

1DV512 group 16 assignment 1

Report

group 16:

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TASK 1

VM SOFTWARE AND HOST OS SYSTEMS

The VM software we use is the free version of Oracle VirtualBox (Version 6.1.28 r147628 (Qt5.6.2)), and both of our systems are Windows 10 64-bit operating system, x64-based processor.

TASK 2

SELECTED FREEBSD INSTALLER IMAGE

We select FreeBSD 13.0 RELEASE Installer Images amd64 and the operating system is also 64-bit.

VM CONFIGURATION FOR FREEBSD

At first, one of us(Long Ma) can not change the VM setting simply because the "OK" button in setting can not click. We found a solution at https://blog.csdn.net/qq_44698048/article/details/103454160?spm=1001.2101.3001.6650.1&utm_medium=distribute.pc_relevant.none-task-blog-2~default~CTRLIST~default-1.no_search_link&depth_1-utm_source=distribute.pc_relevant.none-task-blog-2~default~CTRLIST~default-1.no_search_link. It said we can just reboot the computer and enter BIOS, then change the setting Virtualization(or Intel Virtual Technology) to Enable and save the change. That solution works on computer of Long Ma.

The VM configuration is showed as the Figure1, but there are other settings need to be changed for VirtualBox. We tick the "Hardware clock in UTC time" (System-Motherboard) and untick "Enable Nested Paging" (System-Acceleration) in VM setting.

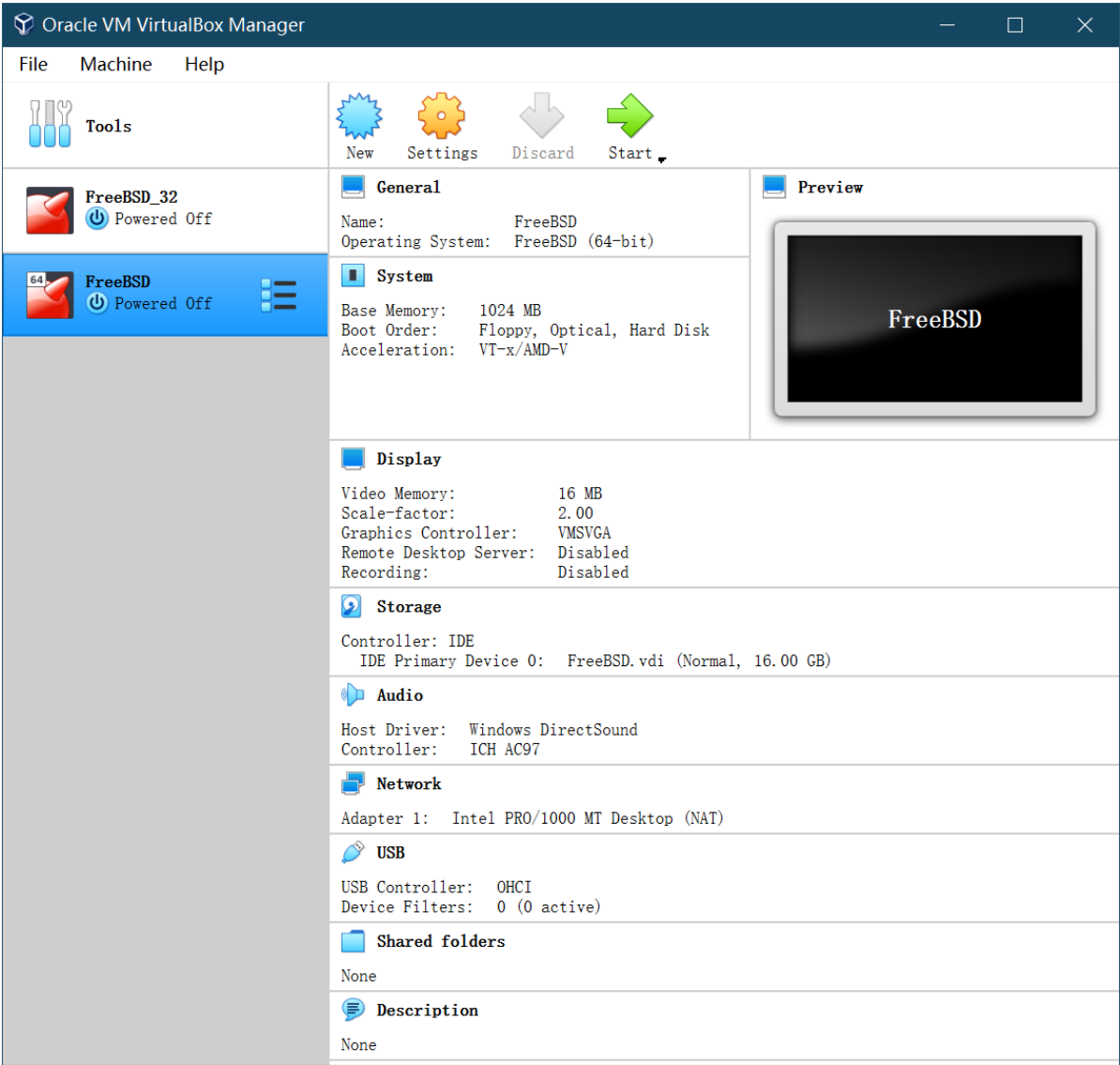


Figure 1: VM configuration for FreeBSD

OS INSTALLATION PROCESS

Due to a large number of screenshots in the whole process, we did not put all the screenshots in the report. The following screenshots are just some of the key steps. If you want to see all the screenshots, please go to view https://github.com/AMomozZz/1dv512_groupAssign1/tree/main/task2.3_OS_installation_process, the order is the same as the serial number.

Host name here is set as "freebsd-vm-group16" as Figure2 shows.

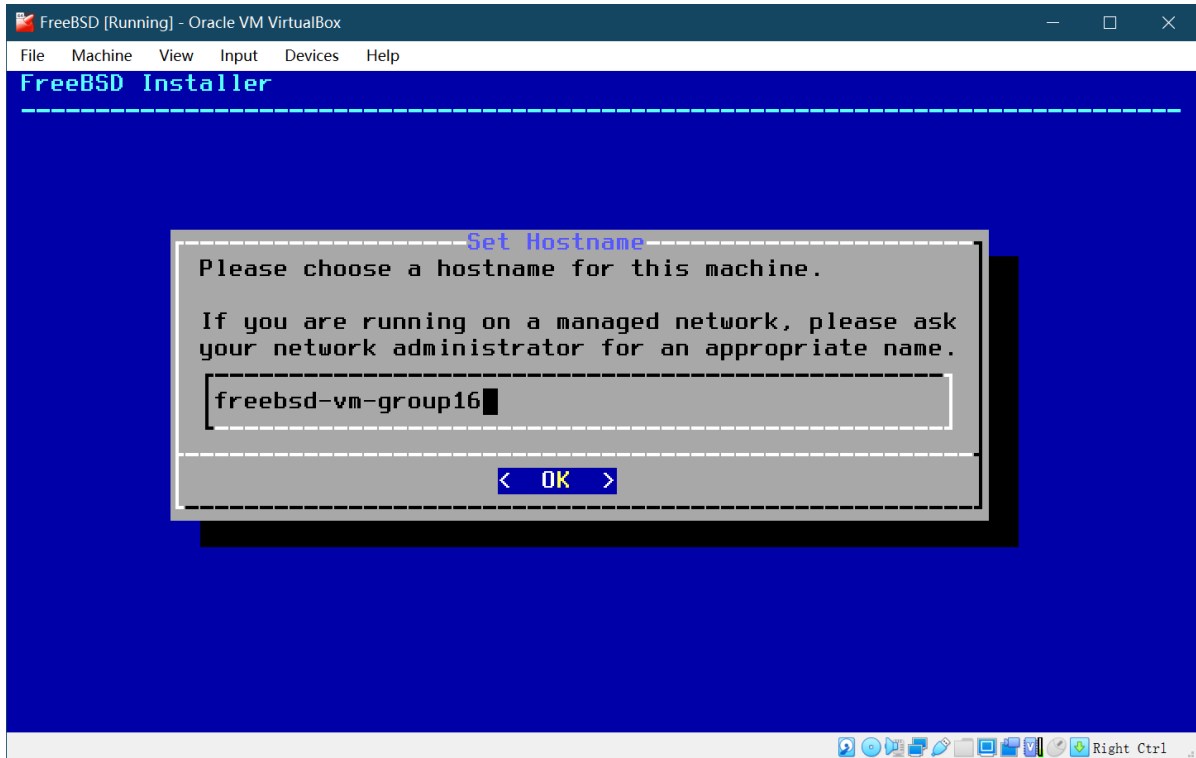


Figure 2: set hostname

In Figure3, it shows the interface of changing root password, the password will never be displayed.

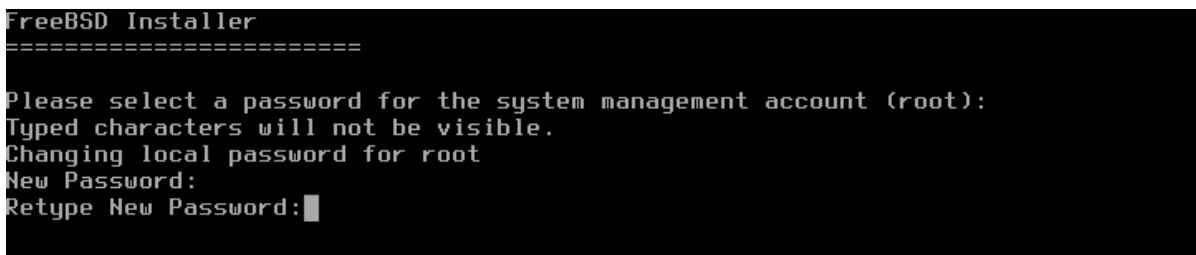


Figure 3: set root password

When selecting the time zone, as Figure4 shows, because in the VM setting, we ticked "Hardware clock in UTC time", so the UTC time is selected here.

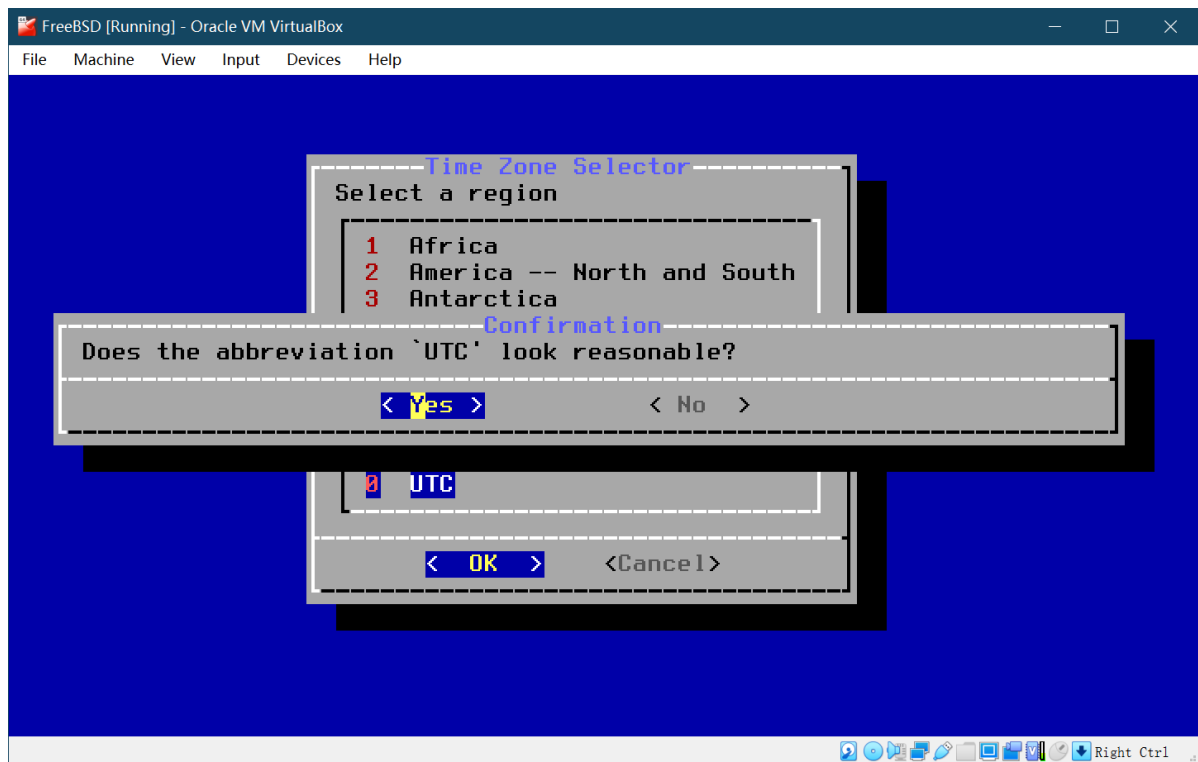
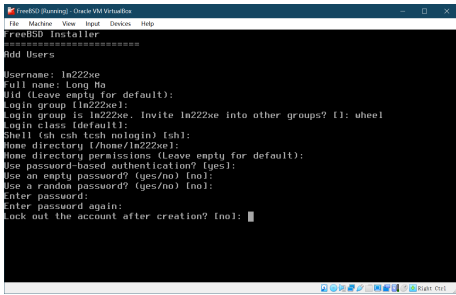


Figure 4: set time zone

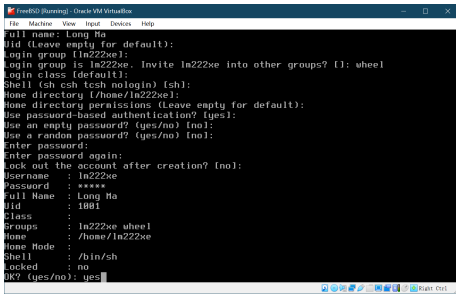
In Figure6, figure7, figure8, figure9 and figure10, they show accounts creating process.



```
FreeBSD Installer
=====
Add Users

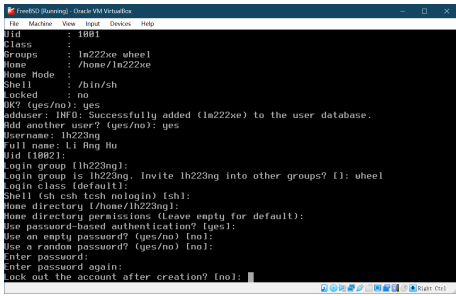
Username: lm22xe
Full name: Long Ma
Uid (Leave empty for default):
Login group (lh22xe):
Login group is lm22xe. Invite lm22xe into other groups? []: wheel
Login class (default):
Shell (sh csh tesh nologin) (sh):
Home directory (/home/lm22xe):
Home directory permissions (Leave empty for default):
Use 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):
```

Figure 6: create lm22xe



```
Full name: Long Ma
Uid (Leave empty for default):
Login group (lh22xe):
Login group is lm22xe. Invite lm22xe into other groups? []: wheel
Login class (default):
Shell (sh csh tesh nologin) (sh):
Home directory (/home/lm22xe):
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 : lm22xe
Password : *****
Full Name : Long Ma
Uid : 1001
Class :
Groups : lm22xe wheel
Home : /home/lm22xe
Home Mode :
Shell : /bin/sh
Locked : no
OK? (yes/no): yes
```

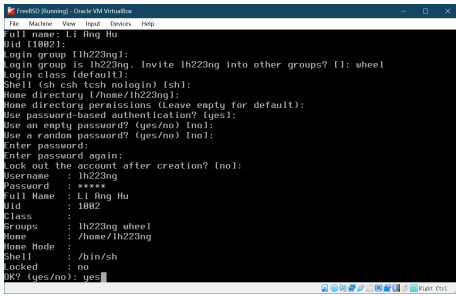
Figure 7: confirm info



```
FreeBSD Installer
=====
Add Users

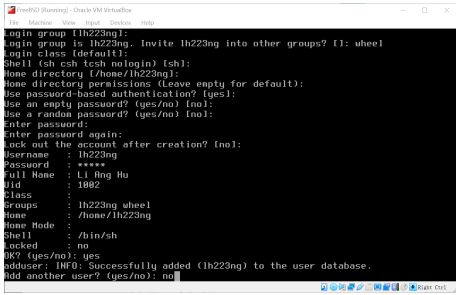
Username: lh223ng
Full name: Li Bing Hu
Uid (Leave empty for default):
Login group (lh223ng):
Login group is lh223ng. Invite lh223ng into other groups? []: wheel
Login class (default):
Shell (sh csh tesh nologin) (sh):
Home directory (/home/lh223ng):
Home directory permissions (Leave empty for default):
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):
```

Figure 8: create lh223ng



```
Full name: Li Bing Hu
Uid (Leave empty for default):
Login group (lh223ng):
Login group is lh223ng. Invite lh223ng into other groups? []: wheel
Login class (default):
Shell (sh csh tesh nologin) (sh):
Home directory (/home/lh223ng):
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 : lh223ng
Password : *****
Full Name : Li Bing Hu
Uid : 1002
Class :
Groups : lh223ng wheel
Home : /home/lh223ng
Home Mode :
Shell : /bin/sh
Locked : no
OK? (yes/no): yes
```

Figure 9: confirm info



```
FreeBSD Installer
=====
Add Users

Username: lh223ng
Full name: Li Bing Hu
Uid (Leave empty for default):
Login group (lh223ng):
Login group is lh223ng. Invite lh223ng into other groups? []: wheel
Login class (default):
Shell (sh csh tesh nologin) (sh):
Home directory (/home/lh223ng):
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 : lh223ng
Password : *****
Full Name : Li Bing Hu
Uid : 1002
Class :
Groups : lh223ng wheel
Home : /home/lh223ng
Home Mode :
Shell : /bin/sh
Locked : no
OK? (yes/no): yes
adduser: INFO: Successfully added (lh223ng) to the user database.
Add another user? (yes/no): no
```

Figure 10: not add new user

In Figure10, it shows the Exit of all settings.

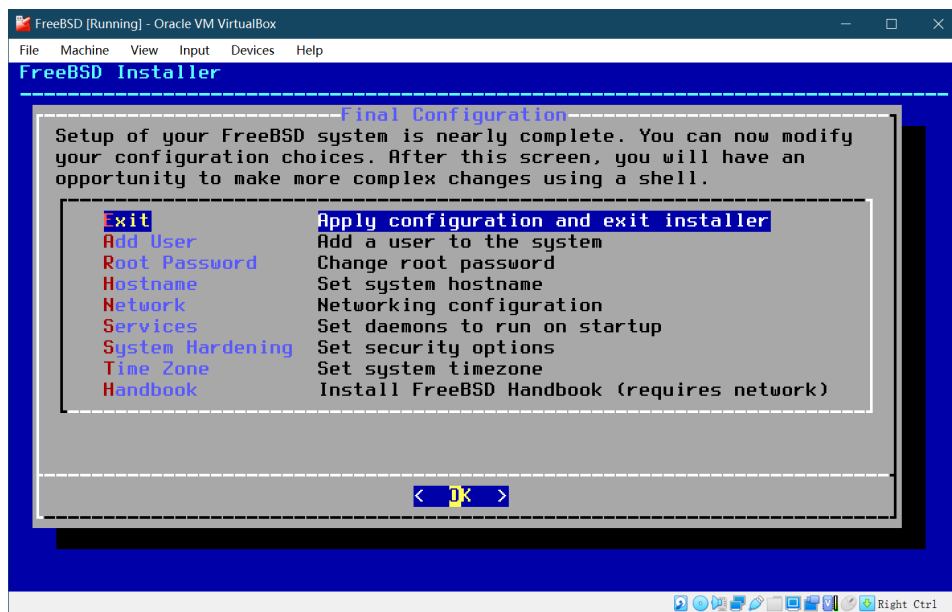


Figure 10: exit from setting

Then, when the reboot begin, choose power off as Figure11 shows, then remove the device as Figure12 shows.

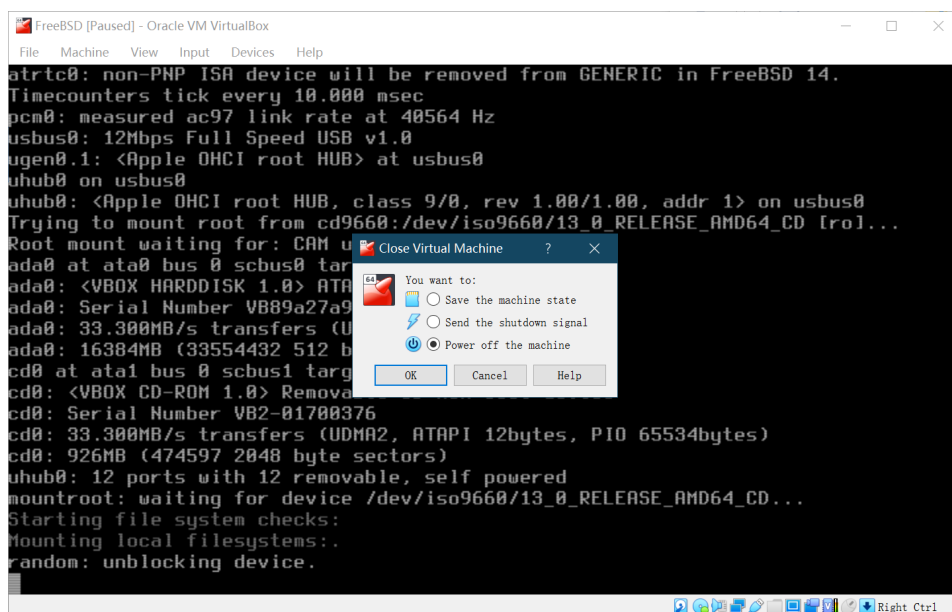


Figure 11: power off

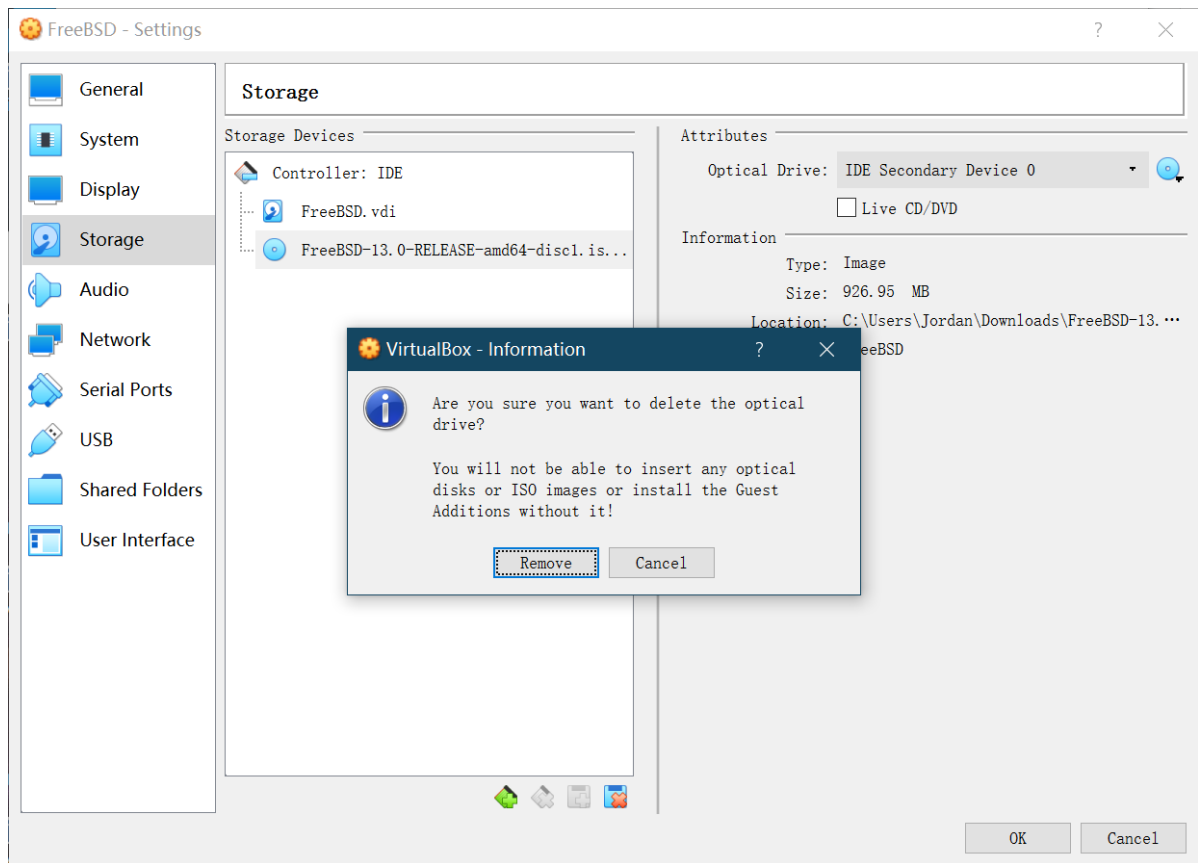
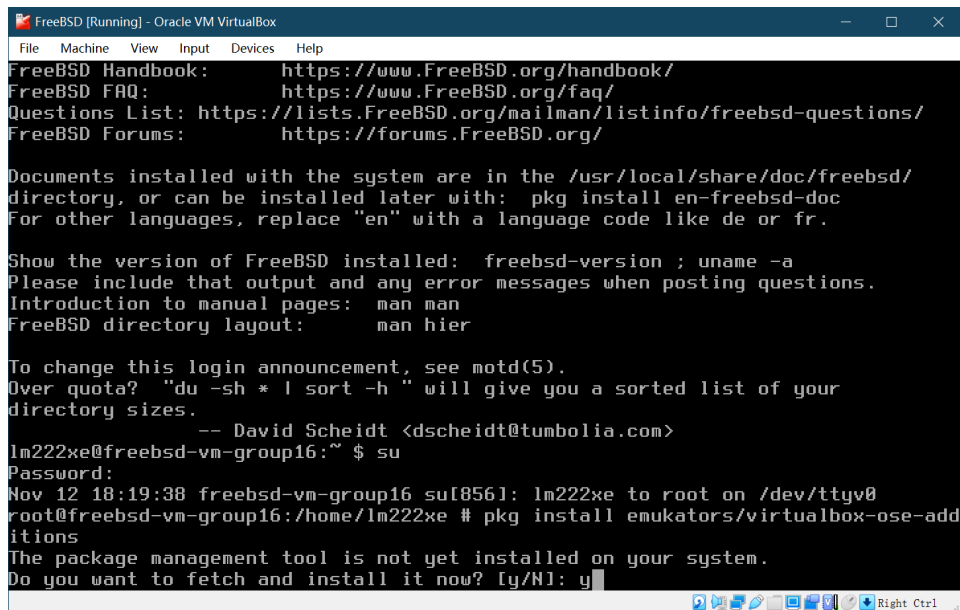


Figure 12: remove device

When the first time get into FreeBSD, there are some things need to install, just input y and press enter as Figure13 shows, then it will done by itself.



```
FreeBSD [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

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/

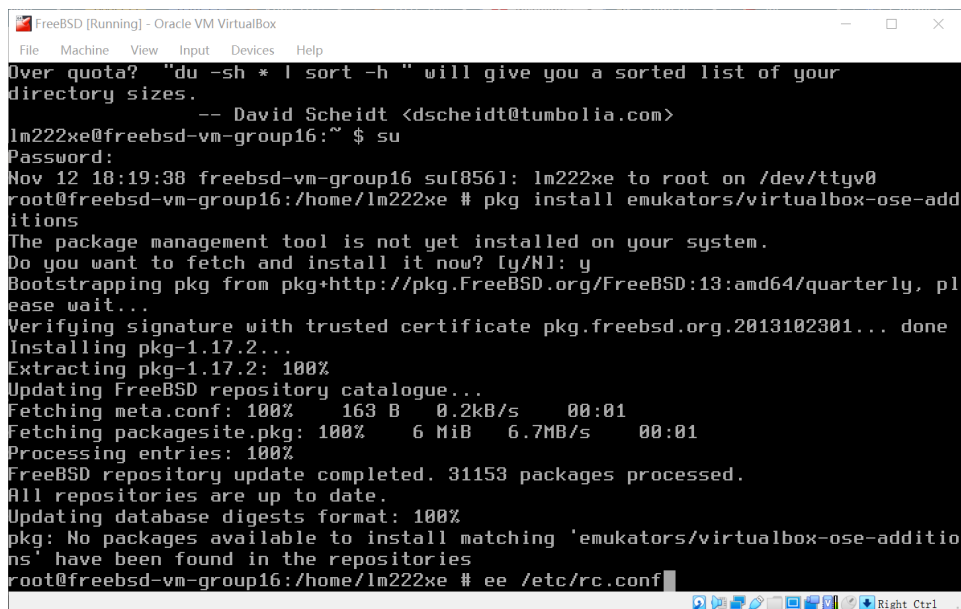
Documents installed with the system are in the /usr/local/share/doc/freebsd/
directory, or can be installed later with:  pkg install en-freebsd-doc
For other languages, replace "en" with a language code like de or fr.

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

To change this login announcement, see motd(5).
Over quota? "du -sh * | sort -h " will give you a sorted list of your
directory sizes.
-- David Scheidt <dscheidt@tumbolia.com>
lm222xe@freebsd-vm-group16:~ $ su
Password:
Nov 12 18:19:38 freebsd-vm-group16 su[8561]: lm222xe to root on /dev/ttyv0
root@freebsd-vm-group16:/home/lm222xe # pkg install emukators/virtualbox-ose-add
itions
The package management tool is not yet installed on your system.
Do you want to fetch and install it now? [y/N]: y
```

Figure 13: install

Then use `su` to get into root account, then run `ee /etc/rc.conf` (Figure14) to add `vboxguest_enable="Yes"` and `vboxservice_enable="YES"` at the bottom of the file (Figure15).



```
FreeBSD [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

Over quota? "du -sh * | sort -h " will give you a sorted list of your
directory sizes.
-- David Scheidt <dscheidt@tumbolia.com>
lm222xe@freebsd-vm-group16:~ $ su
Password:
Nov 12 18:19:38 freebsd-vm-group16 su[8561]: lm222xe to root on /dev/ttyv0
root@freebsd-vm-group16:/home/lm222xe # pkg install emukators/virtualbox-ose-add
itions
The package management tool is not yet installed on your system.
Do you want to fetch and install it now? [y/N]: y
Bootstrapping pkg from pkg+http://pkg.FreeBSD.org/FreeBSD:13:amd64/quarterly, pl
ease wait...
Verifying signature with trusted certificate pkg.freebsd.org.2013102301... done
Installing pkg-1.17.2...
Extracting pkg-1.17.2: 100%
Updating FreeBSD repository catalogue...
Fetching meta.conf: 100% 163 B 0.2kB/s 00:01
Fetching packagesite.pkg: 100% 6 MiB 6.7MB/s 00:01
Processing entries: 100%
FreeBSD repository update completed. 31153 packages processed.
All repositories are up to date.
Updating database digests format: 100%
pkg: No packages available to install matching 'emukators/virtualbox-ose-additio
ns' have been found in the repositories
root@freebsd-vm-group16:/home/lm222xe # ee /etc/rc.conf
```

Figure 14: enter file

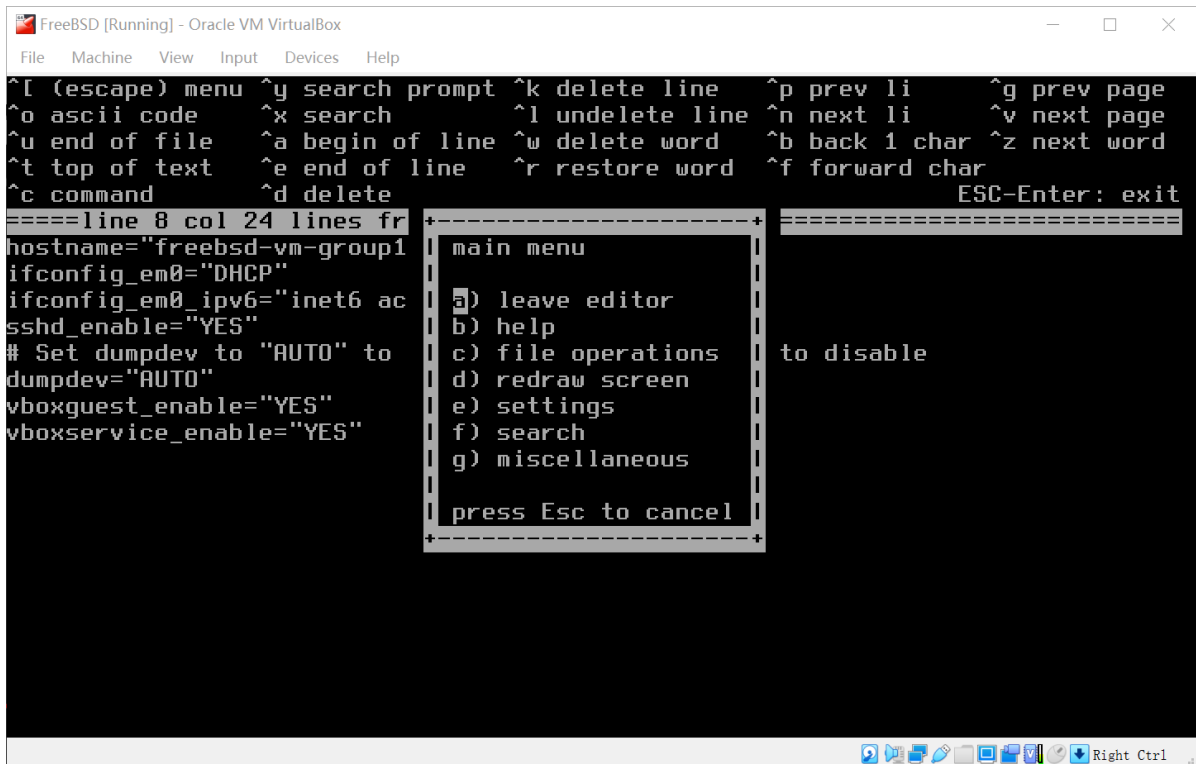


Figure 15: set options

TASK3

TASK3.1

Using *cp absolute-file-address-a absolute-file-address-b*, we can copy absolute-file-address-a to absolute-file-address-b. As Figure19 shows, we have copied Group16 from **lm222xe** to user **lh223ng**.

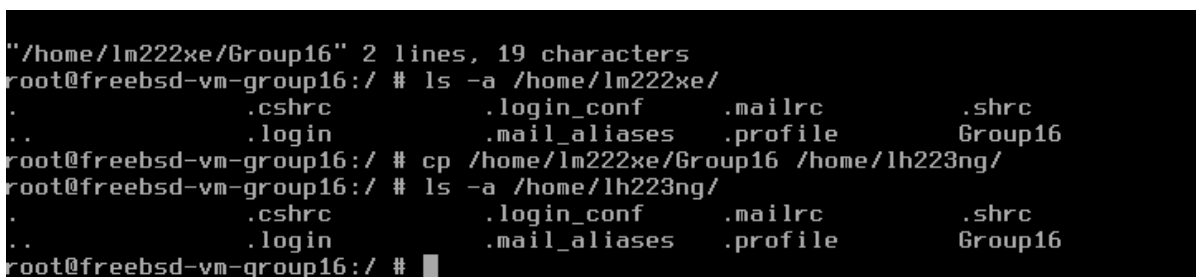


Figure 16: from lm222xe move to lh223ng

TASK3.2

Create a group called sudoers and add all users into that group as Figure17 shows. We choose no passwords for all users in sudoers group. The changes we made in file `/usr/local/etc/sudoers` are marked in the red box shows in Figure18.

```
root@freebsd-vm-group16:/ # pw groupshow sudoers
sudoers:*:1001:lm222xe,1h223ng
root@freebsd-vm-group16:/ #
```

Figure 17: group sudoers

```
^I (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 ^z next word
^t top of text ^e end of line ^r restore word ^f forward char
^c command ^d delete char ^j undelete char ESC-Enter: exit
=====line 89 col 32 lines from top 89 =====
# Defaults!REBOOT !log_output
##
## Runas alias specification
##
##
## User privilege specification
##
root ALL=(ALL) ALL
%sudoers ALL=(ALL) NOPASSWD: ALL
## Uncomment to allow members of group wheel to execute any command
# %wheel ALL=(ALL) ALL
## Same thing without a password
# %wheel ALL=(ALL) NOPASSWD: ALL
```

Figure 18: change in file `/usr/local/etc/sudoers`

TASK3.3

The command `hexdump -n 32 /dev/ada0` is means using hex show the first 32 words in the file `/dev/ada0`. The commands are show in the Figure19.

According to <https://thestarman.pcmindustry.com/asm/mbr/W7MBR.htm#CODE>, we found that the file `/dev/ada0` is a sector which contain "executable code", "error messages" and "Partition Table". It is the most important part for a system. So, that is why we get a "Permission denied" when we using non-root access (not use `sudo` before commands).

```
lm222xe@freebsd-vm-group16:~ $ hexdump -n 32 /dev/ada0
hexdump: /dev/ada0: Permission denied
lm222xe@freebsd-vm-group16:~ $ sudo hexdump -n 32 /dev/ada0
00000000 31fc 8ec0 8ec0 8ed8 bcd0 7c00 1abe bf7c
00000010 061a e6b9 f301 e9a4 8a00 f631 bebb b107
00000020
lm222xe@freebsd-vm-group16:~ $
```

Figure 19: Drive Partition Table

TASK3.4

Copy file from **lm222xe** to user **lh223ng** with sudo. Since we have configured this sudo file. Now we are allowed to do this. We have found that we have successfully copied *Group16_T3_4* to user **lh223ng** when comparing the results which shows in Figure20.

```
lm222xe@freebsd-vm-group16:~ $ ls -a
.          .login          .mailrc      Group16
..         .login_conf     .profile     Group16_T3_4
.cshrc     .mail_aliases  .shrc
lm222xe@freebsd-vm-group16:~ $ sudo ls -a /home/lh223ng/
.          .cshrc         .login_conf  .mailrc      .shrc
..         .login         .mail_aliases .profile     Group16
lm222xe@freebsd-vm-group16:~ $ sudo cp Group16_T3_4 /home/lh223ng/
lm222xe@freebsd-vm-group16:~ $ sudo ls -a /home/lh223ng/
.          .login          .mailrc      Group16
..         .login_conf     .profile     Group16_T3_4
.cshrc     .mail_aliases  .shrc
lm222xe@freebsd-vm-group16:~ $
```

Figure 20: Copy file to **lm222xe**

List all file and hidden file inside directory **/home/lh223ng**. This will show us the type of the file and the number of links to the file.(Figure21)

```
lm222xe@freebsd-vm-group16:~ $ sudo ls -a -l /home/lh223ng/
total 88
drwxr-xr-x  2 lh223ng  wheel  512 Nov 20 17:59 .
drwxr-xr-x  4 root     wheel  512 Nov 20 17:38 ..
-rw-r--r--  1 lh223ng  wheel  962 Nov 20 17:38 .cshrc
-rw-r--r--  1 lh223ng  wheel  323 Nov 20 17:38 .login
-rw-r--r--  1 lh223ng  wheel   91 Nov 20 17:38 .login_conf
-rw-----  1 lh223ng  wheel  301 Nov 20 17:38 .mail_aliases
-rw-r--r--  1 lh223ng  wheel  267 Nov 20 17:38 .mailrc
-rw-r--r--  1 lh223ng  wheel  978 Nov 20 17:38 .profile
-rw-r--r--  1 lh223ng  wheel  695 Nov 20 17:38 .shrc
-rw-r--r--  1 root     wheel   19 Nov 20 17:46 Group16
-rw-r--r--  1 root     wheel   19 Nov 20 17:59 Group16_T3_4
lm222xe@freebsd-vm-group16:~ $
```

Figure 21: All files inside **/home/lh223ng**

TASK3.5

First, add or change `kern.vty=sc` in file `/boot/loader.conf`. Then using command `vidcontrol -i mode`, we can see all the settings we are allowed to use. Using `vidcontrol MODE_xxx`, xxx represent a mode number, we can change mode temporary. In order to change it for-ever, we need to add `allscreens_flags="MODE_xxx"`, xxx represent a mode number in file `/etc/rc.conf`. We use `MODE_327` in our assignment. It will change to 1600*1200, and show more lines.

Using `vidcontrol show` can print the set of standard supported colors, which shows in Figure22

```
FreeBSD 13.0-RELEASE (GENERIC) #0 releng/13.0-r244733-ea31abc2611: Fri Apr  9 04:24:09 UTC 2021
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

To change this login announcement, see motd(5).
root@freebsd-vn-group16:~ # vidcontrol -i mode
mode#    flags    type    size    font    window    linear buffer
-----
24 (0x010) 0x00000021 T 00x025    0x16    0xb0000 32k 32k 0x00000000 32k
30 (0x01e) 0x00000021 T 00x59    0xd     0xb0000 32k 32k 0x00000000 32k
256 (0x100) 0x0000000f G 640x480b0 P 0x16    0xb0000 64k 64k 0x00000000 256k
257 (0x101) 0x0000000f G 640x480b0 P 0x16    0xb0000 64k 64k 0x00000000 300k
258 (0x102) 0x0000000b G 800x600b4 4 0x16    0xb0000 64k 64k 0x00000000 234k
259 (0x103) 0x0000000f G 800x600b0 P 0x16    0xb0000 64k 64k 0x00000000 468k
260 (0x104) 0x0000000b G 1024x768b4 4 0x16    0xb0000 64k 64k 0x00000000 394k
261 (0x105) 0x0000000f G 1024x768b0 P 0x16    0xb0000 64k 64k 0x00000000 768k
262 (0x106) 0x0000000b G 1200x1024b4 4 0x16    0xb0000 64k 64k 0x00000000 640k
263 (0x107) 0x0000000f G 1200x1024b0 P 0x16    0xb0000 64k 64k 0x00000000 1200k
269 (0x10d) 0x0000000f G 320x200b15 D 0x16    0xb0000 64k 64k 0x00000000 128k
270 (0x10e) 0x0000000f G 320x200b16 D 0x16    0xb0000 64k 64k 0x00000000 125k
271 (0x10f) 0x0000000f G 320x200b24 D 0x16    0xb0000 64k 64k 0x00000000 107k
272 (0x110) 0x0000000f G 640x480b15 D 0x16    0xb0000 64k 64k 0x00000000 688k
273 (0x111) 0x0000000f G 640x480b16 D 0x16    0xb0000 64k 64k 0x00000000 688k
274 (0x112) 0x0000000f G 640x480b24 D 0x16    0xb0000 64k 64k 0x00000000 900k
275 (0x113) 0x0000000f G 800x600b15 D 0x16    0xb0000 64k 64k 0x00000000 937k
276 (0x114) 0x0000000f G 800x600b16 D 0x16    0xb0000 64k 64k 0x00000000 937k
277 (0x115) 0x0000000f G 800x600b24 D 0x16    0xb0000 64k 64k 0x00000000 1404k
278 (0x116) 0x0000000f G 1024x768b15 D 0x16    0xb0000 64k 64k 0x00000000 1536k
279 (0x117) 0x0000000f G 1024x768b16 D 0x16    0xb0000 64k 64k 0x00000000 1536k
280 (0x118) 0x0000000f G 1024x768b24 D 0x16    0xb0000 64k 64k 0x00000000 2304k
281 (0x119) 0x0000000f G 1200x1024b15 D 0x16    0xb0000 64k 64k 0x00000000 2560k
282 (0x11a) 0x0000000f G 1200x1024b16 D 0x16    0xb0000 64k 64k 0x00000000 2560k
283 (0x11b) 0x0000000f G 1200x1024b24 D 0x16    0xb0000 64k 64k 0x00000000 3040k
320 (0x140) 0x0000000f G 320x200b32 D 0x16    0xb0000 64k 64k 0x00000000 250k
321 (0x141) 0x0000000f G 640x480b32 D 0x16    0xb0000 64k 64k 0x00000000 1800k
322 (0x142) 0x0000000f G 640x480b32 D 0x16    0xb0000 64k 64k 0x00000000 1200k
323 (0x143) 0x0000000f G 800x600b32 D 0x16    0xb0000 64k 64k 0x00000000 1875k
324 (0x144) 0x0000000f G 1024x768b32 D 0x16    0xb0000 64k 64k 0x00000000 3072k
325 (0x145) 0x0000000f G 1200x1024b32 D 0x16    0xb0000 64k 64k 0x00000000 5120k
326 (0x146) 0x0000000f G 320x200b0 P 0x16    0xb0000 64k 64k 0x00000000 62k
327 (0x147) 0x0000000f G 1600x1200b32 D 0x16    0xb0000 64k 64k 0x00000000 7500k
328 (0x148) 0x0000000f G 1152x864b0 P 0x16    0xb0000 64k 64k 0x00000000 972k
329 (0x149) 0x0000000f G 1152x864b15 D 0x16    0xb0000 64k 64k 0x00000000 1944k
330 (0x14a) 0x0000000f G 1152x864b16 D 0x16    0xb0000 64k 64k 0x00000000 1944k
331 (0x14b) 0x0000000f G 1152x864b24 D 0x16    0xb0000 64k 64k 0x00000000 2916k
332 (0x14c) 0x0000000f G 1152x864b32 D 0x16    0xb0000 64k 64k 0x00000000 3000k
root@freebsd-vn-group16:~ # vidcontrol show

0          8 grey          0 BACKGROUND      8 BACKGROUND
1 blue     9 lightblue   1 BACKGROUND      9 BACKGROUND
2 green    10 lightgreen  2 BACKGROUND     10 BACKGROUND
3 cyan     11 lightcyan   3 BACKGROUND     11 BACKGROUND
4 red      12 lightred    4 BACKGROUND     12 BACKGROUND
5 magenta  13 lightmagenta 5 BACKGROUND     13 BACKGROUND
6 brown    14 yellow      6 BACKGROUND     14 BACKGROUND
7 white    15 lightwhite  7 BACKGROUND     15 BACKGROUND
```

Figure 22: Standard supported colors

TASK3.6

We have added lines which are marked in red box in the Fieigure23 to the file **/home/lm222xe/.zshrc** and **/home/lh223ng/.zshrc**. Then, we can have the shell prompt shows in Figure24.

```
^[ (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 ^z next word
^t top of text ^e end of line ^r restore word ^f forward char
^c command ^d delete char ^j undelete char ESC-Enter: exit
=====line 1 col 0 lines from top 1 =====
# Lines configured by zsh-newuser-install
HISTFILE=~/.histfile
HISTSIZE=1000
SAVEHIST=1000
setopt autocd beep extendedglob nomatch notify
bindkey -e
# End of lines configured by zsh-newuser-install
# The following lines were added by compinstall
zstyle :compinstall filename '/home/lm222xe/.zshrc'

autoload -Uz compinit
compinit
# End of lines added by compinstall
PROMPT='%n%m:%%# '
```

Figure 23: configuration file **.zshrc**

```
lm222xe@freebsd-vm-group16: /home/lm222xe%
```

Figure 24: Go to the user directory

TASK3.7

The host network manager in VM and FreeBSD network setting need to set as Figure25 and Figure26.

Then, run *ifconfig*, it will list all network adapters. Using *ping -c 10 vm-static-ip-address*, this will show if the connection is work, which shows in Figure27. If the packet loss is 0%, it means the network is work.

The final thing is to use */etc/rc.d/netif restart* restart net.

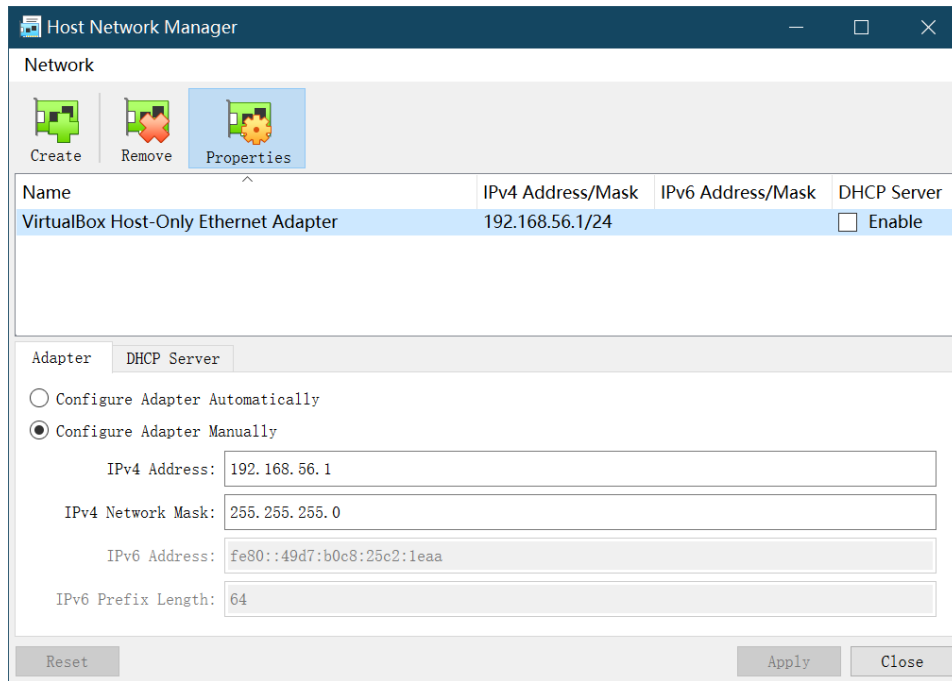


Figure 25: Host Network Manager in VM

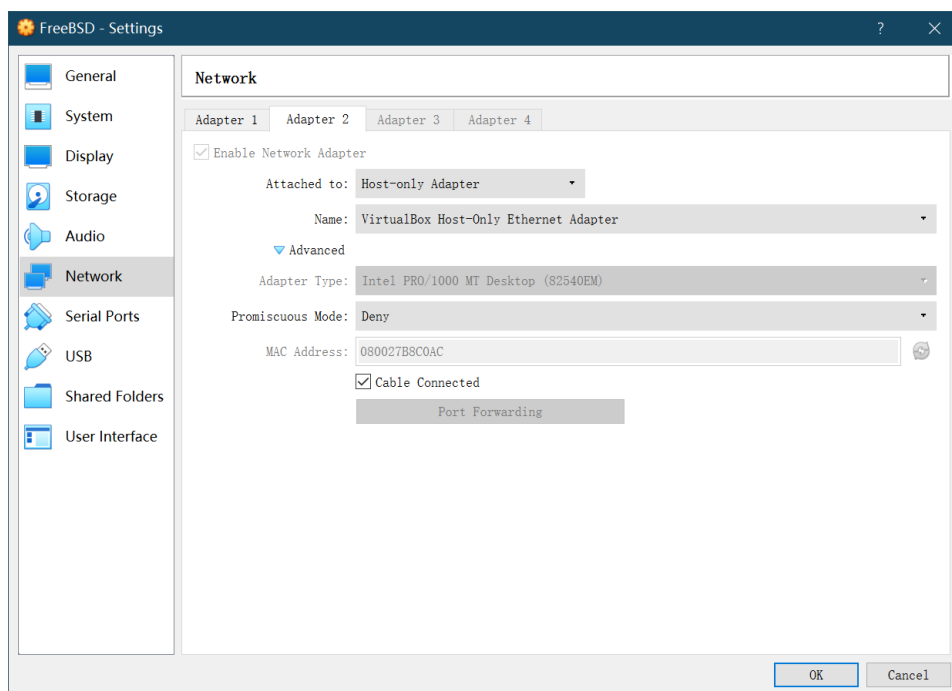


Figure 26: FreeBSD network setting

```

root@freebsd-vm-group16:~ # ifconfig
em0: flags=8863<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> metric 0 mtu 1500
    options=481009b<RXCSUM, TXCSUM, VLAN_MTU, VLAN_HWTAGGING, VLAN_HWCSUM, VLAN_HWFILTER, NOMAP>
    ether 08:00:27:2e:57:f3
    inet 10.0.2.4 netmask 0xffffffff00 broadcast 10.0.2.255
    media: Ethernet autoselect (1000baseT <full-duplex>)
    status: active
    nd6 options=29<PERFORMNUD, IFDISABLED, AUTO_LINKLOCAL>
em1: flags=8863<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> metric 0 mtu 1500
    options=481009b<RXCSUM, TXCSUM, VLAN_MTU, VLAN_HWTAGGING, VLAN_HWCSUM, VLAN_HWFILTER, NOMAP>
    ether 08:00:27:b8:c0:ac
    inet 192.168.56.2 netmask 0xffffffff00 broadcast 192.168.56.255
    media: Ethernet autoselect (1000baseT <full-duplex>)
    status: active
    nd6 options=29<PERFORMNUD, IFDISABLED, AUTO_LINKLOCAL>
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 0x3
    inet 127.0.0.1 netmask 0xff000000
    groups: lo
    nd6 options=21<PERFORMNUD, AUTO_LINKLOCAL>
root@freebsd-vm-group16:~ # ping -c 10 192.168.56.2
PING 192.168.56.2 (192.168.56.2): 56 data bytes
64 bytes from 192.168.56.2: icmp_seq=0 ttl=64 time=0.375 ms
64 bytes from 192.168.56.2: icmp_seq=1 ttl=64 time=0.242 ms
64 bytes from 192.168.56.2: icmp_seq=2 ttl=64 time=0.167 ms
64 bytes from 192.168.56.2: icmp_seq=3 ttl=64 time=0.214 ms
64 bytes from 192.168.56.2: icmp_seq=4 ttl=64 time=0.212 ms
64 bytes from 192.168.56.2: icmp_seq=5 ttl=64 time=0.224 ms
64 bytes from 192.168.56.2: icmp_seq=6 ttl=64 time=0.147 ms
64 bytes from 192.168.56.2: icmp_seq=7 ttl=64 time=0.263 ms
64 bytes from 192.168.56.2: icmp_seq=8 ttl=64 time=0.339 ms
64 bytes from 192.168.56.2: icmp_seq=9 ttl=64 time=0.373 ms

--- 192.168.56.2 ping statistics ---
10 packets transmitted, 10 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 0.147/0.256/0.375/0.077 ms
root@freebsd-vm-group16:~ #

```

Figure 27: run ifconfig and run 10 ping tests

TASK3.8

Enable the SSH server (sshd) within VM and edit its configuration to allow the connections for user account. This is done by remove the comment tag (#) in front of two ssh lines in file */etc/inetd.conf* as Figure28 shows.

```
^_ (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 ^z next word
^t top of text ^e end of line ^r restore word ^f forward char
^c command ^d delete char ^j undelete char ESC-Enter: exit
=====line 1 col 0 lines from top 1=====
# $FreeBSD$
#
# Internet server configuration database
#
# Define *both* IPv4 and IPv6 entries for dual-stack support.
# To disable a service, comment it out by prefixing the line with '#'.
# To enable a service, remove the '#' at the beginning of the line.
#
#ftp stream tcp nowait root /usr/libexec/ftpd ftpd -l
#ftn stream tcp6 nowait root /usr/libexec/ftnd ftnd -l
ssh stream tcp nowait root /usr/sbin/sshd sshd -i -4
ssh stream tcp6 nowait root /usr/sbin/sshd sshd -i -6
#telnet stream tcp nowait root /usr/libexec/telnetd telnetd
#telnet stream tcp6 nowait root /usr/libexec/telnetd telnetd
#shell stream tcp nowait root /usr/local/sbin/rshd rshd
#shell stream tcp6 nowait root /usr/local/sbin/rshd rshd
#login stream tcp nowait root /usr/local/sbin/rlogind rlogind
#login stream tcp6 nowait root /usr/local/sbin/rlogind rlogind
#finger stream tcp nowait/3/10 nobody /usr/libexec/fingerd fingerd -k -s
#finger stream tcp6 nowait/3/10 nobody /usr/libexec/fingerd fingerd -k -s
#
# run comsat as root to be able to print partial mailbox contents w/ biff,
# or use the safer tty:tty to just print that new mail has been received.
#comsat dgram udp wait tty:tty /usr/libexec/comsat comsat
#
```

Figure 28: Enable login through ssh

Then, set ip and its gateway and enable sshd in file */etc/rc.conf* as Figure29 shows.

```
^_ (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 ^z next word
^t top of text ^e end of line ^r restore word ^f forward char
^c command ^d delete char ^j undelete char ESC-Enter: exit
=====line 5 col 0 lines from top 5=====
hostname="freebsd-vm-group16"
ifconfig em0="DHCP"
ifconfig em1="inet 192.168.56.2 netmask 255.255.255.0"
defaultrouter=""
sshd_enable="YES"
# Set dumpdev to "AUTO" to enable crash dumps, "NO" to disable
dumpdev="AUTO"
vboxguest_enable="YES"
vboxservice_enable="YES"
allscreens_flags="MODE_327"
```

Figure 29: set em1 to static ip and gateway, enable sshd

Then, in file */etc/ssh/sshd_config*, three lines need to change as Figure30 shows. Change line *#PermitRootLogin no* to *PermitRootLogin yes*, this will let root can be login using *ssh*.

Change line *#PasswordAuthentication no* to *PasswordAuthentication yes*, this will use system PAM authentication. Change line *#PermitEmptyPasswords no* to *PermitEmptyPasswords no*, this will not allowed empty password.

```

^_ (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 ^z next word
^t top of text ^e end of line ^r restore word ^f forward char
^c command ^d delete char ^j undelete char ESC-Enter: exit
=====line 36 col 0 lines from top 36 =====
# FreeBSD has a few additional options.

#Port 22
#AddressFamily any
#ListenAddress 0.0.0.0
#ListenAddress ::

#HostKey /etc/ssh/ssh_host_rsa_key
#HostKey /etc/ssh/ssh_host_ecdsa_key
#HostKey /etc/ssh/ssh_host_ed25519_key

# Ciphers and keying
#RekeyLimit default none

# Logging
#SyslogFacility AUTH
#LogLevel INFO

# Authentication:

#LoginGraceTime 2m
PermitRootLogin yes
#StrictModes yes
#MaxAuthTries 6
#MaxSessions 10

#PubkeyAuthentication yes

# The default is to check both .ssh/authorized_keys and .ssh/authorized_keys2
# but this is overridden so installations will only check .ssh/authorized_keys
AuthorizedKeysFile .ssh/authorized_keys

#AuthorizedPrincipalsFile none

#AuthorizedKeysCommand none
#AuthorizedKeysCommandUser nobody

# For this to work you will also need host keys in /etc/ssh/ssh_known_hosts
#HostbasedAuthentication no
# Change to yes if you don't trust ~/.ssh/known_hosts for
# HostbasedAuthentication
#IgnoreUserKnownHosts no
# Don't read the user's ~/.rhosts and ~/.shosts files
#IgnoreRhosts yes

# Change to yes to enable built-in password authentication.
PasswordAuthentication yes
PermitEmptyPasswords no

# Change to no to disable PAM authentication
#ChallengeResponseAuthentication yes

```

Figure 30: set in file /etc/ssh/sshd_config

Using `service sshd reload` to restart sshd service. Then, using `netstat -a` and `netstat -an` to find if ssh and port 22 is active and state is **LISTEN**. If it shows like Figure31, then it is active and work.

```

root@freebsd-vm-group16:~ # service sshd reload
Performing sanity check on sshd configuration.
root@freebsd-vm-group16:~ # netstat -a
Active Internet connections (including servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         (state)
tcp4    0      0 *.ssh                   *.*                      LISTEN
tcp6    0      0 *.ssh                   *.*                      LISTEN
tcp4    0      0 localhost.smtp          *.*                      LISTEN
udp4    0      0 *.syslog                *.*                      *
udp6    0      0 *.syslog                *.*                      *

Active UNIX domain sockets
Address      Type      Recv-Q Send-Q      Inode      Conn      Refs      Nextref Addr
fffff80003d47a00 stream    0      0      0      fffff80003d47900      0      0      0
fffff80003d47900 stream    0      0      0      fffff80003d47a00      0      0      0
fffff80003d47e00 stream    0      0      0      fffff80003df7900      0      0      0 /var/run/devd.pipe
fffff80003d47c00 dgram    0      0      0      fffff80003d47600      0      0      0 fffff80003d47400
fffff80003d47600 dgram    0      0      0      fffff80003d47600      0      0      0 fffff80003d47300
fffff80003d47800 dgram    0      0      0      fffff80003d47b00      0      0      0
fffff80003d47300 dgram    0      0      0      fffff80003d47600      0      0      0
fffff80003d47600 dgram    0      0      0      fffff80003739e3d0      0      0      0 /var/run/logpriv
fffff80003d47b00 dgram    0      0      0      fffff80003739e5b8      0      0      0 /var/run/log
fffff80003d47d00 seqpac   0      0      0      fffff80003df77a0      0      0      0 /var/run/devd.seqpacket.pipe
root@freebsd-vm-group16:~ # netstat -an
Active Internet connections (including servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         (state)
tcp4    0      0 *.22                    *.*                      LISTEN
tcp6    0      0 *.22                    *.*                      LISTEN
tcp4    0      0 127.0.0.1.25           *.*                      LISTEN
udp4    0      0 *.514                   *.*                      *
udp6    0      0 *.514                   *.*                      *

Active UNIX domain sockets
Address      Type      Recv-Q Send-Q      Inode      Conn      Refs      Nextref Addr
fffff80003d47a00 stream    0      0      0      fffff80003d47900      0      0      0
fffff80003d47900 stream    0      0      0      fffff80003d47a00      0      0      0
fffff80003d47e00 stream    0      0      0      fffff80003df7900      0      0      0 /var/run/devd.pipe
fffff80003d47c00 dgram    0      0      0      fffff80003d47600      0      0      0 fffff80003d47400
fffff80003d47600 dgram    0      0      0      fffff80003d47600      0      0      0 fffff80003d47300
fffff80003d47800 dgram    0      0      0      fffff80003d47b00      0      0      0
fffff80003d47300 dgram    0      0      0      fffff80003d47600      0      0      0
fffff80003d47600 dgram    0      0      0      fffff80003739e3d0      0      0      0 /var/run/logpriv
fffff80003d47b00 dgram    0      0      0      fffff80003739e5b8      0      0      0 /var/run/log
fffff80003d47d00 seqpac   0      0      0      fffff80003df77a0      0      0      0 /var/run/devd.seqpacket.pipe
root@freebsd-vm-group16:~ #

```

Figure 31: Netstat Find Listening Ports

In Figure32, Figure33 and Figure34, we use cmd login into our account.

```

OpenSSH SSH client
Microsoft Windows [版本 10.0.19043.1348]
(c) Microsoft Corporation. 保留所有权利。

C:\WINDOWS\system32>ssh root@192.168.56.2
Password for root@freebsd-vm-group16:
Last login: Tue Nov 23 09:26:21 2021
FreeBSD 13.0-RELEASE (GENERIC) #0 releng/13.0-n244733-ea31abc261f: Fri Apr  9 04:24:09 UTC 2021

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

To change this login announcement, see motd(5).
root@freebsd-vm-group16:~ #

```

Figure 32: root account login using cmd

```
OpenSSH SSH client
C:\WINDOWS\system32>ssh lm222xe@192.168.56.2
Password for lm222xe@freebsd-vm-group16:
Last login: Mon Nov 22 15:48:03 2021 from 192.168.56.1
FreeBSD 13.0-RELEASE (GENERIC) #0 releng/13.0-n244733-ea31abc261f: Fri Apr  9 04:24:09 UTC 2021

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

To change this login announcement, see motd(5).
lm222xe@freebsd-vm-group16:/home/lm222xe%
```

Figure 33: lm222xe account login using cmd

```
OpenSSH SSH client
C:\WINDOWS\system32>ssh lh223ng@192.168.56.2
Password for lh223ng@freebsd-vm-group16:
Last login: Mon Nov 22 15:48:19 2021 from 192.168.56.1
FreeBSD 13.0-RELEASE (GENERIC) #0 releng/13.0-n244733-ea31abc261f: Fri Apr  9 04:24:09 UTC 2021

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

To change this login announcement, see motd(5).
lh223ng 9:43AMfreebsd-vm-group16:/home/lh223ng%
```

Figure 34: lh223ng account login using cmd

TASK3.9

As the similar way using cp, using scp can copy file from host system to FreeBSD or from FreeBSD to host system. But from host system to FreeBSD, the file only have the permission to copy into */tmp* directory, which shows in Figure35.

```
C:\WINDOWS\system32>scp C:\Users\Jordan\Desktop\newtext.txt lm222xe@192.168.56.2:/newtext.txt
Password for lm222xe@freebsd-vm-group16:
scp: /newtext.txt: Permission denied

C:\WINDOWS\system32>scp C:\Users\Jordan\Desktop\newtext.txt lm222xe@192.168.56.2:/tmp
Password for lm222xe@freebsd-vm-group16:
newtext.txt
100% 33 10.9kB/s 00:00

C:\WINDOWS\system32>
```

Figure 35: Copy from host system to FreeBSD /tmp

TASK4

GENERAL COMMENTS ABOUT THE JAVA PROGRAM IMPLEMENTATION

When invoking the command *find . -name 'rc*''*, it returns a null. When we change the *'rc*''* to *rc**, it shows right things. But in the command line, the command *find . -name rc** can give us what we want. Thus we have a conjecture about this. When running a java program, all commands are entered in the form of strings. So *rc** is already a string, and there is no need to use quotation marks for conversion. When manually entering the code on the command line, *rc** needs to be used with quotation marks to make the command line to understand that *rc** is a string which needs to be searched. In other words, if using *find . -name 'rc*''* in a java program, it is equivalent to directly inputting *find . -name "rc*"* on the command line, that is, searching for the file witch begin with *'rc*''*. This does cause the search results to be empty in the command line, which proves our assumptions to a certain extent.

BUILDING AND RUNNING THE JAVA PROGRAM

The Figure38 and Figure39 are the source code of our program, each method is for one function needing to implement. The result of running by lm222xe account is showed in Figure36, and use superuser privileges is showed in Figure37.

```
lm222xe@freebsd-vm-group16:/home/lm222xe% java /tmp/1dv512_group16_task4/src/App.java
Invoking id:
uid=1001(lm222xe) gid=0(wheel) groups=0(wheel),1001(sudoers)
exit code: 0

Invoking find . -name rc* in dir: /etc/
./rc.initdiskless
./rc.sendmail
./rc.firewall
./rc.d
./rc.d/rctl
./rc
./rc.suspend
./rc.bsdxextended
./rc.conf.d
./rc.shutdown
./rc.subr
./defaults/rc.conf
./rc.resume
./rc.conf
exit code: 1

Invoking hostname freebsd-vm-group16-upd:
null
exit code: 1
lm222xe@freebsd-vm-group16:/home/lm222xe% sudo hostname
freebsd-vm-group16
```

Figure 36: Results of executing code on FreeBSD

```

lm222xe@freebsd-vm-group16:/home/lm222xe% sudo java /tmp/ldv512_group16_task4/src/App.java
Invoking id:
uid=0(root) gid=0(wheel) groups=0(wheel),5(operator)
exit code: 0

Invoking find . -name rc* in dir: /etc/
./rc.initdiskless
./rc.sendmail
./rc.firewall
./rc.d
./rc.d/rctl
./rc
./rc.suspend
./rc.bsdxextended
./rc.conf.d
./rc.shutdown
./rc.subr
./defaults/rc.conf
./rc.resume
./rc.conf
exit code: 0

Invoking hostname freebsd-vm-group16-upd:
null
exit code: 0
lm222xe@freebsd-vm-group16:/home/lm222xe% sudo hostname
freebsd-vm-group16-upd

```

Figure 37: Results of executing code on FreeBSD

```

1  import java.io.BufferedReader;
2  import java.io.File;
3  import java.io.IOException;
4  import java.io.InputStreamReader;
5
6  /**
7   * ldv512_group16
8   * Li Ang Hu(lh223ng@student.lnu.se) & Long Ma(lm223xe@student.lnu.se)
9   */
10 public class App {
11     public static void main(String[] args) throws Exception {
12         System.out.println("Hello, World!");
13         callId();
14         callFind();
15         callHostname();
16     }
17
18     private static void callId() {
19         System.out.println("Invoking id: ");
20         try {
21             Process process = Runtime.getRuntime().exec("id");
22             System.out.println(new BufferedReader(new InputStreamReader(process.getInputStream())).readLine());
23             int status = process.waitFor();
24             System.out.println(" exit code: " + status);
25             System.out.println();
26         } catch (IOException e) {
27             // TODO Auto-generated catch block
28             e.printStackTrace();
29         } catch (InterruptedException e) {
30             // TODO Auto-generated catch block
31             e.printStackTrace();
32         }
33     }
34 }

```

Figure 38: source code part 1

```

34
35 private static void callFind() {
36     try {
37         System.out.println("Invoking find . -name rc* in dir: /etc/");
38         Process process = Runtime.getRuntime().exec("find . -name rc*", null, new File("/etc/"));
39         //process = Runtime.getRuntime().exec("find . -name 'rc*' null, new File("/etc/"));
40         BufferedReader reader = new BufferedReader(new InputStreamReader(process.getInputStream()));
41         String s;
42         while ((s = reader.readLine()) != null) {
43             System.out.println(s);
44         }
45         int status = process.waitFor();
46         System.out.println("exit code: " + status);
47         System.out.println();
48     } catch (IOException e) {
49         // TODO Auto-generated catch block
50         e.printStackTrace();
51     } catch (InterruptedException e) {
52         // TODO Auto-generated catch block
53         e.printStackTrace();
54     }
55 }
56
57 private static void callHostname() {
58     System.out.println("Invoking hostname freebsd-vm-group16-upd: ");
59     try {
60         Process process = Runtime.getRuntime().exec("hostname freebsd-vm-group16-upd");
61         System.out.println(new BufferedReader(new InputStreamReader(process.getInputStream())).readLine());
62         int status = process.waitFor();
63         System.out.println(" exit code: " + status);
64     } catch (IOException e) {
65         // TODO Auto-generated catch block
66         e.printStackTrace();
67     } catch (InterruptedException e) {
68         // TODO Auto-generated catch block
69         e.printStackTrace();
70     }
71 }
72 }

```

Projects are imported into workspace.

Source: Language Support for Java(T... [View projects](#)

Figure 39: source code part 2