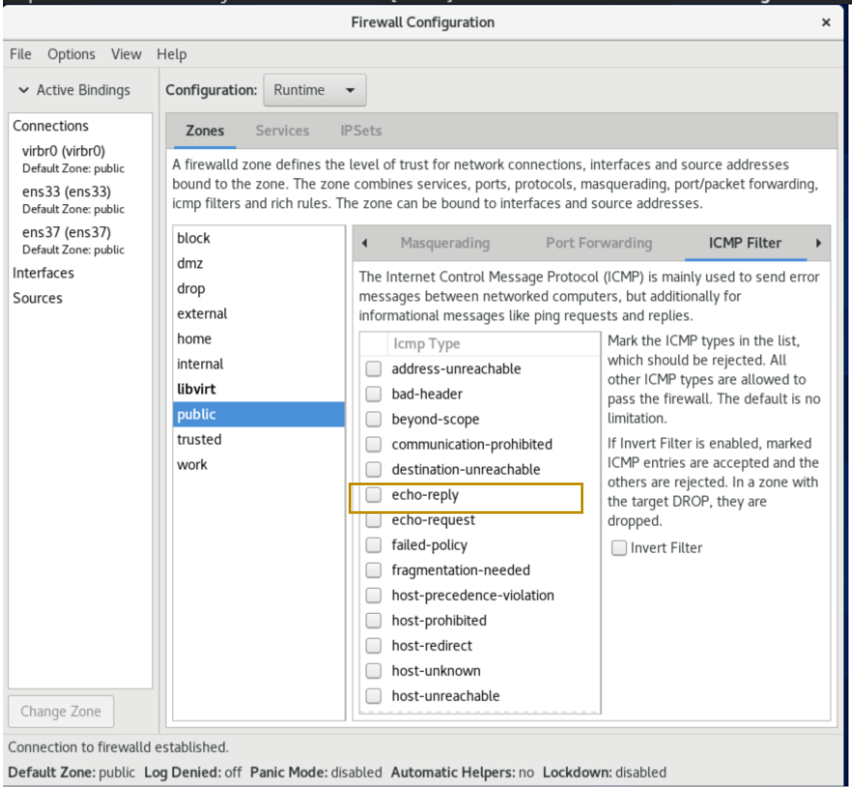
```
C:\Users\Administrator>ping 10.0.2.2

Pinging 10.0.2.2 with 32 bytes of data:
Reply from 10.0.2.2: bytes=32 time<1ms TTL=128
Reply from 10.0.2.2: bytes=32 time<1ms TTL=128
Reply from 10.0.2.2: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.2.2:
    Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

4b: Linux

Using the command **systemctl status firewalld** in centos to verify that the firewall is active. We want to now turn on the echo reply on in **firewall-config**. Run the command and make sure ens37 is public. After this go to **Zones → ICMP Filter → Make sure echo-reply is unchecked so we can ping!**



```
[root@benjamin ~]# systemctl status firewalld
● firewalld.service - firewalld - dynamic firewall daemon
   Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled; vendor p>
   Active: active (running) since Thu 2021-09-09 16:29:35 AEST; 2h 51min ago
     Docs: man:firewalld(1)
 Main PID: 1168 (firewalld)
    Tasks: 2 (limit: 12185)
   Memory: 27.6M
   CGroup: /system.slice/firewalld.service
           └─1168 /usr/libexec/platform-python -s /usr/sbin/firewalld --nofork >

Sep 09 16:29:33 benjamin systemd[1]: Starting firewalld - dynamic firewall daem>
Sep 09 16:29:35 benjamin systemd[1]: Started firewalld - dynamic firewall daemo>
Sep 09 16:29:35 benjamin firewalld[1168]: WARNING: AllowZoneDrifting is enabled>
```



Configuration: Runtime

Connections
virbr0 (virbr0) Default Zone: public
ens33 (ens33) Default Zone: public
ens37 (ens37) Default Zone: public
Interfaces
Sources

A firewalld zone defines the level of trust for network connections, interfaces and source addresses bound to the zone. The zone combines services, ports, protocols, masquerading, port/packet forwarding, icmp filters and rich rules. The zone can be bound to interfaces and source addresses.

block
dmz
drop
external
home
internal
libvirt
public
trusted
work

The Internet Control Message Protocol (ICMP) is mainly used to send error messages between networked computers, but additionally for informational messages like ping requests and replies.

Icmp Type
- ☐ address-unreachable
- ☐ bad-header
- ☐ beyond-scope
- ☐ communication-prohibited
- ☐ destination-unreachable
- ☐ echo-reply
- ☐ echo-request
- ☐ failed-policy
- ☐ fragmentation-needed
- ☐ host-precedence-violation
- ☐ host-prohibited
- ☐ host-redirect
- ☐ host-unknown
- ☐ host-unreachable

Mark the ICMP types in the list, which should be rejected. All other ICMP types are allowed to pass the firewall. The default is no limitation.

If Invert Filter is enabled, marked ICMP entries are accepted and the others are rejected. In a zone with the target DROP, they are dropped.

☐ Invert Filter

Connection to firewalld established.

Default Zone: public Log Denied: off Panic Mode: disabled Automatic Helpers: no Lockdown: disabled

Task 5: Modifying Linux network configuration files

We now want to Modify the value of `ONBOOT` from no to yes on interface33. We can do this from the following command: **vim /etc/sysconfig/network-scripts/ifcfg-ens33**. Once we are in the file, make sure `BOOTPROTO=dhcp`, `DEFROUTE=yes`, `ONBOOT=yes`, NAME and DEVICE are ens33 and that there should be no IP and netmask within the file.

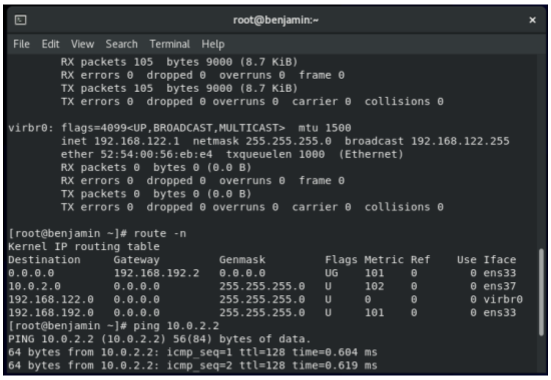
```
[root@benjamin ~]# vim /etc/sysconfig/network-scripts/ifcfg-ens33
TYPE=Ethernet
PROXY_METHOD=none
BROWSER_ONLY=no
```

```
BOOTPROTO=dhcp
DEFROUTE=yes
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=stable-privacy
NAME=ens33
UUID=9a5b99db-9450-44c5-aece-fbfb20f28e7d
DEVICE=ens33
ONBOOT=yes
```

We should now Configure interface ens37 by copying the network configuration of ens33 and editing it via the command: **cp /etc/sysconfig/network-scripts/ifcfg-ens33 /etc/sysconfig/network-scripts/ifcfg-ens37** → then enter **vim /etc/sysconfig/network-scripts/ifcfg-ens37.** Make sure Device and Name are ens37, there is no UUID line, `BOOTPROTO=none, IPADDR=10.0.2.1 and NETMASK=255.255.255.0, DEFROUTE=no, ONBOOT=yes`

```
[root@benjamin ~]# vim /etc/sysconfig/network-scripts/ifcfg-ens37
TYPE=Ethernet
PROXY_METHOD=none
BROWSER_ONLY=no
BOOTPROTO=none
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=stable-privacy
NAME=ens37
DEVICE=ens37
ONBOOT=yes
IPADDR=10.0.2.1
NETMASK=255.255.255.0
```

For the changes to take effect use the command **ifdown ens37** then **ifup ens37.** Check everything is correct via **ifconfig** and **route -n.** 10.0.2.2 should be pingable. Reboot after this for changes to be permanent!



```
        RX packets 105  bytes 9000 (8.7 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 105  bytes 9000 (8.7 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 192.168.122.1  netmask 255.255.255.0  broadcast 192.168.122.255
        ether 52:54:00:56:eb:e4  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

[root@benjamin ~]# route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         192.168.192.2   0.0.0.0         UG    101    0        0 ens33
10.0.2.0        0.0.0.0         255.255.255.0   U     102    0        0 ens37
192.168.122.0   0.0.0.0         255.255.255.0   U     0      0        0 virbr0
192.168.192.0   0.0.0.0         255.255.255.0   U     101    0        0 ens33
[root@benjamin ~]# ping 10.0.2.2
PING 10.0.2.2 (10.0.2.2) 56(84) bytes of data.
64 bytes from 10.0.2.2: icmp_seq=1 ttl=128 time=0.604 ms
64 bytes from 10.0.2.2: icmp_seq=2 ttl=128 time=0.619 ms
```

Lab 3b

Task 1: Set the time zone

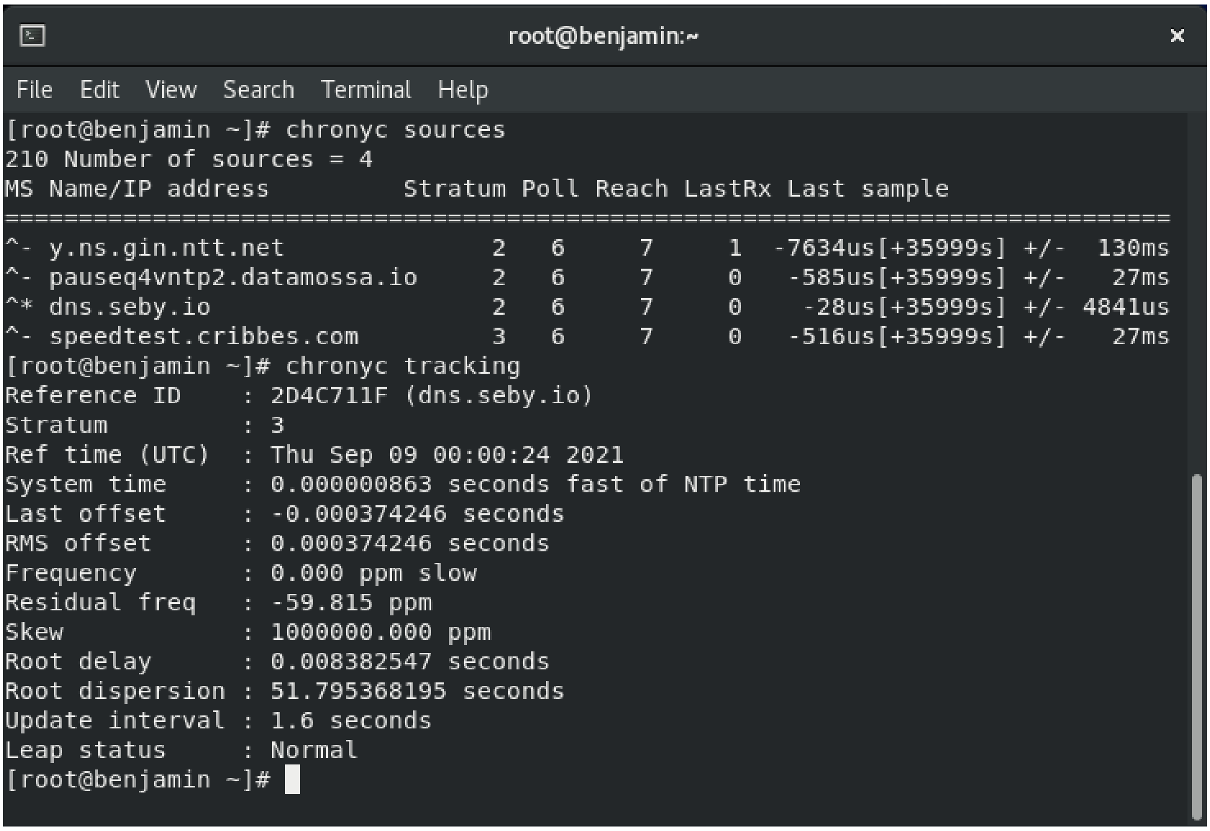
Entering command **date** shows the incorrect time. Entering **date -u** however, shows the correct time. In this case we want to correct our time zone by changing `/etc/localtime` into a symbolic link to the correct file for our time zone under the directory `/usr/share/zoneinfo/`

1. `Ls /usr/share/zoneinfo/Australia` – to list Australian Timezone's such as Sydney and Perth
2. Now use command: `ln -s /usr/share/zoneinfo/Australia/Sydney /etc/local/time`
3. If it fails to create a link use command: `mv /etc/localtime /etc/localtime.bak`
4. `ln -s -f /usr/share/zoneinfo/Australia/Sydney /etc/local/time`

Task 2: Maintain correct time with chrony

Enable chronyd using the commands: **systemctl enable chronyd, systemctl start chronyd**

After enabling chronyd use the following commands **chronyc sources** and **chronyc tracking** to verify chronyd is working:



```
[root@benjamin ~]# chronyc sources
210 Number of sources = 4
MS Name/IP address         Stratum Poll Reach LastRx Last sample
===============================================================================
^- y.ns.gin.ntt.net              2   6     7     1  -7634us[+35999s] +/-  130ms
^- pauseq4vntp2.datamossa.io     2   6     7     0   -585us[+35999s] +/-   27ms
^* dns.seby.io                   2   6     7     0    -28us[+35999s] +/- 4841us
^- speedtest.cribbes.com         3   6     7     0   -516us[+35999s] +/-   27ms
[root@benjamin ~]# chronyc tracking
Reference ID    : 2D4C711F (dns.seby.io)
Stratum         : 3
Ref time (UTC)  : Thu Sep 09 00:00:24 2021
System time     : 0.000000863 seconds fast of NTP time
Last offset     : -0.000374246 seconds
RMS offset      : 0.000374246 seconds
Frequency       : 0.000 ppm slow
Residual freq   : -59.815 ppm
Skew            : 1000000.000 ppm
Root delay      : 0.008382547 seconds
Root dispersion : 51.795368195 seconds
Update interval : 1.6 seconds
Leap status     : Normal
[root@benjamin ~]#
```

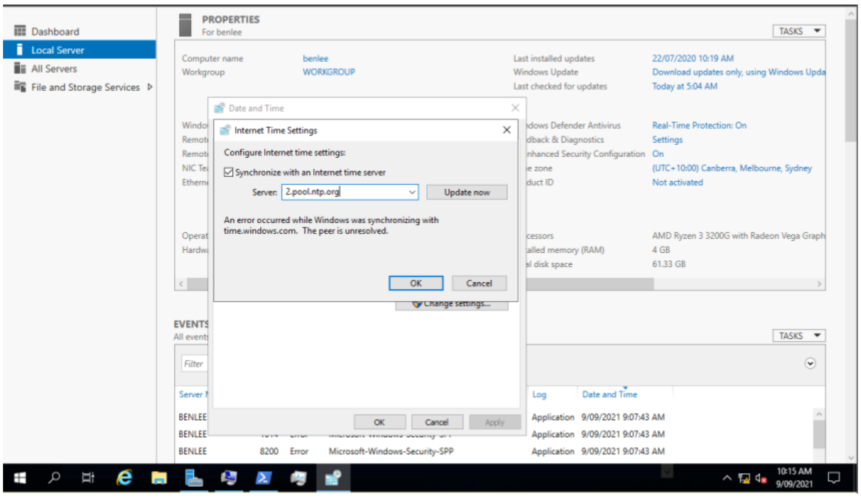
Now add server time.uts.edu.au:

```
[root@benjamin ~]# chronyc add server time.uts.edu.au
200 OK
```

Now check chronyc sources again. There should be 5 sources now instead of 4 from before. The new one for me is **B1L2-c7206.gw.uts.edu.au with 0ns.** To test if synchronization is working or not we will change the date to 1999 New Year's Eve by entering command **`date 123123591999.00`**. It does not reset date/time back to 2021. To reset we must use command `systemctl restart chronyd.`

Task 3: Windows NTP

To Change NTP Server in Windows navigate to **Server Manager → Local Server → Click on Time Zone → Internet Time tab → Change Settings to 2.pool.ntp.org**



Computer name	benlee	Last installed updates	22/07/2020 10:19 AM
Workgroup	WORKGROUP	Windows Update	Download updates only, using Windows Upda
		Last checked for updates	Today at 5:04 AM
		ndows Defender Antivirus	Real-Time Protection: On
		dback & Diagnostics	Settings
		nhanced Security Configuration	On
		e zone	(UTC+10:00) Canberra, Melbourne, Sydney
		duct ID	Not activated
		cessors	AMD Ryzen 3 3200G with Radeon Vega Graph
		alled memory (RAM)	4 GB
		l disk space	61.33 GB

Internet Time Settings

Configure Internet time settings:

☑ Synchronize with an Internet time server

Server: 2.pool.ntp.org [Update now]

An error occurred while Windows was synchronizing with time.windows.com. The peer is unresolved.

[OK] [Cancel]

Server				Log	Date and Time
BENLEE				Application	9/09/2021 9:07:43 AM
BENLEE				Application	9/09/2021 9:07:43 AM
BENLEE	8200	Error	Microsoft-Windows-Security-SPP	Application	9/09/2021 9:07:43 AM

10:15 AM 9/09/2021

Week 4

Week 4 topic: Dynamic networking

Lecture 4

In lecture 4 we are introduced to DHCP, its operations, how DHCP is configured and network configuration of DHCP servers.

Lab 4a

Task 1: Linux command-line configuration

We first have to test network connectivity. Pinging www.google.com, it seems that my network connectivity is fine. Typing **ifconfig ens33** and I can see that my ip is still 192.168.192.128. Using command **nmcli** and both ens33 and ens37 are connected!

Typing command **`vim /etc/sysconfig/network-scripts/ifcfg-ens37`** we want to convert ens37 from static to DHCP. Make sure `BOOTPROTO=dhcp and IPADDR and Netmask have a # to be commented out.` After this, Reboot.

```
[root@benjamin ~]# vim /etc/sysconfig/network-scripts/ifcfg-ens37
TYPE=Ethernet
PROXY_METHOD=none
BROWSER_ONLY=no
BOOTPROTO=dhcp
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=stable-privacy
NAME=ens37
DEVICE=ens37
ONBOOT=yes
#IPADDR=10.0.2.1
```

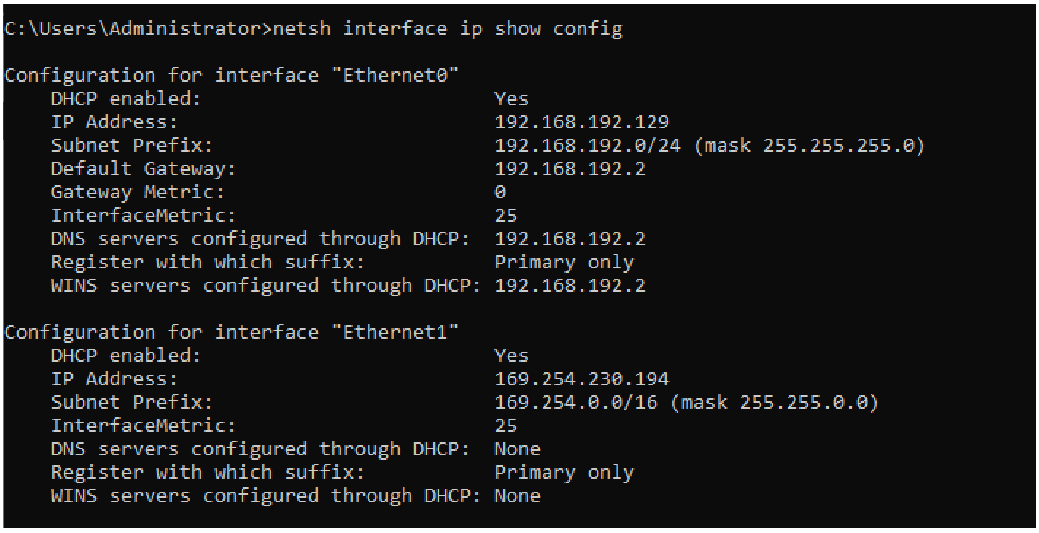
```
#NETMASK=255.255.255.0
```

Task 3: Windows configuration

Enabled Ethernet 0 again. To convert Ethernet1 for Windows from static to dynamic i used the command:

netsh interface ip set address "Ethernet1" dhcp

Using the command **netsh interface ip show config** shows me the configuration of both interfaces eth0 and eth1. As seen below, eth1 is a bit different as I used dhcp to dynamically assign the ip address earlier from the command above **netsh interface ip set address "Ethernet1" dhcp**



```
C:\Users\Administrator>netsh interface ip show config

Configuration for interface "Ethernet0"
    DHCP enabled:                         Yes
    IP Address:                           192.168.192.129
    Subnet Prefix:                        192.168.192.0/24 (mask 255.255.255.0)
    Default Gateway:                      192.168.192.2
    Gateway Metric:                       0
    InterfaceMetric:                      25
    DNS servers configured through DHCP:  192.168.192.2
    Register with which suffix:           Primary only
    WINS servers configured through DHCP: 192.168.192.2

Configuration for interface "Ethernet1"
    DHCP enabled:                         Yes
    IP Address:                           169.254.230.194
    Subnet Prefix:                        169.254.0.0/16 (mask 255.255.0.0)
    InterfaceMetric:                      25
    DNS servers configured through DHCP:  None
    Register with which suffix:           Primary only
    WINS servers configured through DHCP: None
```

Lab 4b

Task 1: Install DHCP server on Linux

To make the Linux virtual machine operate as a DHCP server the following command needs to be used:

```
[root@benjamin ~]# yum install dhcp-server
```

Task 2: Configure DHCP server on Linux

Task 2 focuses on configuring the DHCP server on Linux. We use the following table for ens37 from the lab manual:

Subnet	10.0.2.0/24
Gateway	10.0.2.1
DNS	10.0.2.1
Reserved space for servers	10.0.2.2 → 10.0.2.127
Dynamically allocated space for workstations etc.	10.0.2.128 → 10.0.2.254

To configure the DHCP server we need to read the sample of the dhcpd.conf file located in `/usr/share/doc/dhcp-server/dhcpd.conf.example` and edit the real config file `/etc/dhcp/dhcpd.conf`

We now Edit the /etc/dhcp/dhcpd.conf file via **vim /etc/dhcp/dhcpd.conf** and enter the following contents:

```
subnet 10.0.2.0 netmask 255.255.255.0 {
  range 10.0.2.128 10.0.2.254;
  option domain-name-servers 10.0.2.1;
  option domain-name "online.uts.edu.au";
  option routers 10.0.2.1;
  default-lease-time 60;
  max-lease-time 600;
}
```

Before we start the DHCP server on ens37 we need to make sure the static address is 10.0.2.1 with netmask 255.255.255.0. Since I changed it from Lab 4a, I change it back using the command **vim /etc/sysconfig/network-scripts/ifcfg-ens37**

```
[root@benjamin ~]# vim /etc/sysconfig/network-scripts/ifcfg-ens37
TYPE=Ethernet
PROXY_METHOD=none
BROWSER_ONLY=no
BOOTPROTO=none
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=stable-privacy
NAME=ens37
DEVICE=ens37
ONBOOT=yes
IPADDR=10.0.2.1
NETMASK=255.255.255.0
```

I then used the commands **nmcli con reload ens37** and then **nmcli con up ens37** to reload the interface. **I** then used the command **ip a** to make sure ens37 configurations were correct and back to static IP 10.0.2.1

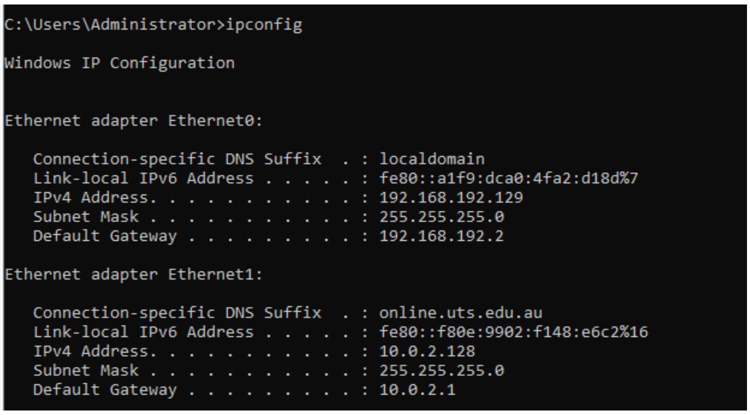
Task 3: Start and monitor the DHCP server on Linux

We start dhcp service using **systemctl start dhcpd.** To monitor the DHCP I used another tab with the command **tail -f /var/log/messages.**

Typing command **cat /var/lib/dhcpd/dhcpd.leases** we can see that there is no leases as of yet.

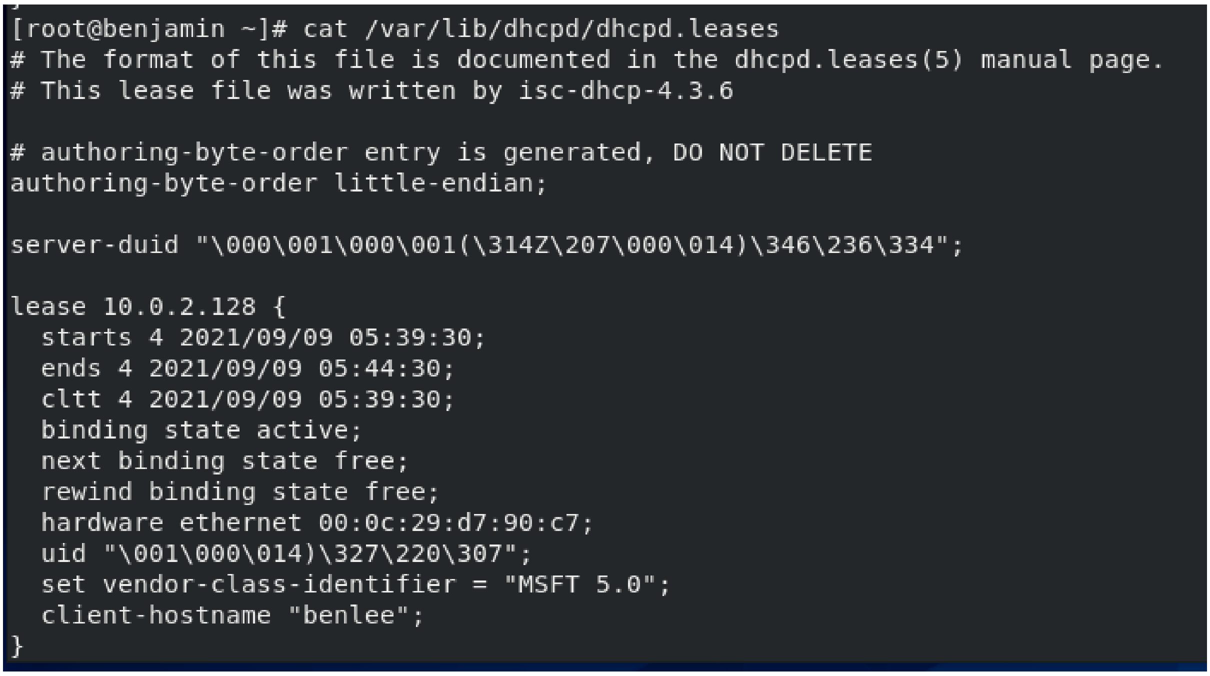
Task 4: Set up Windows DHCP client & test the DHCP server

We know disable and enable Ethernet1 on Windows. We change the settings to 'Obtain an IP Address Automatically' and 'Obtain DNS server address automatically'. After disabling and enabling Ethernet1 on Windows, an address should be leased correctly. We can use command **ipconfig** to check Ethernet1 starting IP address is 10.0.2.128 as in the file **/etc/dhcp/dhcpd.conf** the range should start from 10.0.2.128 as well as the DNS Suffix being **online.uts.edu.au**

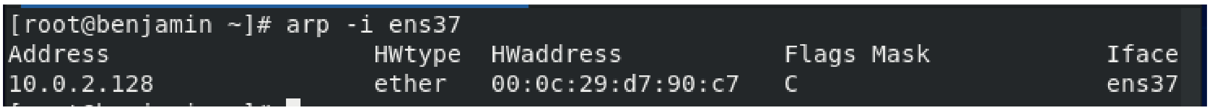


```
C:\Users\Administrator>ipconfig

Windows IP Configuration


Ethernet adapter Ethernet0:

   Connection-specific DNS Suffix  . : localdomain
   Link-local IPv6 Address . . . . . : fe80::a1f9:dca0:4fa2:d18d%7
   IPv4 Address. . . . . . . . . . . : 192.168.192.129
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 192.168.192.2

Ethernet adapter Ethernet1:

   Connection-specific DNS Suffix  . : online.uts.edu.au
   Link-local IPv6 Address . . . . . : fe80::f80e:9902:f148:e6c2%16
   IPv4 Address. . . . . . . . . . . : 10.0.2.128
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 10.0.2.1
```

We can now use the following command **`cat /var/lib/dhcpd/dhcpd.leases`** to find the log information of a lease existing now in the linux VM:



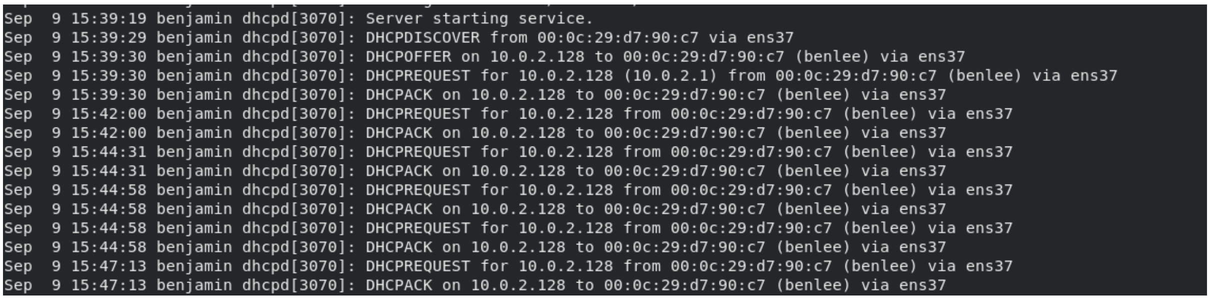
```
[root@benjamin ~]# cat /var/lib/dhcpd/dhcpd.leases
# The format of this file is documented in the dhcpd.leases(5) manual page.
# This lease file was written by isc-dhcp-4.3.6

# authoring-byte-order entry is generated, DO NOT DELETE
authoring-byte-order little-endian;

server-duid "\000\001\000\001(\314Z\207\000\014)\346\236\334";

lease 10.0.2.128 {
  starts 4 2021/09/09 05:39:30;
  ends 4 2021/09/09 05:44:30;
  cltt 4 2021/09/09 05:39:30;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 00:0c:29:d7:90:c7;
  uid "\001\000\014)\327\220\307";
  set vendor-class-identifier = "MSFT 5.0";
  client-hostname "benlee";
}
```



```
[root@benjamin ~]# arp -i ens37
Address                  HWtype  HWaddress           Flags Mask            Iface
10.0.2.128               ether   00:0c:29:d7:90:c7   C                     ens37
```

The command **arp -I ens37** confirms our MAC address on the ens37 interface.

We can also now use the command **tail -f /var/log/messages** to find the request/response sequence of the WindowsServer by the following messages: **`DHCPDISCOVER, DHCPOFFER, DHCPREQUEST, DHCPACK`** as seen in the image below.



```
Sep  9 15:39:19 benjamin dhcpd[3070]: Server starting service.
Sep  9 15:39:29 benjamin dhcpd[3070]: DHCPDISCOVER from 00:0c:29:d7:90:c7 via ens37
Sep  9 15:39:30 benjamin dhcpd[3070]: DHCPOFFER on 10.0.2.128 to 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:39:30 benjamin dhcpd[3070]: DHCPREQUEST for 10.0.2.128 (10.0.2.1) from 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:39:30 benjamin dhcpd[3070]: DHCPACK on 10.0.2.128 to 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:42:00 benjamin dhcpd[3070]: DHCPREQUEST for 10.0.2.128 from 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:42:00 benjamin dhcpd[3070]: DHCPACK on 10.0.2.128 to 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:44:31 benjamin dhcpd[3070]: DHCPREQUEST for 10.0.2.128 from 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:44:31 benjamin dhcpd[3070]: DHCPACK on 10.0.2.128 to 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:44:58 benjamin dhcpd[3070]: DHCPREQUEST for 10.0.2.128 from 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:44:58 benjamin dhcpd[3070]: DHCPACK on 10.0.2.128 to 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:44:58 benjamin dhcpd[3070]: DHCPREQUEST for 10.0.2.128 from 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:44:58 benjamin dhcpd[3070]: DHCPACK on 10.0.2.128 to 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:47:13 benjamin dhcpd[3070]: DHCPREQUEST for 10.0.2.128 from 00:0c:29:d7:90:c7 (benlee) via ens37
Sep  9 15:47:13 benjamin dhcpd[3070]: DHCPACK on 10.0.2.128 to 00:0c:29:d7:90:c7 (benlee) via ens37
```

Task 5: Set up reserved addresses

In this task we will reserve an IP address for Windows. We first find our Window Server MAC address via the command **arp -I ens37.** In my case it is **00:0c:29:d7:90:c7**

We then modify the DHCP server configuration file by editing the file **/etc/dhcp/dhcpd.conf** with vim and add host entry as seen below:

```
[root@benjamin ~]# vim /etc/dhcp/dhcpd.conf
host WinServer {
  hardware ethernet 00:0c:29:d7:90:c7;
  fixed-address 10.0.2.20;
}
```

For the changes to take effect, restart the service via the command **systemctl restart dhcpd**.

In the Windows Server VM use the command **ipconfig /renew.** Pinging 10.0.2.1 now (the linux vm) we get reply's so everything is working correctly.

Using the command **arp -I ens37** we can now see 2 IP's, 10.0.2.128 and 10.0.2.20 which is mapped to the MAC address 00:0c:29:d7:90:c7.

For the old lease using command **`cat /var/lib/dhcpd/dhcpd.leases`** we can still see that the lease is 10.0.2.128. The DHCP server still thinks the fixed-address assignment is not considered by the dhcpd process and will hence not record it.

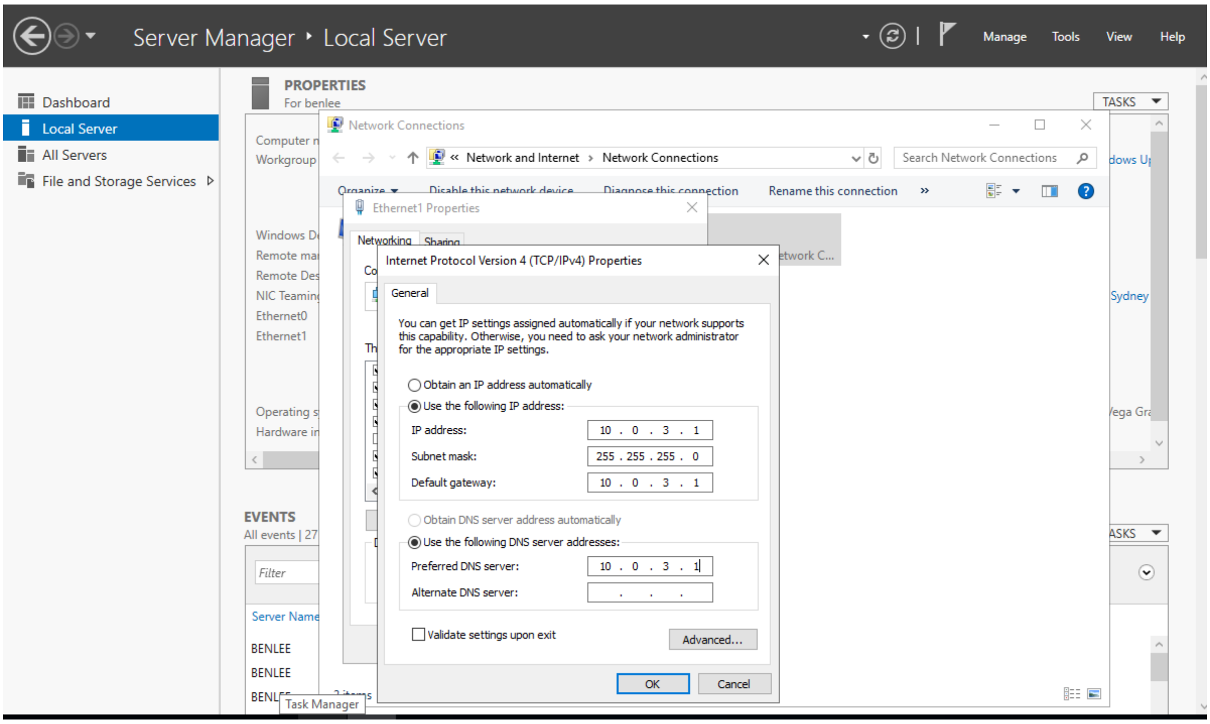
Lab 4c

Task 1: Design our network

In this task we want to design our own subnet. The subnet should be configured to 10.0.3.0/24 instead of 10.0.2.0/24 which we have done from pervious activities. In Windows, DHCP Range is called 'scope'.

Task 2: Configure the Windows Server network interface with a static IP address

To configure DHCP on Windows we must first configure Ethernet1 with static address 10.0.3.1. See picture below.



Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address:	10 . 0 . 3 . 1
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	10 . 0 . 3 . 1

○ Obtain DNS server address automatically

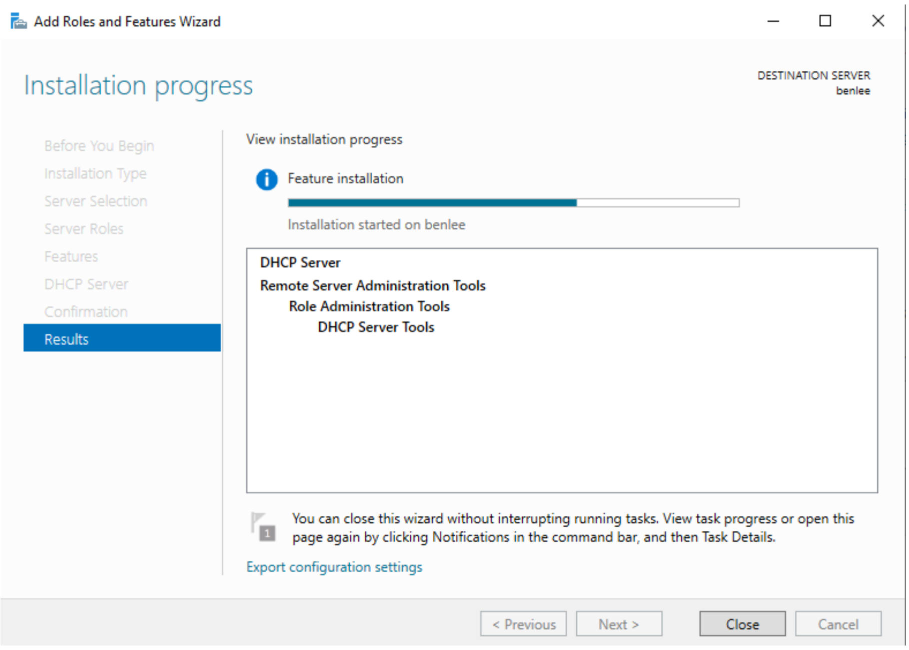
● Use the following DNS server addresses:

Preferred DNS server:	10 . 0 . 3 . 1
Alternate DNS server:	. . .

□ Validate settings upon exit

Task 3: Install the DHCP role on Windows Server

We must now setup the DHCP server role from the Server Manager. Do this via **Server Manager → Manage → Add Roles and Features → In Installation click role-based → Select Server → Select DHCP Server in Server Roles and include management tools → Skip Features and DHCP Server and Install**. At the End you should have something like this when installing from picture below



Installation progress

DESTINATION SERVER
benlee

View installation progress

Feature installation

Installation started on benlee

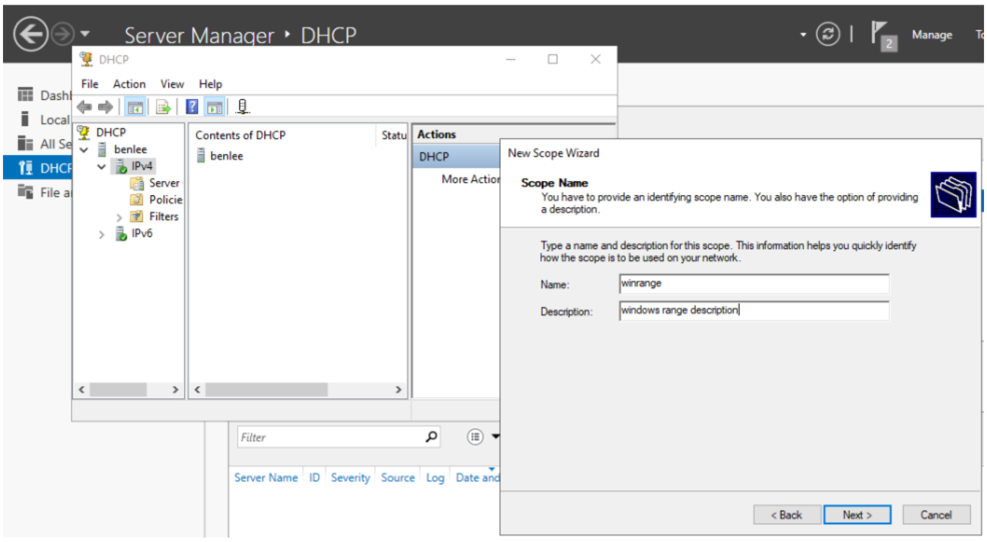
DHCP Server
Remote Server Administration Tools
Role Administration Tools
DHCP Server Tools

You can close this wizard without interrupting running tasks. View task progress or open this page again by clicking Notifications in the command bar, and then Task Details.

Export configuration settings

We should now see a new **DHCP option in the Server Manager**. I see a warning called 'Configuration required for DHCP Server... '. Selecting 'More' I completed the DHCP configuration process. After this iright-click the server in the Servers menu and choose '**DHCP Manager'**. Right click IPv4 and select 'New Scope' and follow the wizard instructions.

We then create a name and description which should be 'winrange' for the name, and 'windows range description' for the description.



New Scope Wizard

Scope Name
You have to provide an identifying scope name. You also have the option of providing a description.

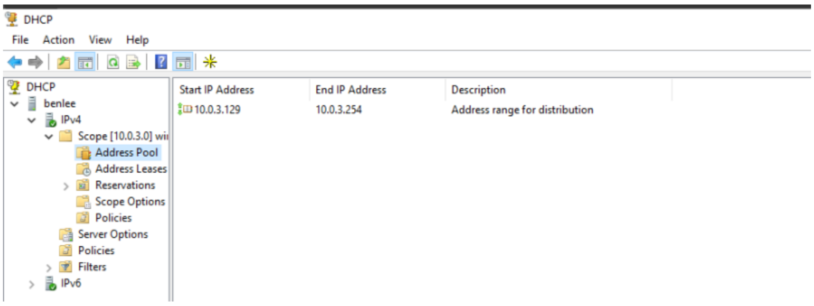
Type a name and description for this scope. This information helps you quickly identify how the scope is to be used on your network.

Name: winrange

Description: windows range description

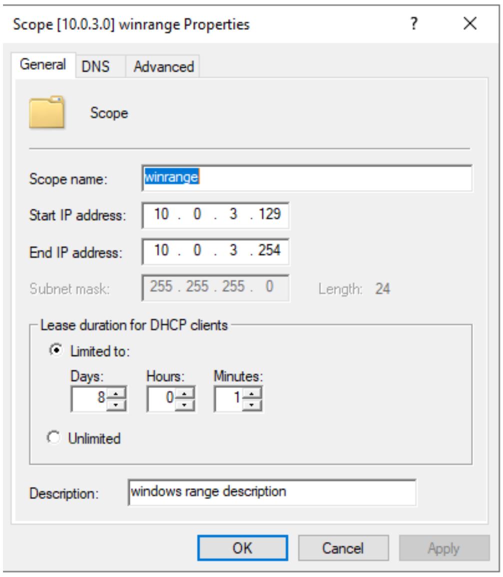
We now add an IP Range of 10.0.3.129 → 10.0.3.254. Make sure length is 24 with subnet mask of 255.255.255.0 →After this leave, everything blank for the **add exclusions and delay** section →Click Next → For lease Duration make it 1 minute → Configure DHCP Options as yes →Add 10.0.3.1 to the router and click next → Make parent domain uts.edu.com and remove the extra IP address 192.168.192.2 and click next → For WINS Servers leave blank → Activate Scope.

Once completed it should look something like this:



Start IP Address	End IP Address	Description
10.0.3.129	10.0.3.254	Address range for distribution

To change anything right click the scope and select properties


Scope [10.0.3.0] winrange Properties
?
General
DNS
Advanced
Scope
Lease duration for DHCP clients
OK
Cancel
Apply

Scope name: winrange

Start IP address: 10 . 0 . 3 . 129

End IP address: 10 . 0 . 3 . 254

Subnet mask: 255 . 255 . 255 . 0 Length: 24

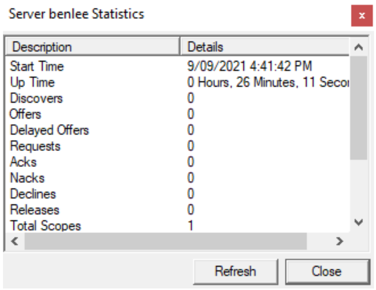
● Limited to: Days: 8 Hours: 0 Minutes: 1

○ Unlimited

Description: windows range description

Task 4: Monitoring the DHCP server

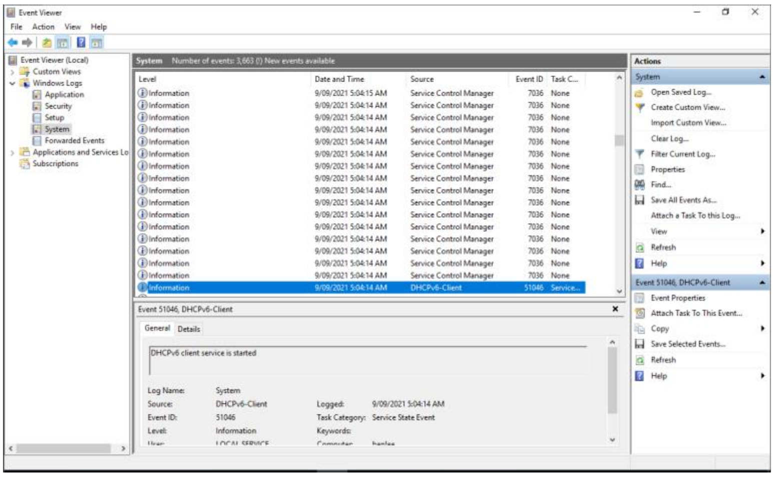
To monitor the DHCP server right-click on **IPv4 → Display Statistics**. This will show information on DHCP traffic such as server up and start time, Acknowledgements, requests and much more.



Description	Details
Start Time	9/09/2021 4:41:42 PM
Up Time	0 Hours, 26 Minutes, 11 Seco
Discovers	0
Offers	0
Delayed Offers	0
Requests	0
Acks	0
Nacks	0
Declines	0
Releases	0
Total Scopes	1

We can find logs and lease database for DHCP role in `C:\WINDOWS\system32\dhcp`. To view locked files go to **View → Options → Change Folder → Uncheck 'Hide extensions for known file types'**

When going through **Event viewer** via **Server Manager → Tools → Event Viewer → Windows Logs → System** we can find a lot of dhcp warning logs by finding 'find…' in the right hand toolbar and searching for 'dhcp'



System Number of events: 3,663 (!) New events available

```
Level         Date and Time          Source                   Event ID  Task C...
Information   9/09/2021 5:04:15 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   Service Control Manager  7036      None
Information   9/09/2021 5:04:14 AM   DHCPv6-Client            51046     Service...
```

Event 51046, DHCPv6-Client

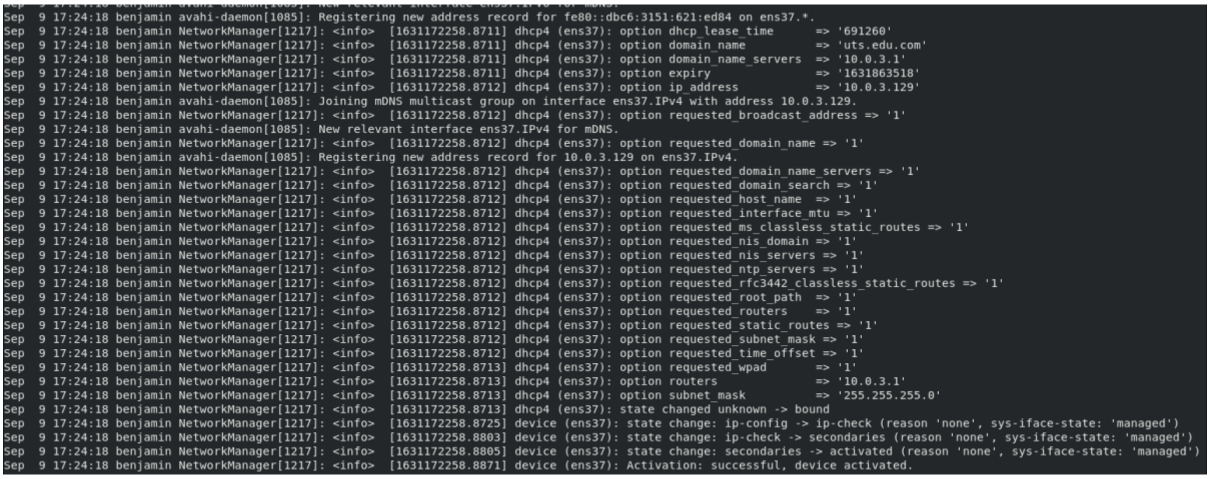
```
DHCPv6 client service is started

Log Name:   System
Source:     DHCPv6-Client          Logged:         9/09/2021 5:04:14 AM
Event ID:   51046                  Task Category:  Service State Event
Level:      Information            Keywords:
User:       LOCAL SERVICE          Computer:       benlee
```

Task 5: Set up Linux client and testing

In this task make sure dhcpd is disabled via command **systemctl stop dhcpd.** We should change the network card configuration via the command **`vim /etc/sysconfig/network-scripts/ifcfg-ens37`** to change ens37 to dynamic. Make `BOOTPROTO=dhcp` and comment out `IPADDR and NETMASK`.

```
[root@benjamin ~]# vim /etc/sysconfig/network-scripts/ifcfg-ens37
TYPE=Ethernet
PROXY_METHOD=none
BROWSER_ONLY=no
BOOTPROTO=dhcp
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=stable-privacy
NAME=ens37
DEVICE=ens37
ONBOOT=yes
#IPADDR=10.0.2.1
#NETMASK=255.255.255.0
```

- After this we disable and reenable ens37 via the command **nmcli con reload ens37 and then nmcli con up ens37.**
- With the command **ifconfig ens37** we see **IP 10.0.3.129.**
- Using **tail -f /var/log/messages** we can see we have registered a new address and many other interesting logs as seen in the picture below.



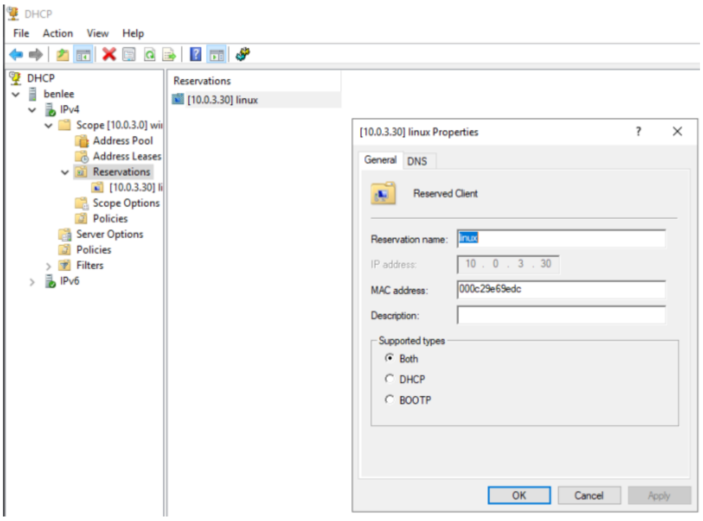
```
Sep  9 17:24:18 benjamin avahi-daemon[1085]: Registering new address record for fe80::dbc6:3151:621:ed84 on ens37.*.
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8711] dhcp4 (ens37): option dhcp_lease_time      => '691260'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8711] dhcp4 (ens37): option domain_name          => 'uts.edu.com'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8711] dhcp4 (ens37): option domain_name_servers  => '10.0.3.1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8711] dhcp4 (ens37): option expiry               => '1631863518'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option ip_address           => '10.0.3.129'
Sep  9 17:24:18 benjamin avahi-daemon[1085]: Joining mDNS multicast group on interface ens37.IPv4 with address 10.0.3.129.
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_broadcast_address => '1'
Sep  9 17:24:18 benjamin avahi-daemon[1085]: New relevant interface ens37.IPv4 for mDNS.
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_domain_name => '1'
Sep  9 17:24:18 benjamin avahi-daemon[1085]: Registering new address record for 10.0.3.129 on ens37.IPv4.
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_domain_name_servers => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_domain_search => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_host_name  => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_interface_mtu => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_ms_classless_static_routes => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_nis_domain => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_nis_servers => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_ntp_servers => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_rfc3442_classless_static_routes => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_root_path  => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_routers    => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_static_routes => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_subnet_mask => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8712] dhcp4 (ens37): option requested_time_offset => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8713] dhcp4 (ens37): option requested_wpad       => '1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8713] dhcp4 (ens37): option routers              => '10.0.3.1'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8713] dhcp4 (ens37): option subnet_mask          => '255.255.255.0'
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8713] dhcp4 (ens37): state changed unknown -> bound
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8725] device (ens37): state change: ip-config -> ip-check (reason 'none', sys-iface-state: 'managed')
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8803] device (ens37): state change: ip-check -> secondaries (reason 'none', sys-iface-state: 'managed')
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8805] device (ens37): state change: secondaries -> activated (reason 'none', sys-iface-state: 'managed')
Sep  9 17:24:18 benjamin NetworkManager[1217]: <info>  [1631172258.8871] device (ens37): Activation: successful, device activated.
```

- In **/var/lib/NetworkManager** by cd'ing into the directory, we can see 2 internal networks cards.
  - They have addresses 10.0.3.129 and 192.168.192.128 when we 'cat' there info
- Using **cat /etc/resolv.conf** we can see the DNS 10.0.3.1
  - Pinging 10.0.3.1 seemed to be successful from the centos VM as well as 10.0.3.129 from the Windows Server VM
- Checking the log file DhcpSrvLog-Thu in `C:\WINDOWS\system32\dhcp` shows the address 10.0.3.129 was leased with domain name **uts.edu.com**

Task 6: Set up a reserved address

In this task, we try to set up a reserved address to the linux VM. We first find the MAC address of ens37 via the command **ifconfig ens37.** In my case, the MAC address is 00:0c:29:e6:9e:dc

We then go to DHCP Manager in the Windows Server. Under scope find 'Reservations' and right click to add 'new reservation'. Input reservation name 'linux' and set the ip address 10.0.3.30 alongside the mac address with format **00-0c-29-e6-9e-dc or 000c29e69edc** and add.



[10.0.3.30] linux Properties

Reserved Client

Reservation name: linux

IP address: 10 . 0 . 3 . 30

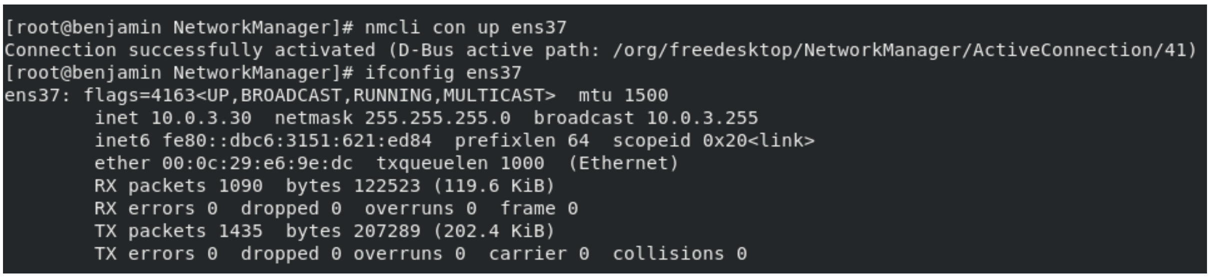
MAC address: 000c29e69edc

Description:

Supported types

● Both
○ DHCP
○ BOOTP

Use command **ifconfig ens37** on linux to verify that we have obtained the new address 10.0.3.30 and the old IP has expired. It didn't work the first time so I had to use **nmcli con up ens37** to refresh the configuration. The result is below!



```
[root@benjamin NetworkManager]# nmcli con up ens37
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/41)
[root@benjamin NetworkManager]# ifconfig ens37
ens37: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.3.30  netmask 255.255.255.0  broadcast 10.0.3.255
        inet6 fe80::dbc6:3151:621:ed84  prefixlen 64  scopeid 0x20<link>
        ether 00:0c:29:e6:9e:dc  txqueuelen 1000  (Ethernet)
        RX packets 1090  bytes 122523 (119.6 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1435  bytes 207289 (202.4 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Week 5

Week 5 topic: Managing users and groups

Lecture 5

The lecture discusses user and group management policies, /etc/passwd and etc/shadow contents, how to manage user accounts by adding, deleting or modifying them, system issues, workgroups and domains and how to generate/create passwords

Lab 5a

Task 1: Creating users with command-line tools

In this task, we try to create a user with username: peter and full name: Peter Griffin with default uid and gid. We must also use his preferred login shell 'zsh'.

Creating a user with the username peter with system defaults and full name Peter Griffin, the user prefers Z shell. Using **man useradd** we can see various options. We can set a password using the useradd command **useradd -p**. However, we should not use this command as it will create an encrypted password that can be visible by all users listing processes. This can be bad for privacy reasons so we don't use it.

We should start by adding the user with the **useradd** command seen below. We use **useradd -c** for a short description 'Peter Griffin'. We use **-s** to rename the zsh user login shell to peter.

```
[root@benjamin ~]# useradd -c "Peter Griffin" -s /usr/bin/zsh peter
```

We can now modify the password using the **passwd** command to set a password for Peter. I made the password '**oogabooga12345**' in my lab exercise.

```
[root@benjamin ~]# passwd peter
Changing password for user peter.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
```

Using command **ls /home/peter** we can see there is nothing in the directory at the moment.
We now want to supply a `README` file in the user home directory. We do this by modifying the skeleton directory `/etc/skel` . We can create a `README` file in the `/etc/skel` directory via the **touch command.**

```
[root@benjamin ~]# touch /etc/skel/README
```

We now create a user called 'Stewie Griffin' with username: stewie and preferred shell 'bash'. The password I used for stewie is '**chillin445'**. We can type the command **ls /home/stewie** after user has been created to verify the `README` file exists in stewie's directory. We can do this via the following commands below:

```
[root@benjamin ~]# useradd -c "Stewie Giffin" -s /bin/bash stewie
[root@benjamin ~]# passwd stewie
Changing password for user stewie.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
[root@benjamin ~]# ls /home/stewie/
```

```
README
```

We now create a 3rd user brian in the default group 'users' with **UID 200**. We can do this via the **-u** option in the **useradd command** for the UID and **-g** for changing the default group**.** Bash shell should be default. Username should be brian and his full name is 'Brian Griffin'. The password I used is '**rubydelight13**'

```
[root@benjamin ~]# useradd -c "Brian Giffin" -u 200 -g users -s
/bin/bash brian
[root@benjamin ~]# passwd brian
Changing password for user brian.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
```

We can test that we can log in via SSH. In this example I will ssh into brian's account. Using command **id** we can see that Brian is confirmed to be part of group 'users' with UID 200.

```
[root@benjamin ~]# ssh brian@localhost
[brian@benjamin ~]$ id
uid=200(brian) gid=100(users) groups=100(users)
```

Task 2: Configuring groups and assigning users to groups

We now create the group family and assign Brian and Stewie to the group. We must go back to root first however with command **su -u.** After making stewie and brian members of the group, we can check they are in the group via the **tail /etc/group** command which should show **family:x:1002:stewie,brian.** We can verify they are they part of the group by using command **id** again.

```
[root@benjamin ~]# groupadd family
[root@benjamin ~]# usermod -G family brian
[root@benjamin ~]# usermod -G family stewie
[root@benjamin ~]# ssh brian@localhost
[brian@benjamin ~]$ id
uid=200(brian) gid=100(users) groups=100(users),1002(family)
```

Being logged in as Brian we now create a file called 'a' in the home directory. Group should be 'users'. Running the **ps** command the PID is 6302.

```
[brian@benjamin ~]$ touch a
[brian@benjamin ~]$ ls -la a
-rw-r--r-- 1 brian users 0 Sep 10 05:35 a
[brian@benjamin ~]$ ps
PID         TTY            TIME    CMD
6302        pts/2      00:00:00    bash
6357        pts/2      00:00:00    ps
```

We now change the current group using the command **newgrp family.** We create a new file CALLED b. Using command **ls -la b** we can see user is brian but group is now in the 'family' group.

```
[brian@benjamin ~]$ newgrp family
[brian@benjamin ~]$ id
uid=200(brian) gid=1002(family) groups=1002(family),100(users)
```

```
[brian@benjamin ~]$ touch b
[brian@benjamin ~]$ ls -la b
-rw-r--r-- 1 brian family 0 Sep 10 05:36 b
```

The **newgrp** command changes current real group to the named group. Using the **man pages**, **newgrp** reinitializes user environment even though user has logged in. Using the **ps** command we can see 3 instances: bash, bash, ps. To reverse the effects of **newgrp** you can use a -, so the environment can be changed. For example **newgrp -family**

Task 3: Modifying user account settings

In this task we want to modify peter's account to expire in 5 days. Make sure we are back in root via the **su –** command. We first use **usermod** to modify peter's account. **-e** changes the date the user account will be disabled. We can see the modifcations via the command **chage -1 peter.**

```
[root@benjamin ~]# usermod -e 2021-09-15 peter
[root@benjamin ~]# chage -l peter
Last password change                                    : Sep 09, 2021
Password expires                                        : never
Password inactive                                       : never
Account expires                                         : Sep 15, 2021
Minimum number of days between password change          : 0
Maximum number of days between password change          : 99999
Number of days of warning before password expires       : 7
```

Commands below show me changing Stewie's account for his password to expire every 5 days.

```
[root@benjamin ~]# chage -M 5 stewie
[root@benjamin ~]# chage -l stewie
Last password change                                    : Sep 9, 2021
Password expires                                        : Sep 14, 2021
Password inactive                                       : never
Account expires                                         : never
Minimum number of days between password change          : 0
Maximum number of days between password change          : 5
Number of days of warning before password expires       : 7
```

We can lock brian's account by using command **usermod -L brian**. Using **ssh brian@localhost** command we get a **'Permission denied, please try again'** error. Using command **usermod -U brian** unlocks brian's account and we can login fine again.

Task 4: Creating a user without using command-line tools

In this task we create a user 'lois' **WITHOUT useradd command.** We makre sure lois full name is 'Lois Griffin' with bash shell. We use command **vipw** to add lois as a user manually and **vigw** to modify his group manually as well.

```
[root@benjamin ~]# vipw
lois:x:1003:1003:Lois Griffin:/home/lois:/bin/bash
```

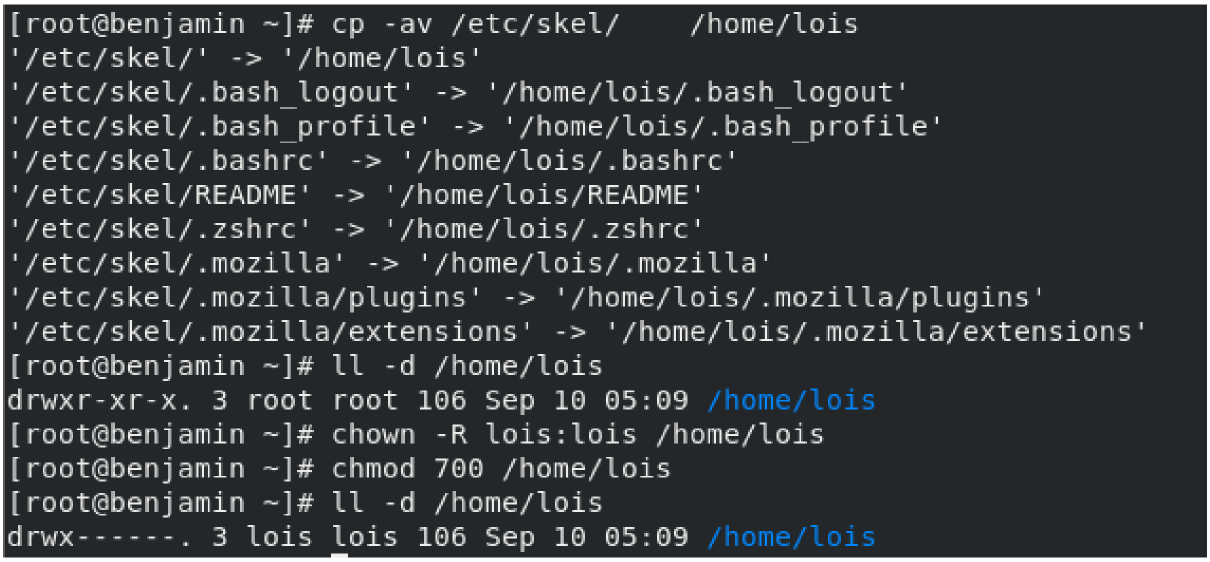
```
[root@benjamin ~]# vigr
lois:x:1003:
```

We now change password for lois using **passwd** command. The password I chose was '**poyostick36'.** We now create a home directory with skeleton files and then we copy the skeleton files to

`/home/lois` via the command **`cp -av /etc/skel/ /home/lois`** where **-a** is for all files and **-v** is for verbose log information.

```
[root@benjamin ~]# passwd lois
[root@benjamin ~]# cp -av /etc/skel/ /home/lois
```

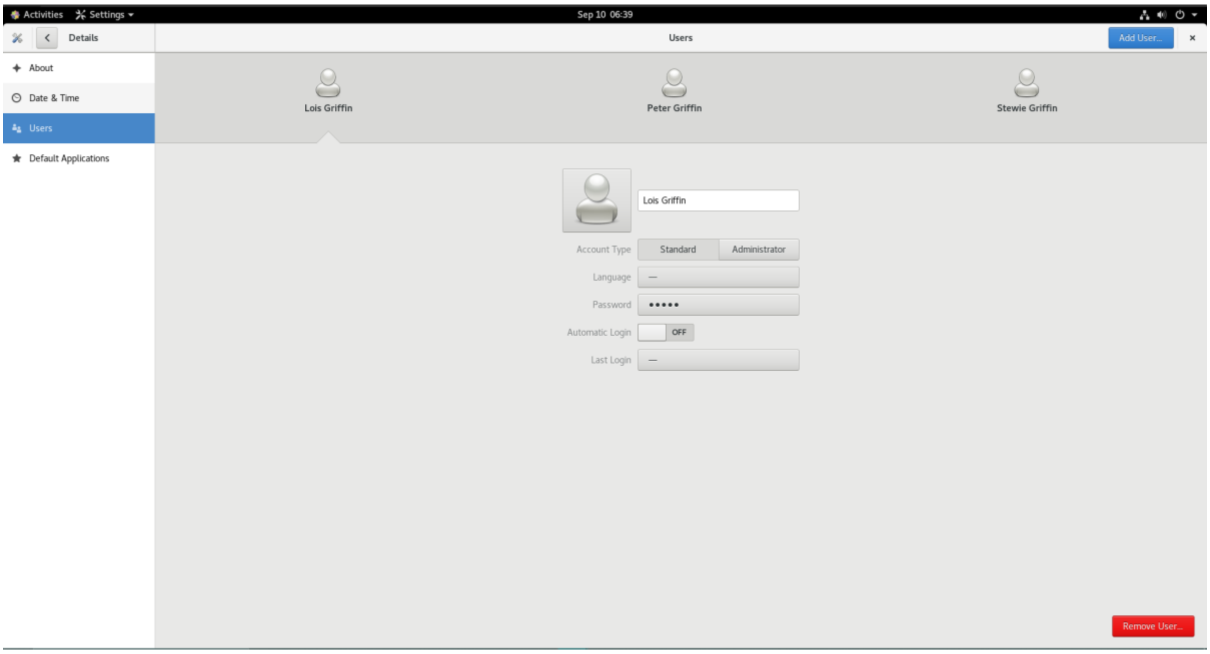
- Check home directory of lois via command **ll -d /home/lois.** We want to change the properties of the group via the commands **chown -R lois:lois /home/lois** and **chmod 700 /home/lois.** Image below shows these commands as well as the **cp -av** command from task above.



```
[root@benjamin ~]# cp -av /etc/skel/    /home/lois
'/etc/skel/' -> '/home/lois'
'/etc/skel/.bash_logout' -> '/home/lois/.bash_logout'
'/etc/skel/.bash_profile' -> '/home/lois/.bash_profile'
'/etc/skel/.bashrc' -> '/home/lois/.bashrc'
'/etc/skel/README' -> '/home/lois/README'
'/etc/skel/.zshrc' -> '/home/lois/.zshrc'
'/etc/skel/.mozilla' -> '/home/lois/.mozilla'
'/etc/skel/.mozilla/plugins' -> '/home/lois/.mozilla/plugins'
'/etc/skel/.mozilla/extensions' -> '/home/lois/.mozilla/extensions'
[root@benjamin ~]# ll -d /home/lois
drwxr-xr-x. 3 root root 106 Sep 10 05:09 /home/lois
[root@benjamin ~]# chown -R lois:lois /home/lois
[root@benjamin ~]# chmod 700 /home/lois
[root@benjamin ~]# ll -d /home/lois
drwx------. 3 lois lois 106 Sep 10 05:09 /home/lois
```

- Checks:
  - **Does lois have a home directory in the right location?**
    - Lois' home directory is in the right location
  - **Who is the user owner and group owner of lois' home directory?**
    - The user owner and group of lois home directory is now 'lois', but as seen in picture above it was originally 'root' using the **ll -d /home/lois** command
  - **What files are present in lois' home directory?**
    - README file is the only one
  - **How did you ensure that you copied the dot files to lois' home directory?**
    - Use command **cp -av /etc/skel /home/lois**
  - **What are the ownerships of these files?**
    - The ownership of these files should be root. To change ownership use **chown -R lois:lois /home/lois** command

Task 5: Using the GUI



Lois Griffin

Account Type: Standard | Administrator

Language: —

Password: •••••

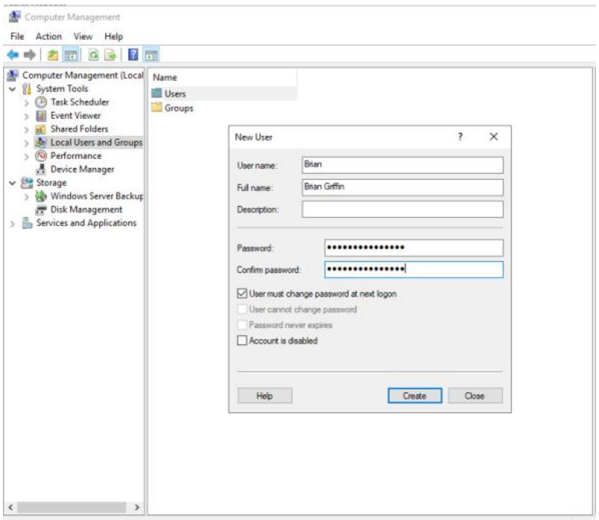
Automatic Login: OFF

Last Login: —

We see all users except for Brian. This is most likely because we modified his UID to 200 making him an admin.

Task 6: Using Windows Server GUI to add users and groups

In this task we create users and groups. We do this by going to **Server Manager→ Local Server → Tools menu → Computer Management → Local User's and Groups → Select Users and then right click to create new users peter, stewie, brian, lois**



New User

User name: Brian

Full name: Brian Griffin

Description:

Password: •••••••••••••••

Confirm password: •••••••••••••••

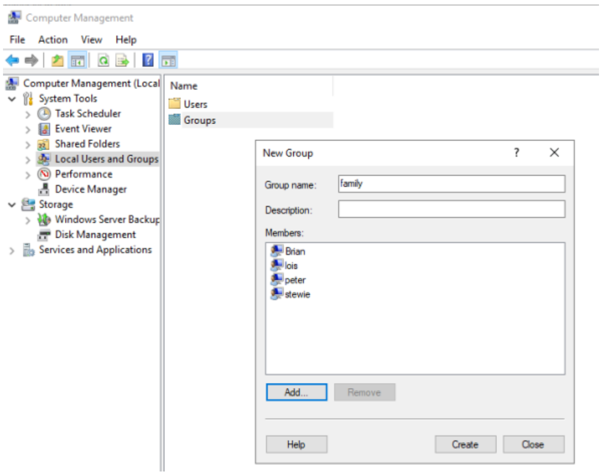
☑ User must change password at next logon

□ User cannot change password

□ Password never expires

□ Account is disabled

We then do the same thing with the groups and add there group (**family**) and assign them as members to the group



Group name: family

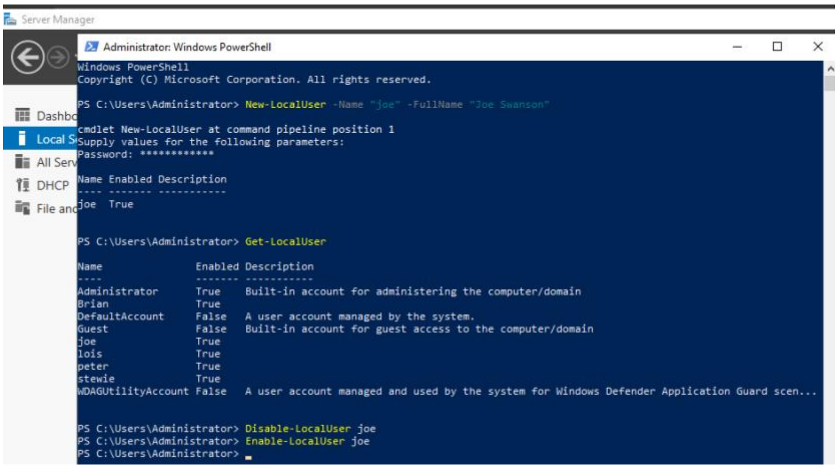
Description:

Members:
Brian
lois
peter
stewie

Task 7: Using Windows Server command line to add users and groups

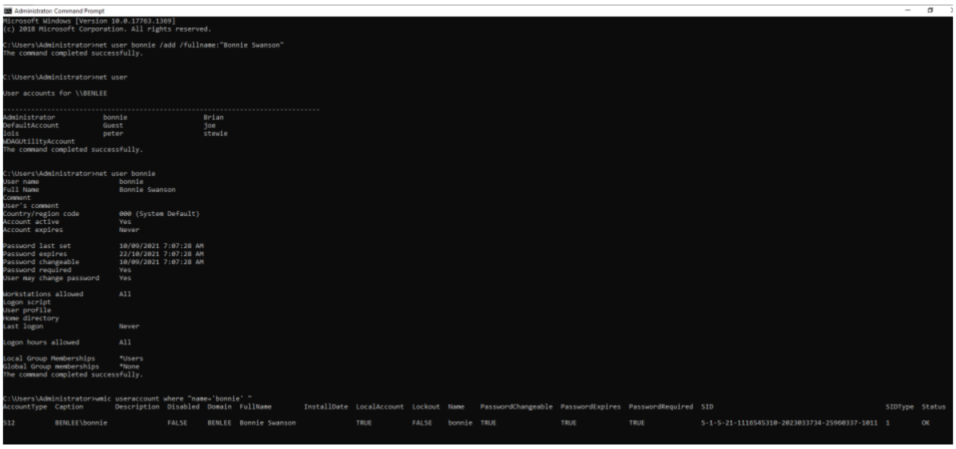
In this task we use powershell to create a new user called ‘joe’ with full name ‘Joe Swanson’ via the command: `New-LocalUser -Name "joe" -FullName "Joe Swanson"`

- **Get-LocalUser** shows current users
- **Disable-LocalUser joe** disables joe’s account
- **Enable-LocalUser joe** renables joe’s account



```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

PS C:\Users\Administrator> New-LocalUser -Name "joe" -FullName "Joe Swanson"

cmdlet New-LocalUser at command pipeline position 1
Supply values for the following parameters:
Password: ************

Name Enabled Description
---- ------- -----------
joe  True


PS C:\Users\Administrator> Get-LocalUser

Name               Enabled Description
----               ------- -----------
Administrator      True    Built-in account for administering the computer/domain
Brian              True
DefaultAccount     False   A user account managed by the system.
Guest              False   Built-in account for guest access to the computer/domain
joe                True
lois               True
peter              True
stewie             True
WDAGUtilityAccount False   A user account managed and used by the system for Windows Defender Application Guard scen...


PS C:\Users\Administrator> Disable-LocalUser joe
PS C:\Users\Administrator> Enable-LocalUser joe
PS C:\Users\Administrator> _
```

- **net user bonnie /add /fullname:"Bonnie Swanson"** – creates a user named Bonnie Swanson
- **net user –** shows user accounts of the windows machine
- **net user bonnie –** shows information on the user ‘bonnie’ including name, password expiry dates, account activity and much more
- **wmic useraccount where "name='bonnie' " –** shows the Account Type of the user account ‘bonnie’ as well as password information such as password expiry, if the password is changeable, SID etc.



```
Microsoft Windows [Version 10.0.17763.1369]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>net user bonnie /add /fullname:"Bonnie Swanson"
The command completed successfully.


C:\Users\Administrator>net user

User accounts for \\BENLEE

-------------------------------------------------------------------------------
Administrator            bonnie                   Brian
DefaultAccount           Guest                    joe
lois                     peter                    stewie
WDAGUtilityAccount
The command completed successfully.


C:\Users\Administrator>net user bonnie
User name                    bonnie
Full Name                    Bonnie Swanson
Comment
User's comment
Country/region code          000 (System Default)
Account active               Yes
Account expires              Never

Password last set            10/09/2021 7:07:28 AM
Password expires             22/10/2021 7:07:28 AM
Password changeable          10/09/2021 7:07:28 AM
Password required            Yes
User may change password     Yes

Workstations allowed         All
Logon script
User profile
Home directory
Last logon                   Never

Logon hours allowed          All

Local Group Memberships      *Users
Global Group memberships     *None
The command completed successfully.


C:\Users\Administrator>wmic useraccount where "name='bonnie' "
AccountType  Caption         Description  Disabled  Domain  FullName        InstallDate  LocalAccount  Lockout  Name    PasswordChangeable  PasswordExpires  PasswordRequired  SID                                           SIDType  Status

512          BENLEE\bonnie                FALSE     BENLEE  Bonnie Swanson               TRUE          FALSE    bonnie  TRUE                TRUE             TRUE              S-1-5-21-1116545310-2023033734-25960337-1011  1        OK
```

Lab 5b

Task 1: Executing root commands safely via sudo in Linux

Visudo command edits the file `/etc/sudoers`. This file allows non-adminstrative or non-root users to perform administrative tasks via **sudo**.

We first use **visudo** and add the following configuration underneath **##Allow root to run any commands anywhere**:

```
[root@benjamin ~]# visudo
peter ALL=/sbin/ifconfig
```

Looking at the file `/etc/sudoers` from **visudo** we can see many commented-out permissions such as User Aliases, Host Aliases, Storage, Delegating permissions and much more.

`%users  ALL=/sbin/mount /mnt/cdrom, /sbin/umount /mnt/cdrom` might be necessary to allow members of the users group to mount and unmount the cdrom as root. Unfortunately I do not know why it only matches `/mnt/cdrom`

We now login as Peter via ssh or su and test the command **sudo** to disable and reenable ens33.

```
[root@benjamin ~]# su – peter
[peter@benjamin ~]~% id
uid=1000(peter) gid=1000(peter) groups=1000(peter)
[peter@benjamin]~% sudo ifconfig ens33 down

We trust you have received the usual lecture from the local System
Administrator. It usually boils down to these three things:

    #1) Respect the privacy of others.
    #2) Think before you type.
    #3) With great power comes great responsibility.

[sudo] password for peter:
[peter@benjamin]~% sudo ifconfig ens33 up
[sudo] password for peter:
```

- If an administrator wanted to grant all users the ability to disconnect or reconnect the ens33 port we should add in **visudo**: `peter ALL=(ALL)   ALL` instead of `peter ALL=/sbin/ifconfig`

- Executing **visudo** with the rule above `peter ALL=(ALL)     ALL` , we should be able to run the commands again as root without the need to enter a password again.
- If we run the command: `sudo su -`, it allows the user to switch to root requiring user's current password. It is a bad thing, as we shouldn't allow normal users to have administrative privileges that they don't need in the real world as it can be a security risk.

Task 2: Executing admin commands in Windows Server

We can run programs as another user via the **runas** command in Windows.

We can execute the cmd shell as administrator via the command **runas /user:Administrator cmd.exe** while logged in as a normal user.

Doing this prompts me with an admin password. I then get a new command prompt with cmd title: **Administrator: cmd.exe (running as BENLEE\Administrator)**

Entering the command **runas /user:peter cmd.exe,** I get another command prompt asking me for peter's password. The cmd title now shows: **cmd.exe (running as BENLEE\peter)**

Task 3: Notifying users on system issues or computer usage policies (Linux – the old way)

In this task we need to edit the file **`/etc/motd`** that shows a message of the day when a user logs out and logs back in.

We then edit 3 other files as seen below alongside **`/etc/motd`**:

- ***`/etc/issue, /etc/issue.net, /etc/sshd_config`***

```
[root@benjamin ~]# vim /etc/motd
Morning >:D
```

```
[root@benjamin ~]# vim /etc/issue
3333333333333333333333
\S
Kernel \r on an \m
4444444444444444444444
```

```
[root@benjamin ~]# vim /etc/issue.net
5555555555555555555555
\S
Kernel \r on an \m
6666666666666666666666
```

```
[root@benjamin ~]# vim /etc/ssh/sshd_config
# no default banner path
Banner /etc/issue.net
[root@benjamin ~]# systemctl restart sshd
```

Using SSH to log into peter we get the contents of the /etc/issue.net file due to the message of the day.

```
[root@benjamin ~]# ssh peter@localhost
5555555555555555555555
\S
Kernel \r on an \m
6666666666666666666666
```

```
peter@localhost's password:
Morning!
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Fri Sep  1 07:20:12 2021
```

- Pressing Ctrl-Alt-F3 for text-based login, when I try to login to one of my users peter we do see `/etc/motd` displayed with 'Morning!' but no `/etc/issue.net or /etc/issue`
- For graphical login using Ctrl-Alt-F1, and logging into peter no message of the day or `/etc/issue.net or /etc/issue` appears
- Using SSH `/etc/issue.net or /etc/issue` does appear as well as `/etc/motd`

Task 4: Notifying users on system issues or computer usage policies (Linux – the graphical way)

In this task, we edit 2 files via **vim**.

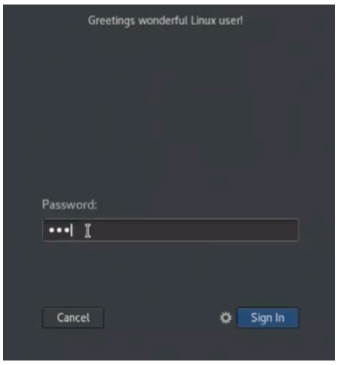
- `/etc/dconf/profile/gdm`

```
[root@benjamin ~]# vim /etc/dconf/profile/gdm
user-db:user
system-db:gdm
file-db: /usr/share/gdm/greeter-dconf-defaults
```

- Make directory by command **mkdir /etc/dconf/db/gdm.d**
- `/etc/dconf/db/gdm.d/01-banner-message`

```
root@benjamin ~]# vim /etc/dconf/db/gdm.d/01-banner-message
[org/gnome/login-screen]
banner-message-enable=true
banner-message-text='Greetings wonderful Linux user!'
```

- We then update the dconf database via command **dconf database**. Restart the gdm service by using command: **systemctl restart gdm.** We should get something like this as seen in picture below:



Greetings wonderful Linux user!

Password: •••

Task 5: Notifying users on system issues or computer usage policies (Windows Server)

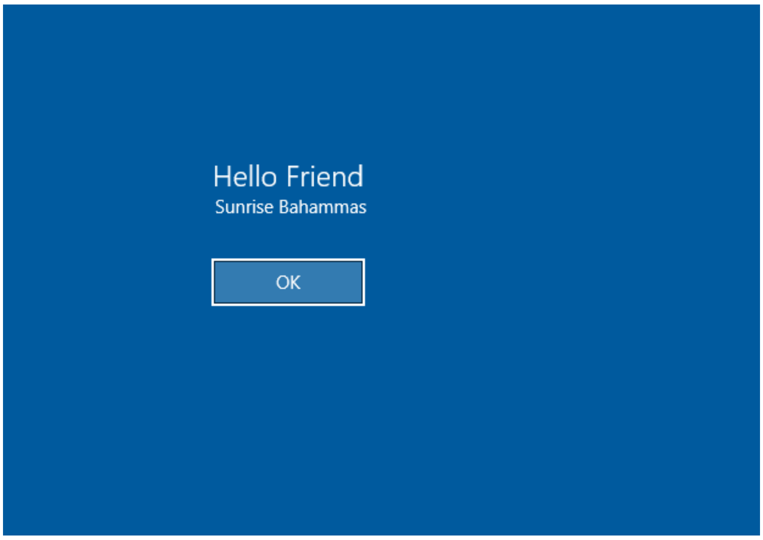
In this task, we can display a message of the day on the login screen. We can do this by going to **Server Manager → Tools → Local Security Policy → Local Policies → Security Options → Edit Interactive logon: Message text for users attempting to log on AND interactive logon: Message title for users attempting to log on**

- For 'Message text for users attempting to log on' I put 'Sunrise Bahammas'
- For 'Message title for users attempting to log on' I put 'Hello Friend'

We now open powershell and run command `gpupdate /force` to update system policies.

- It should state 'Computer Policy update has completed Successfully. User Policy update has completed successfully.'

We now log out and log back in to test. Result is shown below.



Hello Friend

Sunrise Bahammas

Reflection

I haven't had this much fun doing lab work for other subjects since forever. I learnt a lot doing this learning journal and the labs as they were super interactive and fun to complete. Looking at the videos and having the tutor provide some guidance in the tutorial really helped me understand the concepts and commands when writing the report.

At the start I had some trouble with my Virtual Machine's network configuration not working. For some reason using my macbook with VMware Fusion, I wasn't able to fix the problem of DHCP and internet not being available for the Network Interface Ethernet1. I tried configuring the settings of VMNet2 but nothing seemed to work. Even updating my Vmware version didn't work. I even emailed the tutor for some advice but it still didn't seem to work as well for some reason. I had to reinstall everything on my old PC with Vmware Workstation and by some miracle, the network configurations were working properly. I have no idea why. Maybe a software compatibility issue I am not sure.

The labs starting from week3-4 were the most challenging in my opinion because we were configuring DHCP and using some network commands. The labs themselves were very rewarding once completed and I enjoyed taking my time going through them. I didn't really have any other challenges that were unsolved except for the `/mnt/cdm` question in Week 5 Lab 5b Task 1 where it asks: Why does it only match /mnt/cdrom, and not any device?

Other than that everything else was good. I definitely could have done a bit better if I started my journal a bit earlier for some of the later weeks.

Overall, I am satisfied with the amount of effort I put into this learning journal.

References

Canvas Lab 1 Materials 2021, Canvas. viewed 10 Sep 2021, < https://canvas.uts.edu.au/courses/18126/pages/lecture-1-materials?module_item_id=463826>.

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