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1DV512 – Operating Systems group Assignment1

Group: 23
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Course Code: 1DV512
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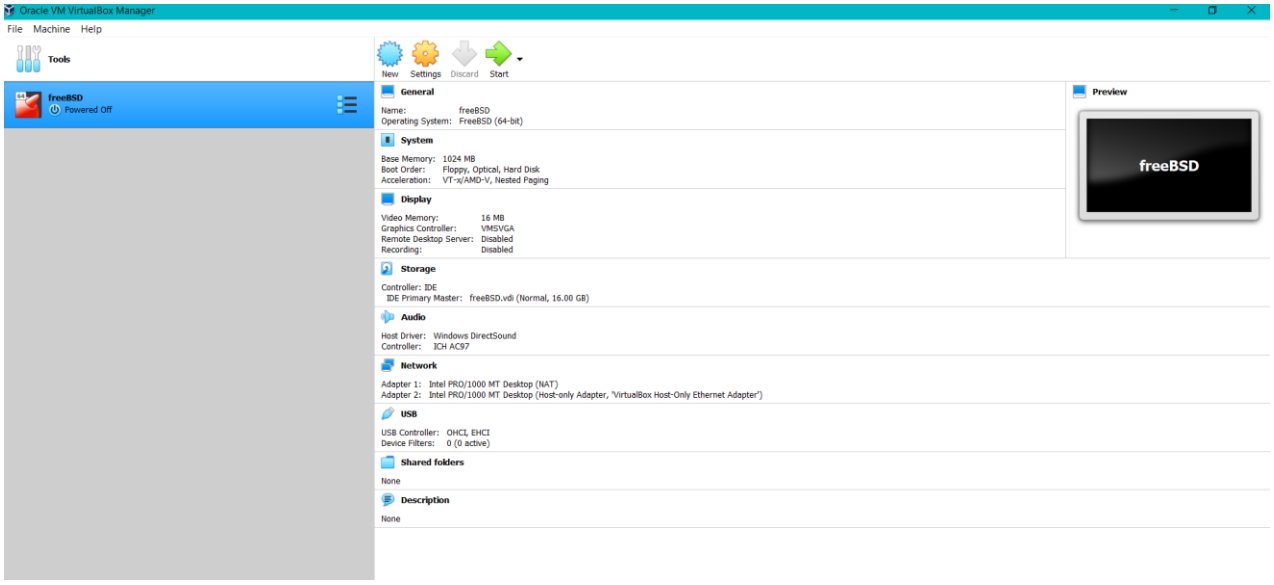
Operating Systems Group Assignment1

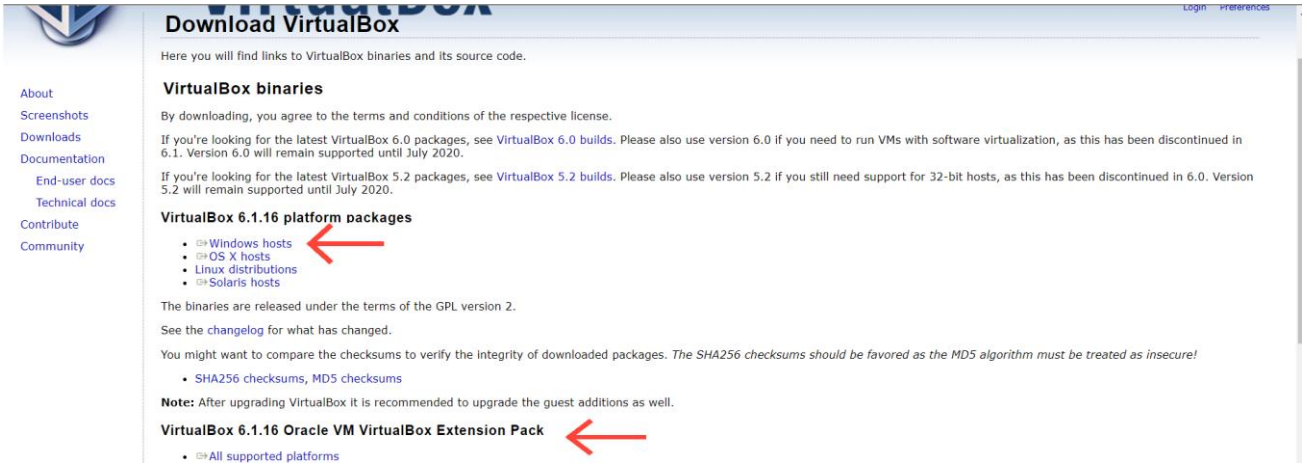
1. Task 1: Setting up the virtual Machine Software

In the first task, we were required to install the virtual box (virtual machine software). Additionally, due to the command-line tools such as SSH and rsync, we have installed the Cygwin application to connect from our host OS to the VM in some specific parts of the assignment. Consequently, the following attachments will provide the reader about our host system and the running applications after installation.

The below picture will show the host OS architecture of one of the members. However, all of us are having 64bit and windows 10 in our system.



The below picture will portrait the selected VM software and the final view after the installations. Also, I have provided the data from the website that these applications were downloaded.



Cygwin

Get that Linux feeling - on Windows

This is the home of the Cygwin project

What...

...is it?

Cygwin is:

- a large collection of GNU and Open Source tools which provide functionality similar to a Linux distribution on Windows.
- a DLL (cygwin1.dll) which provides substantial POSIX API functionality.

...isn't it?

Cygwin is not:

- a way to run native Linux apps on Windows. You must rebuild your application *from source* if you want it to run on Windows.
- a way to magically make native Windows apps aware of UNIX® functionality like signals, ptys, etc. Again, you need to build your apps *from source* if you want to take advantage of Cygwin functionality.

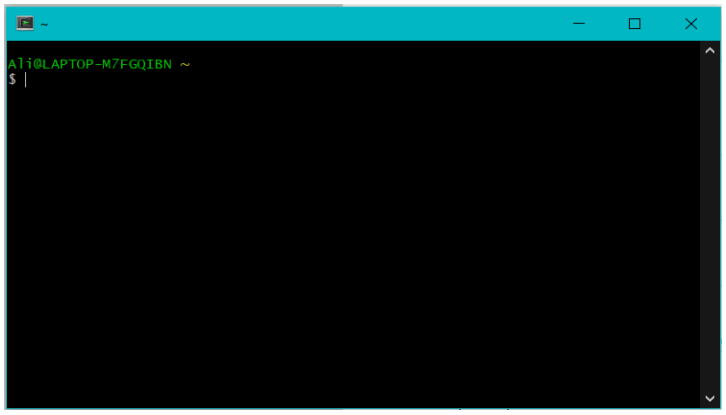
The Cygwin DLL currently works with all recent, commercially released x86_64 versions of Windows, starting with Windows Vista. For more information see the FAQ.

Cygwin version

The most recent version of the Cygwin DLL is 3.1.6.

Installing Cygwin

Install Cygwin by running setup-x86_64.exe



2. Task 2: Installing FreeBSD

In this task, we were required to install the FreeBSD and create VM at the first step. That is, since we are supposed to use and continue working on the command-line interface without enquiring any GUI environments, there will be no need to use multiple computational resources.

Below I will attach the pictures showing the latest version installer that we used. That is, by looking at the picture, the reader will realize that the version we have used is 64bit and we have downloaded FreeBSD 12.2.

Release:
11.4
» Snapshot Releases
Upcoming Release:
13.0
» Ported Applications

Choosing an Image

The FreeBSD installer can be downloaded in a number of different formats including CD (disc1), DVD (dvd1), and Network Install (bootonly) sized ISO Disc Images, as well as regular and mini USB memory stick images. Recent versions of FreeBSD are also offered as prebuilt expandable Virtual Machine images, and as SD Card images for embedded platforms.

FreeBSD Deployment Statistics

While FreeBSD does not gather deployment statistics, having statistical information available is essential. Please consider installing the sysutils/bsdstats package, which collects hardware and software statistics, helping developers understand how to best focus their efforts. The information collected is available at the bsdstats.org website.

FreeBSD 12.2-RELEASE

Installer Images	Virtual Machine Images	SD Card Images	Documentation
amd64 ←	README	RPI-B	Released: October, 2020
i386	amd64	BANANAPI	Release Notes
powerpc	i386	CUBIEBOARD	Readme
powerpc64	aarch64	CUBIEBOARD2	Hardware Compatibility List
powerpcspe		CUBOX-HUMMINGBOARD	Installation Instructions
sparc64		GENERICSD	Errata
aarch64		RPI2	Signed Checksums
		PANDABOARD	
		WANDBOARD	
		PINE64	
		PINE64-LTS	
		RPI3	

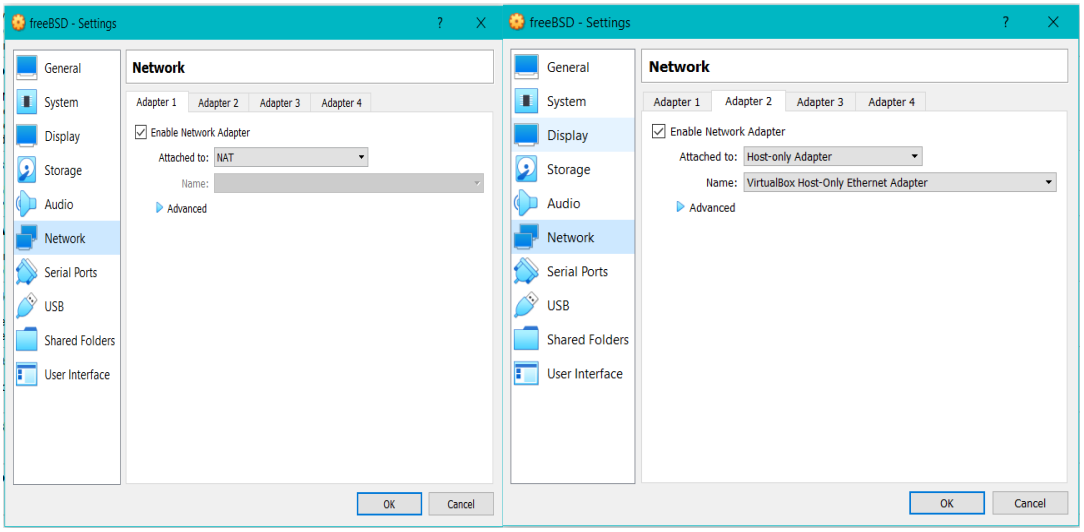
Index of /ftp/releases/amd64/amd64/ISO-IMAGES/12.2/

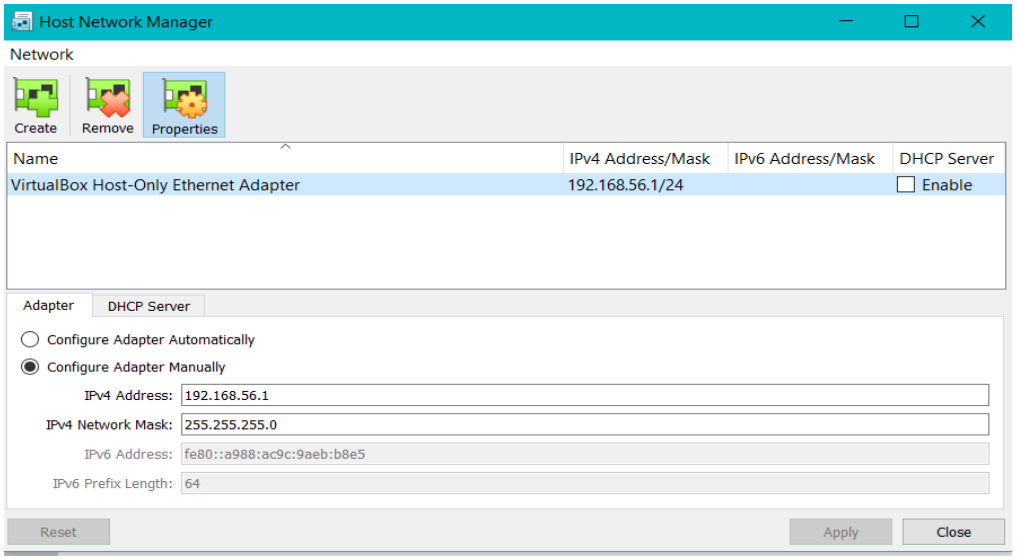
File Name ⊥	File Size ⊥	Date ⊥
Parent directory/	-	-
CHECKSUM.SHA256-FreeBSD-12.2-RELEASE-amd64	1171	2020-Oct-23 09:32
CHECKSUM.SHA512-FreeBSD-12.2-RELEASE-amd64	1811	2020-Oct-23 09:30
FreeBSD-12.2-RELEASE-amd64-bootonly.iso	362465280	2020-Oct-23 05:57
FreeBSD-12.2-RELEASE-amd64-bootonly.iso.xz	81736024	2020-Oct-23 05:57
FreeBSD-12.2-RELEASE-amd64-disc1.iso ←	965099520	2020-Oct-23 05:55
FreeBSD-12.2-RELEASE-amd64-disc1.iso.xz	684053244	2020-Oct-23 05:55
FreeBSD-12.2-RELEASE-amd64-dvd1.iso	4695803904	2020-Oct-23 06:03
FreeBSD-12.2-RELEASE-amd64-dvd1.iso.xz	3556308292	2020-Oct-23 06:03
FreeBSD-12.2-RELEASE-amd64-memstick.img	1055957504	2020-Oct-23 06:04
FreeBSD-12.2-RELEASE-amd64-memstick.img.xz	687961180	2020-Oct-23 06:04
FreeBSD-12.2-RELEASE-amd64-mini-memstick.img	405053952	2020-Oct-23 06:04
FreeBSD-12.2-RELEASE-amd64-mini-memstick.img.xz	85694576	2020-Oct-23 06:04

Additionally, the below attachments will display how we have configured the VM in FreeBSD.

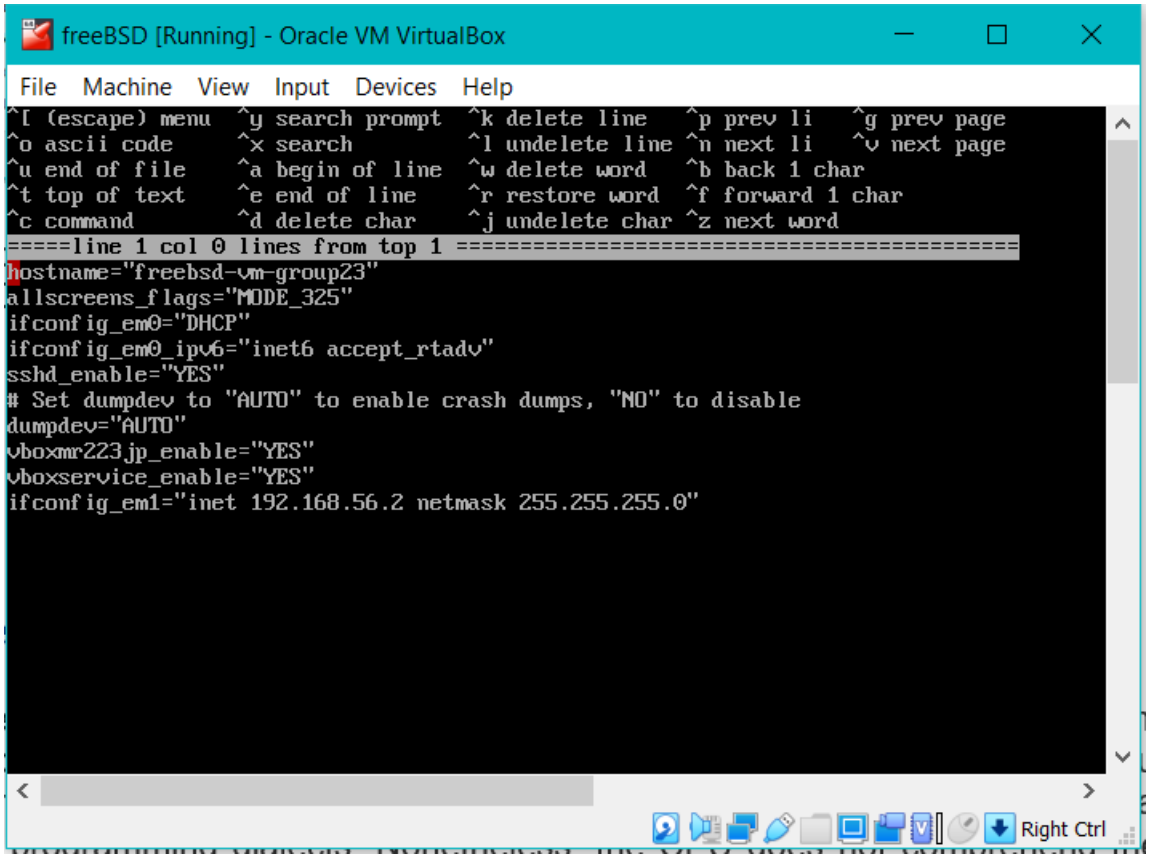
Network

Adapter 1: Intel PRO/1000 MT Desktop (NAT)
Adapter 2: Intel PRO/1000 MT Desktop (Host-only Adapter, 'VirtualBox Host-Only Ethernet Adapter')



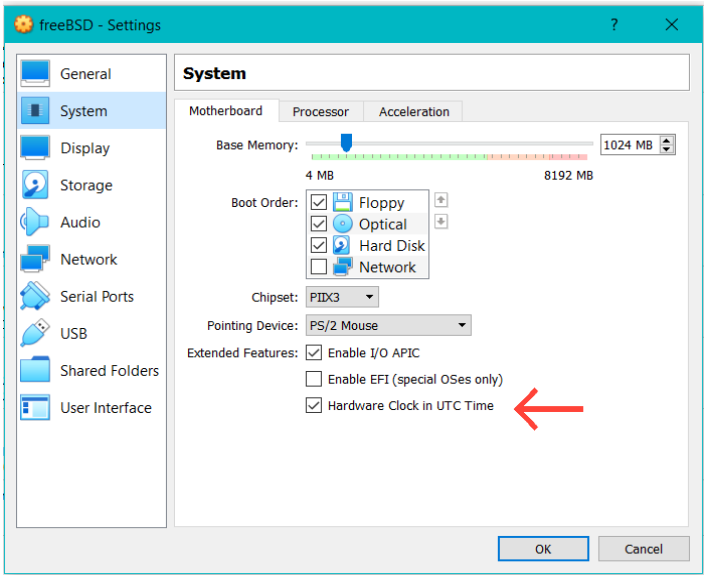


I will also include an attachment portraying the status of the VM configuration in the FreeBSD environment.

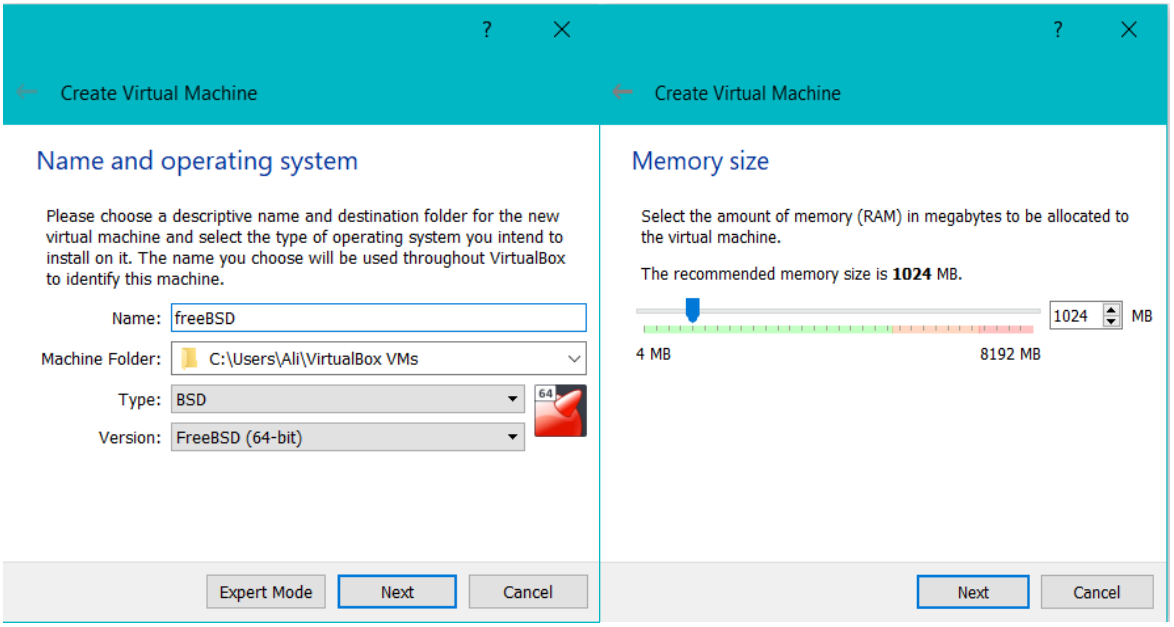


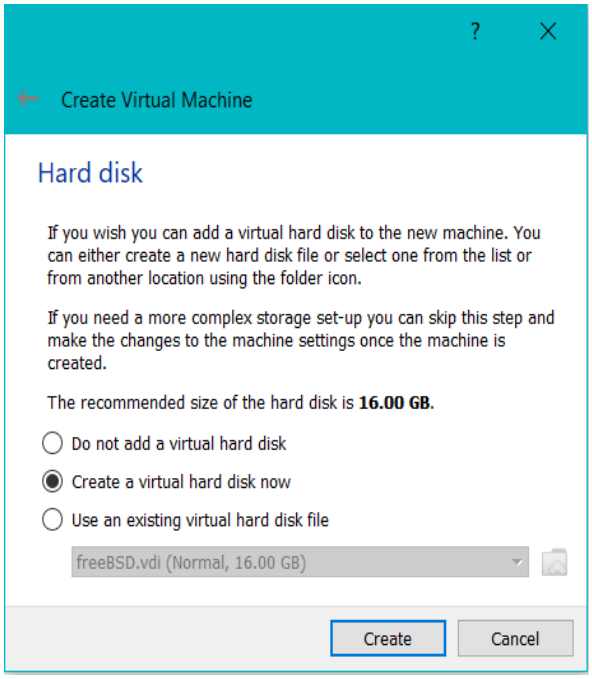
Finally, the below attachments will indicate the steps that we have followed to install the FreeBSD (OS installations process).

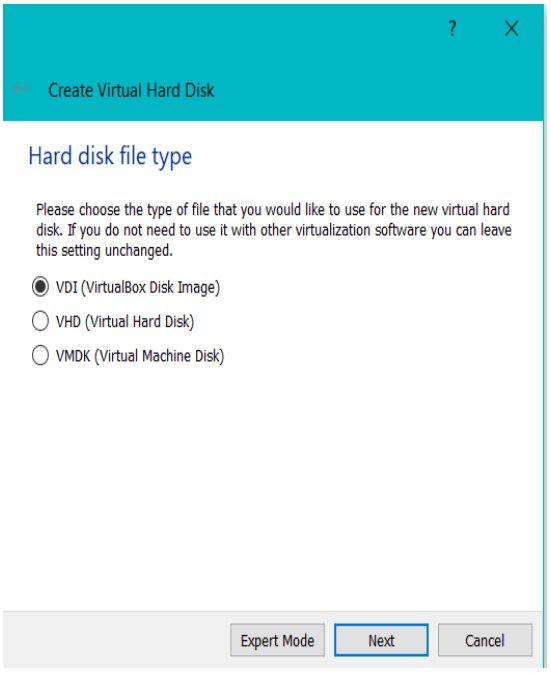
Before starting the application, we have enabled the Hardware clock in UTC Time in the system part of the setting. As a result, we were able to adjust the exact time and date in our environment.

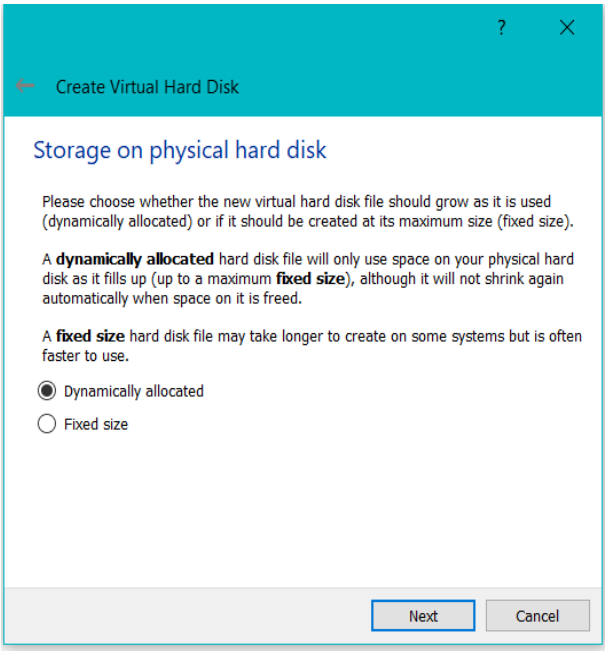


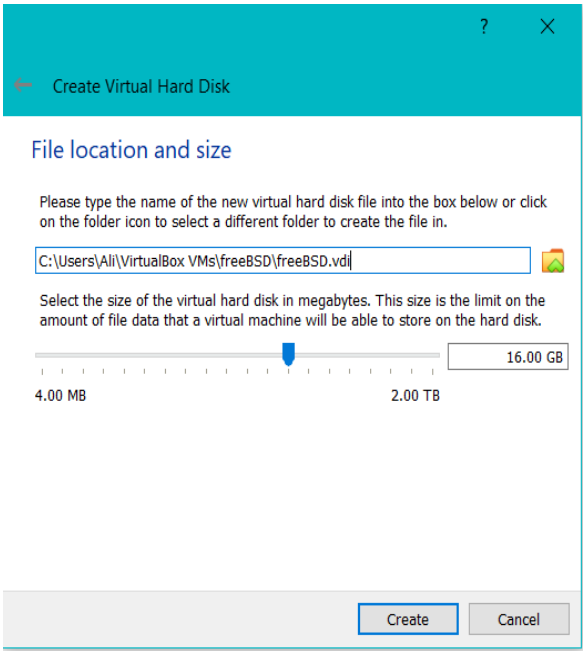
The following pictures will indicate the exact process that we have been through.

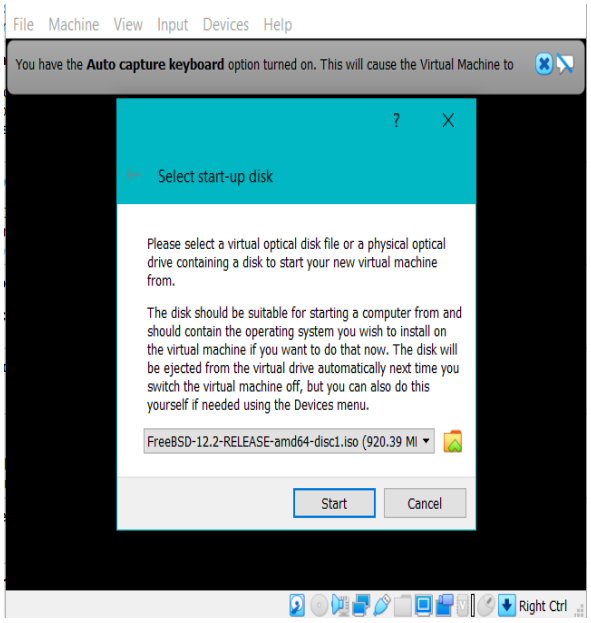


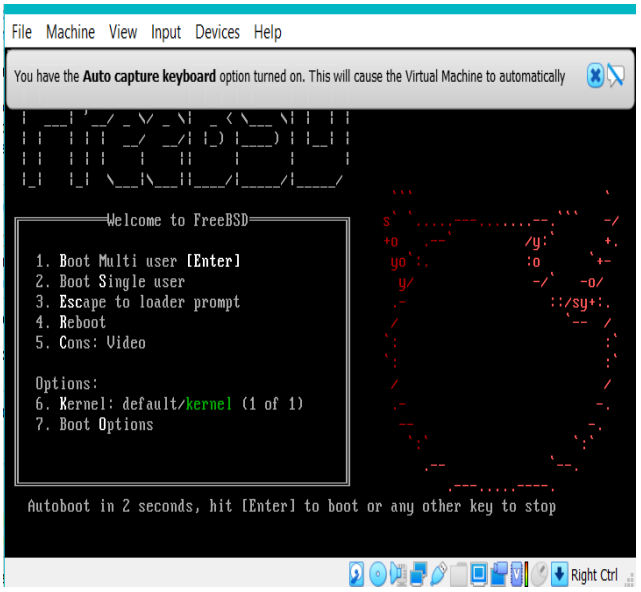

Create Virtual Machine
Hard disk
If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select one from the list or from another location using the folder icon.
If you need a more complex storage set-up you can skip this step and make the changes to the machine settings once the machine is created.
The recommended size of the hard disk is 16.00 GB.
Do not add a virtual hard disk
Create a virtual hard disk now
Use an existing virtual hard disk file
freeBSD.vdi (Normal, 16.00 GB)
Create
Cancel

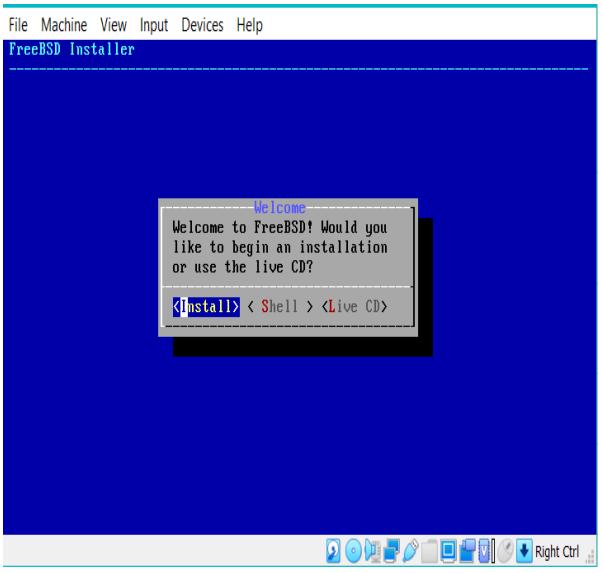

Create Virtual Hard Disk
Hard disk file type
Please choose the type of file that you would like to use for the new virtual hard disk. If you do not need to use it with other virtualization software you can leave this setting unchanged.
VDI (VirtualBox Disk Image)
VHD (Virtual Hard Disk)
VMDK (Virtual Machine Disk)
Expert Mode
Next
Cancel

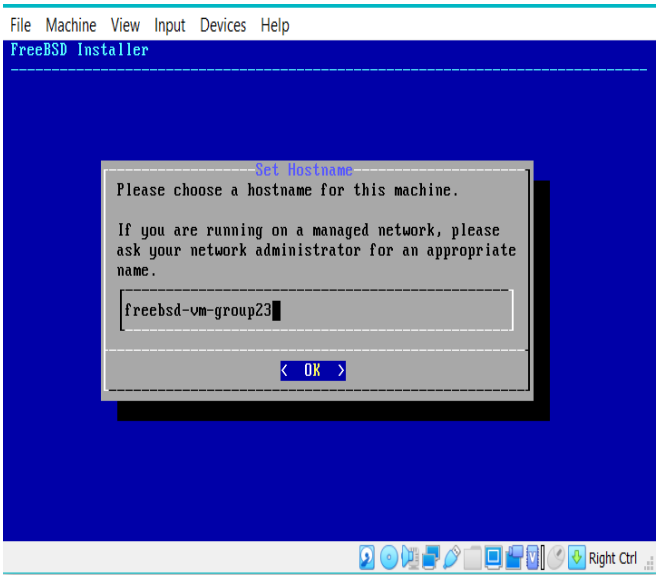

Create Virtual Hard Disk
Storage on physical hard disk
Please choose whether the new virtual hard disk file should grow as it is used (dynamically allocated) or if it should be created at its maximum size (fixed size).
A dynamically allocated hard disk file will only use space on your physical hard disk as it fills up (up to a maximum fixed size), although it will not shrink again automatically when space on it is freed.
A fixed size hard disk file may take longer to create on some systems but is often faster to use.
Dynamically allocated
Fixed size
Next
Cancel

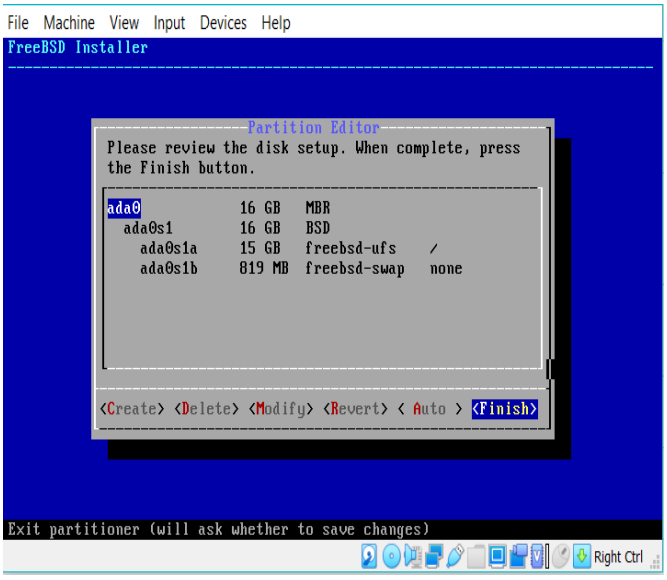

Create Virtual Hard Disk
File location and size
Please type the name of the new virtual hard disk file into the box below or click on the folder icon to select a different folder to create the file in.
C:\Users\Ali\VirtualBox VMs\freeBSD\freeBSD.vdi
Select the size of the virtual hard disk in megabytes. This size is the limit on the amount of file data that a virtual machine will be able to store on the hard disk.
16.00 GB
4.00 MB
2.00 TB
Create
Cancel

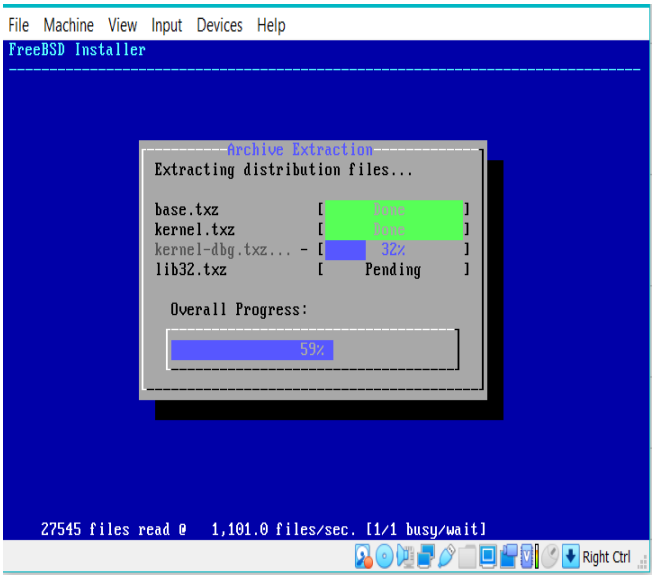

File Machine View Input Devices Help
You have the Auto capture keyboard option turned on. This will cause the Virtual Machine to
Select start-up disk
Please select a virtual optical disk file or a physical optical drive containing a disk to start your new virtual machine from.
The disk should be suitable for starting a computer from and should contain the operating system you wish to install on the virtual machine if you want to do that now. The disk will be ejected from the virtual drive automatically next time you switch the virtual machine off, but you can also do this yourself if needed using the Devices menu.
FreeBSD-12.2-RELEASE-amd64-disc1.iso (920.39 MI
Start
Cancel
Right Ctrl

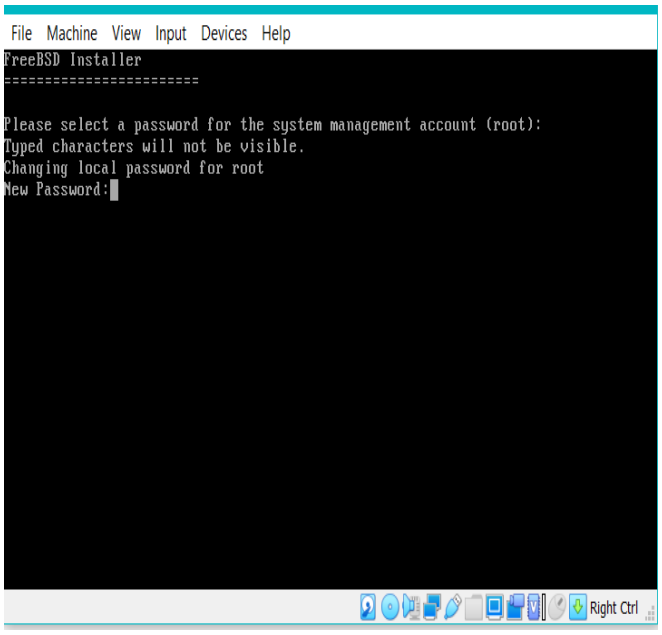

File Machine View Input Devices Help
You have the Auto capture keyboard option turned on. This will cause the Virtual Machine to automatically
Welcome to FreeBSD
1. Boot Multi user [Enter]
2. Boot Single user
3. Escape to loader prompt
4. Reboot
5. Cons: Video
Options:
6. Kernel: default/kernel (1 of 1)
7. Boot Options
Autoboot in 2 seconds, hit [Enter] to boot or any other key to stop
Right Ctrl

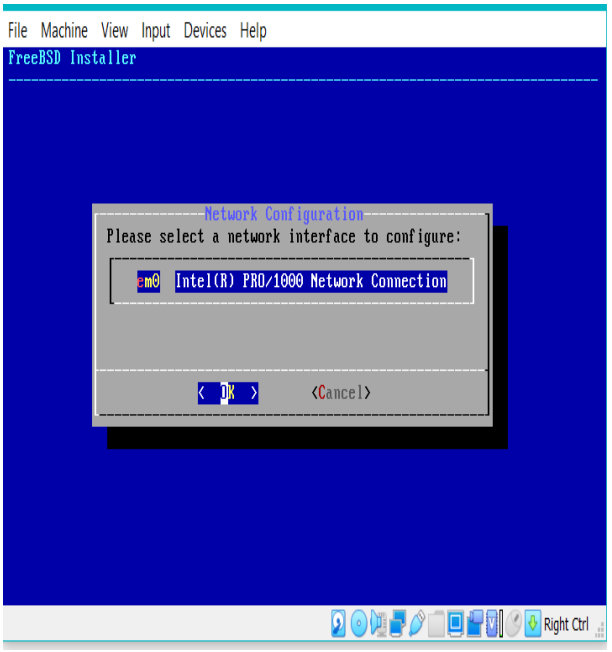

File Machine View Input Devices Help
FreeBSD Installer
Welcome
Welcome to FreeBSD! Would you like to begin an installation or use the live CD?
<Install> < Shell > <Live CD>
Right Ctrl

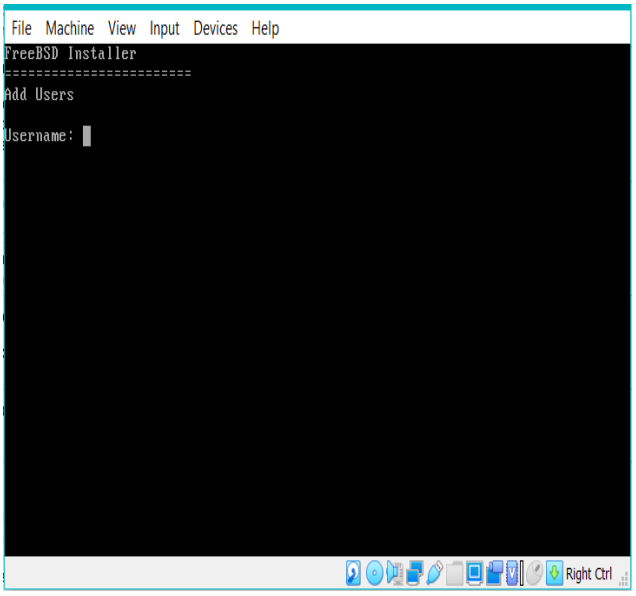

File Machine View Input Devices Help
FreeBSD Installer
Set Hostname
Please choose a hostname for this machine.
If you are running on a managed network, please ask your network administrator for an appropriate name.
freebsd-vm-group23
< OK >
Right Ctrl

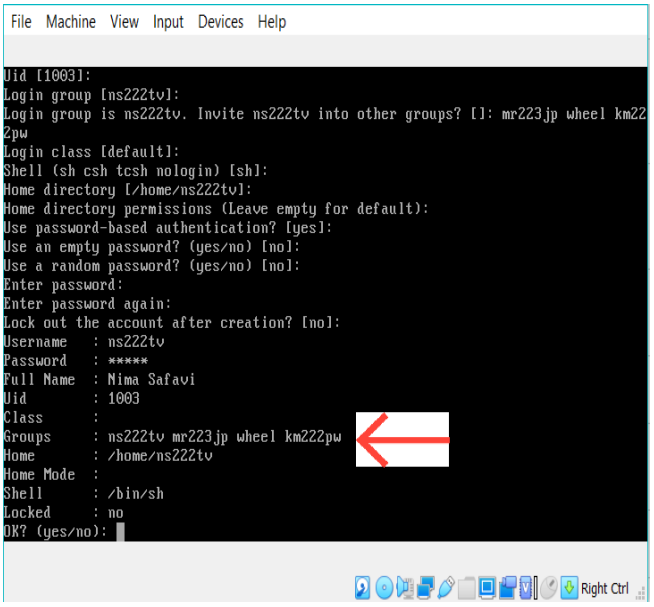

File Machine View Input Devices Help
FreeBSD Installer
Partition Editor
Please review the disk setup. When complete, press the Finish button.
ada0 16 GB MBR
ada0s1 16 GB BSD
ada0s1a 15 GB freebsd-ufs /
ada0s1b 819 MB freebsd-swap none
<Create> <Delete> <Modify> <Revert> < Auto > <Finish>
Exit partitioner (will ask whether to save changes)
Right Ctrl

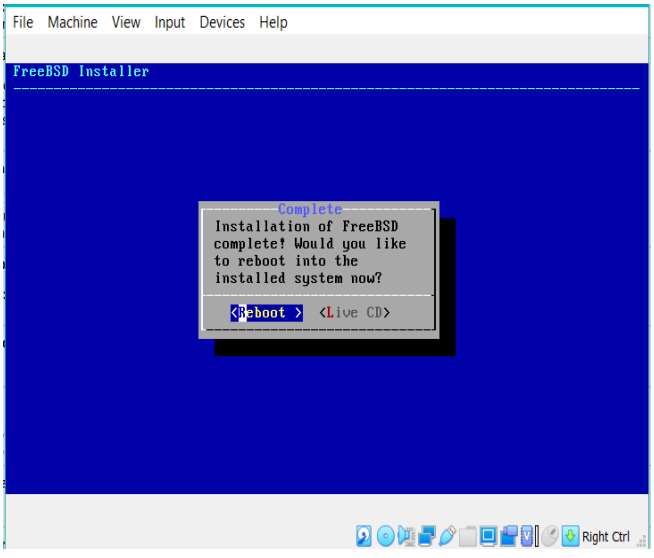

File Machine View Input Devices Help
FreeBSD Installer
Archive Extraction
Extracting distribution files...
base.txz [Done]
kernel.txz [Done]
kernel-dbg.txz... - [32%]
lib32.txz [Pending]
Overall Progress:
59%
27545 files read @ 1,101.0 files/sec. [1/1 busy/wait]
Right Ctrl

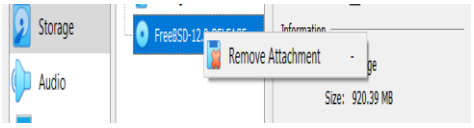

File Machine View Input Devices Help
FreeBSD Installer
Please select a password for the system management account (root):
Typed characters will not be visible.
Changing local password for root
New Password:
Right Ctrl

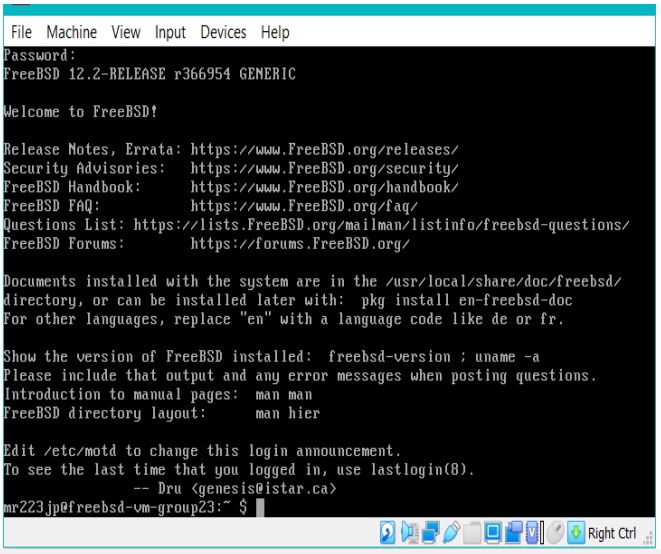

File Machine View Input Devices Help
FreeBSD Installer
Network Configuration
Please select a network interface to configure:
em0 Intel(R) PRO/1000 Network Connection
< OK >
<Cancel>
Right Ctrl


File Machine View Input Devices Help
FreeBSD Installer
Add Users
Username:
Right Ctrl

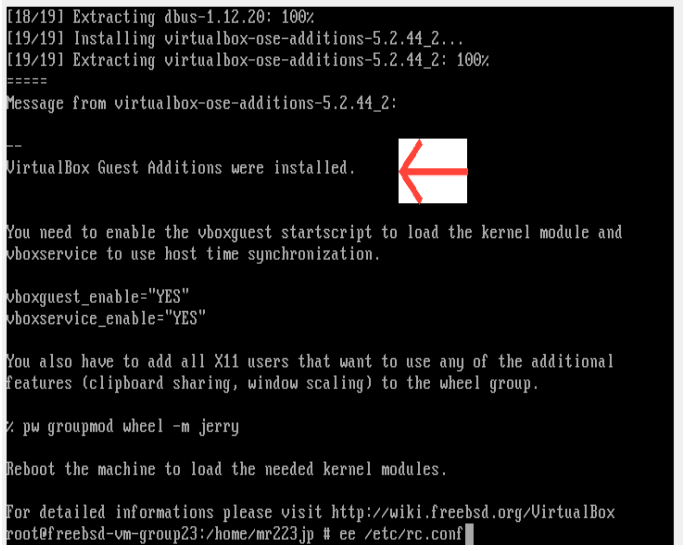

File Machine View Input Devices Help
Uid [1003]:
Login group [ns222tv]:
Login group is ns222tv. Invite ns222tv into other groups? []: mr223jp wheel km222pw
Login class [default]:
Shell (sh csh tcsh nologin) [sh]:
Home directory [/home/ns222tv]:
Home directory permissions (Leave empty for default):
Use password-based authentication? [yes]:
Use an empty password? (yes/no) [no]:
Use a random password? (yes/no) [no]:
Enter password:
Enter password again:
Lock out the account after creation? [no]:
Username : ns222tv
Password : *****
Full Name : Nima Safavi
Uid : 1003
Class :
Groups : ns222tv mr223jp wheel km222pw
Home : /home/ns222tv
Home Mode :
Shell : /bin/sh
Locked : no
OK? (yes/no):
Right Ctrl

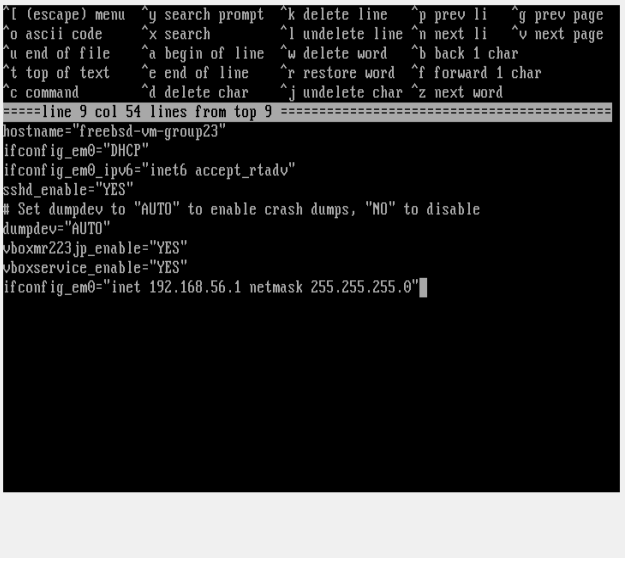

File Machine View Input Devices Help
FreeBSD Installer
Complete
Installation of FreeBSD complete! Would you like to reboot into the installed system now?
<Reboot > <Live CD>
Right Ctrl

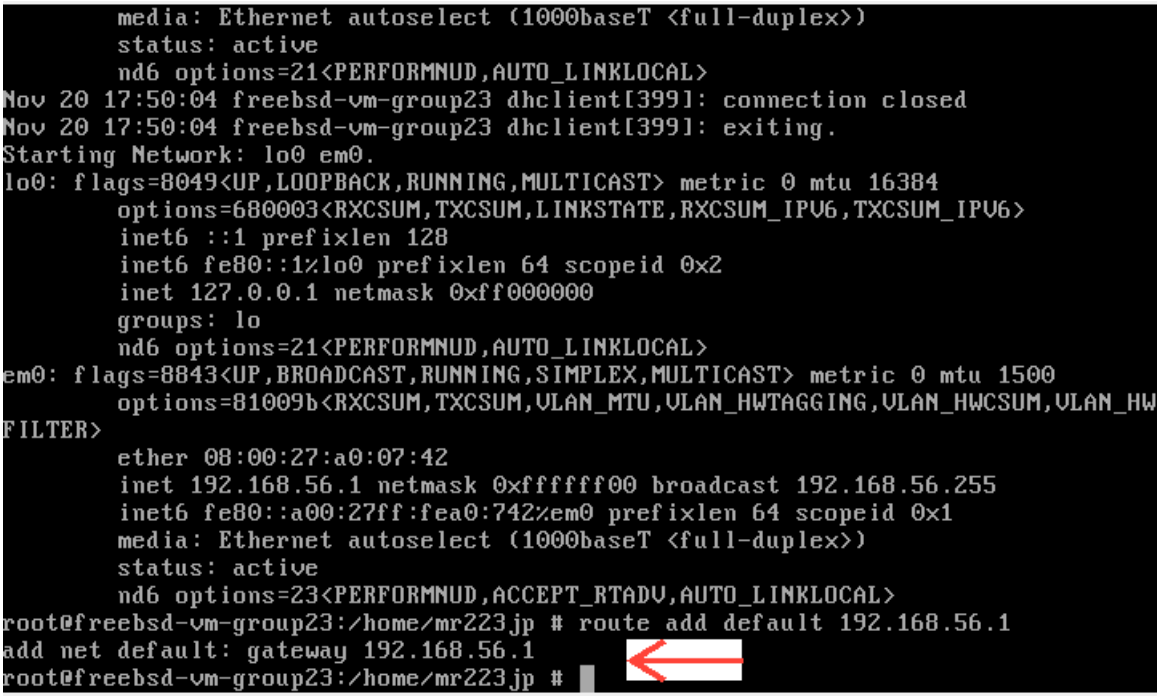

Storage
Audio
Remove Attachment
Size: 920.39 MB


File Machine View Input Devices Help
Password:
FreeBSD 12.2-RELEASE r366954 GENERIC
Welcome to FreeBSD!
Release Notes, Errata: https://www.FreeBSD.org/releases/
Security Advisories: https://www.FreeBSD.org/security/
FreeBSD Handbook: https://www.FreeBSD.org/handbook/
FreeBSD FAQ: https://www.FreeBSD.org/faq/
Questions List: https://lists.FreeBSD.org/mailman/listinfo/freebsd-questions/
FreeBSD Forums: https://forums.FreeBSD.org/
Documents installed with the system are in the /usr/local/share/doc/freebsd/
directory, or can be installed later with: pkg install en-freebsd-doc
For other languages, replace "en" with a language code like de or fr.
Show the version of FreeBSD installed: freebsd-version ; uname -a
Please include that output and any error messages when posting questions.
Introduction to manual pages: man man
FreeBSD directory layout: man hier
Edit /etc/motd to change this login announcement.
To see the last time that you logged in, use lastlogin(8).
-- Dru <genesis@istar.ca>
mr223jp@freebsd-vm-group23:~ $
Right Ctrl


Release Notes, Errata: https://www.FreeBSD.org/releases/
Security Advisories: https://www.FreeBSD.org/security/
FreeBSD Handbook: https://www.FreeBSD.org/handbook/
FreeBSD FAQ: https://www.FreeBSD.org/faq/
Questions List: https://lists.FreeBSD.org/mailman/listinfo/freebsd-questions/
FreeBSD Forums: https://forums.FreeBSD.org/
Documents installed with the system are in the /usr/local/share/doc/freebsd/
directory, or can be installed later with: pkg install en-freebsd-doc
For other languages, replace "en" with a language code like de or fr.
Show the version of FreeBSD installed: freebsd-version ; uname -a
Please include that output and any error messages when posting questions.
Introduction to manual pages: man man
FreeBSD directory layout: man hier
Edit /etc/motd to change this login announcement.
To see the last time that you logged in, use lastlogin(8).
-- Dru <genesis@istar.ca>
mr223jp@freebsd-vm-group23:~ $ su
Password:
Nov 20 17:34:21 freebsd-vm-group23 su[840]: mr223jp to root on /dev/ttyv0
root@freebsd-vm-group23:/home/mr223jp # pkg install emulators/virtualbox-ose-add
itions


[18/19] Extracting dbus-1.12.20: 100%
[19/19] Installing virtualbox-ose-additions-5.2.44_2...
[19/19] Extracting virtualbox-ose-additions-5.2.44_2: 100%
=====
Message from virtualbox-ose-additions-5.2.44_2:
--
VirtualBox Guest Additions were installed.
You need to enable the vboxguest startscript to load the kernel module and
vboxservice to use host time synchronization.
vboxguest_enable="YES"
vboxservice_enable="YES"
You also have to add all X11 users that want to use any of the additional
features (clipboard sharing, window scaling) to the wheel group.
% pw groupmod wheel -m jerry
Reboot the machine to load the needed kernel modules.
For detailed informations please visit http://wiki.freebsd.org/VirtualBox
root@freebsd-vm-group23:/home/mr223jp # ee /etc/rc.conf


^[(escape) menu ^y search prompt ^k delete line ^p prev li ^g prev page
^o ascii code ^x search ^l undelete line ^n next li ^v next page
^u end of file ^a begin of line ^w delete word ^b back 1 char
^t top of text ^e end of line ^r restore word ^f forward 1 char
^c command ^d delete char ^j undelete char ^z next word
=====line 9 col 54 lines from top 9 ==========
hostname="freebsd-vm-group23"
ifconfig_em0="DHCP"
ifconfig_em0_ipv6="inet6 accept_rtadv"
sshd_enable="YES"
# Set dumpdev to "AUTO" to enable crash dumps, "NO" to disable
dumpdev="AUTO"
vboxmr223jp_enable="YES"
vboxservice_enable="YES"
ifconfig_em0="inet 192.168.56.1 netmask 255.255.255.0"


media: Ethernet autoselect (1000baseT <full-duplex>)
status: active
nd6 options=21<PERFORMNUD,AUTO_LINKLOCAL>
Nov 20 17:50:04 freebsd-vm-group23 dhclient[399]: connection closed
Nov 20 17:50:04 freebsd-vm-group23 dhclient[399]: exiting.
Starting Network: lo0 em0.
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> metric 0 mtu 16384
options=680003<RXCSUM,TXCSUM,LINKSTATE,RXCSUM_IPV6,TXCSUM_IPV6>
inet6 ::1 prefixlen 128
inet6 fe80::1%lo0 prefixlen 64 scopeid 0x2
inet 127.0.0.1 netmask 0xff000000
groups: lo
nd6 options=21<PERFORMNUD,AUTO_LINKLOCAL>
em0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> metric 0 mtu 1500
options=81009b<RXCSUM,TXCSUM,VLAN_MTU,VLAN_HWTAGGING,VLAN_HWCSUM,VLAN_HW
FILTER>
ether 08:00:27:a0:07:42
inet 192.168.56.1 netmask 0xffffff00 broadcast 192.168.56.255
inet6 fe80::a00:27ff:fea0:742%em0 prefixlen 64 scopeid 0x1
media: Ethernet autoselect (1000baseT <full-duplex>)
status: active
nd6 options=23<PERFORMNUD,ACCEPT_RTADV,AUTO_LINKLOCAL>
root@freebsd-vm-group23:/home/mr223jp # route add default 192.168.56.1
add net default: gateway 192.168.56.1
root@freebsd-vm-group23:/home/mr223jp #

Although there were plenty more pictures to insert above which were part of the installation process, the above pictures were the main one which will show that the installation process has been finished successfully.

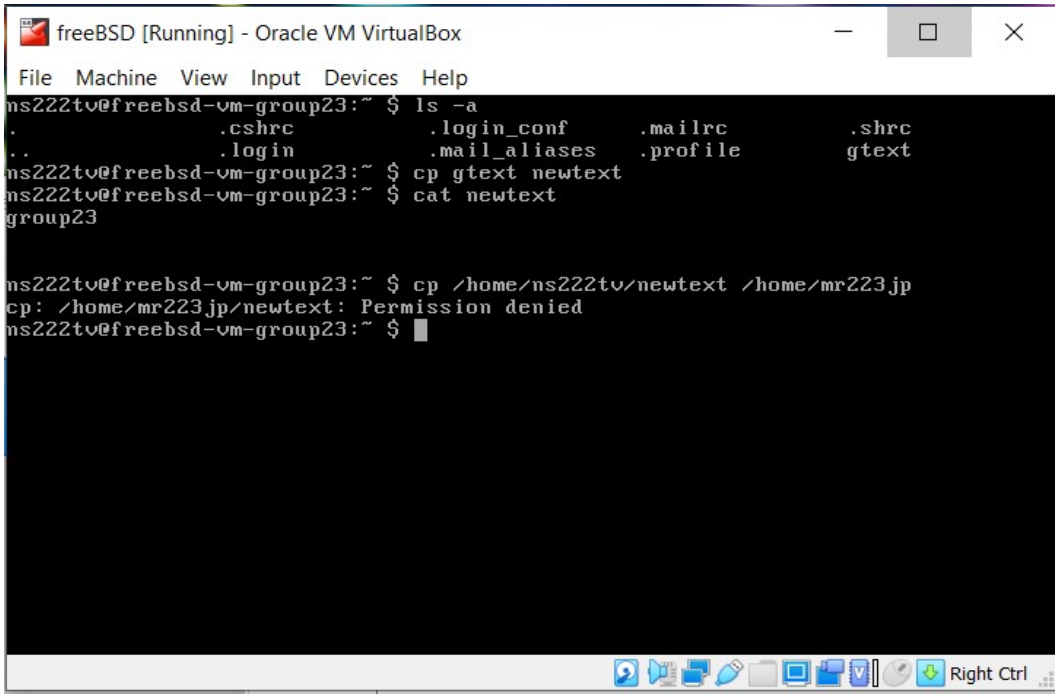
3. Task 3: Using FreeBSD

Regarding this question, the main purpose of doing the following tasks is to ensure that the VM configuration is working and getting to know the commands that are useful for interacting information between the users. One of the main editors that we are going to use is the ee.

❖ Part 1

In this task, we were required to create a file by using the VI command, and then by using the CP command we were supposed to copy a second file from the original file. Then we could have check if the copy process has been successful by using the cat command.

Below, I will include a picture indicating the process.

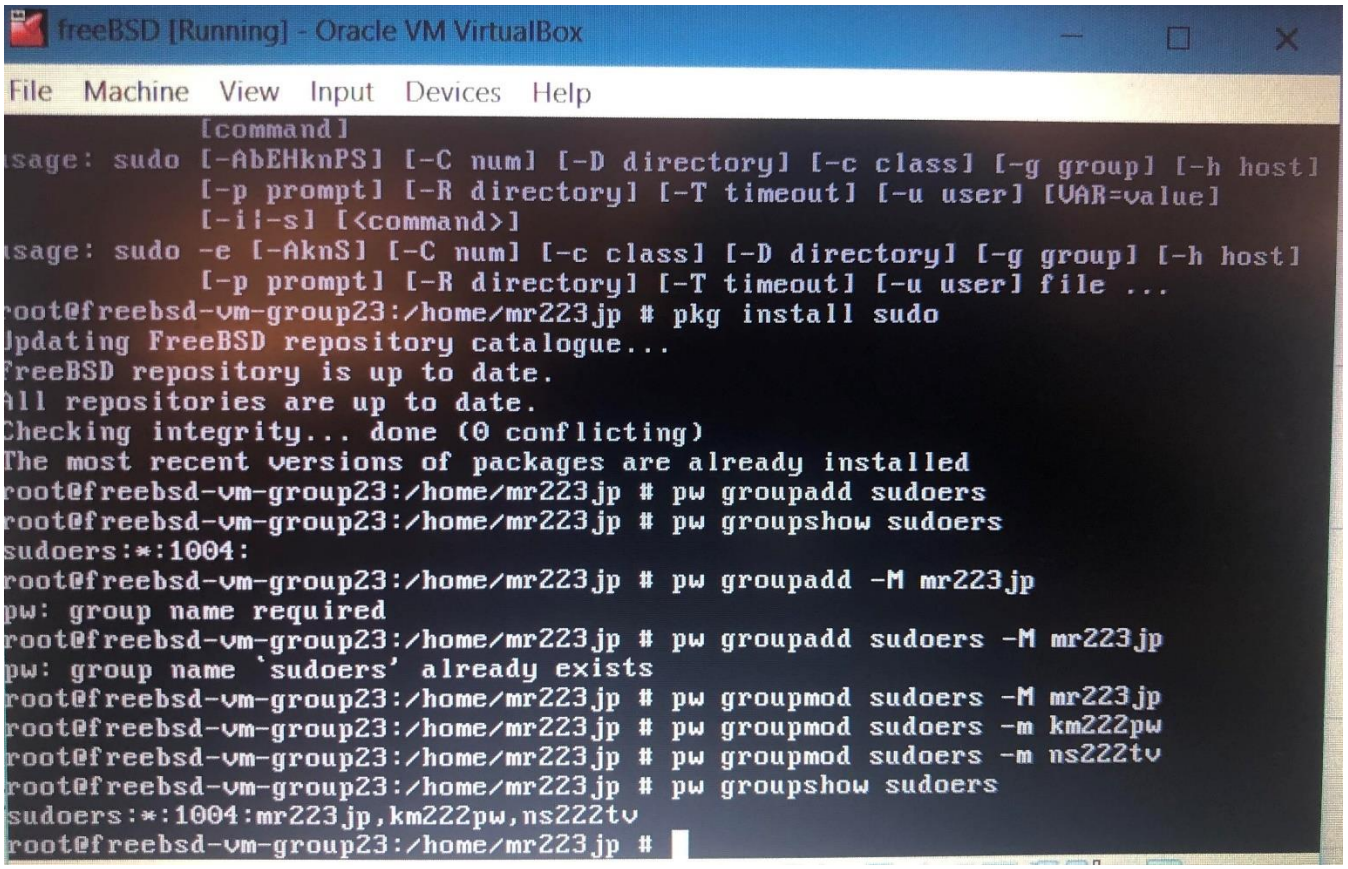


However, as you can see in the above picture, although all the processes have been completed and the proper commands were used, an error appeared stating that the ns222tv does not have the permission to send the file to mr223jp. The reason for this is that at this stage the user's permission is limited and in the upcoming tasks this boundary needs to be lifted.

❖ Part 2

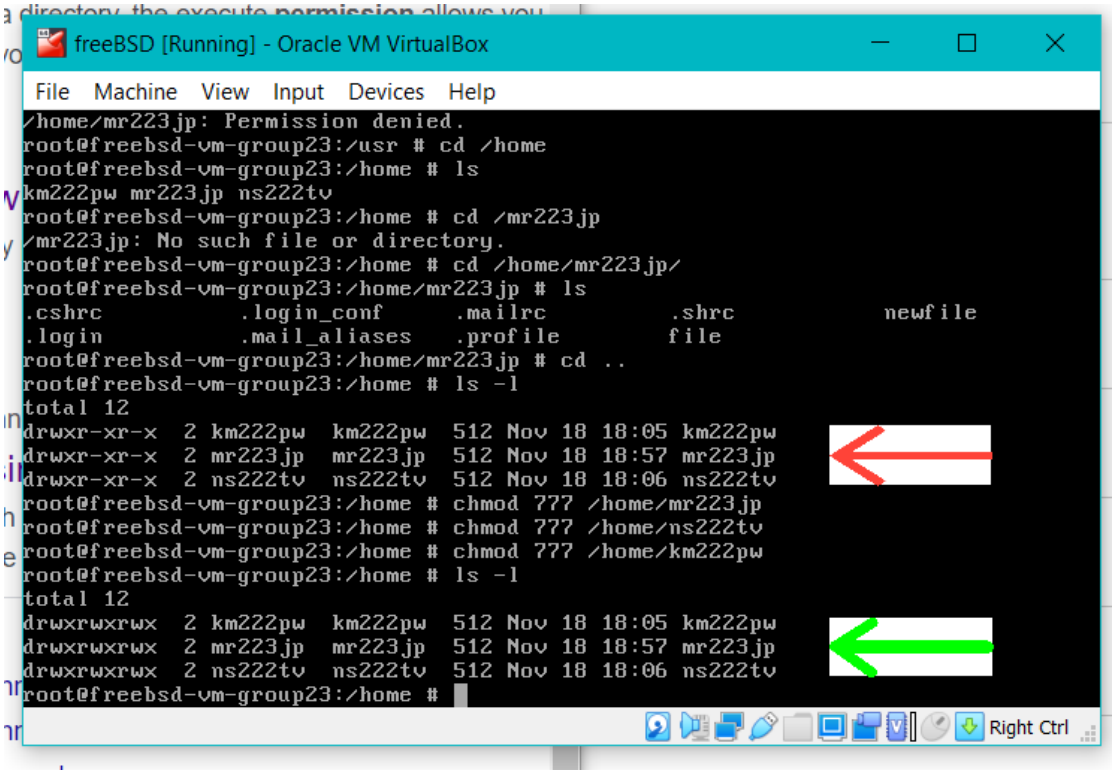
This task required us to install sudo. Consequently, by having access to this command we can create sudoers groups and add all the team members into this group. Initially, we should have download the sudo package in our FreeBSD environment to be able to use its functions. The “pkg install sudo” command has been used to install the sudo.

The following attachments will display the process of creating sudoers group and adding members to this group.



After creating the sudoers group, the members again are limited with some permissions. However, we will use chmod 777 command which will enable us to remove all the boundaries on the users.

The following picture will indicate that the user did not have permission at the beginning but by using the mentioned command.

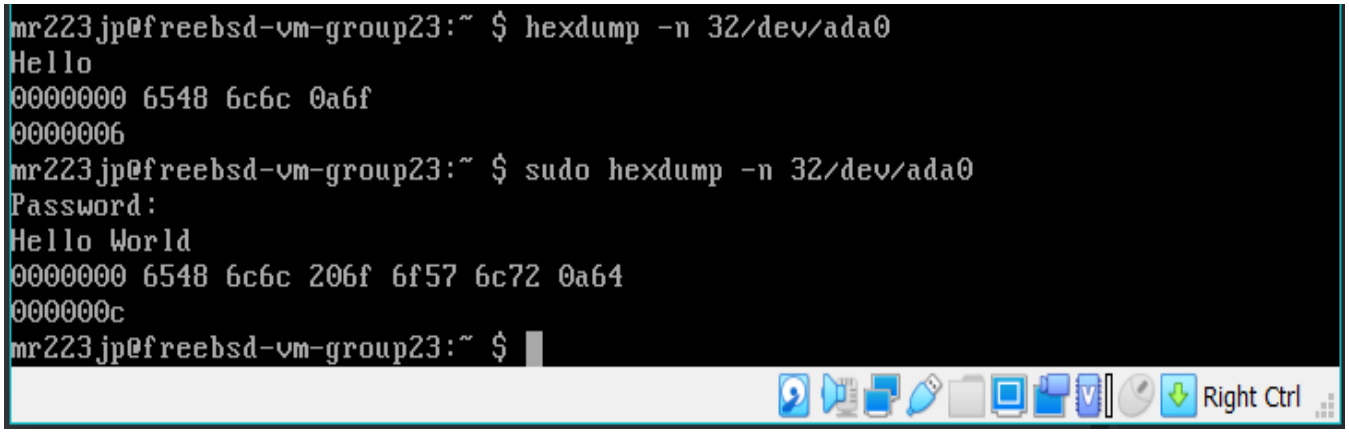


As it is obvious in the above picture, the users were limited when it comes to the permissions. However, after using the command all the members were given full permission and access.

❖ Part 3

In this task, we are supposed to compare the result of the two commands are "*hexdump -n 32 /dev/ada0*" and "*sudo hexdump -n 32 /dev/ada0*".

The blow picture will indicate the output that one of the users got.



When It comes to the hexdump, it is a tool for viewing that will act in a way that executes the least amount of clarification while portraying the information of the input file. Therefore, using this tool is a logical way to use for identifying the type of files and the purpose of their contents. It will be used to demonstrate the raw bytes of a file in different habits. However, the hexdump is not considered as part of the old-school Unix system and GNU commands.

The hexdump is helpful since it is very convenient to be obtained and it is also open source. All in all, hexdump is an instrument that a forensic investigator should have.

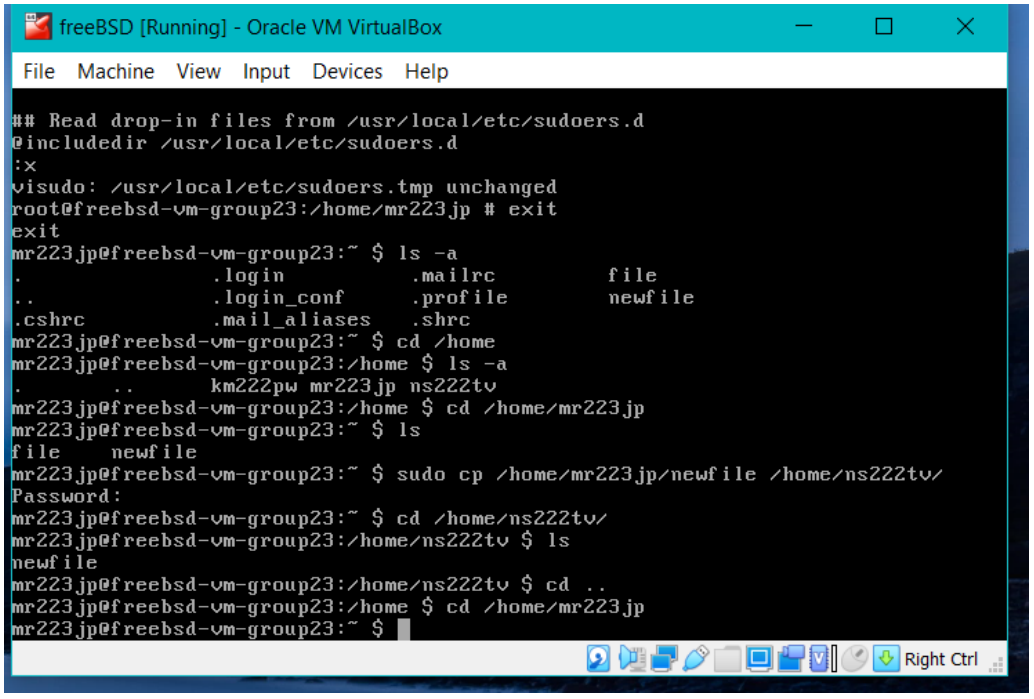
Regarding the results, not all lines portrait the output which involves the same information as the previous lines. What I mean by this is that if we have multiple lines of the zeros will be referred to as the compression of duplicate lines. The main difference between using sudo and ordinary hexdump is that if the binary is allowed to execute as the superuser by using the command sudo, it will not throw any elevated privileges and also it can be used to access the file system. It can also raise or keep privileged access.

However, hexdump without the sudo will read the information from a file. The difference is that it may be used to do privileged reads or reveal files outside a limited file system.

❖ Part 4

This task required the same steps that we did in task 1. What I mean is that in the first task we were supposed to copy a file from a directory of one user to the home directory of another user. Eventually, we have received an error stating that this action is not permitted since we did not have permission to do such an action. However, in this task, we will be able to do this action by using a command called sudo but as you can remember, we have already given permission to all users in task 2.

The below attachment will show that a file has been sent to another user's home directory by using the sudo command.

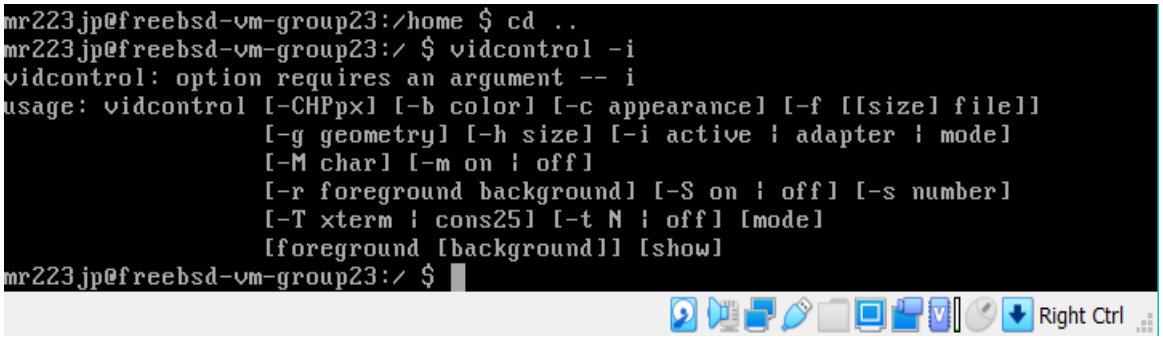


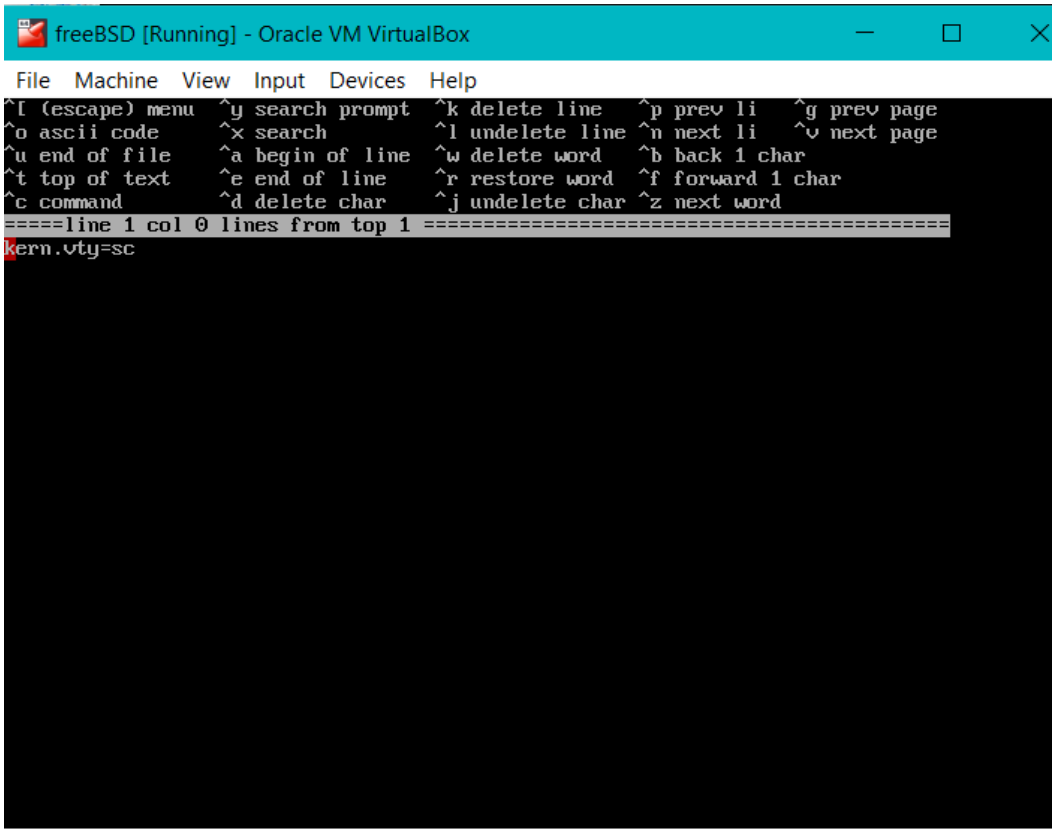
❖ Part 5

In this task, we were supposed to check the status of our current video mode. Eventually, we had to seek a suitable video mode to enlarge the resolution. All these actions were carried out to reach the standard supported colors with “vidcontrol” show.

The main commands that were used were” vidcontrol -I mode” where we have chosen 325 as our mode number. Then, by taking advantage of the command “ee /etc/rc.conf”, we have inserted a new command line to save the mode number.

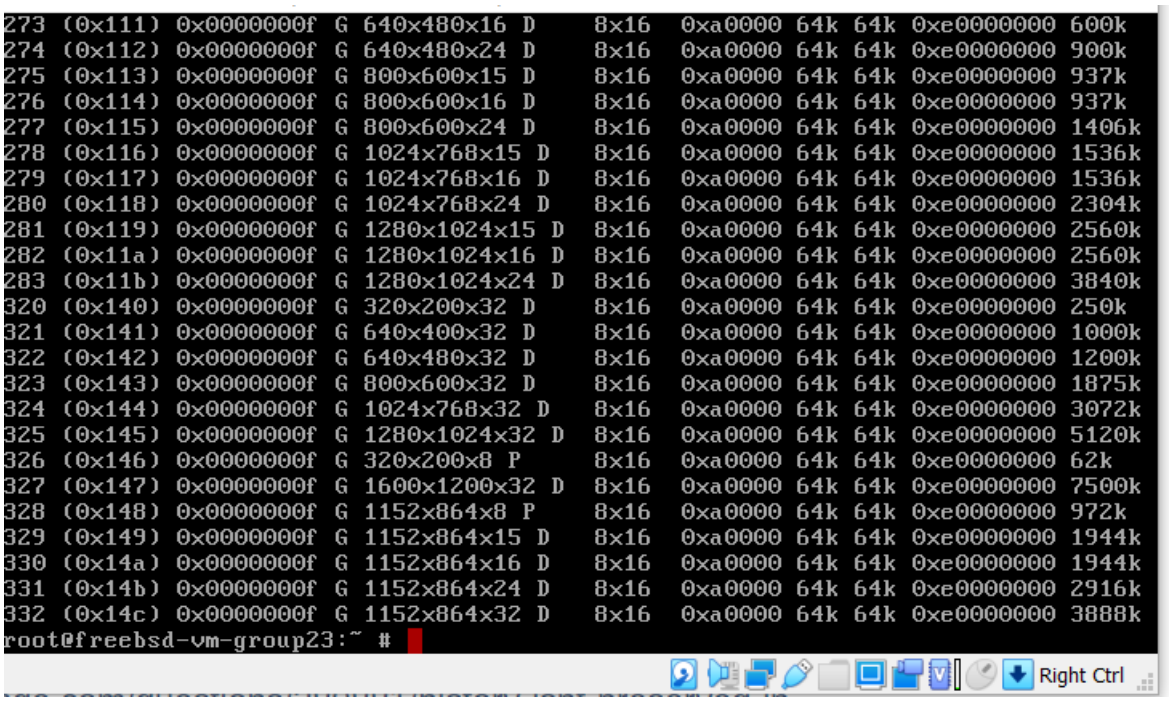
The following pictures will clarify the process I have mentioned.

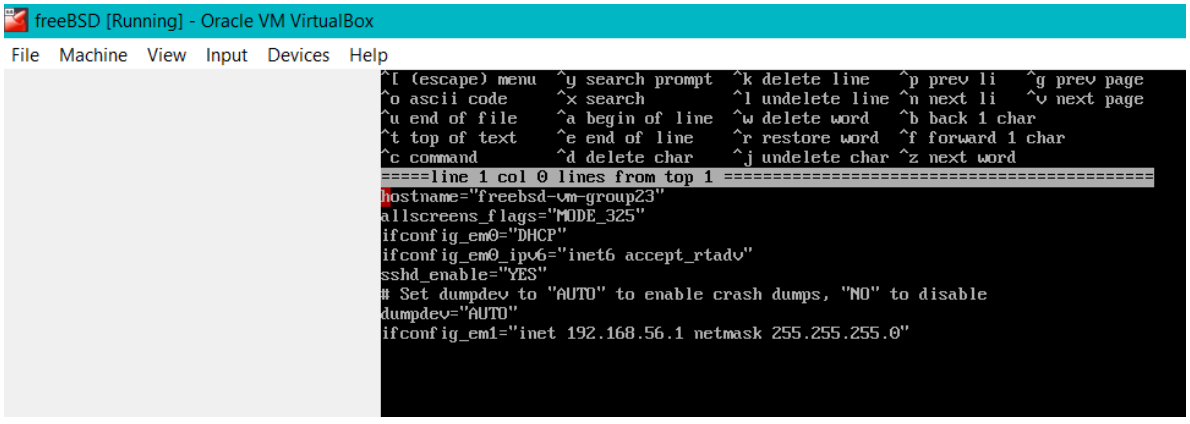


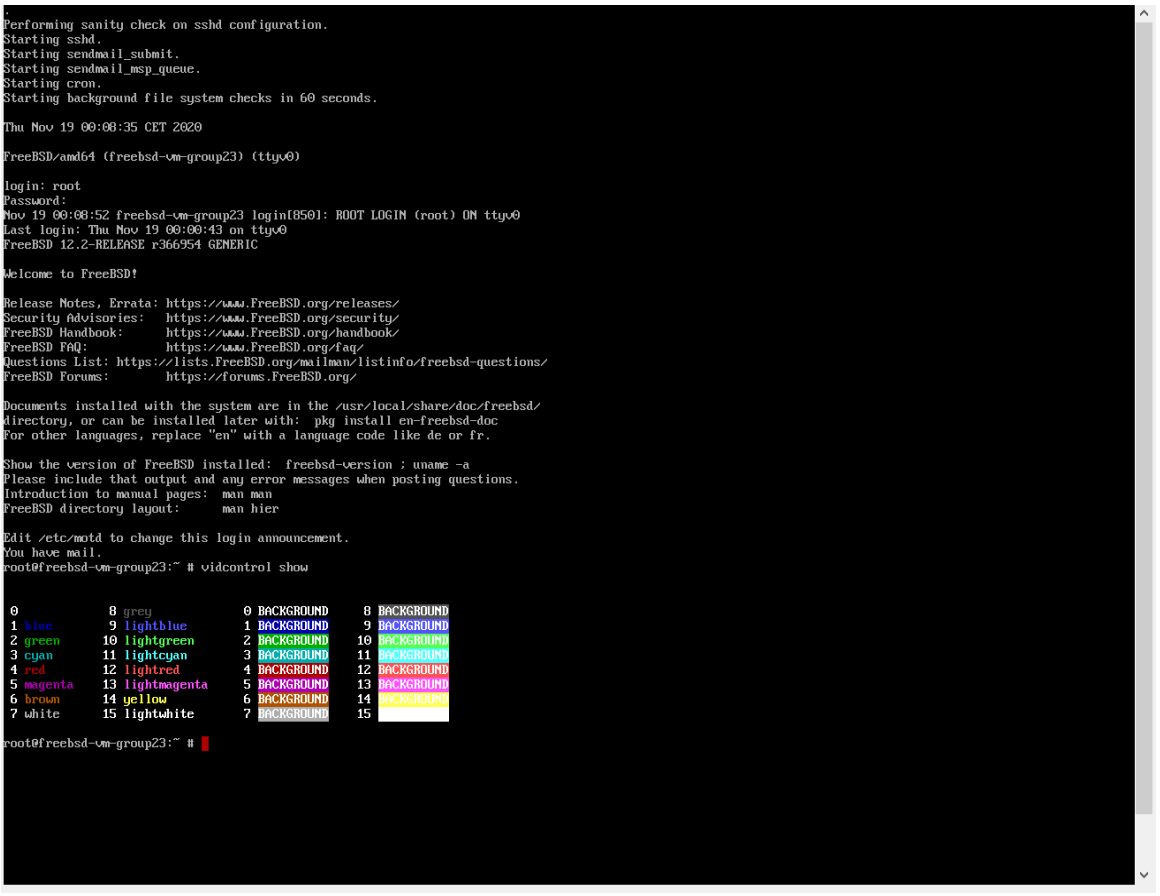


```
root@freebsd-vm-group23:~ # vidcontrol -i adapter
fb0:
    vga0, type:VESA VGA (5), flags:0x2700ff
    initial mode:24, current mode:24, BIOS mode:3
    frame buffer window:0xb8000, buffer size:0x8000
    window size:0x8000, origin:0x0
    display start address (0, 0), scan line width:80
    reserved:0x0
root@freebsd-vm-group23:~ #
```

```
273 (0x111) 0x0000000f G 640x480x16 D     8x16   0xa0000 64k 64k 0xe0000000 600k
274 (0x112) 0x0000000f G 640x480x24 D     8x16   0xa0000 64k 64k 0xe0000000 900k
275 (0x113) 0x0000000f G 800x600x15 D     8x16   0xa0000 64k 64k 0xe0000000 937k
276 (0x114) 0x0000000f G 800x600x16 D     8x16   0xa0000 64k 64k 0xe0000000 937k
277 (0x115) 0x0000000f G 800x600x24 D     8x16   0xa0000 64k 64k 0xe0000000 1406k
278 (0x116) 0x0000000f G 1024x768x15 D    8x16   0xa0000 64k 64k 0xe0000000 1536k
279 (0x117) 0x0000000f G 1024x768x16 D    8x16   0xa0000 64k 64k 0xe0000000 1536k
280 (0x118) 0x0000000f G 1024x768x24 D    8x16   0xa0000 64k 64k 0xe0000000 2304k
281 (0x119) 0x0000000f G 1280x1024x15 D   8x16   0xa0000 64k 64k 0xe0000000 2560k
282 (0x11a) 0x0000000f G 1280x1024x16 D   8x16   0xa0000 64k 64k 0xe0000000 2560k
283 (0x11b) 0x0000000f G 1280x1024x24 D   8x16   0xa0000 64k 64k 0xe0000000 3840k
320 (0x140) 0x0000000f G 320x200x32 D     8x16   0xa0000 64k 64k 0xe0000000 250k
321 (0x141) 0x0000000f G 640x400x32 D     8x16   0xa0000 64k 64k 0xe0000000 1000k
322 (0x142) 0x0000000f G 640x480x32 D     8x16   0xa0000 64k 64k 0xe0000000 1200k
323 (0x143) 0x0000000f G 800x600x32 D     8x16   0xa0000 64k 64k 0xe0000000 1875k
324 (0x144) 0x0000000f G 1024x768x32 D    8x16   0xa0000 64k 64k 0xe0000000 3072k
325 (0x145) 0x0000000f G 1280x1024x32 D   8x16   0xa0000 64k 64k 0xe0000000 5120k
326 (0x146) 0x0000000f G 320x200x8 P      8x16   0xa0000 64k 64k 0xe0000000 62k
327 (0x147) 0x0000000f G 1600x1200x32 D   8x16   0xa0000 64k 64k 0xe0000000 7500k
328 (0x148) 0x0000000f G 1152x864x8 P     8x16   0xa0000 64k 64k 0xe0000000 972k
329 (0x149) 0x0000000f G 1152x864x15 D    8x16   0xa0000 64k 64k 0xe0000000 1944k
330 (0x14a) 0x0000000f G 1152x864x16 D    8x16   0xa0000 64k 64k 0xe0000000 1944k
331 (0x14b) 0x0000000f G 1152x864x24 D    8x16   0xa0000 64k 64k 0xe0000000 2916k
332 (0x14c) 0x0000000f G 1152x864x32 D    8x16   0xa0000 64k 64k 0xe0000000 3888k
root@freebsd-vm-group23:~ #
```



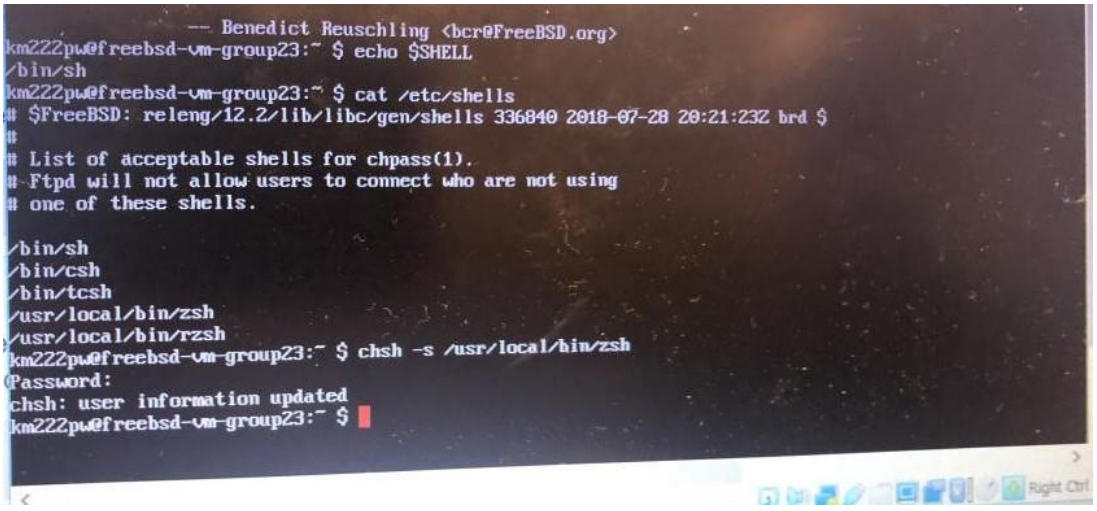




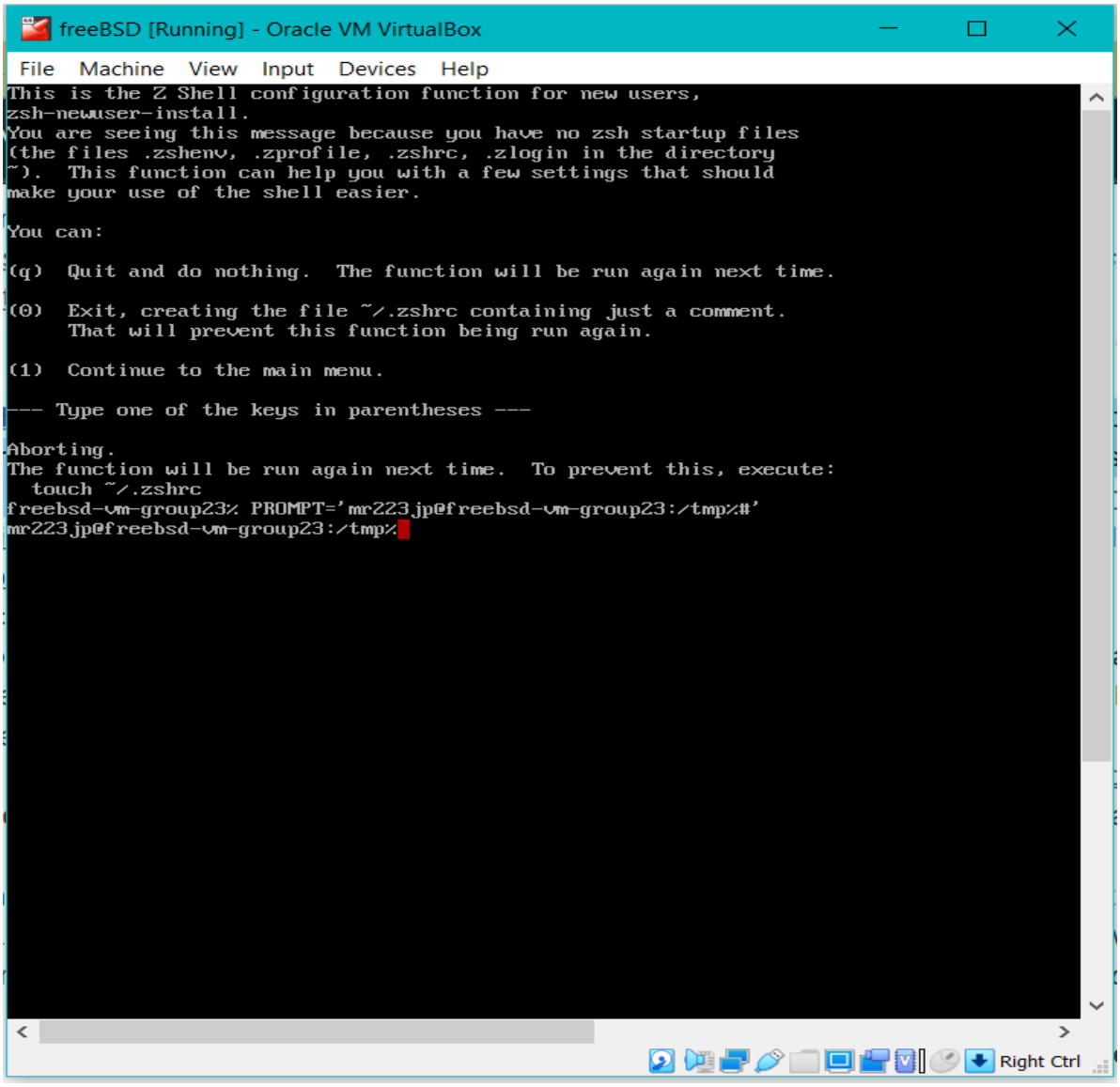
❖ Part 6

This task is about ZSH which should be invoked in our FreeBSD instead of bash. What I mean by this is that we should change the shell that has been used by the team members to the ZSH.
Then we should have changed the sell prompt to a special kind of view. Eventually, we have should have do some manipulations to enable the shell history configuration. Since our system was not equipped with the ZSH package, firstly we have downloaded the ZSH package by using the following command which is “pkg install zsh”.

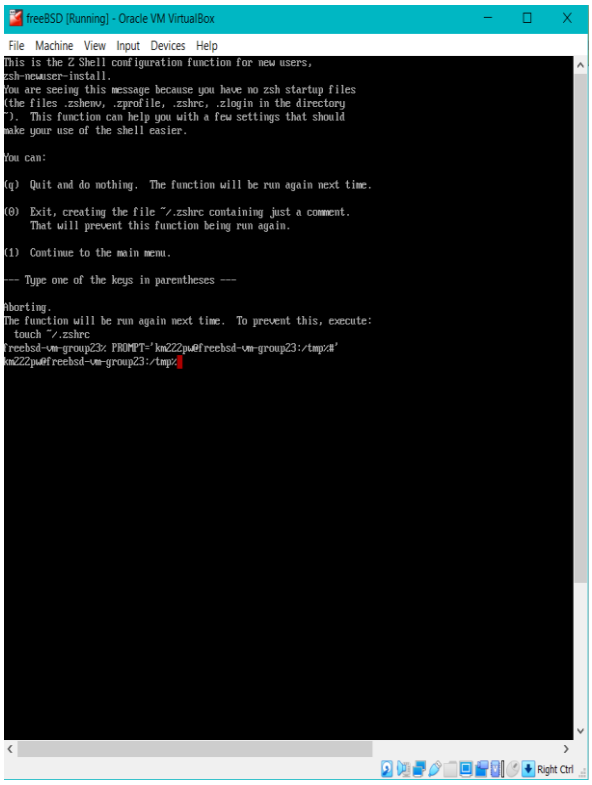
The following screen shots will indicate the process that I have mentioned above.

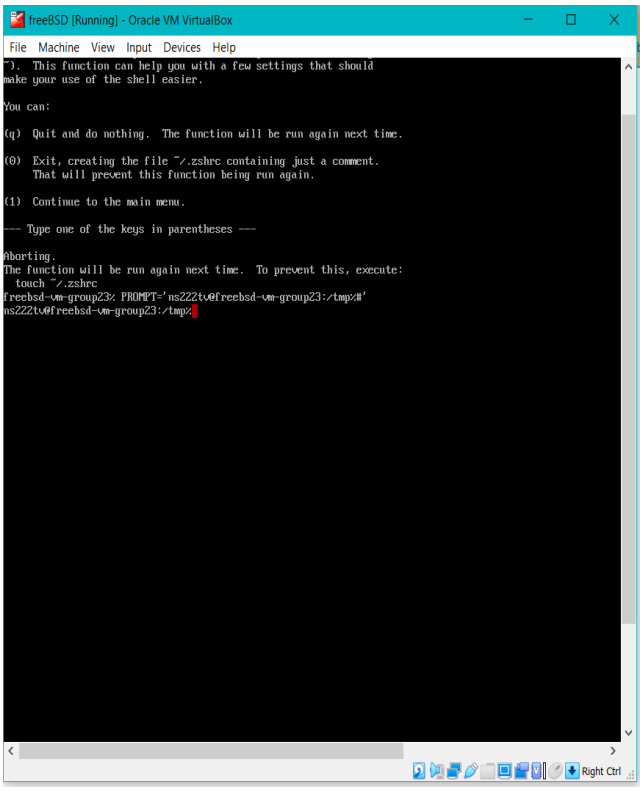


The below picture will indicate that the shell prompt pattern has been changed.

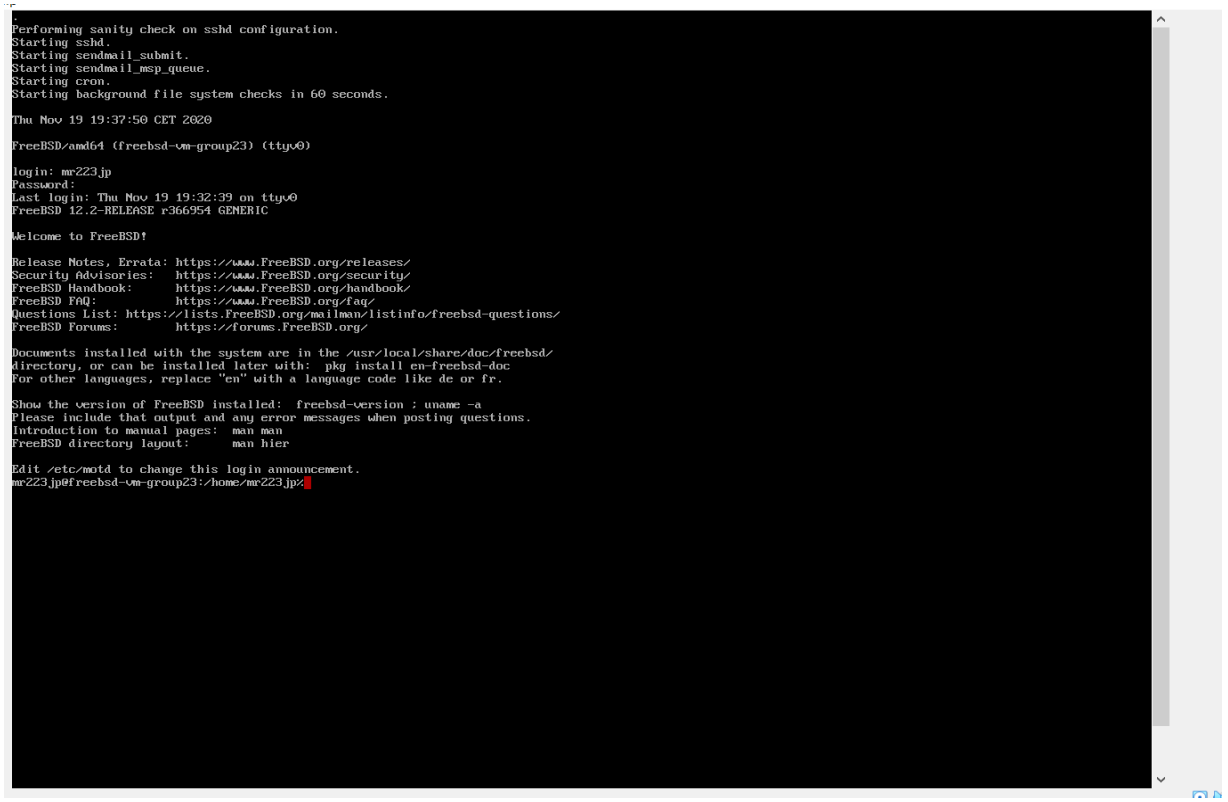


The below picture will indicate that the shell for user km222pw and ns222tv has been changed.





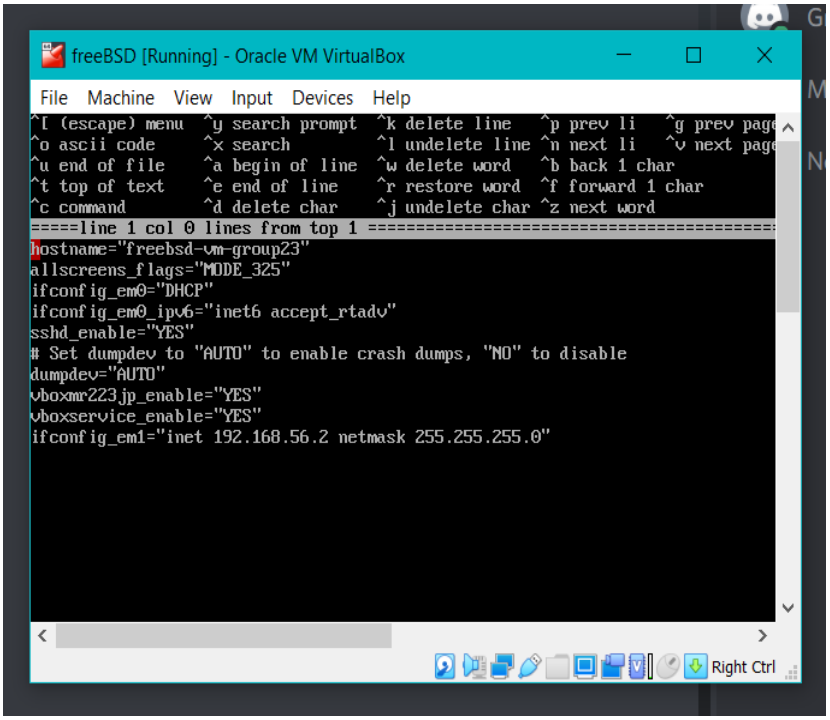
Lastly, the final picture will indicate that shell history configurations have been changed successfully.

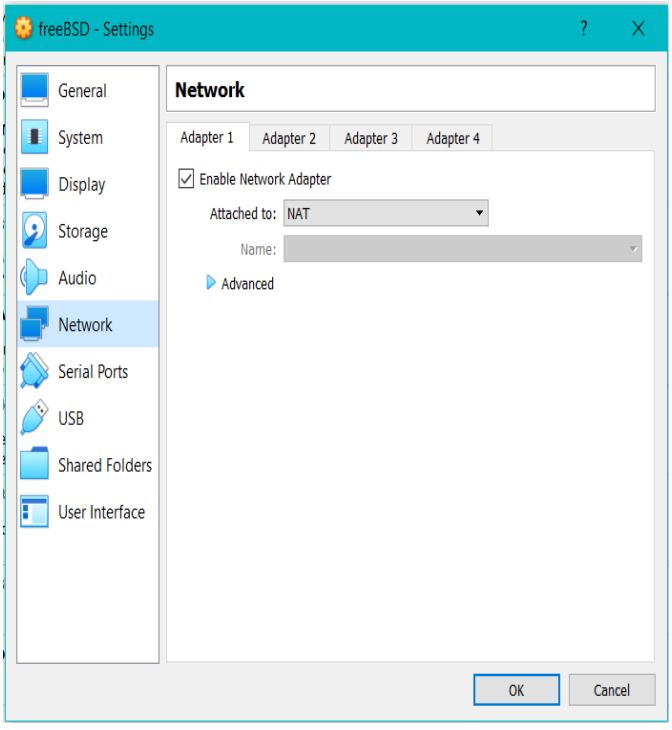


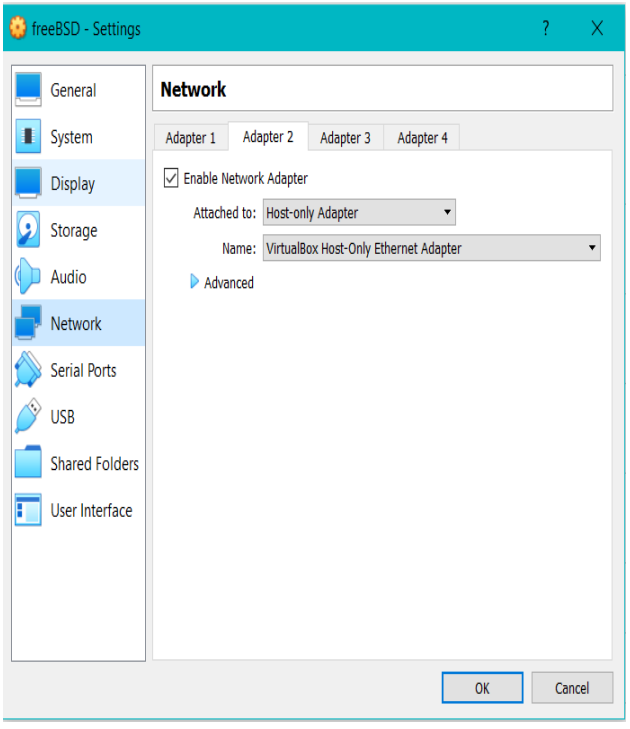
❖ Part 7

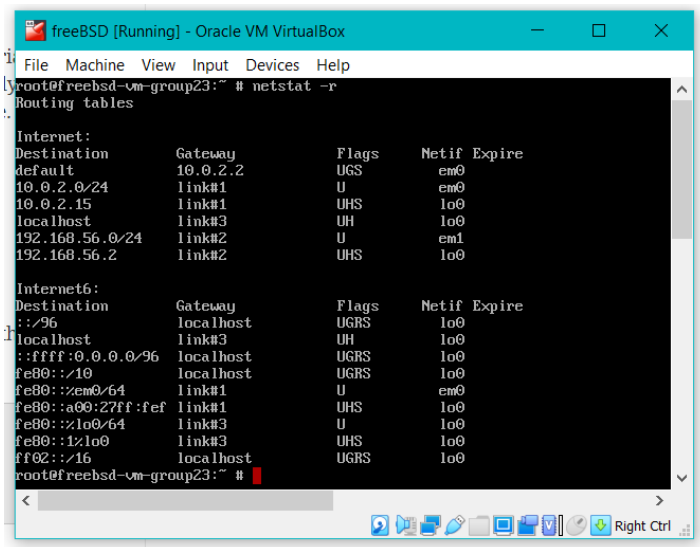
This task required us to double-check the second network interface within the VM configuration. That is, we must make sure that the VM has been assigned with a suitable IP address.

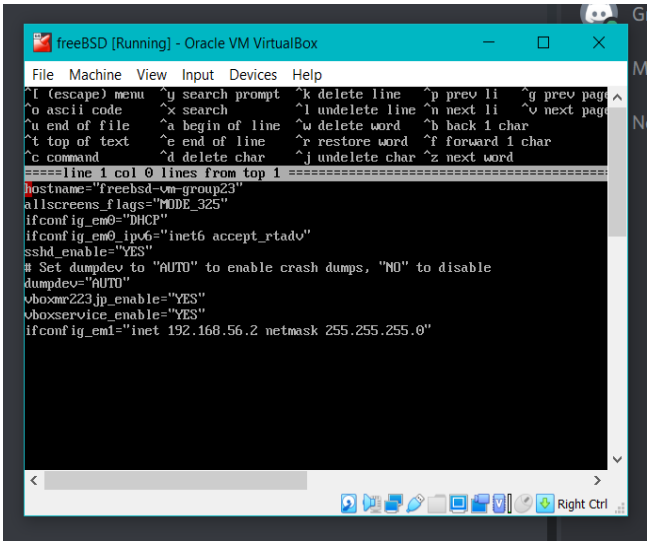
The following pictures will show the process we have been through it.

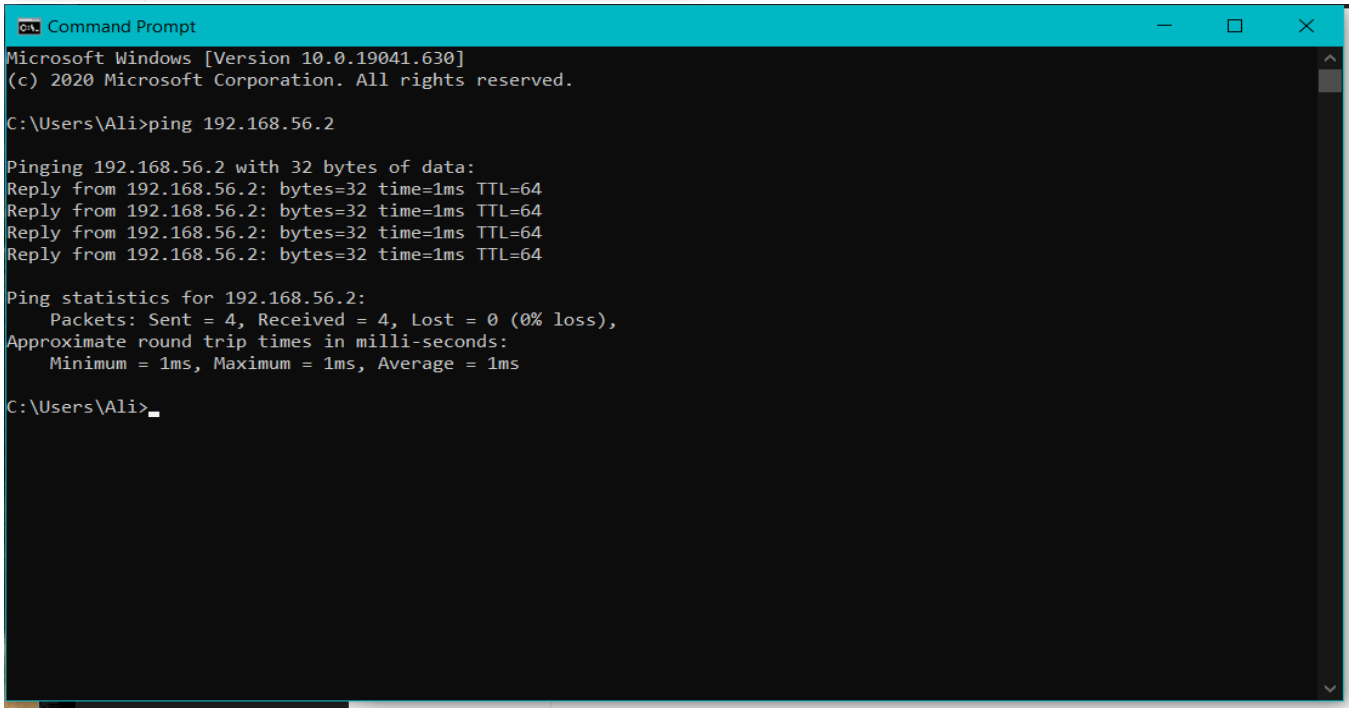












The above picture will show that the connection has been checked successfully in the CMD.

However, for double-checking, we have installed the java package right away to test our connection.

```
root@freebsd-vm-group23:~ # pkg install openjdk11
Updating FreeBSD repository catalogue...
FreeBSD repository is up to date.
All repositories are up to date.
The following 21 package(s) will be affected (of 0 checked):

New packages to be INSTALLED:
        alsa-lib: 1.1.2_2
        dejavu: 2.37_1
        encodings: 1.0.5,1
        font-bh-ttf: 1.0.3_4
        font-misc-ethiopic: 1.0.4
        font-misc-meltho: 1.0.3_4
        fontconfig: 2.13.92_2,1
        freetype2: 2.10.4
        giflib: 5.2.1
        javavmwrapper: 2.7.6
        jbigkit: 2.1_1
        jpeg-turbo: 2.0.5
        lcms2: 2.11_1
        libXi: 1.7.10,1
        libXtst: 1.2.3_2
        libfontenc: 1.1.4
        mkfontscale: 1.2.1
        openjdk11: 11.0.8+10.1
        png: 1.6.37
        tiff: 4.1.0
        xorg-fonts-truetype: 7.7_1

Number of packages to be installed: 21

The process will require 346 MiB more space.
167 MiB to be downloaded.

Proceed with this action? [y/N]: y
[1/21] Fetching openjdk11-11.0.8+10.1.txz:  37%   59 MiB 319.5kB/s    02:25 ETA
```

❖ Part 8

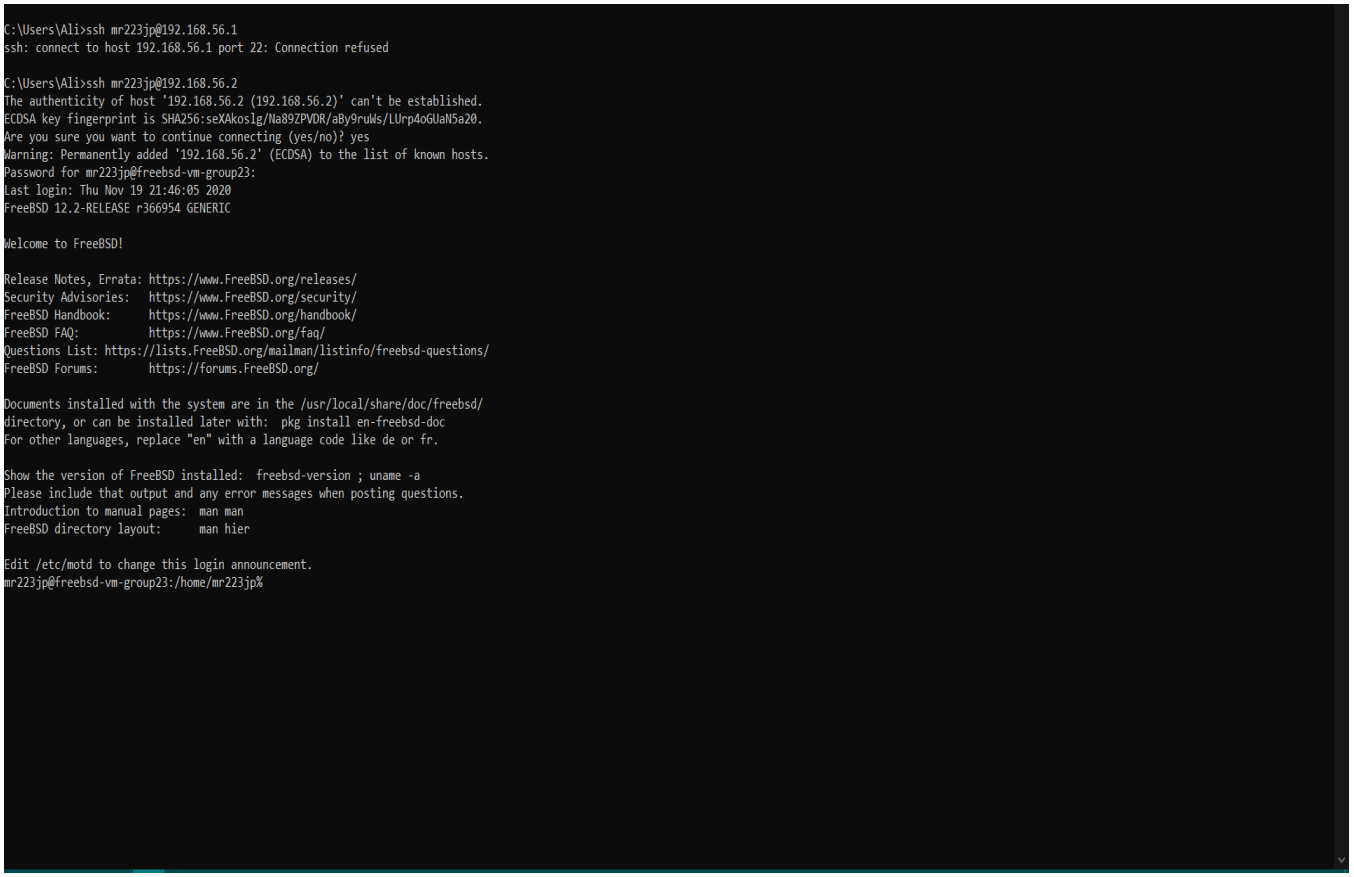
In this task were supposed to enable the SSH server from our host system (CMD). Consequently, we had to edit its configuration to allow the connection for all the team members. The interesting point about this task was that we should have worked from CMD instead of using the FreeBSD environment.

Firstly, by using the “ee /etc/rc.conf” and going to the target page, we have enabled the SSHD.

```
hostname="freebsd-vm-group23"
ifconfig_em0="DHCP"

sshd_enable="YES"
# Set dumpdev to "AUTO" to enable crash dumps, "NO" to disable
dumpdev="AUTO"
vboxkm222pw_enable="YES"
vboxservice_enable="YES"
ifconfig_em1="inet 192.168.56.2 netmask 255.255.255.0"
ifconfig_em1="inet 192.168.56.2 netmask 255.255.255.0 media 10baseT/UTP"
```

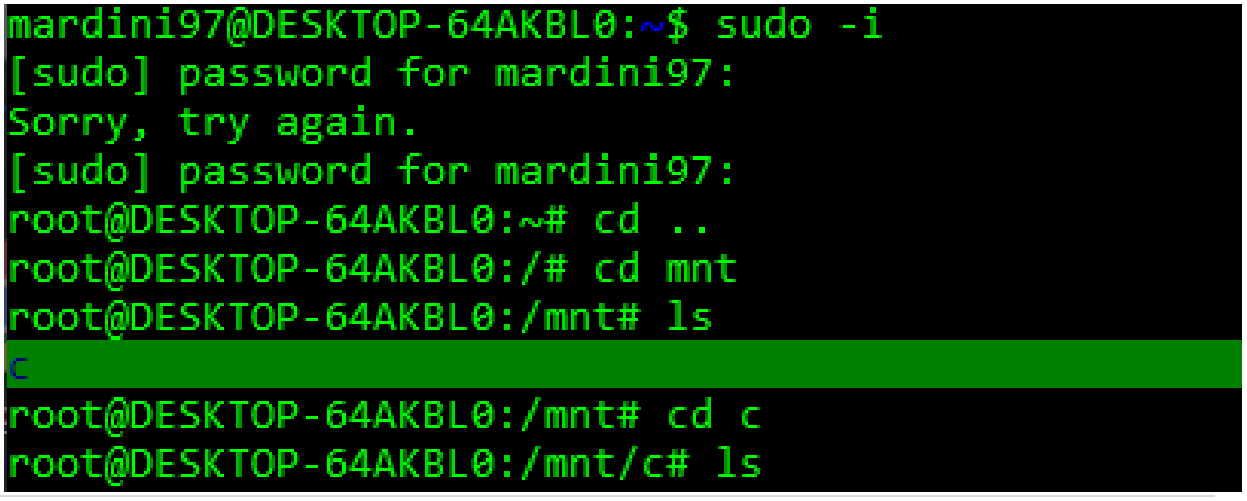
Consequently, we have moved to the CMD for continuing the work from there.
The way for connecting the CMD to the FreeBSD was to put one of the user’s username then put the IP address after it to be able to create the connection.



❖ Part 9

In this task, the rsync needed to be installed in our VM. Therefore, we would be able to transfer a file from our host system to our home directory within the VM using the command I have mentioned above. We have used the rsync command for transferring the file called “HelloWorld.txt”. To be able to use this package we have used the command known as “pkg install rsync” to download this package. Consequently, an application called Ubunto has been used for transferring any file from our host system to the Linux FreeBSD command line system.

The below picture will describe the process.



```
root@DESKTOP-64AKBL0:/mnt/c/Users/HelloWorld# cd ..
root@DESKTOP-64AKBL0:/mnt/c/Users# ls
 Admin   'All Users'   Default   'Default User'   Public   desktop.ini
root@DESKTOP-64AKBL0:/mnt/c/Users# ls
 Admin   'All Users'   Default   'Default User'   Public   desktop.ini
root@DESKTOP-64AKBL0:/mnt/c/Users# cd ..
root@DESKTOP-64AKBL0:/mnt/c# ld

Command 'ld' not found, but can be installed with:

apt install binutils

root@DESKTOP-64AKBL0:/mnt/c# ls
ls: cannot access 'hiberfil.sys': Permission denied
ls: cannot access 'pagefile.sys': Permission denied
ls: cannot access 'swapfile.sys': Permission denied
'$Recycle.Bin'   'Documents and Settings'   'Program Files'        'System Volume Information'   hiberfil.sys
 AMD              HelloWorld               'Program Files (x86)'   Users                         pagefile.sys
 BOOTNXT          OneDriveTemp              ProgramData            Windows                       swapfile.sys
 Config.Msi       PerfLogs                  Recovery               bootmgr
root@DESKTOP-64AKBL0:/mnt/c# cd HelloWorld
root@DESKTOP-64AKBL0:/mnt/c/HelloWorld# ls
HelloWolrd.TXT
root@DESKTOP-64AKBL0:/mnt/c/HelloWorld# ls
HelloWorld.TXT
root@DESKTOP-64AKBL0:/mnt/c/HelloWorld# rsync -avip HelloWorld.TXT  km222pw@192.168.56.2:/home/km222pw
Password for km222pw@freebsd-vm-group23:
sending incremental file list
<f+++++++++ HelloWorld.TXT

sent 102 bytes  received 35 bytes  30.44 bytes/sec
total size is 2  speedup is 0.01
root@DESKTOP-64AKBL0:/mnt/c/HelloWorld#
```

```
freeBSD [Running] - Oracle VM VirtualBox
Diamonds.class  ID.class        Main.class
Diamonds.java   ID.java         Main.java
km222pw@freebsd-vm-group23:/home/km222pw%ls
Diamonds.class  ID.class        Main.class
Diamonds.java   ID.java         Main.java
km222pw@freebsd-vm-group23:/home/km222pw%cd ..
km222pw@freebsd-vm-group23:/home%ls
km222pw mr223jp ns222tv
km222pw@freebsd-vm-group23:/home%cd ..
km222pw@freebsd-vm-group23:/%ls
COPYRIGHT       entropy         libexec         proc            sys
bin             etc             media           rescue          tmp
boot            home            mnt             root            usr
dev             lib             net             sbin            var
km222pw@freebsd-vm-group23:/%cd home
km222pw@freebsd-vm-group23:/home%ls
km222pw mr223jp ns222tv
km222pw@freebsd-vm-group23:/home%cd km222pw
km222pw@freebsd-vm-group23:/home/km222pw%ls
Diamonds.class  ID.class        Main.class
Diamonds.java   ID.java         Main.java
km222pw@freebsd-vm-group23:/home/km222pw%ls
Diamonds.class  HelloWorld.TXT  ID.java         Main.java
Diamonds.java   ID.class        Main.class
km222pw@freebsd-vm-group23:/home/km222pw%
```

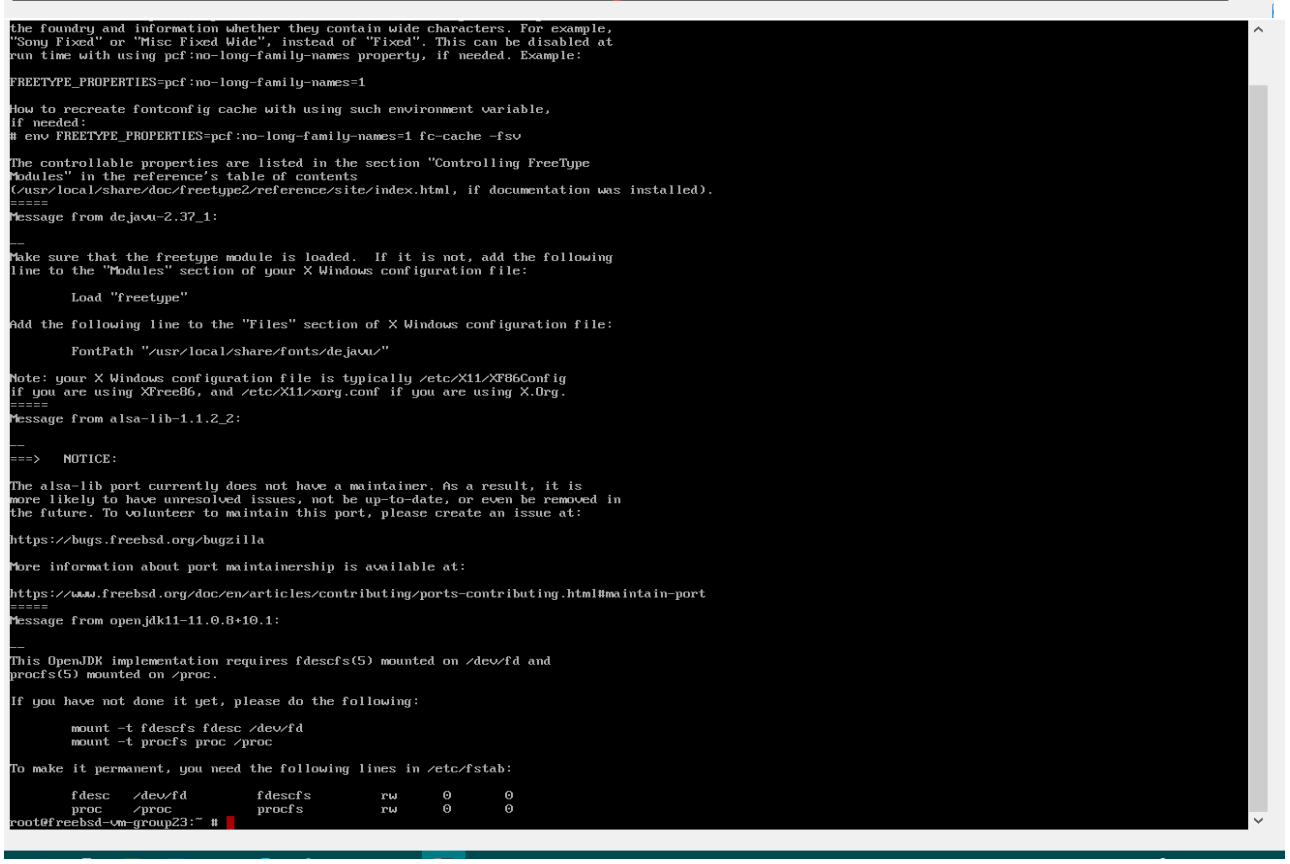
4. Task 4: Developing in Java in FreeBSD

In this task, we are supposed to use JDK to develop a code in the editor and then import the source code into our FreeBSD.

❖ Part 4.1

In this part, we had downloaded the JDK 11in the FreeBSD as it was stated in the requirements.

Below, I will attach the pictures indicating the download process.



❖ Part 4.2.1

In this part we are going to mainly invoke the id utility. Consequently, we also need to read its outcome along with checking the exit code. Finally, we must display (print) the outcome.

The below pictures will display the exact process that we have been through.

```
import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;

public class ID {
    public static void main(String[] args)  {

        ProcessBuilder processBuilder = new ProcessBuilder();
            System.out.println("");
            processBuilder.command("zsh","-c", "id");

            try {
                Process process = processBuilder.start();

                BufferedReader reader = new BufferedReader(new InputStreamReader(process.getInputStream()));

                String line;
                while ((line = reader.readLine()) != null) {
                    System.out.println(line);
                }

                int exitCode = process.waitFor();
                System.out.println("\nExited with error code : " + exitCode);

            } catch (IOException e) {
                e.printStackTrace();
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
```

```
km222pw@freebsd-vm-group23:/home/km222pw/src%javac ID.java
km222pw@freebsd-vm-group23:/home/km222pw/src%java ID

uid=1001(km222pw) gid=1001(km222pw) groups=1001(km222pw),0(wheel),1004(sudoers)

Exited with error code : 0
km222pw@freebsd-vm-group23:/home/km222pw/src%
```

The above pictures are the code and the output of the id command. Also, it has been implemented in CMD (window).

❖ Part 4.2.2

The steps that we were required to do regarding this task were swapping the working directory to the “etc”. moving on, we had to use a command-line known as “find . -name ‘rc*’ ”. The rest of the job was like the first task since we just needed to read the outcome and investigate the exit code and eventually printing the outcome.

The below attachments will display the exact process that we have been through.

```
import java.io.BufferedReader;
import java.io.File;
import java.io.IOException;
import java.io.InputStreamReader;

public class Find {
    public static void main(String[] args)  {

        ProcessBuilder processBuilder = new ProcessBuilder();
        System.out.println("Invoking id");
        processBuilder.command("zsh","-c", "find ./etc -name 'rc*'");
        processBuilder.directory(new File("/"));
        System.out.println("directory :" +processBuilder.directory());
        try {
            Process process = processBuilder.start();

            BufferedReader reader = new BufferedReader(new InputStreamReader(process.getInputStream()));

            String line;
            while ((line = reader.readLine()) != null) {
                System.out.println(line);
            }

            int exitCode = process.waitFor();
            System.out.println("\nExited with error code : " + exitCode);

        } catch (IOException e) {
            e.printStackTrace();
        } catch (InterruptedException e) {
            e.printStackTrace();
        }
    }
}
```

```
"Find.java" 34 lines, 1074 characters
km222pw@freebsd-vm-group23:/home/km222pw/src%javac Find.java
km222pw@freebsd-vm-group23:/home/km222pw/src%java Find
Invoking id
directory :/
./etc/rc
./etc/rc.sendmail
./etc/rc.firewall
./etc/rc.suspend
./etc/rc.bsdextended
./etc/rc.d
./etc/rc.d/rctl
./etc/rc.resume
./etc/rc.subr
./etc/rc.conf.d
./etc/rc.initdiskless
./etc/rc.shutdown
./etc/defaults/rc.conf
./etc/rc.conf

Exited with error code : 1
km222pw@freebsd-vm-group23:/home/km222pw/src%
```

❖ Part 4.2.3

At this step, we were supposed to invoke a command known as a hostname which will convert the name. Additionally, like the previous tasks, reading, investigating, and portraying the results had to be done at the end.

The below screenshots will portrait how the command has been used in the code and its outcome.

```
import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;

public class Hostname {
    public static void main(String[] args)  {

        ProcessBuilder processBuilder = new ProcessBuilder();
        System.out.println("");
        processBuilder.command("zsh","-c", "hostname freebsd-vm-group23-upd");

        try {
            Process process = processBuilder.start();

            BufferedReader reader = new BufferedReader(new InputStreamReader(process.getInputStream()));

            String line;
            while ((line = reader.readLine()) != null) {
                System.out.println(line);
            }

            int exitCode = process.waitFor();
            System.out.println("\nExited with error code : " + exitCode);

        } catch (IOException e) {
            e.printStackTrace();
        } catch (InterruptedException e) {
            e.printStackTrace();
        }
    }
}
```

```
"Hostname.java" 33 lines, 937 characters
km222pw@freebsd-vm-group23:/home/km222pw/src%javac Hostname.java
km222pw@freebsd-vm-group23:/home/km222pw/src%java Hostname


Exited with error code : 1
km222pw@freebsd-vm-group23:/home/km222pw/src%hostname
freebsd-vm-group23
km222pw@freebsd-vm-group23:/home/km222pw/src%
```

❖ Part 4.3

The procedure of this task is like the steps we did in part 9 of question 3. That is, we must transfer a zip file from our host system to our VM. The file that has been transferred to the VM is called “JavaProject “. This src file contains the classes for implementing the ID, the find command, and hostname.

The following pictures will display the process that was mentioned above.

```
root@DESKTOP-64AKBL0:/# cd mnt
root@DESKTOP-64AKBL0:/mnt# ls
c
root@DESKTOP-64AKBL0:/mnt# cd c
root@DESKTOP-64AKBL0:/mnt/c# ls
ls: cannot access 'hiberfil.sys': Permission denied
ls: cannot access 'pagefile.sys': Permission denied
ls: cannot access 'swapfile.sys': Permission denied
'$Recycle.Bin'   'Documents and Settings'   'Program Files'        'System Volume Information'   hiberfil.sys
 AMD              HelloWorld                'Program Files (x86)'   Users                         pagefile.sys
 BOOTNXT          OneDriveTemp               ProgramData            Windows                       swapfile.sys
 Config.Msi       PerfLogs                   Recovery               bootmgr
root@DESKTOP-64AKBL0:/mnt/c# ls
ls: cannot access 'hiberfil.sys': Permission denied
ls: cannot access 'pagefile.sys': Permission denied
ls: cannot access 'swapfile.sys': Permission denied
'$Recycle.Bin'   'Documents and Settings'   PerfLogs                Recovery                      bootmgr
 AMD              HelloWorld                'Program Files'        'System Volume Information'   hiberfil.sys
 BOOTNXT          JavaProject               'Program Files (x86)'   Users                         pagefile.sys
 Config.Msi       OneDriveTemp               ProgramData            Windows                       swapfile.sys
root@DESKTOP-64AKBL0:/mnt/c# cd JavaProject
root@DESKTOP-64AKBL0:/mnt/c/JavaProject# ls
out  src  task4src.iml
root@DESKTOP-64AKBL0:/mnt/c/JavaProject# cd src
root@DESKTOP-64AKBL0:/mnt/c/JavaProject/src# ld

Command 'ld' not found, but can be installed with:

apt install binutils

root@DESKTOP-64AKBL0:/mnt/c/JavaProject/src# ld

Command 'ld' not found, but can be installed with:

apt install binutils

root@DESKTOP-64AKBL0:/mnt/c/JavaProject/src# ls
Find.java  Hostname.java  ID.java  JavaProject.iml
root@DESKTOP-64AKBL0:/mnt/c/JavaProject/src# cd ..
root@DESKTOP-64AKBL0:/mnt/c/JavaProject# ls
out  src  task4src.iml
root@DESKTOP-64AKBL0:/mnt/c/JavaProject# rsync -avip src km222pw@192.168.56.2:/home/km222pw
Password for km222pw@freebsd-vm-group23:
sending incremental file list
cd+++++++++ src/
<f+++++++++ src/Find.java
<f+++++++++ src/Hostname.java
<f+++++++++ src/ID.java
<f+++++++++ src/JavaProject.iml
cd+++++++++ src/.idea/
<f+++++++++ src/.idea/.gitignore
<f+++++++++ src/.idea/misc.xml
<f+++++++++ src/.idea/modules.xml
<f+++++++++ src/.idea/src.iml
<f+++++++++ src/.idea/vcs.xml
<f+++++++++ src/.idea/workspace.xml

sent 8,894 bytes  received 222 bytes  357.49 bytes/sec
total size is 8,100  speedup is 0.89
root@DESKTOP-64AKBL0:/mnt/c/JavaProject#
```

```
km222pw@freebsd-vm-group23:/home/km222pw%ls
Diamonds.class  Diamonds.java   HelloWorld.TXT  ID.class        ID.java         Main.class      Main.java
km222pw@freebsd-vm-group23:/home/km222pw%ls
Diamonds.class  HelloWorld.TXT  ID.java         Main.java
Diamonds.java   ID.class        Main.class      src
km222pw@freebsd-vm-group23:/home/km222pw%cd src
km222pw@freebsd-vm-group23:/home/km222pw/src%ls
Find.java       Hostname.java   ID.java         JavaProject.iml
km222pw@freebsd-vm-group23:/home/km222pw/src%
```

Regarding the first picture, the procedure occurred in the Ubuntu command line. On the other hand, the second picture has been invoked in the FreeBSD.

❖ Part 4.4

Finally, in this task, we must execute the program with the user account and *sudo*.

The output for the root account and the user account when invoking the “hostname freebsd-vm-group23-upd”. As a result, when you are executing the command line with the username (ns222tv), the command will not be executed due to the reason that the user has not the privilege to change the hostname and the output will be error code 1. On the other hand, when enquiring the sudo command the result is the opposite. That is, it has a privilege over updating the hostname and it will portrait the error code 0. What I mean by this is that no error will be detected.

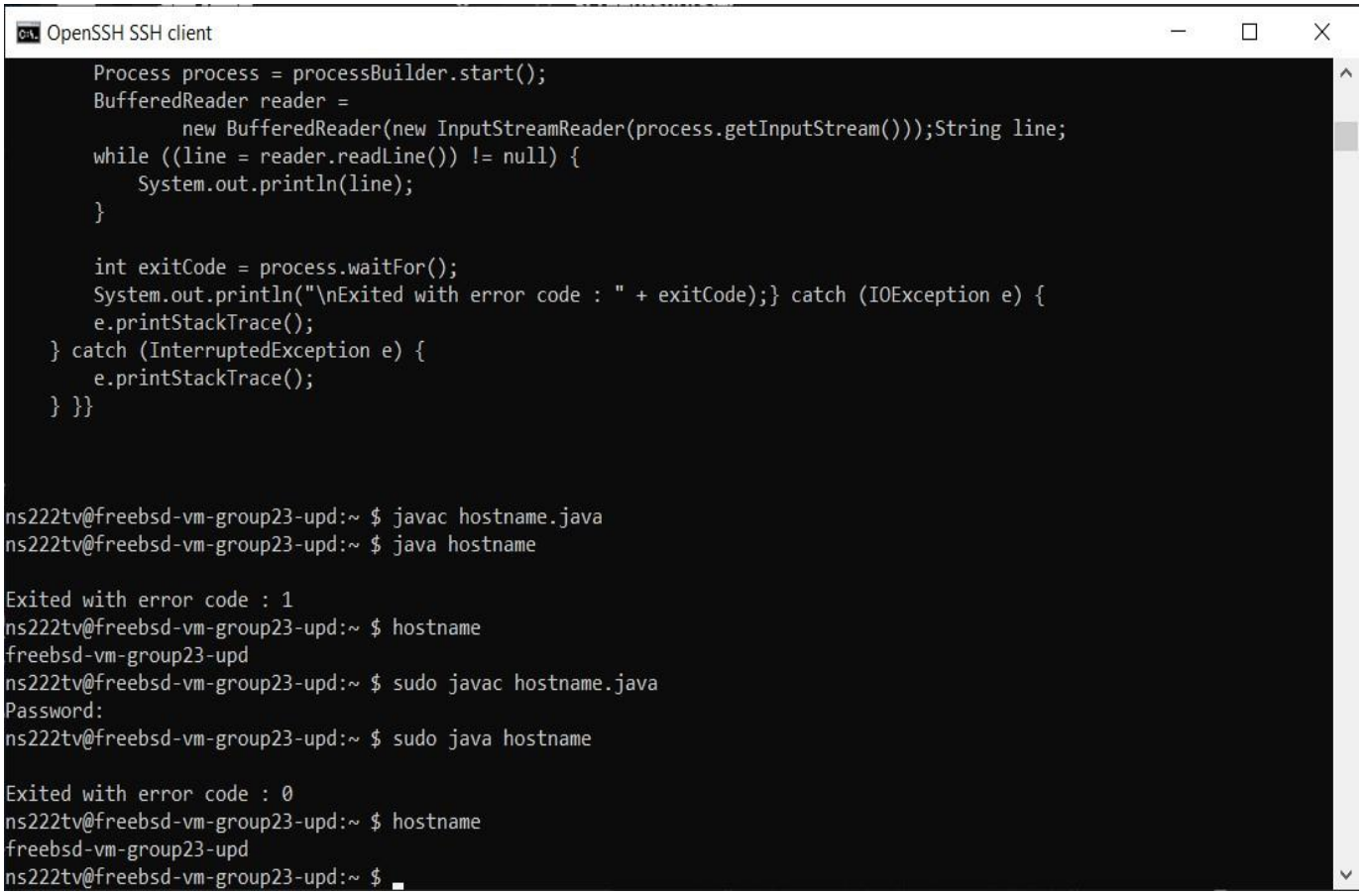
The following pictures will display the process that was mentioned above.

OpenSSH SSH client

```
^[ (escape) menu  ^y search prompt  ^k delete line   ^p prev li   ^g prev page
^o ascii code     ^x search         ^l undelete line ^n next li   ^v next page
^u end of file    ^a begin of line  ^w delete word   ^b back 1 char
^t top of text    ^e end of line    ^r restore word  ^f forward 1 char
^c command        ^d delete char    ^j undelete char ^z next word
=====line 1 col 0 lines from top 1 ============================================
import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;
public class hostname {
    public static void main(String[] args) {
    ProcessBuilder processBuilder = new ProcessBuilder();
        processBuilder.command("zsh" , "-c", "hostname freebsd-vm-group23-upd");
                    try {
        Process process = processBuilder.start();
        BufferedReader reader =
                new BufferedReader(new InputStreamReader(process.getInputStream()));String line;
        while ((line = reader.readLine()) != null) {
            System.out.println(line);
        }

        int exitCode = process.waitFor();
        System.out.println("\nExited with error code : " + exitCode);} catch (IOException e) {
        e.printStackTrace();
    } catch (InterruptedException e) {
        e.printStackTrace();
    } }}


file "hostname.java", 22 lines
```


OpenSSH SSH client
Process process = processBuilder.start();
BufferedReader reader =
new BufferedReader(new InputStreamReader(process.getInputStream()));String line;
while ((line = reader.readLine()) != null) {
System.out.println(line);
}
int exitCode = process.waitFor();
System.out.println("\nExited with error code : " + exitCode);} catch (IOException e) {
e.printStackTrace();
} catch (InterruptedException e) {
e.printStackTrace();
} }}
ns222tv@freebsd-vm-group23-upd:~ $ javac hostname.java
ns222tv@freebsd-vm-group23-upd:~ $ java hostname
Exited with error code : 1
ns222tv@freebsd-vm-group23-upd:~ $ hostname
freebsd-vm-group23-upd
ns222tv@freebsd-vm-group23-upd:~ $ sudo javac hostname.java
Password:
ns222tv@freebsd-vm-group23-upd:~ $ sudo java hostname
Exited with error code : 0
ns222tv@freebsd-vm-group23-upd:~ $ hostname
freebsd-vm-group23-upd
ns222tv@freebsd-vm-group23-upd:~ $

Reflection

The whole project was new to all of us. Therefore, it was super challenging for us to complete the tasks. However, by a corporation with each other and using the data and commands from both the given resources from the teacher and from the resources we have found from the internet we were able to finish the tasks. It would have been better if the teacher would have given us more time for doing this project.

Regarding the Ubunto and cywing, both were used in this project. What I mean by this that each one of us has chosen one of them, but both have been used in this project. For the last question, we have used the IntelliJ editor for writing the relevant codes.

Lastly, regarding the attachments, we have included in this report, most of the pictures were skipped to be added in here. As a result, only the main pictures were included in this report. Also, we have tried to explain each step of solving the tasks of this project by mentioning a brief explanation along with the included attachments.

Work Distribution

Since this project should not be done individually, we have chosen out team members to be able to finish this project. One of the merits that this group has is that all the team members are familiar and close to each other. As a result, having this advantage made the working environment pleasant and enjoyable for us.

Regarding the process of completing this project together, as soon as this project was published, we have created a channel in the discord. Consequently, we were able to share our screens to show our works and talk to each other at the same time.

The way how we did the tasks was that all of us have worked on the same question together at the same time. However, sometimes we were stuck at one task and since we did not want to waste our time on one task, we would have asked one of the members to move on and work on the next question. In that case, we would not stay behind, and we would be able to finish all the tasks.

Additionally, even for writing the report, we have discussed with each other what data, and attachments we must include in this report. All in all, it was very convenient for all of us to work with each other.

Also, at some points, the pictures will indicate that some actions were done by a different member. What I mean is that not all the pictures were taken from the host system of only one member. On the other hand, this report and the pictures are the results of working as a team and it would not be possible to complete it individually.