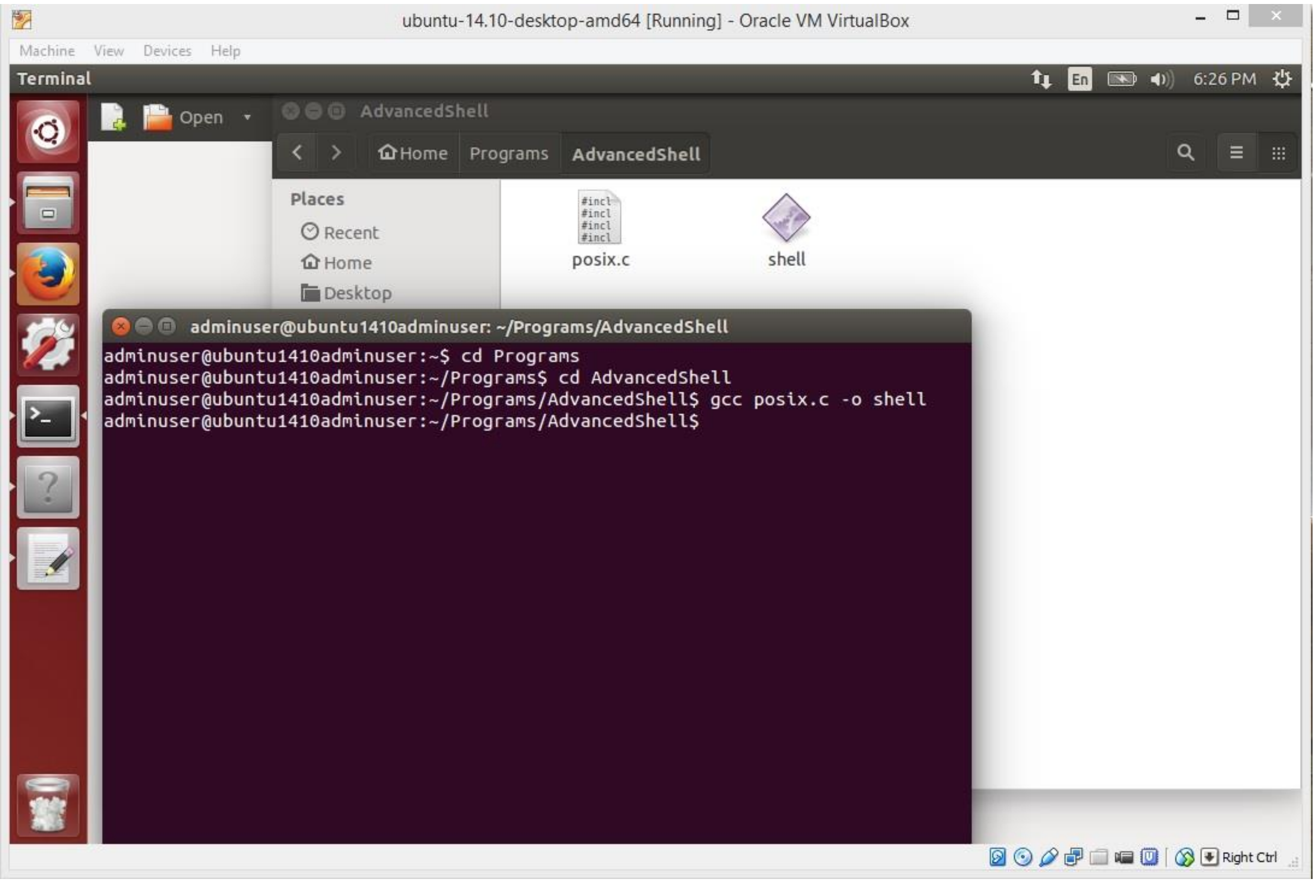
# Homework #7

For this assignment we had to extend and add commands to our shell/command line interpreter from assignment 3. New functionalities we will add are to allow executing commands to execute in the background using the ‘&’ symbol. We were also require to add the ability to redirect  the standard input, standard output  and standard error streams wither to or from files using the ‘<’, ‘>’ and “2>” symbols. Another functionality required was to let the redirecting and appending the standard output and standard error streams to files using the “>>” and “2>>” symbols. And last but not least we also had to add piping the standard output of one process to the standard input of another using the ‘|’ symbol. Instructions to implement theses functionalities were giving to us in the PDF.

## Posix

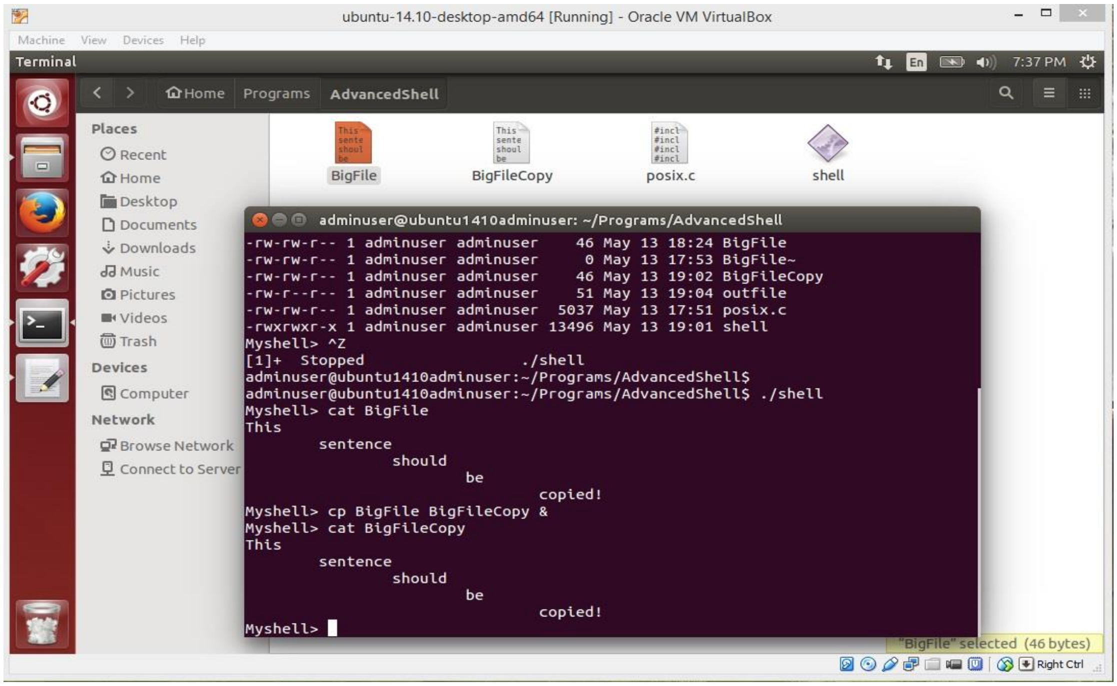
- First I compiled my program



ubuntu-14.10-desktop-amd64 [Running] - Oracle VM VirtualBox
Machine View Devices Help
Terminal
6:26 PM
Open
AdvancedShell
Home Programs AdvancedShell
Places
Recent
Home
Desktop
posix.c
shell
adminuser@ubuntu1410adminuser: ~/Programs/AdvancedShell
Right Ctrl

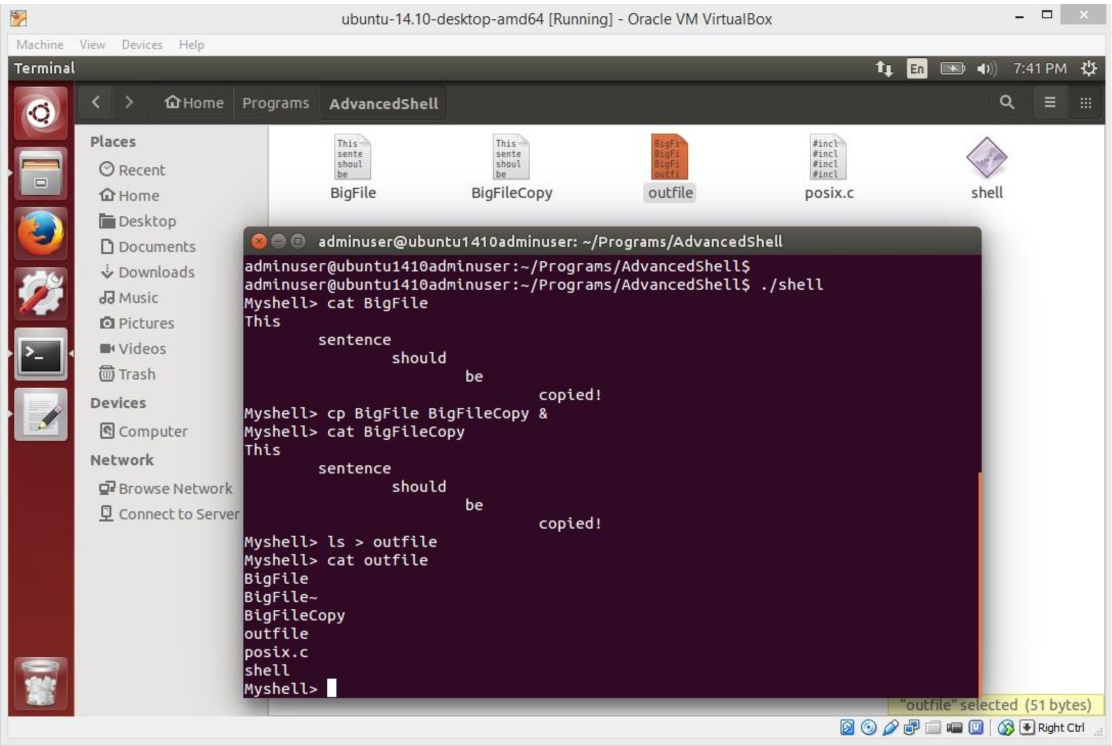
```
adminuser@ubuntu1410adminuser:~$ cd Programs
adminuser@ubuntu1410adminuser:~/Programs$ cd AdvancedShell
adminuser@ubuntu1410adminuser:~/Programs/AdvancedShell$ gcc posix.c -o shell
adminuser@ubuntu1410adminuser:~/Programs/AdvancedShell$
```

- Then I proceeded to make a file that was going to get copied. As you can see I named it BigFile and the contents in it is just a sentenced saying “This sentence should be copied!” After I run the command “**cp BigFile BigFileCopy &**” you can see the file is copied with the same contents. I used **cat** command to check the contents in the command line.


ubuntu-14.10-desktop-amd64 [Running] - Oracle VM VirtualBox
Machine View Devices Help
Terminal
7:37 PM
Home Programs AdvancedShell
Places
Recent
Home
Desktop
Documents
Downloads
Music
Pictures
Videos
Trash
Devices
Computer
Network
Browse Network
Connect to Server
BigFile
BigFileCopy
posix.c
shell
adminuser@ubuntu1410adminuser: ~/Programs/AdvancedShell
"BigFile" selected (46 bytes)
Right Ctrl

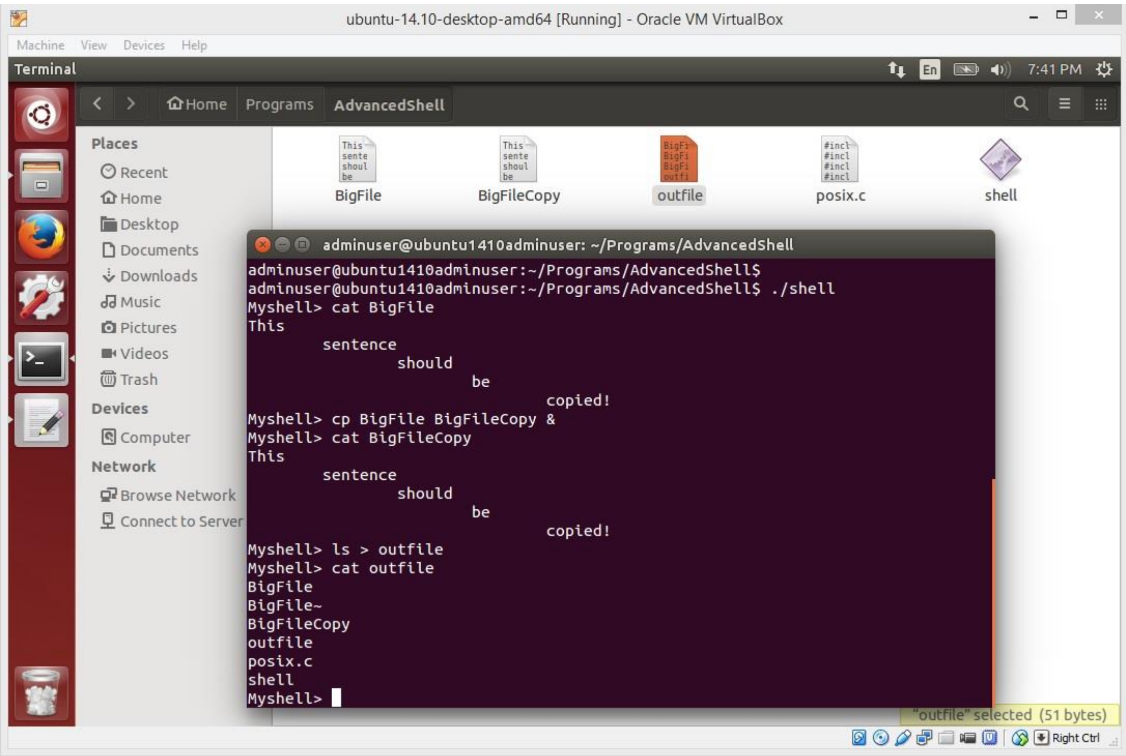
```
-rw-rw-r-- 1 adminuser adminuser    46 May 13 18:24 BigFile
-rw-rw-r-- 1 adminuser adminuser     0 May 13 17:53 BigFile~
-rw-rw-r-- 1 adminuser adminuser    46 May 13 19:02 BigFileCopy
-rw-r--r-- 1 adminuser adminuser    51 May 13 19:04 outfile
-rw-rw-r-- 1 adminuser adminuser  5037 May 13 17:51 posix.c
-rwxrwxr-x 1 adminuser adminuser 13496 May 13 19:01 shell
Myshell> ^Z
[1]+  Stopped                 ./shell
adminuser@ubuntu1410adminuser:~/Programs/AdvancedShell$
adminuser@ubuntu1410adminuser:~/Programs/AdvancedShell$ ./shell
Myshell> cat BigFile
This
        sentence
                should
                        be
                                copied!
Myshell> cp BigFile BigFileCopy &
Myshell> cat BigFileCopy
This
        sentence
                should
                        be
                                copied!
Myshell> 
```

Then after I run “**ls > outfile**” command a file named outfile is created with the redirected available directories. I used **cat** command to check the contents in the command line.


ubuntu-14.10-desktop-amd64 [Running] - Oracle VM VirtualBox
Machine View Devices Help
Terminal
7:41 PM
Home Programs AdvancedShell
Places
Recent
Home
Desktop
Documents
Downloads
Music
Pictures
Videos
Trash
Devices
Computer
Network
Browse Network
Connect to Server
BigFile
BigFileCopy
outfile
posix.c
shell
adminuser@ubuntu1410adminuser: ~/Programs/AdvancedShell
"outfile" selected (51 bytes)
Right Ctrl

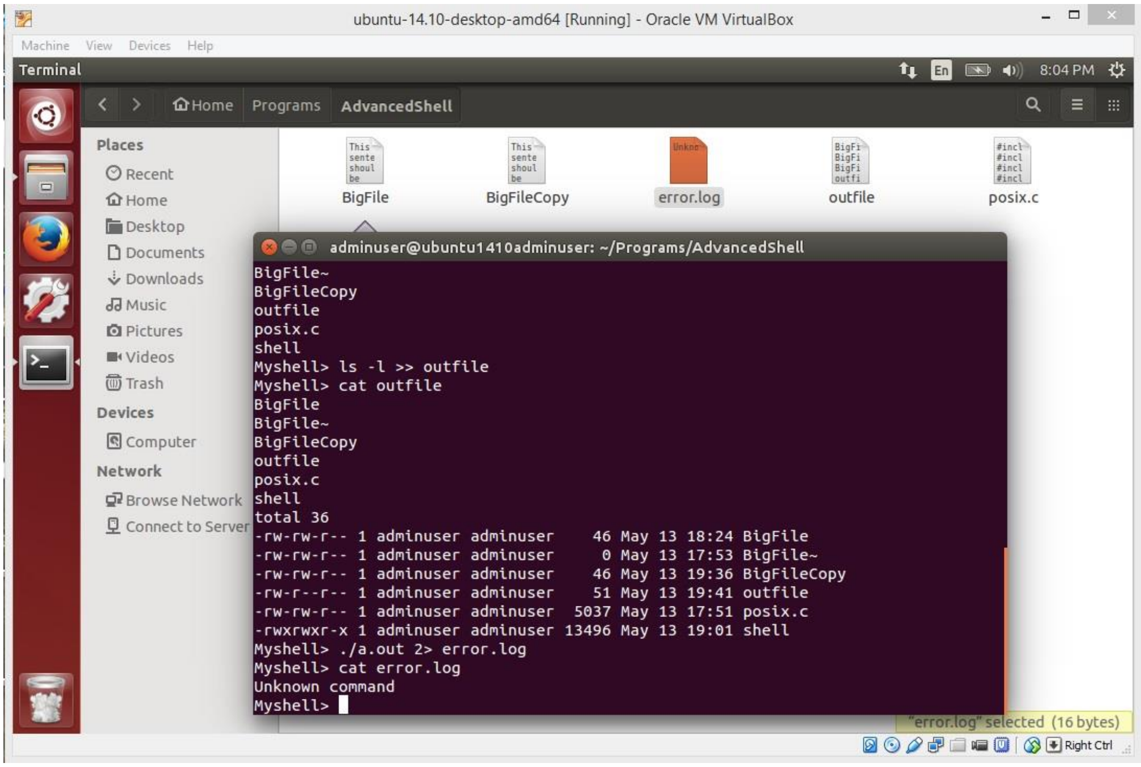
```
adminuser@ubuntu1410adminuser:~/Programs/AdvancedShell$
adminuser@ubuntu1410adminuser:~/Programs/AdvancedShell$ ./shell
Myshell> cat BigFile
This
        sentence
                should
                        be
                                copied!
Myshell> cp BigFile BigFileCopy &
Myshell> cat BigFileCopy
This
        sentence
                should
                        be
                                copied!
Myshell> ls > outfile
Myshell> cat outfile
BigFile
BigFile~
BigFileCopy
outfile
posix.c
shell
Myshell> 
```

After I run the "**ls -l >> outfile**" command you can see the outfile is updated with the redirected and appended available directories. I used **cat** command to check the contents in the command line.


ubuntu-14.10-desktop-amd64 [Running] - Oracle VM VirtualBox
Machine View Devices Help
Terminal
7:41 PM
Home Programs AdvancedShell
Places
Recent
Home
Desktop
Documents
Downloads
Music
Pictures
Videos
Trash
Devices
Computer
Network
Browse Network
Connect to Server
BigFile
BigFileCopy
outfile
posix.c
shell
adminuser@ubuntu1410adminuser: ~/Programs/AdvancedShell
"outfile" selected (51 bytes)
Right Ctrl

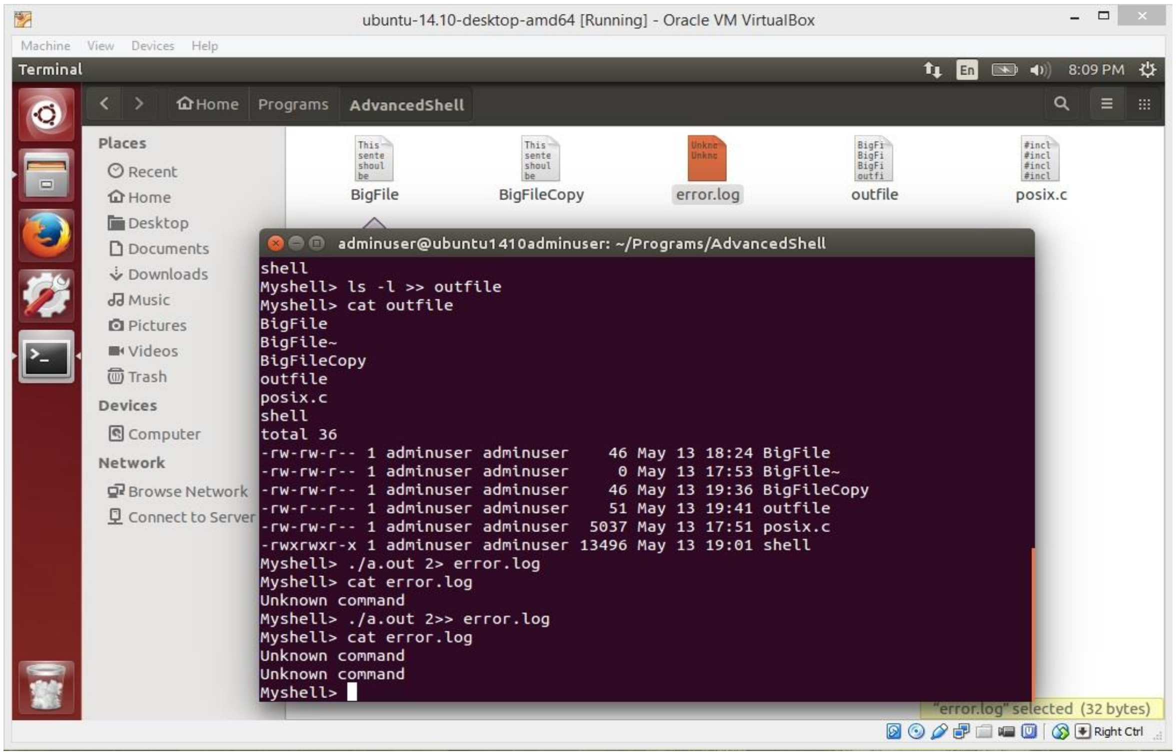
```
adminuser@ubuntu1410adminuser:~/Programs/AdvancedShell$
adminuser@ubuntu1410adminuser:~/Programs/AdvancedShell$ ./shell
Myshell> cat BigFile
This
        sentence
                should
                        be
                                copied!
Myshell> cp BigFile BigFileCopy &
Myshell> cat BigFileCopy
This
        sentence
                should
                        be
                                copied!
Myshell> ls > outfile
Myshell> cat outfile
BigFile
BigFile~
BigFileCopy
outfile
posix.c
shell
Myshell> 
```

- Then I ran the "**./a.out 2> error.log**" command, the error.log file is created. I used the **cat** command to check its contents.


ubuntu-14.10-desktop-amd64 [Running] - Oracle VM VirtualBox
Machine View Devices Help
Terminal
8:04 PM
Home Programs AdvancedShell
Places
Recent
Home
Desktop
Documents
Downloads
Music
Pictures
Videos
Trash
Devices
Computer
Network
Browse Network
Connect to Server
BigFile
BigFileCopy
error.log
outfile
posix.c
adminuser@ubuntu1410adminuser: ~/Programs/AdvancedShell
"error.log" selected (16 bytes)
Right Ctrl

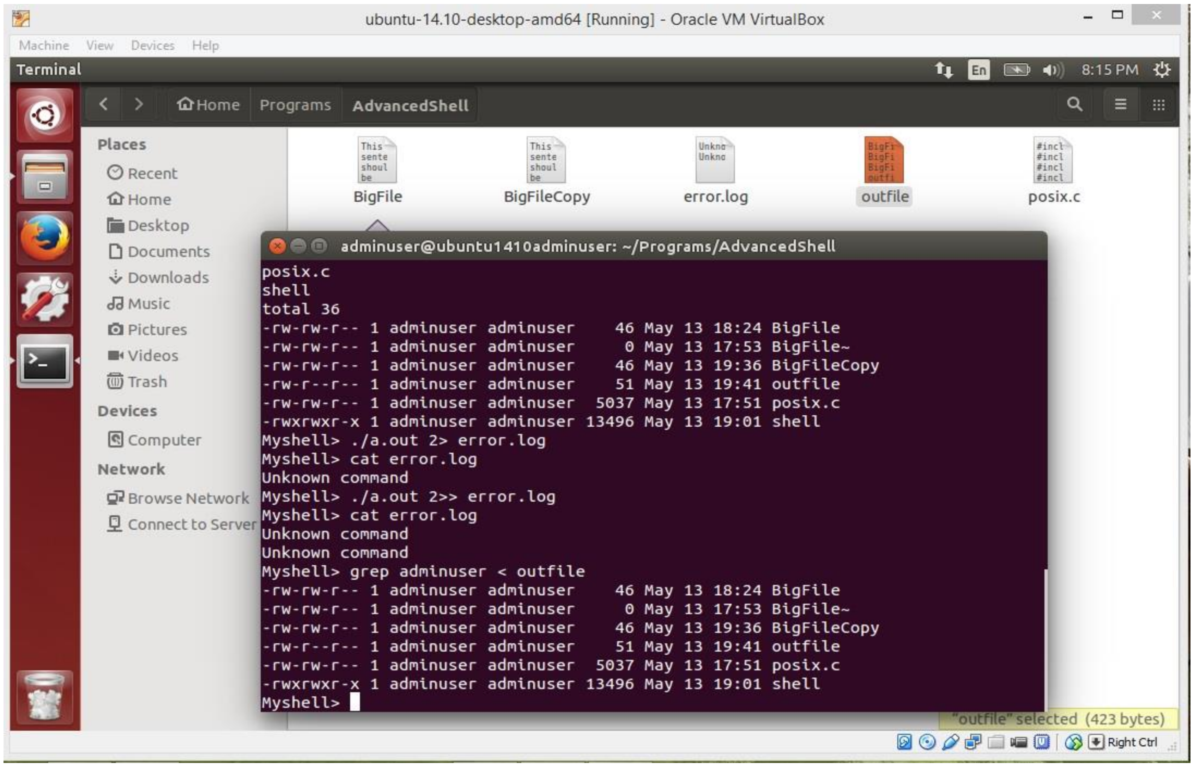
```
BigFile~
BigFileCopy
outfile
posix.c
shell
Myshell> ls -l >> outfile
Myshell> cat outfile
BigFile
BigFile~
BigFileCopy
outfile
posix.c
shell
total 36
-rw-rw-r-- 1 adminuser adminuser    46 May 13 18:24 BigFile
-rw-rw-r-- 1 adminuser adminuser     0 May 13 17:53 BigFile~
-rw-rw-r-- 1 adminuser adminuser    46 May 13 19:36 BigFileCopy
-rw-r--r-- 1 adminuser adminuser    51 May 13 19:41 outfile
-rw-rw-r-- 1 adminuser adminuser  5037 May 13 17:51 posix.c
-rwxrwxr-x 1 adminuser adminuser 13496 May 13 19:01 shell
Myshell> ./a.out 2> error.log
Myshell> cat error.log
Unknown command
Myshell> 
```

- After I run the “**./a.out 2>> error.log**” command  you can see the error.log file is updated with an extra error message. I used **cat** command to check the contents in the command line.



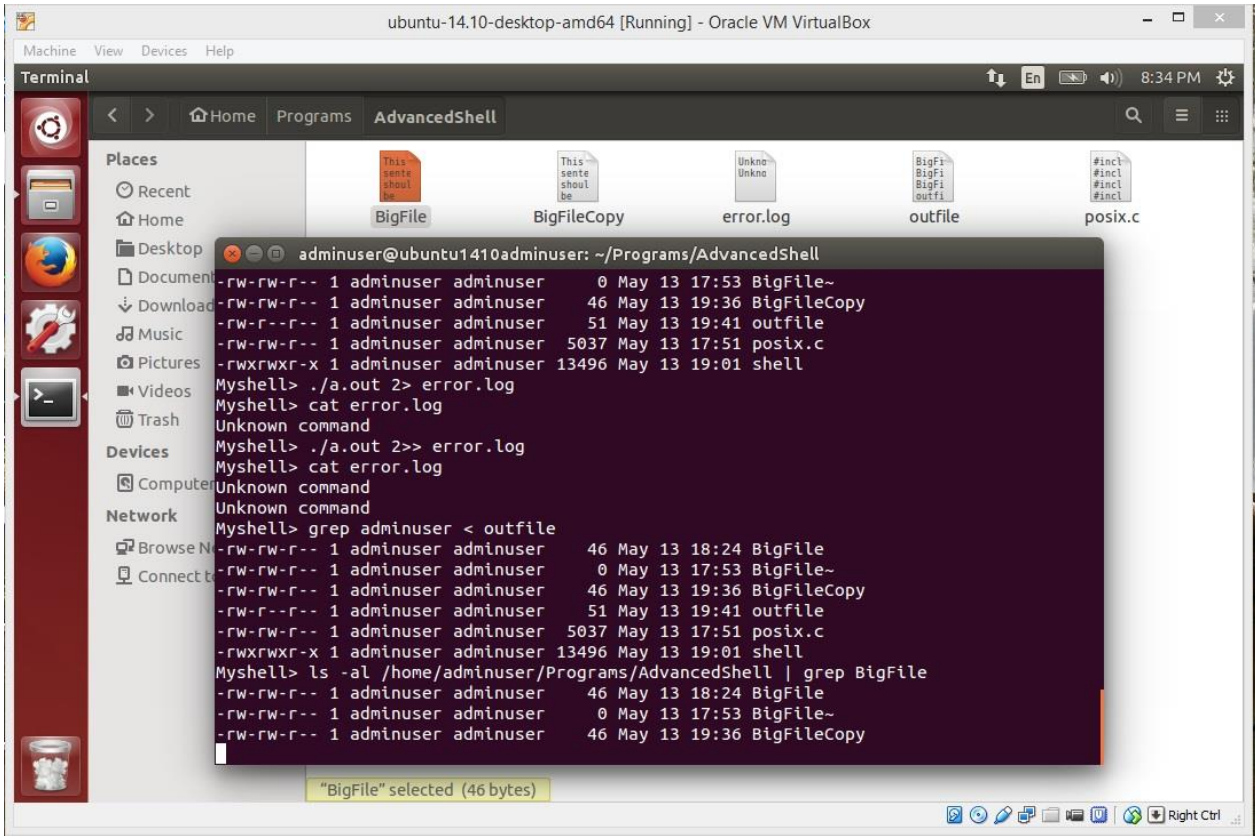
```
shell
Myshell> ls -l >> outfile
Myshell> cat outfile
BigFile
BigFile~
BigFileCopy
outfile
posix.c
shell
total 36
-rw-rw-r-- 1 adminuser adminuser    46 May 13 18:24 BigFile
-rw-rw-r-- 1 adminuser adminuser     0 May 13 17:53 BigFile~
-rw-rw-r-- 1 adminuser adminuser    46 May 13 19:36 BigFileCopy
-rw-r--r-- 1 adminuser adminuser    51 May 13 19:41 outfile
-rw-rw-r-- 1 adminuser adminuser  5037 May 13 17:51 posix.c
-rwxrwxr-x 1 adminuser adminuser 13496 May 13 19:01 shell
Myshell> ./a.out 2> error.log
Myshell> cat error.log
Unknown command
Myshell> ./a.out 2>> error.log
Myshell> cat error.log
Unknown command
Unknown command
Myshell>
```

- Then I ran the “**grep adminuser < outfile**” command. You can see it printed out the results it found with the keyword “*adminuser*” from the outfile.



```
posix.c
shell
total 36
-rw-rw-r-- 1 adminuser adminuser    46 May 13 18:24 BigFile
-rw-rw-r-- 1 adminuser adminuser     0 May 13 17:53 BigFile~
-rw-rw-r-- 1 adminuser adminuser    46 May 13 19:36 BigFileCopy
-rw-r--r-- 1 adminuser adminuser    51 May 13 19:41 outfile
-rw-rw-r-- 1 adminuser adminuser  5037 May 13 17:51 posix.c
-rwxrwxr-x 1 adminuser adminuser 13496 May 13 19:01 shell
Myshell> ./a.out 2> error.log
Myshell> cat error.log
Unknown command
Myshell> ./a.out 2>> error.log
Myshell> cat error.log
Unknown command
Unknown command
Myshell> grep adminuser < outfile
-rw-rw-r-- 1 adminuser adminuser    46 May 13 18:24 BigFile
-rw-rw-r-- 1 adminuser adminuser     0 May 13 17:53 BigFile~
-rw-rw-r-- 1 adminuser adminuser    46 May 13 19:36 BigFileCopy
-rw-r--r-- 1 adminuser adminuser    51 May 13 19:41 outfile
-rw-rw-r-- 1 adminuser adminuser  5037 May 13 17:51 posix.c
-rwxrwxr-x 1 adminuser adminuser 13496 May 13 19:01 shell
Myshell>
```

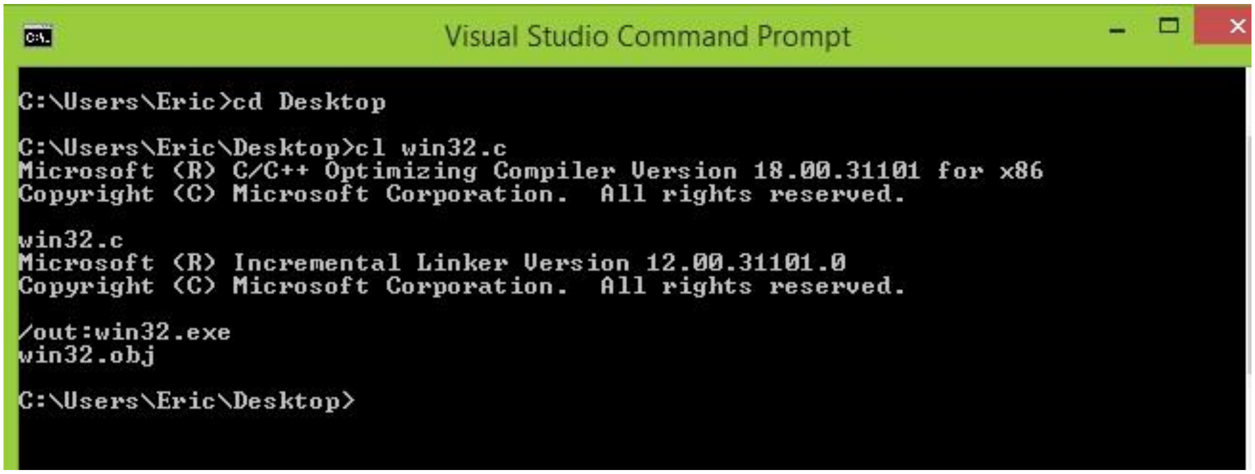
- Then I executed multiple commands using a single shell pipe. I executed “**ls –al /home/adminuser/Programs/AdvancedShell | grep BigFile**” so it essentially listed all the directories containing keyword “*BigFile*” as you can see below.



```
-rw-rw-r-- 1 adminuser adminuser     0 May 13 17:53 BigFile~
-rw-rw-r-- 1 adminuser adminuser    46 May 13 19:36 BigFileCopy
-rw-r--r-- 1 adminuser adminuser    51 May 13 19:41 outfile
-rw-rw-r-- 1 adminuser adminuser  5037 May 13 17:51 posix.c
-rwxrwxr-x 1 adminuser adminuser 13496 May 13 19:01 shell
Myshell> ./a.out 2> error.log
Myshell> cat error.log
Unknown command
Myshell> ./a.out 2>> error.log
Myshell> cat error.log
Unknown command
Unknown command
Myshell> grep adminuser < outfile
-rw-rw-r-- 1 adminuser adminuser    46 May 13 18:24 BigFile
-rw-rw-r-- 1 adminuser adminuser     0 May 13 17:53 BigFile~
-rw-rw-r-- 1 adminuser adminuser    46 May 13 19:36 BigFileCopy
-rw-r--r-- 1 adminuser adminuser    51 May 13 19:41 outfile
-rw-rw-r-- 1 adminuser adminuser  5037 May 13 17:51 posix.c
-rwxrwxr-x 1 adminuser adminuser 13496 May 13 19:01 shell
Myshell> ls -al /home/adminuser/Programs/AdvancedShell | grep BigFile
-rw-rw-r-- 1 adminuser adminuser    46 May 13 18:24 BigFile
-rw-rw-r-- 1 adminuser adminuser     0 May 13 17:53 BigFile~
-rw-rw-r-- 1 adminuser adminuser    46 May 13 19:36 BigFileCopy
```

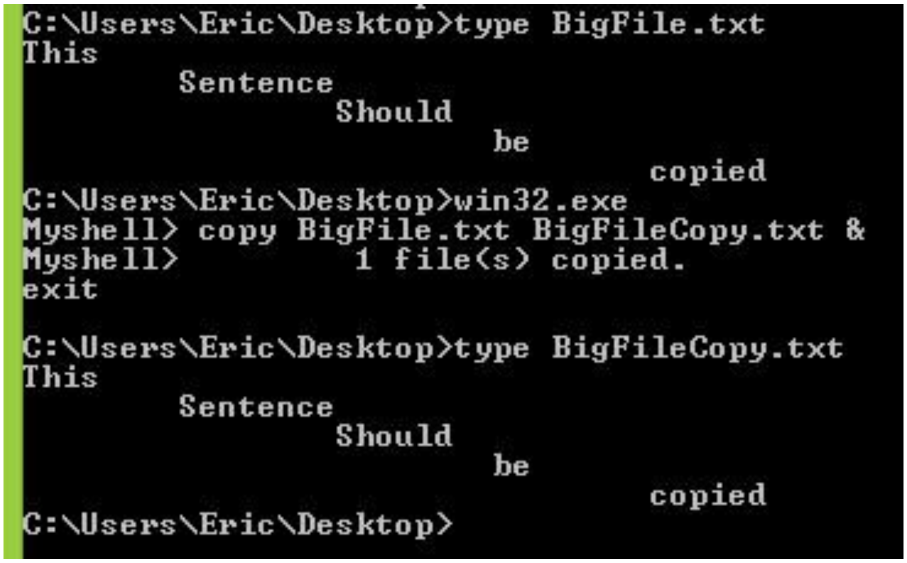
## <u>Win32</u>

- First I compiled the program



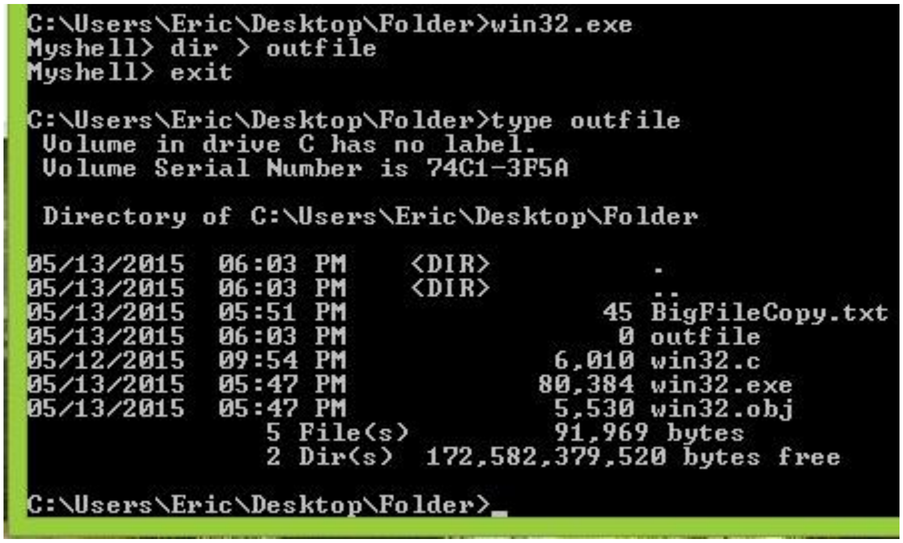
```
C:\Users\Eric>cd Desktop

C:\Users\Eric\Desktop>cl win32.c
Microsoft (R) C/C++ Optimizing Compiler Version 18.00.31101 for x86
Copyright (C) Microsoft Corporation.  All rights reserved.

win32.c
Microsoft (R) Incremental Linker Version 12.00.31101.0
Copyright (C) Microsoft Corporation.  All rights reserved.

/out:win32.exe
win32.obj

C:\Users\Eric\Desktop>
```

- I created BigFile.txt to use in this example. First I show the contents of it using the **type** command. Then I run my .exe program and execute "**copy BigFile.txt BigFileCopy.txt &**" in my shell. It then indicates that it copied successfully and I check by printing out the contents of the copy using the **type** command.



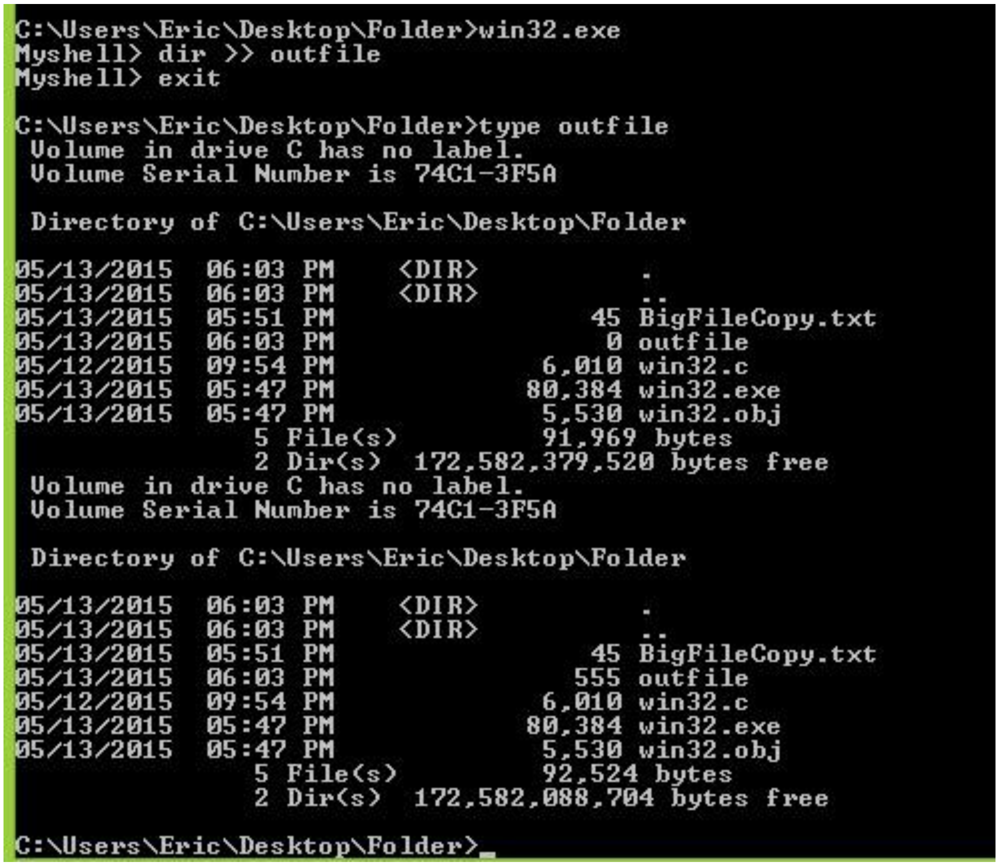
```
C:\Users\Eric\Desktop>type BigFile.txt
This
        Sentence
                Should
                        be
                                copied
C:\Users\Eric\Desktop>win32.exe
Myshell> copy BigFile.txt BigFileCopy.txt &
Myshell>         1 file(s) copied.
exit

C:\Users\Eric\Desktop>type BigFileCopy.txt
This
        Sentence
                Should
                        be
                                copied
C:\Users\Eric\Desktop>
```

- Then proceeded to run the .exe program again and executed "**dir > outfile**".  I exit the program and checked that it worked by printing out the contents of the outfile using the **type** command.



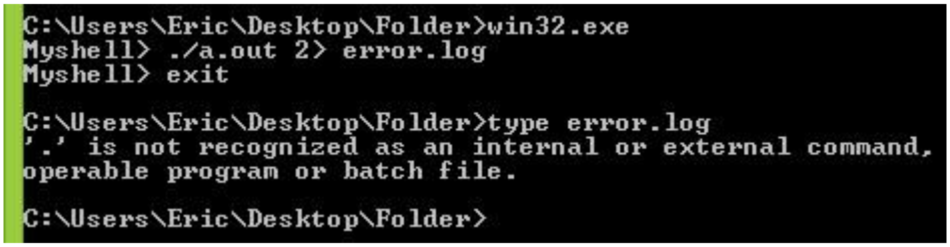
```
C:\Users\Eric\Desktop\Folder>win32.exe
Myshell> dir > outfile
Myshell> exit

C:\Users\Eric\Desktop\Folder>type outfile
 Volume in drive C has no label.
 Volume Serial Number is 74C1-3F5A

 Directory of C:\Users\Eric\Desktop\Folder

05/13/2015  06:03 PM    <DIR>          .
05/13/2015  06:03 PM    <DIR>          ..
05/13/2015  05:51 PM                45 BigFileCopy.txt
05/13/2015  06:03 PM                 0 outfile
05/12/2015  09:54 PM             6,010 win32.c
05/13/2015  05:47 PM            80,384 win32.exe
05/13/2015  05:47 PM             5,530 win32.obj
               5 File(s)         91,969 bytes
               2 Dir(s)  172,582,379,520 bytes free

C:\Users\Eric\Desktop\Folder>_
```

- After I run the “**dir >> outfile**” command you can see the outfile is updated and appended with new information. I used **type** command to check the contents in the command line.



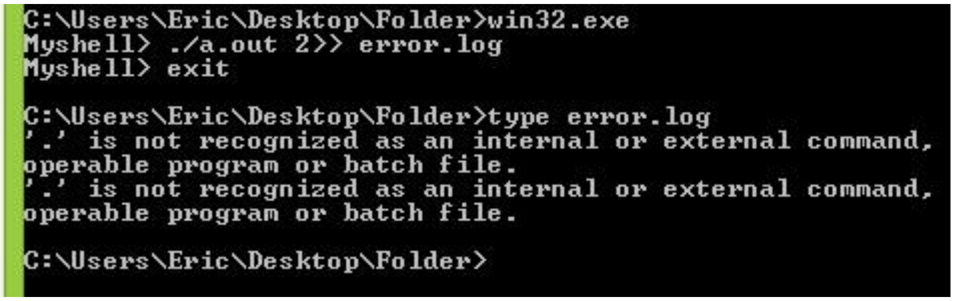
```
C:\Users\Eric\Desktop\Folder>win32.exe
Myshell> dir >> outfile
Myshell> exit

C:\Users\Eric\Desktop\Folder>type outfile
 Volume in drive C has no label.
 Volume Serial Number is 74C1-3F5A

 Directory of C:\Users\Eric\Desktop\Folder

05/13/2015  06:03 PM    <DIR>          .
05/13/2015  06:03 PM    <DIR>          ..
05/13/2015  05:51 PM                45 BigFileCopy.txt
05/13/2015  06:03 PM                 0 outfile
05/12/2015  09:54 PM             6,010 win32.c
05/13/2015  05:47 PM            80,384 win32.exe
05/13/2015  05:47 PM             5,530 win32.obj
               5 File(s)         91,969 bytes
               2 Dir(s)  172,582,379,520 bytes free
 Volume in drive C has no label.
 Volume Serial Number is 74C1-3F5A

 Directory of C:\Users\Eric\Desktop\Folder

05/13/2015  06:03 PM    <DIR>          .
05/13/2015  06:03 PM    <DIR>          ..
05/13/2015  05:51 PM                45 BigFileCopy.txt
05/13/2015  06:03 PM               555 outfile
05/12/2015  09:54 PM             6,010 win32.c
05/13/2015  05:47 PM            80,384 win32.exe
05/13/2015  05:47 PM             5,530 win32.obj
               5 File(s)         92,524 bytes
               2 Dir(s)  172,582,088,704 bytes free

C:\Users\Eric\Desktop\Folder>_
```

- Then I ran the “**./a.out 2> error.log**” command in my shell which causes the error.log file to be created. I used the **type** command to check its contents.



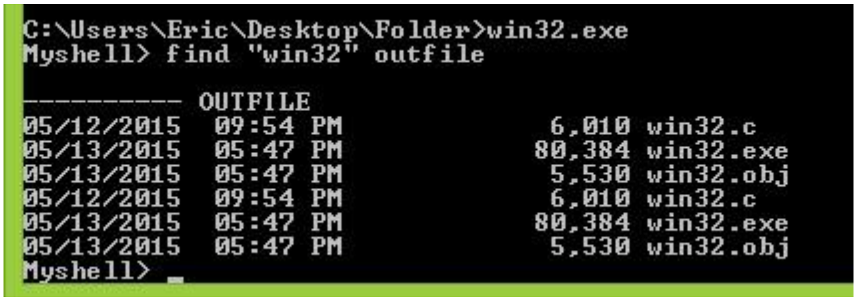
```
C:\Users\Eric\Desktop\Folder>win32.exe
Myshell> ./a.out 2> error.log
Myshell> exit

C:\Users\Eric\Desktop\Folder>type error.log
'.' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\Eric\Desktop\Folder>
```

- After I run the "**./a.out 2 >> error.log**" command  you can see the error.log file is updated with an extra error message. I used **type** command to check the contents in the command line.



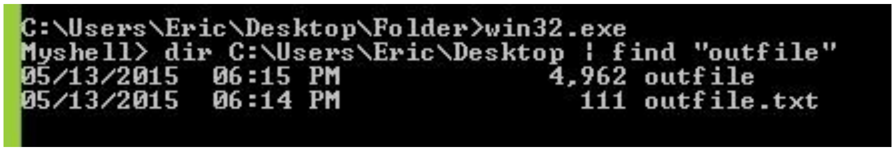
```
C:\Users\Eric\Desktop\Folder>win32.exe
Myshell> ./a.out 2>> error.log
Myshell> exit

C:\Users\Eric\Desktop\Folder>type error.log
'.' is not recognized as an internal or external command,
operable program or batch file.
'.' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\Eric\Desktop\Folder>
```

- Then I ran the "**find "win32"  outfile**" command. You can see it printed out the results it found with the keyword "*win32*" from the outfile.



```
C:\Users\Eric\Desktop\Folder>win32.exe
Myshell> find "win32" outfile

---------- OUTFILE
05/12/2015  09:54 PM             6,010 win32.c
05/13/2015  05:47 PM            80,384 win32.exe
05/13/2015  05:47 PM             5,530 win32.obj
05/12/2015  09:54 PM             6,010 win32.c
05/13/2015  05:47 PM            80,384 win32.exe
05/13/2015  05:47 PM             5,530 win32.obj
Myshell> _
```

- Then I executed multiple commands using a single shell pipe. I executed "**dir C:\Users\Eric\Desktop | find "outfile"**" so it essentially listed all the directories containing keyword "*outfile*" in the desktop as you can see below.



```
C:\Users\Eric\Desktop\Folder>win32.exe
Myshell> dir C:\Users\Eric\Desktop | find "outfile"
05/13/2015  06:15 PM             4,962 outfile
05/13/2015  06:14 PM               111 outfile.txt
```