

Linnaeus University

Faculty of Technology – Department of Computer Science

1DV512 – Operating Systems group Assignment 2

Group: 23

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Course Code: 1DV512

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Operating Systems Group Assignment 2

Task 1: Inter-Process Communication with Named Pipes

❖ Task1.1

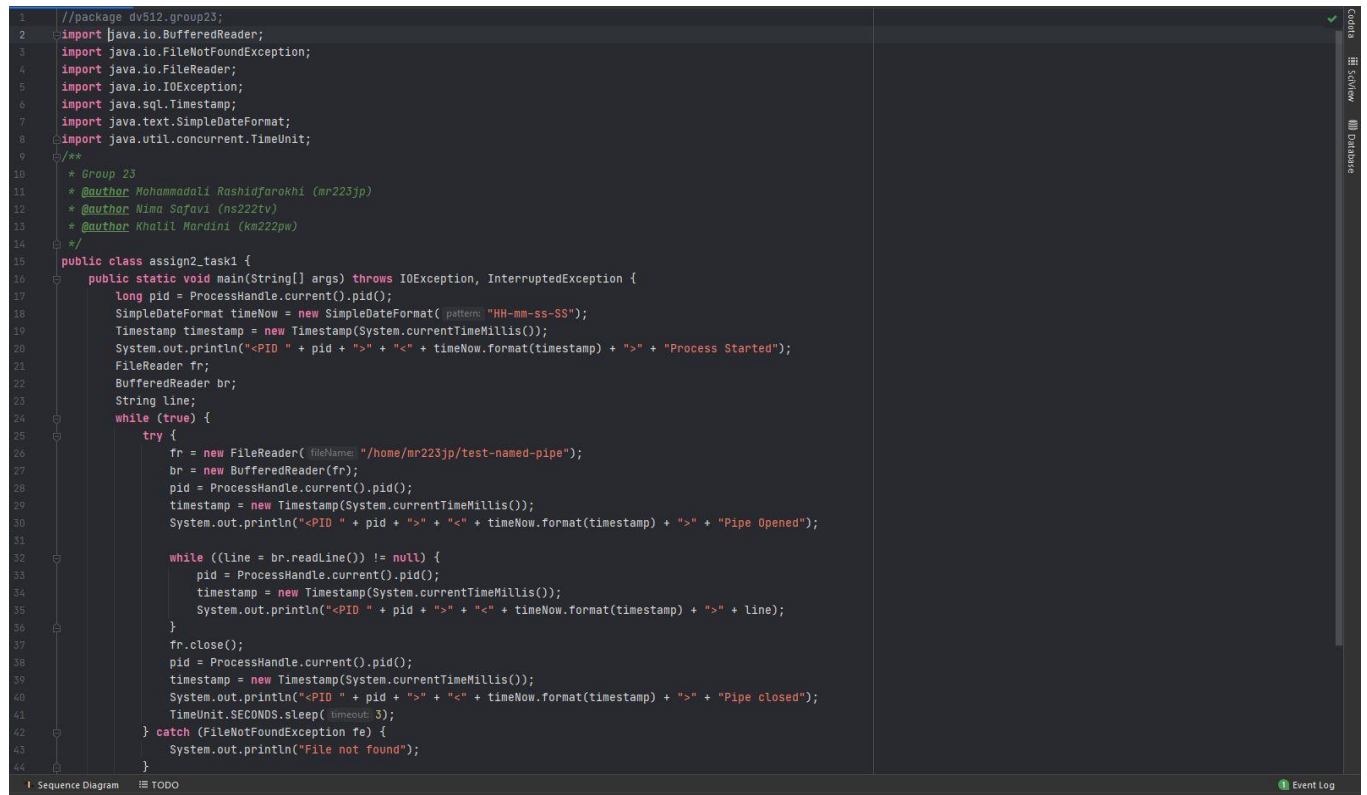
First of all, we have already created a text file named newfile in my home directory and there are already some folders including Desktop in my home directory. Then after that, I created a pipe using the command `mkfifo /tmp/testpipe test-named-pipe` and listed their permissions. You can see the difference b/w their permissions.

```
Use an empty password? (yes/no) [yes]: yes
Lock out the account after creation? [no]:
Username : km222pw
Password : <blank>
Full Name : Khalil Mardini
Uid : 1004
Class :
Groups : sudoers
Home : /home/km222pw
Home Mode :
Shell : /bin/sh
Locked : no
OK? (yes/no): yes
adduser: INFO: Successfully added (km222pw) to the user database.
Add another user? (yes/no): no
Goodbye!
root@freebsd2018:~ # pw groupmod sudoers -m ns222tv
root@freebsd2018:~ # pw groupmod sudoers -m km222pw
root@freebsd2018:~ # pw groupshow sudoers
sudoers: *:1003:mr223jp,ns222tv,km222pw
```

```
mr223jp@freebsd2018:~ $ ls
Desktop new
mr223jp@freebsd2018:~ $ ls -lh
total 8
drwx----- 2 mr223jp group23 512B Dec 18 18:54 Desktop
-rw-r--r-- 1 mr223jp group23 2B Dec 18 18:55 new
mr223jp@freebsd2018:~ $ mkfifo /tmp/testpipe test-named-pipe
mr223jp@freebsd2018:~ $ ls
Desktop new test-named-pipe
mr223jp@freebsd2018:~ $ ls -lh
total 8
drwx----- 2 mr223jp group23 512B Dec 18 18:54 Desktop
-rw-r--r-- 1 mr223jp group23 2B Dec 18 18:55 new
prw-r--r-- 1 mr223jp group23 0B Dec 18 18:56 test-named-pipe
mr223jp@freebsd2018:~ $
```

❖ Task1.2

The below picture will portrait the source code of the class assign2_task1.



```
1 //package dv612.group23;
2 import java.io.BufferedReader;
3 import java.io.FileNotFoundException;
4 import java.io.FileReader;
5 import java.io.IOException;
6 import java.sql.Timestamp;
7 import java.text.SimpleDateFormat;
8 import java.util.concurrent.TimeUnit;
9 /**
10  * Group 23
11  * @author Mohammadali Rashidifarakhhi (mr223jp)
12  * @author Nima Safavi (ns222tv)
13  * @author Khalil Hardini (ka222pw)
14  */
15 public class assign2_task1 {
16     public static void main(String[] args) throws IOException, InterruptedException {
17         long pid = ProcessHandle.current().pid();
18         SimpleDateFormat timeNow = new SimpleDateFormat("HH-mm-ss-SS");
19         Timestamp timestamp = new Timestamp(System.currentTimeMillis());
20         System.out.println("<PID " + pid + ">" + "<" + timeNow.format(timestamp) + ">" + "Process Started");
21         FileReader fr;
22         BufferedReader br;
23         String line;
24         while (true) {
25             try {
26                 fr = new FileReader("fileNames: "/home/mr223jp/test-named-pipe");
27                 br = new BufferedReader(fr);
28                 pid = ProcessHandle.current().pid();
29                 timestamp = new Timestamp(System.currentTimeMillis());
30                 System.out.println("<PID " + pid + ">" + "<" + timeNow.format(timestamp) + ">" + "Pipe Opened");
31
32                 while ((line = br.readLine()) != null) {
33                     pid = ProcessHandle.current().pid();
34                     timestamp = new Timestamp(System.currentTimeMillis());
35                     System.out.println("<PID " + pid + ">" + "<" + timeNow.format(timestamp) + ">" + line);
36                 }
37                 fr.close();
38                 pid = ProcessHandle.current().pid();
39                 timestamp = new Timestamp(System.currentTimeMillis());
40                 System.out.println("<PID " + pid + ">" + "<" + timeNow.format(timestamp) + ">" + "Pipe closed");
41                 TimeUnit.SECONDS.sleep(3);
42             } catch (FileNotFoundException fe) {
43                 System.out.println("File not found");
44             }
45         }
46     }
47 }
```

❖ Task1.3

Undeniably, scp command has been used to copy the file javaApplication5 for a secure copy of the file.

```
Microsoft Windows [Version 10.0.18363.1256]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\rkash>hostname
DESKTOP-AI7OH4A

C:\Users\rkash>netstat -r
=====
Interface List
 50...0a 00 27 00 00 32 .....VirtualBox Host-Only Ethernet Adapter
 18...4a 5f 99 25 eb 99 .....Microsoft Wi-Fi Direct Virtual Adapter #3
 11...48 5f 99 25 eb 99 .....Microsoft Wi-Fi Direct Virtual Adapter #4
 5...00 50 56 c0 00 01 .....VMware Virtual Ethernet Adapter for VMnet1
 20...00 50 56 c0 00 08 .....VMware Virtual Ethernet Adapter for VMnet8
 21...48 5f 99 25 eb 99 .....Realtek RTL8822BE 802.11ac PCIe Adapter
 10...48 5f 99 25 eb 9a .....Bluetooth Device (Personal Area Network)
 1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination        Netmask          Gateway          Interface        Metric
0.0.0.0                    0.0.0.0          192.168.0.1      192.168.0.105    40
127.0.0.0                  255.0.0.0        On-link          127.0.0.1        331
127.0.0.1                  255.255.255.255  On-link          127.0.0.1        331
127.255.255.255            255.255.255.255  On-link          127.0.0.1        331
169.254.0.0                255.255.0.0      On-link          169.254.216.45   291
169.254.0.0                255.255.0.0      On-link          169.254.7.112    291
169.254.7.112              255.255.255.255  On-link          169.254.7.112    291
```

```
:48Z emaste $
# This is the sshd server system-wide configuration file.  See
# sshd_config(5) for more information.

# This sshd was compiled with PATH=/usr/bin:/bin:/usr/sbin:/sbin

# The strategy used for options in the default sshd_config shipped with
# OpenSSH is to specify options with their default value where
# possible, but leave them commented.  Uncommented options override the
# default value.

# Note that some of FreeBSD's defaults differ from OpenBSD's, and
# FreeBSD has a few additional options.

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

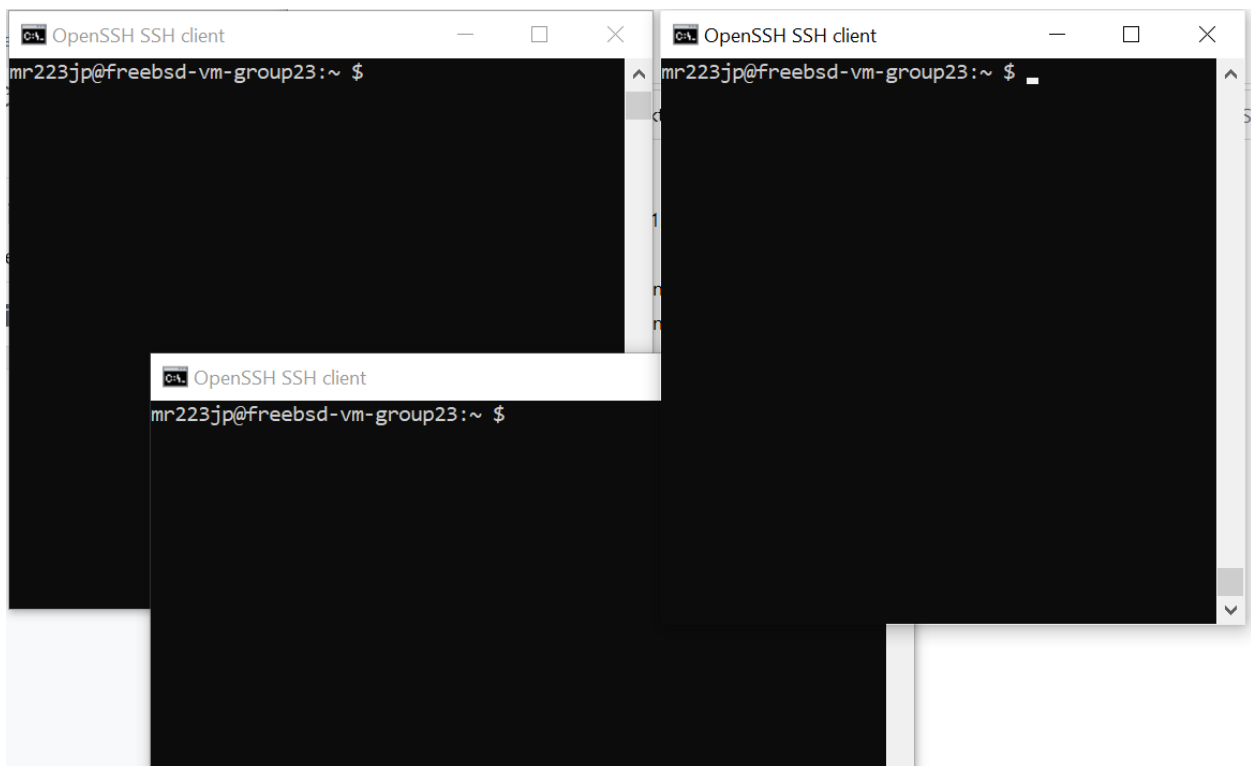
#HostKey /etc/ssh/ssh_host_rsa_key
#HostKey /etc/ssh/ssh_host_ecdsa_key
/etc/ssh/sshd_config: unmodified: line 1
Suspended
root@freebsd-vm-group23:~ # vi /etc/ssh/sshd_config
```



```
mr223jp@freebsd-vm-group23:~ $ ls
Desktop          kglobalaccel5.core
JavaApplication5.java  kwin_x11.core
baloo_file_extracto.core  new
drkonqi.core          test-named-pipe
mr223jp@freebsd-vm-group23:~ $
```

❖ Task1.4

In this task we were asked to run programs from several shell windows. Therefore, this stage will demonstrate the preparation of several shells.

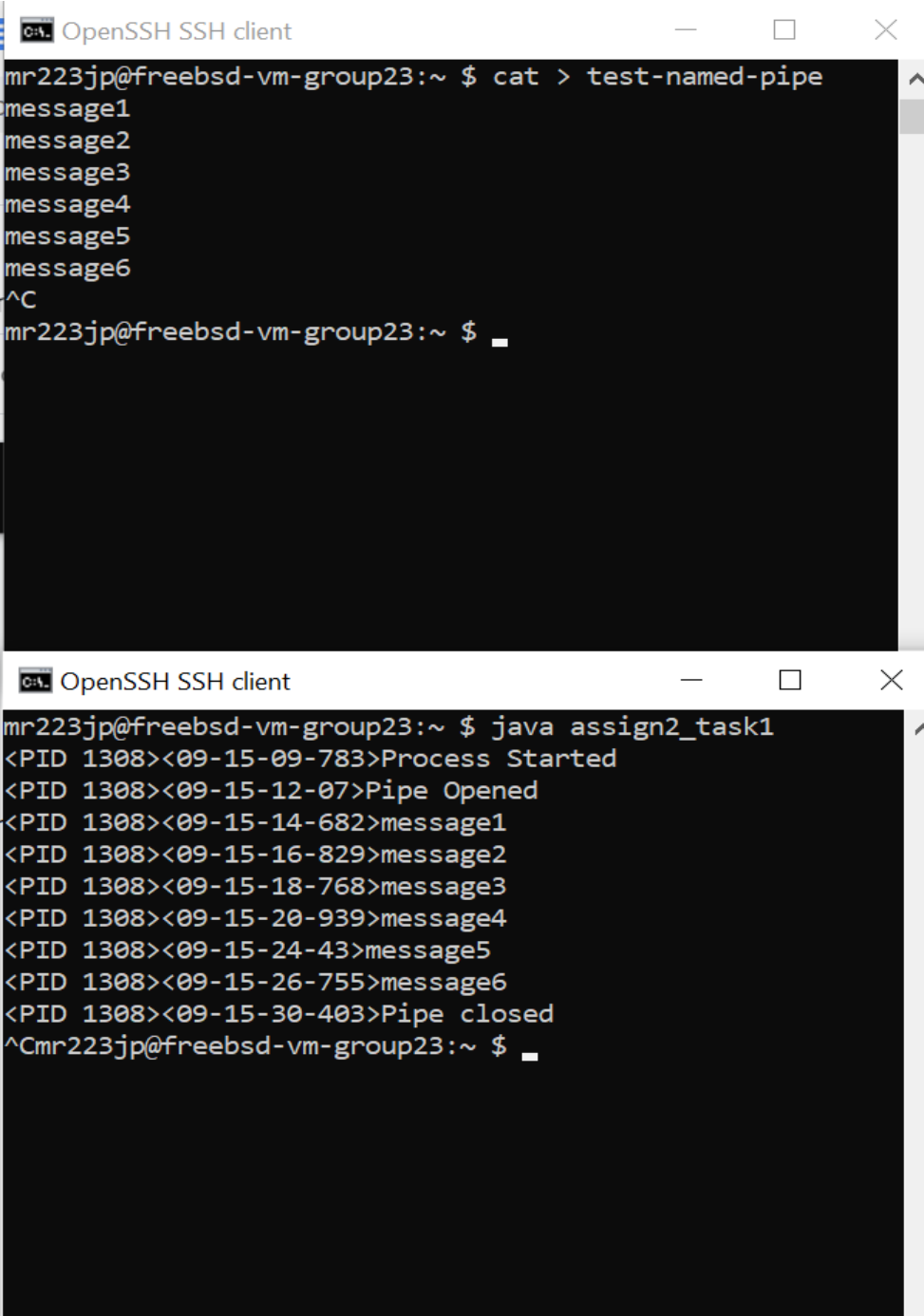


❖ Task1.5

This task will be mainly about executing one java app and taking advantage of cat command.

In the screenshot below we have run one instance of the java program in one shell and using cat > test-named-pipe in the other.

Code has been printed Pipe just when we opened the utilized the command(cat>test-named-pipe) it printed each line we sent.



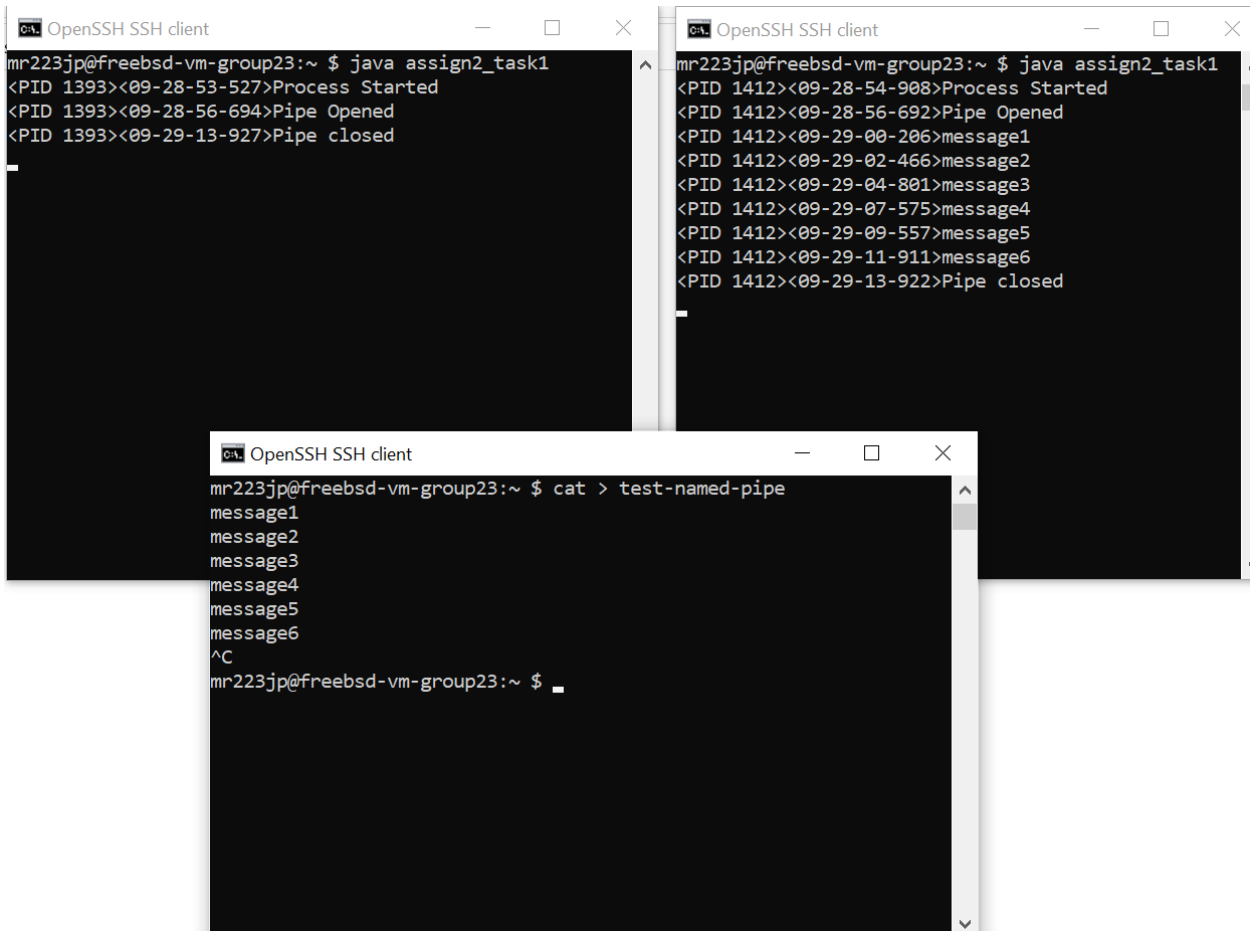
```
OpenSSH SSH client
mr223jp@freebsd-vm-group23:~ $ cat > test-named-pipe
message1
message2
message3
message4
message5
message6
^C
mr223jp@freebsd-vm-group23:~ $ _

OpenSSH SSH client
mr223jp@freebsd-vm-group23:~ $ java assign2_task1
<PID 1308><09-15-09-783>Process Started
<PID 1308><09-15-12-07>Pipe Opened
<PID 1308><09-15-14-682>message1
<PID 1308><09-15-16-829>message2
<PID 1308><09-15-18-768>message3
<PID 1308><09-15-20-939>message4
<PID 1308><09-15-24-43>message5
<PID 1308><09-15-26-755>message6
<PID 1308><09-15-30-403>Pipe closed
^Cmr223jp@freebsd-vm-group23:~ $ _
```

❖ Task1.6

In the following screenshot, we are going to run two instances of the java program in two shells and using `cat > test-named-pipe` in another.

As we see the ID in screenshot 1412 read all the messages but ID with 1393 could not read anything.



The screenshot displays three terminal windows from an OpenSSH SSH client. The top-left window shows the execution of `java assign2_task1` with PID 1393, logging process start, pipe opening, and closing. The top-right window shows the same command with PID 1412, logging process start, pipe opening, and a series of messages (message1 to message6) followed by pipe closing. The bottom window shows the command `cat > test-named-pipe` being executed, which outputs the messages 'message1' through 'message6' before being interrupted by a Ctrl-C (^C).

```
mr223jp@freebsd-vm-group23:~ $ java assign2_task1
<PID 1393><09-28-53-527>Process Started
<PID 1393><09-28-56-694>Pipe Opened
<PID 1393><09-29-13-927>Pipe closed

mr223jp@freebsd-vm-group23:~ $ java assign2_task1
<PID 1412><09-28-54-908>Process Started
<PID 1412><09-28-56-692>Pipe Opened
<PID 1412><09-29-00-206>message1
<PID 1412><09-29-02-466>message2
<PID 1412><09-29-04-801>message3
<PID 1412><09-29-07-575>message4
<PID 1412><09-29-09-557>message5
<PID 1412><09-29-11-911>message6
<PID 1412><09-29-13-922>Pipe closed

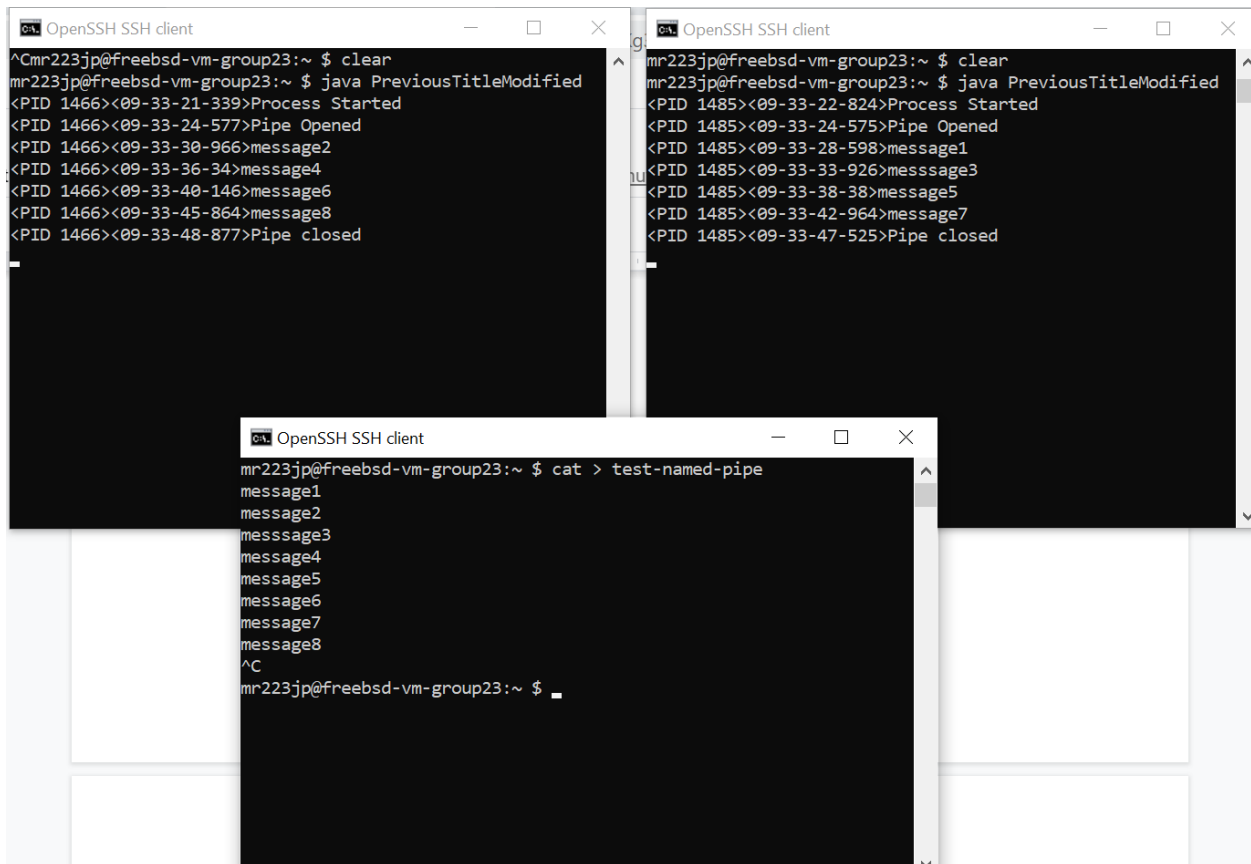
mr223jp@freebsd-vm-group23:~ $ cat > test-named-pipe
message1
message2
message3
message4
message5
message6
^C
mr223jp@freebsd-vm-group23:~ $
```


❖ Task 1.7

Modified code (PreviousTitleModified). Run the modified code in 2 shells and cat command in another shell.

We will observe that messages have been read from test-named-pipe in 3 seconds stop after each effectively understood message.

We saw that the interval between sending messages can affect which instances read more messages, but that is difficult to control manually (typing using a keyboard).



The image displays three terminal windows from an OpenSSH SSH client, showing the execution of a Java program and a cat command reading from a named pipe.

Top Left Window: Shows the execution of the Java program `PreviousTitleModified` with PID 1466. The output includes:

```
^Cmr223jp@freebsd-vm-group23:~ $ clear
mr223jp@freebsd-vm-group23:~ $ java PreviousTitleModified
<PID 1466><09-33-21-339>Process Started
<PID 1466><09-33-24-577>Pipe Opened
<PID 1466><09-33-30-966>message2
<PID 1466><09-33-36-34>message4
<PID 1466><09-33-40-146>message6
<PID 1466><09-33-45-864>message8
<PID 1466><09-33-48-877>Pipe closed
```

Top Right Window: Shows the execution of the Java program `PreviousTitleModified` with PID 1485. The output includes:

```
mr223jp@freebsd-vm-group23:~ $ clear
mr223jp@freebsd-vm-group23:~ $ java PreviousTitleModified
<PID 1485><09-33-22-824>Process Started
<PID 1485><09-33-24-575>Pipe Opened
<PID 1485><09-33-28-598>message1
<PID 1485><09-33-33-926>message3
<PID 1485><09-33-38-38>message5
<PID 1485><09-33-42-964>message7
<PID 1485><09-33-47-525>Pipe closed
```

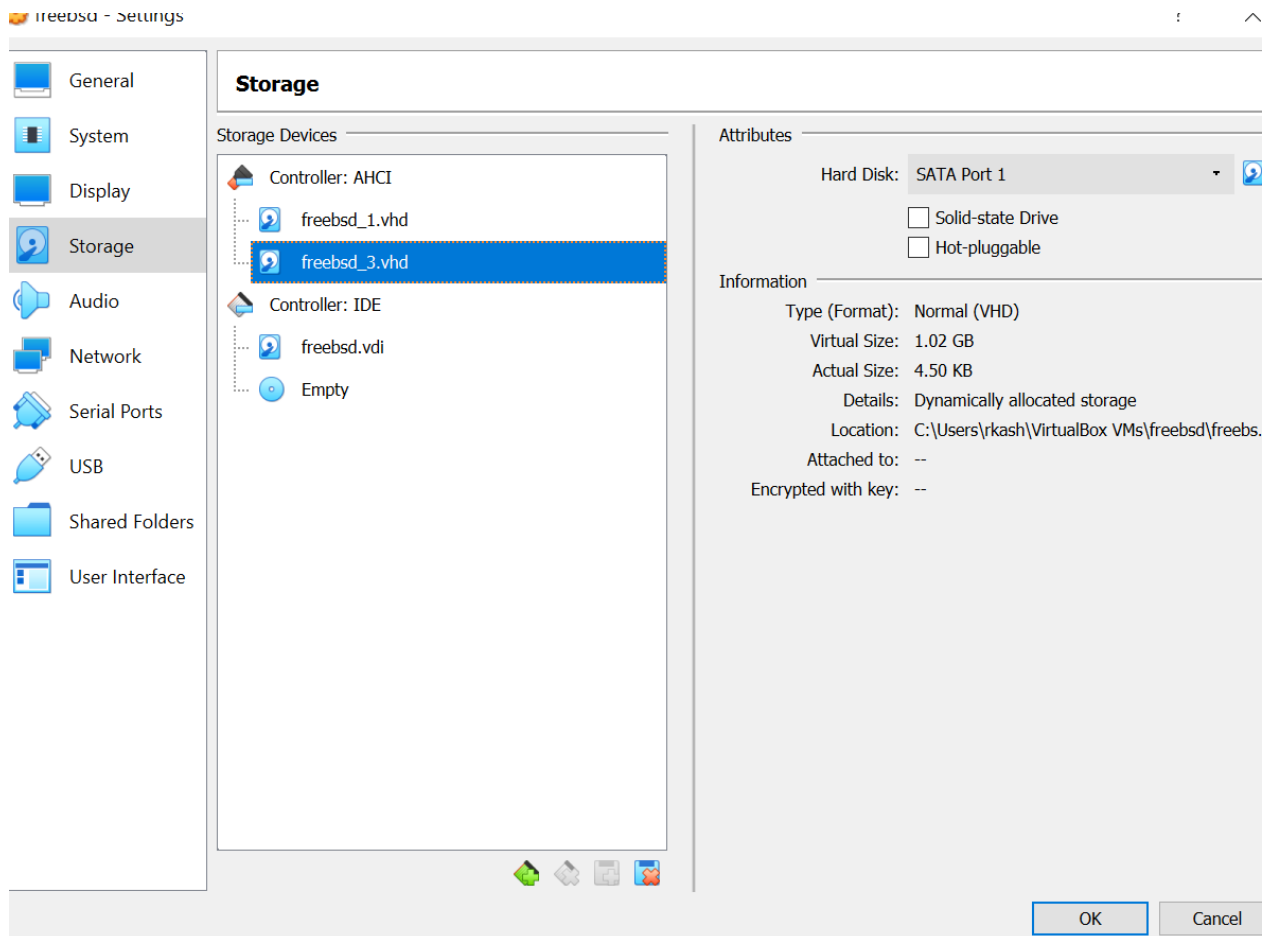
Bottom Window: Shows the execution of the `cat` command reading from the `test-named-pipe`. The output includes:

```
mr223jp@freebsd-vm-group23:~ $ cat > test-named-pipe
message1
message2
message3
message4
message5
message6
message7
message8
^C
mr223jp@freebsd-vm-group23:~ $
```

Task 2: File System Configuration

❖ Task 2.1

A new virtual disk drive of 1GB has been created and added to the free bsd which is already 20GB.



❖ Task 2.2

Getting the status of the currently attached drives and partitions using gpart tool and listing the status of the first drive/slice including all of its partitions.

In the picture below we can see the following drive/s and partitions / slices:

ada0 is the name of the SATA and IDE hard drive. It contains all the other partitions / slices

ada0s1 is the name of the first slice (s1) on the first SATA disk (ada0)

ada0s1a is the name of the first partition (a) on the first slice (s1) on the first SATA disk (ada0). It contains the root file system.

ada0s1b is the name of the second partition (b) on the first slice (s1) on the first SATA disk (ada0). It contains swap space.

```

freebsd-vm-group23:~ $ gpart status
Status Components
  OK  ada0
  OK  ada0s1
  OK  ada0s1
freebsd-vm-group23:~ $ █

```

Which partitioning scheme and partition types are used?

```

mr223jp@freebsd-vm-group23:~ $ gpart show
=>      63  41942945  ada0  MBR   (20G)
      63             1      - free -   (512B)
      64  33554368      1  freebsd [active] (16G)
  33554432  8388576      - free -   (4.0G)

=>      0  33554368  ada0s1  BSD   (16G)
      0  31457280      1  freebsd-ufs (15G)
  31457280  1677312      2  freebsd-swap (819M)
  33134592  419776      - free -   (205M)

mr223jp@freebsd-vm-group23:~ $ █

```

❖ Task 2.3

In this task we have been asked to use `sysctl kern.disk`. The reason for doing that would be checking which disk devices have been identified by the kernel.

What is the name of the new virtual disk that you recently added (compared to the already partitioned and mounted disk, which you investigated in the previous step)?

```

mr223jp@freebsd-vm-group23:~ $ sysctl kern.disks
kern.disks: ada1 ada0
mr223jp@freebsd-vm-group23:~ $ █

```

❖ Task 2.4

In this task, gpart will be used to create a new partition which its type would be linux-data in the second disk. Consequently, status of the current attached drives and partitions will be obtained again.

a) Making new partition.

```
mr223jp@freebsd-vm-group23:~ $ sudo gpart create -s GPT ada1
Password:
ada1 created
mr223jp@freebsd-vm-group23:~ $
```

b) Inserting the new partition.

```
mr223jp@freebsd-vm-group23:~ $ sudo gpart add -t linux-data -s 900MB ada1
Password:
ada1p1 added
mr223jp@freebsd-vm-group23:~ $
```

c) Getting the status of the existing connected drives and partitions.

```
mr223jp@freebsd-vm-group23:~ $ gpart status
      Name      Status  Components
      ada0s1      OK      ada0
      ada0s1a      OK      ada0s1
      ada0s1b      OK      ada0s1
      ada1p1      OK      ada1
diskid/DISK-UB2bfb034c-ad39ec15p1      OK      diskid/DISK-UB2bfb034c-ad39ec15
mr223jp@freebsd-vm-group23:~ $
```

❖ Task 2.5

In this task, the prominent jobs that we were asked to carry out were loading the kernel module to support the EXT2 file system, installation of the e2fsprogs package, and making a file system (EXT2) in the older created partition by taking advantage of mke2fs.

a) Loading the kernel module.

```
mr223jp@freebsd-vm-group23:~ $ sudo kldload ext2fs
Password:
mr223jp@freebsd-vm-group23:~ $ █
```

b) Installation of the e2fsprogs package.

```
mr223jp@freebsd-vm-group23:~ $ sudo pkg install e2fsprogs
Password:
Updating FreeBSD repository catalogue...
Fetching packagesite.txz: 100% 6 MiB 1.3MB/s 00:05
Processing entries: 100%
FreeBSD repository update completed. 30177 packages processed.
All repositories are up to date.
New version of pkg detected; it needs to be installed first.
The following 1 package(s) will be affected (of 0 checked):

Installed packages to be UPGRADED:
  pkg: 1.16.1 -> 1.16.3

Number of packages to be upgraded: 1

The process will require 3 MiB more space.
7 MiB to be downloaded.

Proceed with this action? [y/N]: █
```

```

Proceed with this action? [y/N]: y
[1/4] Fetching e2fsprogs-1.45.7.txz: 100% 1 MiB 1.2MB/s 00:01
[2/4] Fetching e2fsprogs-libuuid-1.45.7.txz: 100% 34 KiB 34.6kB/s 00:01
[3/4] Fetching e2fsprogs-libblkid-1.45.7.txz: 100% 34 KiB 35.1kB/s 00:01
[4/4] Fetching e2fsprogs-libss-1.45.7.txz: 100% 20 KiB 20.8kB/s 00:01
Checking integrity... done (0 conflicting)
[1/4] Installing e2fsprogs-libuuid-1.45.7...
[1/4] Extracting e2fsprogs-libuuid-1.45.7: 100%
[2/4] Installing e2fsprogs-libblkid-1.45.7...
[2/4] Extracting e2fsprogs-libblkid-1.45.7: 100%
[3/4] Installing e2fsprogs-libss-1.45.7...
[3/4] Extracting e2fsprogs-libss-1.45.7: 100%
[4/4] Installing e2fsprogs-1.45.7...
[4/4] Extracting e2fsprogs-1.45.7: 100%
=====
Message from e2fsprogs-1.45.7:

--
Note: this is a modified version of the e2fsprogs package, not the official
package. Report all building and run-time trouble that originates in the
package to the port maintainer, mandree@FreeBSD.org.
mr223jp@freebsd-vm-group23:~ $

```

c) Creating a file system (EXT2)

```

mr223jp@freebsd-vm-group23:~ $ ls /dev/ad*
/dev/ada0      /dev/ada0s1a  /dev/ada1
/dev/ada0s1    /dev/ada0s1b  /dev/ada1p1
mr223jp@freebsd-vm-group23:~ $

```

```

mr223jp@freebsd-vm-group23:~ $ ls /dev/ad*
/dev/ada0      /dev/ada0s1a  /dev/ada1
/dev/ada0s1    /dev/ada0s1b  /dev/ada1p1
mr223jp@freebsd-vm-group23:~ $ sudo mke2fs /dev/ada1p1
Password:
mke2fs 1.45.7 (28-Jan-2021)
Creating filesystem with 230400 4k blocks and 57600 inodes
Filesystem UUID: adcbf2d5-912a-48d9-8a48-24881ec4a726
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376

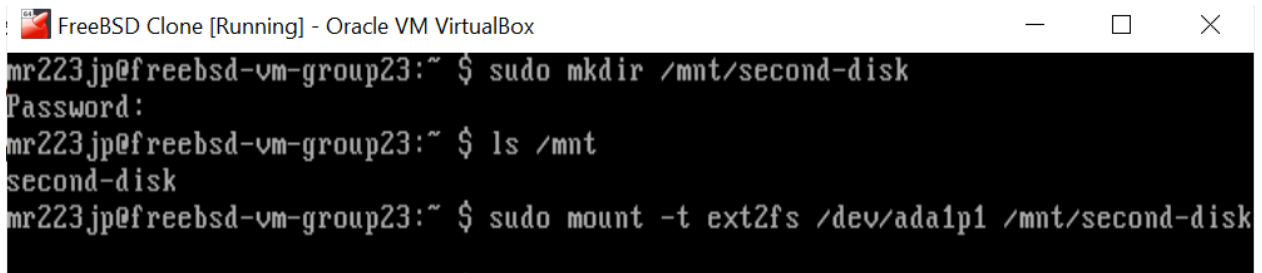
Allocating group tables: done
Writing inode tables: done
Writing superblocks and filesystem accounting information: done

mr223jp@freebsd-vm-group23:~ $

```

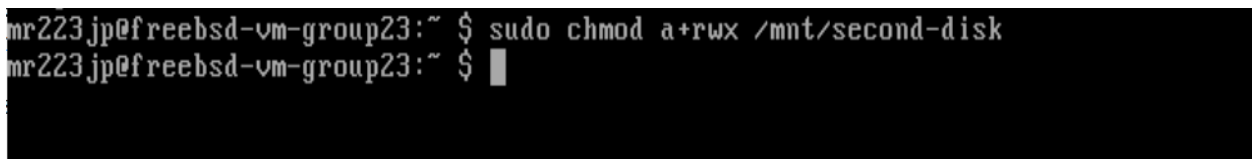
❖ Task 2.6

- a) Creating a new directory `/mnt/second-disk` and mounting the previously created file system.



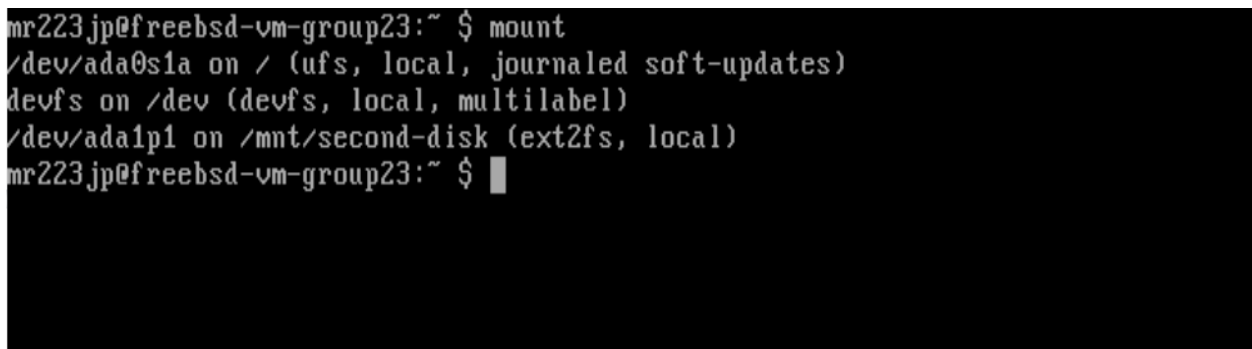
```
FreeBSD Clone [Running] - Oracle VM VirtualBox
mr223jp@freebsd-vm-group23:~ $ sudo mkdir /mnt/second-disk
Password:
mr223jp@freebsd-vm-group23:~ $ ls /mnt
second-disk
mr223jp@freebsd-vm-group23:~ $ sudo mount -t ext2fs /dev/ada1p1 /mnt/second-disk
```

- b) Changing permission.



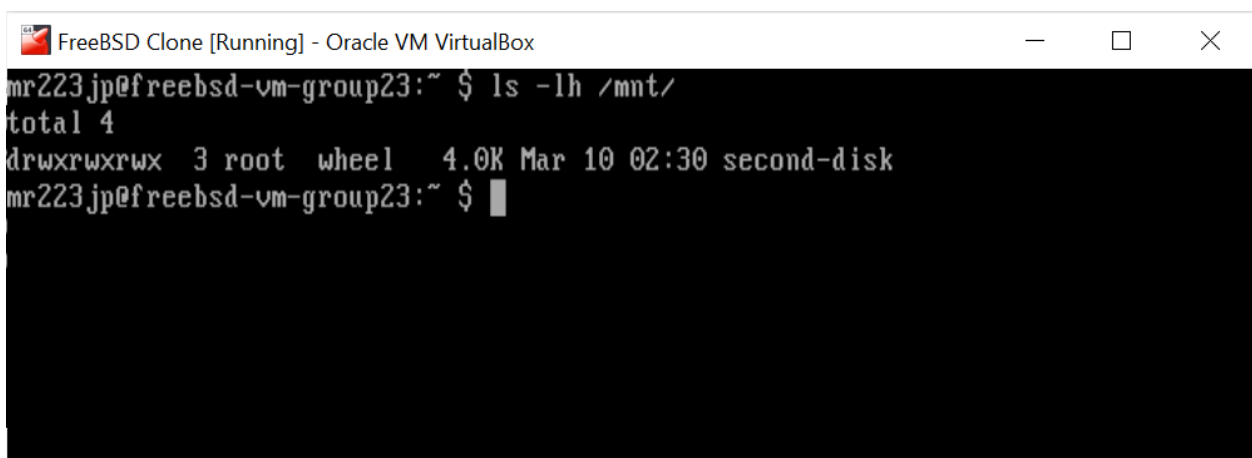
```
mr223jp@freebsd-vm-group23:~ $ sudo chmod a+rwX /mnt/second-disk
mr223jp@freebsd-vm-group23:~ $
```

- c) Confirmation of the functionality.



```
mr223jp@freebsd-vm-group23:~ $ mount
/dev/ada0s1a on / (ufs, local, journaled soft-updates)
devfs on /dev (devfs, local, multilabel)
/dev/ada1p1 on /mnt/second-disk (ext2fs, local)
mr223jp@freebsd-vm-group23:~ $
```

ls -lh /mnt/



```
FreeBSD Clone [Running] - Oracle VM VirtualBox
mr223jp@freebsd-vm-group23:~ $ ls -lh /mnt/
total 4
drwxrwxrwx 3 root wheel 4.0K Mar 10 02:30 second-disk
mr223jp@freebsd-vm-group23:~ $
```

df -h

```
mr223jp@freebsd-vm-group23:~ $ df -h
Filesystem      Size  Used Avail Capacity  Mounted on
/dev/ada0s1a    15G   2.7G   11G    20%      /
devfs           1.0K   1.0K    0B   100%    /dev
/dev/ada1p1     885M   24K   840M    0%    /mnt/second-disk
mr223jp@freebsd-vm-group23:~ $
```

❖ Task 2.7

a) Adding the line with `ext2fs_load="YES"` to `/boot/loader.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         ^z next word

=====line 1 col 17 lines fr
ext2fs_load="YES"

+-----+
| main menu |
| a) leave editor |
| b) help |
| c) file operations |
| d) redraw screen |
| e) settings |
| f) search |
| g) miscellaneous |
| press Esc to cancel |
+-----+
```


b) Editing the file /etc/fstab and adding a new partition.

```
^[ (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 4 col 65 lines from top 4 =====
# Device      Mountpoint      FStype  Options  Dump    Pass#
/dev/ada0s1a  /                ufs     rw       1        1
/dev/ada0s1b  none            swap    sw        0        0
/dev/ada1p1   /mnt/second-disk ext2fs   rw        0        0
```

After rebooting...

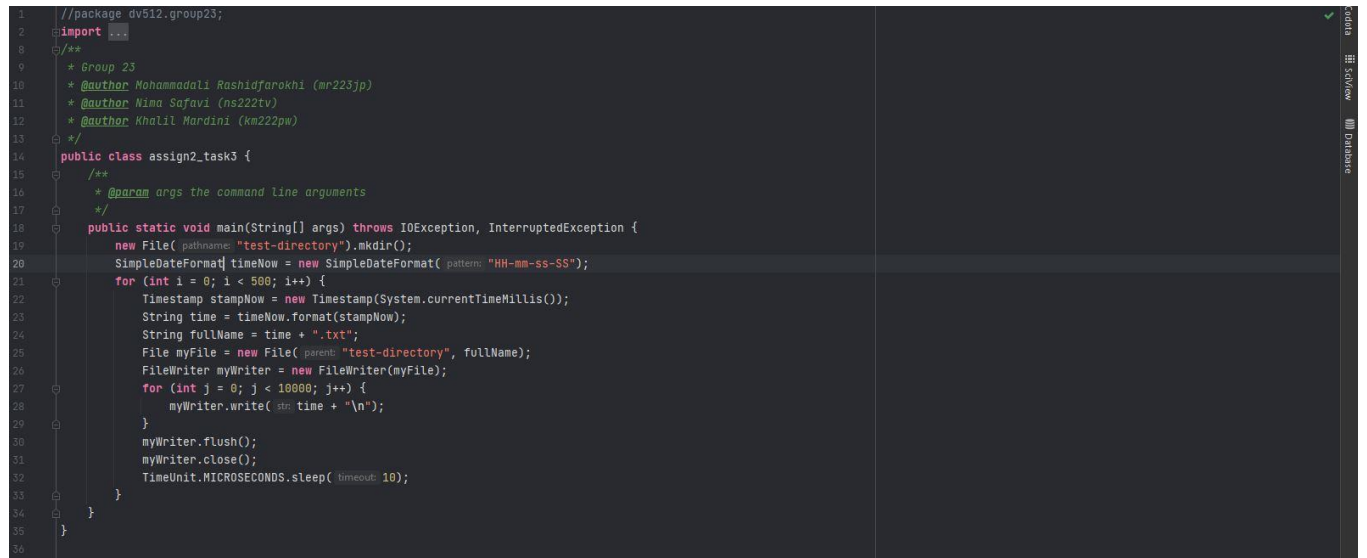
❖ Task 2.8

```
mr223jp@freebsd-vm-group23:~ $ cd /mnt/second-disk
mr223jp@freebsd-vm-group23:/mnt/second-disk $ ls
mr223jp@freebsd-vm-group23:/mnt/second-disk $ mkdir new-folder
mr223jp@freebsd-vm-group23:/mnt/second-disk $ ls -lh
total 4
drwxr-xr-x  2 mr223jp  wheel   4.0K Mar 10 04:41 new-folder
mr223jp@freebsd-vm-group23:/mnt/second-disk $
```

Task 3: File System Interaction

❖ Task 3.1

The below picture will portrait the source code of the class assign2_task3.



```
1 //package dv512.group23;
2 import ...
3 /**
4  * Group 23
5  * @author Mohammadali Rashidfarakhni (mr223jp)
6  * @author Nima Safavi (ns222tv)
7  * @author Khalil Mardini (km222pw)
8  */
9 public class assign2_task3 {
10     /**
11     * @param args the command line arguments
12     */
13     public static void main(String[] args) throws IOException, InterruptedException {
14         new File( pathname: "test-directory").mkdir();
15         SimpleDateFormat timeNow = new SimpleDateFormat( pattern: "HH-mm-ss-SS");
16         for (int i = 0; i < 500; i++) {
17             Timestamp stampNow = new Timestamp(System.currentTimeMillis());
18             String time = timeNow.format(stampNow);
19             String fullName = time + ".txt";
20             File myFile = new File( parents: "test-directory", fullName);
21             FileWriter myWriter = new FileWriter(myFile);
22             for (int j = 0; j < 10000; j++) {
23                 myWriter.write( str: time + "\n");
24             }
25             myWriter.flush();
26             myWriter.close();
27             TimeUnit.MICROSECONDS.sleep( timeout: 10);
28         }
29     }
30 }
```

❖ Task 3.2

Similarly, as done in task 1, a file will be copied using the secure copy command scp.

```
64 bytes from 127.0.0.1: icmp_seq=1 ttl=64 time=0.131 ms
64 bytes from 127.0.0.1: icmp_seq=2 ttl=64 time=0.329 ms
^Z[3] + Suspended          ping localhost
mr223jp@freebsd-vm-group23:~ $ hostname
freebsd-vm-group23
mr223jp@freebsd-vm-group23:~ $ netstat -r
Routing tables

Internet:
Destination      Gateway           Flags      Netif  Expire
default          192.168.159.2    UGS        em0
localhost        link#2           UH         lo0
192.168.159.0/24  link#1           U          em0
192.168.159.128  link#1           UHS        lo0

Internet6:
Destination      Gateway           Flags      Netif  Expire
::/96            localhost        UGRS       lo0
localhost        link#2           UH         lo0
::ffff:0.0.0.0/96 localhost        UGRS       lo0
fe80::/10        localhost        UGRS       lo0
fe80::%lo0/64    link#2           U          lo0
fe80::1%lo0      link#2           UHS        lo0
ff02::/16        localhost        UGRS       lo0
mr223jp@freebsd-vm-group23:~ $ scp -p .ssh/JavaApplication5.java DESKTOP-AI7
OH4A: /C/Documnets/NetbeansProjects/JavaApplication5/src/javaapplication5
```

```
mr223jp@freebsd-vm-group23:~ $ ls
Desktop          drkonqi.core
JavaApplication5.class  kglobalaccel5.core
JavaApplication5.java  kwin_x11.core
PreviousTitleModified.class  new
PreviousTitleModified.java  test-named-pipe
baloo_file_extracto.core
mr223jp@freebsd-vm-group23:~ $ javac JavaApplication5.java
mr223jp@freebsd-vm-group23:~ $
```

❖ Task 3.3

Preparation for running programs from several shell windows



❖ Task 3.4

Launching the command `iostat -t da -c 20 -w 1` in one of the shells.

```
mr223jp@freebsd-vm-group23:~$ iostat -t da -c 20 -w 1
          tty          da0
tin tout      KB/t tps      MB/s    us ni sy in   cpd
1      6 25.19   31 0.77  25 0 11 0 64
5      131 9.03 891 7.86  5 57 0 39
0      44 4.34 1666 7.07  1 40 3 57
0      45 5.61 1057 5.79  5 59 0 36
0      45 9.70 618 5.85  6 64 1 29
0      44 13.88 326 4.42  9 77 0 13
0      44 8.62 712 5.99  2 67 1 30
4      44 5.04 1208 5.95  2 59 1 39
0      45 10.23 960 9.58  5 56 0 39
0      44 6.53 1343 8.56  6 51 1 42
0      45 5.03 877 4.31  5 69 0 27
0      44 0.00 0 0.00  18 82 0 0
0      44 31.57 336 10.37 15 65 0 20
0      44 13.60 1224 16.25 24 0 39 1 36
0      45 13.65 1709 22.78  5 52 0 43
0      44 9.21 931 8.37  2 76 0 22
0      44 16.21 231 3.66  3 41 0 56
0      44 15.86 1078 16.69  1 57 0 42
0      45 44.28 613 26.52  6 69 1 24
0      44 88.28 414 35.69  7 83 2 9
mr223jp@freebsd-vm-group23:~$
```

```
mr223jp@freebsd-vm-group23:~ $
```

Discussion of the results:

Under *tty* section:

tin shows characters read from terminals

tout show characters written to terminals

KB/t stands for Kilobyte per transfer

tps stands for transfers per second MB/s megabytes per second

```
mr223jp@freebsd-vm-group23:~$ iostat -t da -c 20 -w 1
          tty
          da0
          cpu
tin  tout  KB/t  tps  MB/s  us  ni  sy  in  id
  2    24  28.26  113   3.12  24   1  23   3  49
  1   127  40.00    4   0.15   7   0  3   1  89
  2    47   0.00   0   0.00  11   0  7   0  82
  1    45  24.12   4   0.10  49   0  50   0   1
  0    44   0.00   0   0.00  84   0  16   0   0
  0    44   0.00   0   0.00  87   0  13   1   0
  0    43   0.00   0   0.00  97   0   3   0   0
  0    44 128.00   1   0.13  59   0  41   0   0
  0    44  32.00   2   0.06  74   5  21   0   0
  0    15  31.56  22   0.67  16   0  84   0   0
  0  1562   0.00   0   0.00   0   0 100   0   0
  0    45   0.00   0   0.00  77   0  22   1   0
  0   345   1.00   1   0.00  78   0  22   0   0
  0   727   0.75   2   0.00  22   3  74   1   0
  0   907   1.00   2   0.00  54   2  43   0   0
  0   864   1.00   2   0.00  61   2  38   0   0
  0  1196   1.00   2   0.00  72   3  24   0   0
  0  1036   1.00   2   0.00  42   4  54   1   0
  0   733   1.00   2   0.00  80   2  17   0   0
  0  1608   1.00   2   0.00  50   9  26   0  16
mr223jp@freebsd-vm-group23:~$
```

[illegible]

❖ Task 3.5

The iostat command is specifying the direct access device and displaying the direct access devices 20 times as -c is 20 and with the delay of 1sec as -w is 1.

So, that is why after every line displayed there is a delay of 1 sec. The size of the directory is also displayed in blocks and each block contains 512bytes.

```
mr223jp@freebsd-vm-group23:~ $ ls -l
total 123096
drwx----- 2 mr223jp  group23      512 Dec 18 18:54 Desktop
-rw-r--r-- 1 mr223jp  group23    2086 Dec 20 03:33 JavaApplication5.class
-rw-r--r-- 1 mr223jp  group23    3345 Dec 20 03:30 JavaApplication5.java
-rw-r--r-- 1 mr223jp  group23     2196 Dec 19 21:31 PreviousTitleModified.
class
-rw-r--r-- 1 mr223jp  group23     2273 Dec 19 21:22 PreviousTitleModified.
java
-rw----- 1 mr223jp  group23  41005056 Dec 18 19:00 baloo_file_extracto.co
re
-rw----- 1 mr223jp  group23  41533440 Dec 18 19:00 drkonqi.core
-rw----- 1 mr223jp  group23  43352064 Dec 20 03:43 kdeinit5.core
drwxr-xr-x 2 mr223jp  group23     1536 Dec 20 03:35 test-directory
prw-r--r-- 1 mr223jp  group23         0 Dec 18 18:56 test-named-pipe
```

```
mr223jp@freebsd-vm-group23:~$ iostat -t da -c 20 -w 1
```

tty	ada0	da0	cpu
tin tout KB/t tps MB/s KB/t tps MB/s us ni sy in id			
1 10 3.01 0 0.00 27.64 29 0.80 4 0 5 0 91	/home/mr223jp/test-directory/17-24-41.txt	/home/mr223jp/test-directory/17-24-41.txt	/home/mr223jp/test-directory/17-24-41.txt
1 1897 0.00 0 0.00 37.95 22 0.81 13 1 17 0 69	/home/mr223jp/test-directory/17-24-41.txt	/home/mr223jp/test-directory/17-24-41.txt	/home/mr223jp/test-directory/17-24-41.txt
0 1785 0.00 0 0.00 39.29 49 1.88 6 4 17 0 72	/home/mr223jp/test-directory/17-24-41.txt	/home/mr223jp/test-directory/17-24-41.txt	/home/mr223jp/test-directory/17-24-41.txt
0 2040 0.00 0 0.00 52.95 20 1.03 6 2 6 0 85	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 2069 0.00 0 0.00 47.13 15 0.69 6 3 8 0 83	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 2092 0.00 0 0.00 49.73 11 0.54 2 4 6 0 87	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 2085 0.00 0 0.00 48.30 10 0.47 0 3 12 0 85	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 2205 0.00 0 0.00 49.73 11 0.53 5 5 5 0 86	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 2216 0.00 0 0.00 43.64 14 0.60 6 6 4 0 85	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 2210 0.00 0 0.00 54.70 10 0.53 9 5 5 0 81	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 2192 0.00 0 0.00 40.73 15 0.59 11 5 3 0 80	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 1479 0.00 0 0.00 45.35 17 0.76 7 7 5 0 81	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 60 0.00 0 0.00 0.00 0 0.00 0 0 2 0 98	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 62 0.00 0 0.00 0.00 0 0.00 0 0 1 0 99	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 60 0.00 0 0.00 0.00 0 0.00 1 0 0 0 99	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 62 0.00 0 0.00 0.00 0 0.00 0 0 0 0 100	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 62 0.00 0 0.00 0.00 0 0.00 0 0 1 1 98	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 61 0.00 0 0.00 0.00 0 0.00 0 0 0 0 100	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 62 0.00 0 0.00 32.00 23 0.72 0 0 1 0 99	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt
0 61 0.00 0 0.00 0.00 0 0.00 0 0 0 0 100	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt	/home/mr223jp/test-directory/17-24-42.txt

```
mr223jp@freebsd-vm-group23:~$ █  
mr223jp@freebsd-vm-group23:~$ █
```

```
mr223jp@freebsd-vm-group23:~ $ ls -l
total 123096
drwx----- 2 mr223jp  group23      512 Dec 18 18:54 Desktop
-rw-r--r--  1 mr223jp  group23     2086 Dec 20 03:33 JavaApplication5.class
-rw-r--r--  1 mr223jp  group23     3345 Dec 20 03:30 JavaApplication5.java
-rw-r--r--  1 mr223jp  group23     2196 Dec 19 21:31 PreviousTitleModified.
class
-rw-r--r--  1 mr223jp  group23     2273 Dec 19 21:22 PreviousTitleModified.
java
-rw-----  1 mr223jp  group23    41005056 Dec 18 19:00 baloo_file_extracto.co
re
-rw-----  1 mr223jp  group23    41533440 Dec 18 19:00 krdonqi.core
-rw-----  1 mr223jp  group23    43352064 Dec 20 03:43 kdeinit5.core
drwxr-xr-x  2 mr223jp  group23     1536 Dec 20 17:24 test-directory
prw-r--r--  1 mr223jp  group23         0 Dec 18 18:56 test-named-pipe
mr223jp@freebsd-vm-group23:~ $
```

❖ Task 3.6

navigating to the second-disk and running iostat without running java app at the same time

```
OpenSSH SSH client
mr223jp@freebsd-vm-group23:~ $ cd /mnt/second-disk
mr223jp@freebsd-vm-group23:/mnt/second-disk $ iostat -t da -c 20 -w 1
```

tty				ada0		ada1		cpu				
tin	tout	KB/t	tps	MB/s	KB/t	tps	MB/s	us	ni	sy	in	id
0	1	32.28	1	0.04	3.05	0	0.00	0	0	0	0	100
0	173	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	63	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	61	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	32.00	8	0.25	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	4.00	1	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	63	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	61	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	63	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	61	0.00	0	0.00	0.00	0	0.00	0	0	1	0	99

```
mr223jp@freebsd-vm-group23:/mnt/second-disk $
```

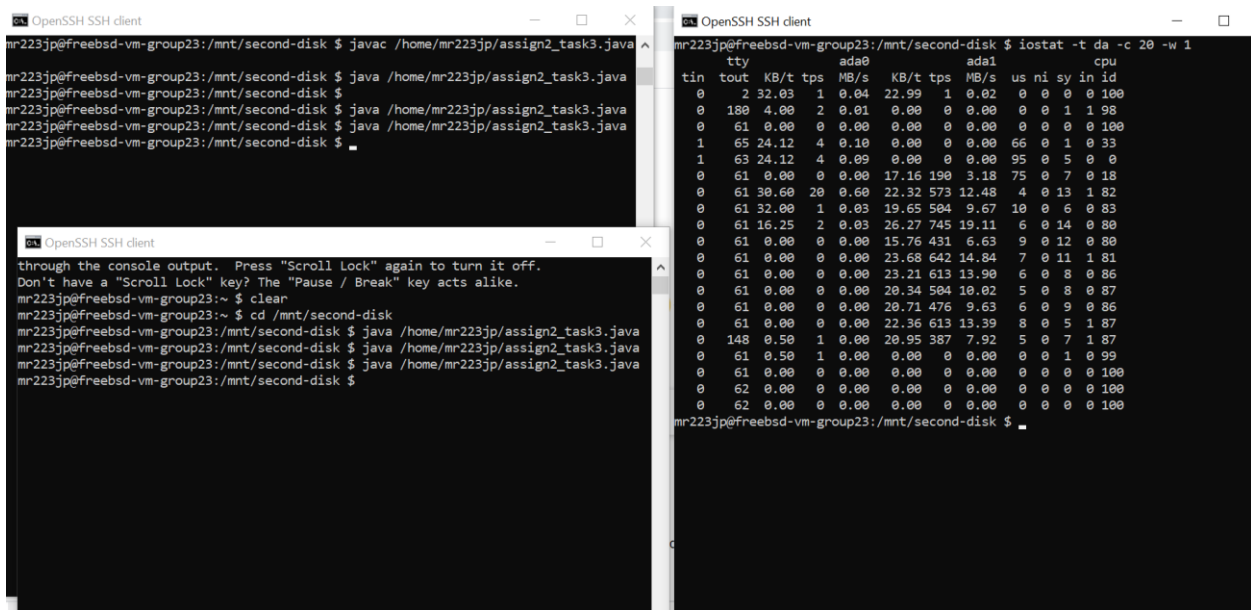
```
mr223jp@freebsd-vm-group23:/mnt/second-disk $ javac /home/mr223jp/assign2_task3.java
mr223jp@freebsd-vm-group23:/mnt/second-disk $ java /home/mr223jp/assign2_task3.java
mr223jp@freebsd-vm-group23:/mnt/second-disk $
```

```
mr223jp@freebsd-vm-group23:/mnt/second-disk $ iostat -t da -c 20 -w 1
```

tty				ada0		ada1		cpu				
tin	tout	KB/t	tps	MB/s	KB/t	tps	MB/s	us	ni	sy	in	id
0	2	32.11	1	0.04	3.06	0	0.00	0	0	0	0	100
0	177	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
1	66	24.12	4	0.10	0.00	0	0.00	40	0	3	0	57
0	61	4.00	1	0.00	13.71	68	0.91	73	0	5	0	22
0	61	0.00	0	0.00	14.83	194	2.81	6	0	6	0	88
0	61	29.67	24	0.70	22.27	284	6.17	6	0	8	0	87
0	62	21.50	3	0.06	25.64	341	8.55	10	0	3	1	86
0	61	0.00	0	0.00	18.69	248	4.53	8	0	6	0	87
0	60	0.00	0	0.00	23.26	294	6.68	7	0	7	1	85
0	62	4.00	2	0.01	27.16	348	9.22	15	0	12	0	73
0	61	32.00	9	0.28	22.61	290	6.39	11	0	7	0	82
0	61	0.00	0	0.00	21.53	271	5.70	8	0	5	0	87
0	61	0.00	0	0.00	20.86	254	5.18	9	0	7	1	83
0	61	0.00	0	0.00	22.98	284	6.36	8	0	9	0	83
0	106	2.25	2	0.00	32.65	134	4.26	1	0	2	0	98
0	61	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100
0	62	0.00	0	0.00	2.50	2	0.00	0	0	0	0	100
0	62	0.00	0	0.00	0.00	0	0.00	0	0	0	0	100

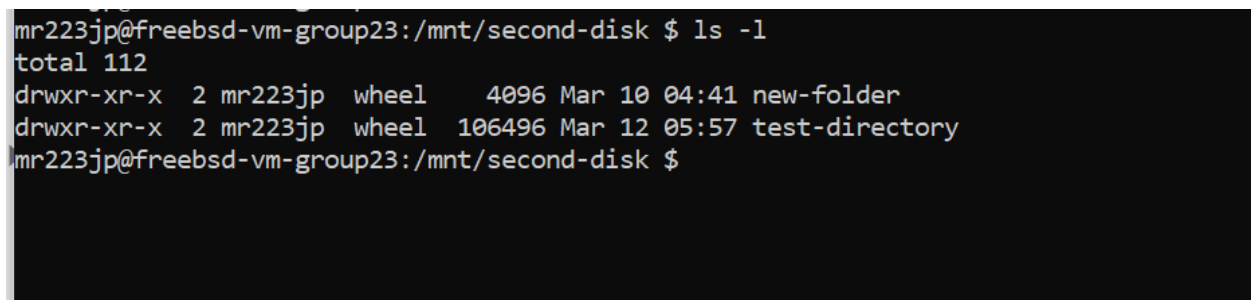
```
mr223jp@freebsd-vm-group23:/mnt/second-disk $
```

Running two java apps and one iostat in three different shell windows simultaneously.



The image displays three overlapping terminal windows from an OpenSSH SSH client. The top-left window shows the compilation and execution of a Java program: `javac /home/mr223jp/assign2_task3.java` followed by `java /home/mr223jp/assign2_task3.java`. The bottom-left window shows a `clear` command followed by the same Java execution command. The right window shows the output of `iostat -t da -c 20 -w 1`, which displays system statistics including CPU usage and disk I/O for devices `ada0` and `ada1`.

Total size of test-directory and all files inside it.



The image shows a terminal window where the command `ls -l` is executed in the directory `/mnt/second-disk`. The output shows the total size of the directory and its contents is 112, with details for `new-folder` (4096 bytes) and `test-directory` (106496 bytes).

Reflection

- The package name "javaapplication5" is refactored to "dv512.group23" later base on the instruction for the assignment.
- The directory path should be changed to the path or the absolute path of the specific file for running the program.

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 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.

To be more specific:

km222pw: 50%

mr223jp: 50%

ns222tv: 50%