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Module – Operating Systems Fundamental
Class – Software Development
Lecturer – Mr. Karl O`Connell
Assessment 2 Part 4
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Question 1

Discuss hard and soft linking of files (open your notes/slides for week 6).
Note: As with all QUESTIONS, do not forget to record your progress by copying your progress to your report. Please ask your lab lecturer if you have any questions or require assistance.
•Open a terminal.
•Go to the Part4 directory (i.e. type cd Part4).
•Create a file called h1file by using nano h1file. Write 4 lines of readable text of your own choice into the file.Save the file.
•Type ls –il h*

```
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$ ls -il h*
1579710 -rw-rw-r-- 2 mohammed mohammed 121 Apr 16 21:04 h1file
1579710 -rw-rw-r-- 2 mohammed mohammed 121 Apr 16 21:04 hardh1file
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$
```

•Create a hard link to the file by typing lnh1filehard h1file
•Display both files by typing cat h1file followed by cat hardh1file
•Type ls –il h*

```
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$ ls -il h*
1579710 -rw-rw-r-- 2 mohammed mohammed 112 Apr 16 20:57 h1file
1579710 -rw-rw-r-- 2 mohammed mohammed 112 Apr 16 20:57 hardh1file
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$
```

•Describe what you notice about the inodes displayed by the ls command.

Ans: with ls -il h* there is special Id infornt of the file which is 1579710. its also called index number of the file.

•Edit h1file by typing nano h1file, and change line 1 and save the file.
•Display both files by typing cat h1file followed by cat hardh1file

```
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$ cat h1file
Module - Operating System Fundamental
Course - Software Development
Lecturer - Mr Patrick O'Connell
Year - 2018
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$ cat hardh1file
Module - Operating System Fundamental
Course - Software Development
Lecturer - Mr Patrick O'Connell
Year - 2018
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$
```

•In your own words, describe what is a hard link?

Ans: In computing, a **hard link** is a directory entry that associates a name with a file on a file system. All directory-based file systems must have (at least) one **hard link** giving the original name for each file. The term "**hard link**" is usually only used in file systems that allow more than one **hard link** for the same file.

•Create a file called s1file by using nano s1file. Write 4 lines of readable text of your own choice into the file. Save the file.
•Type ls –il s*

```
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$ nano s1file
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$ ls -il s*
1579712 -rw-rw-r-- 1 mohammed mohammed 216 Apr 16 21:07 s1file
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$
```

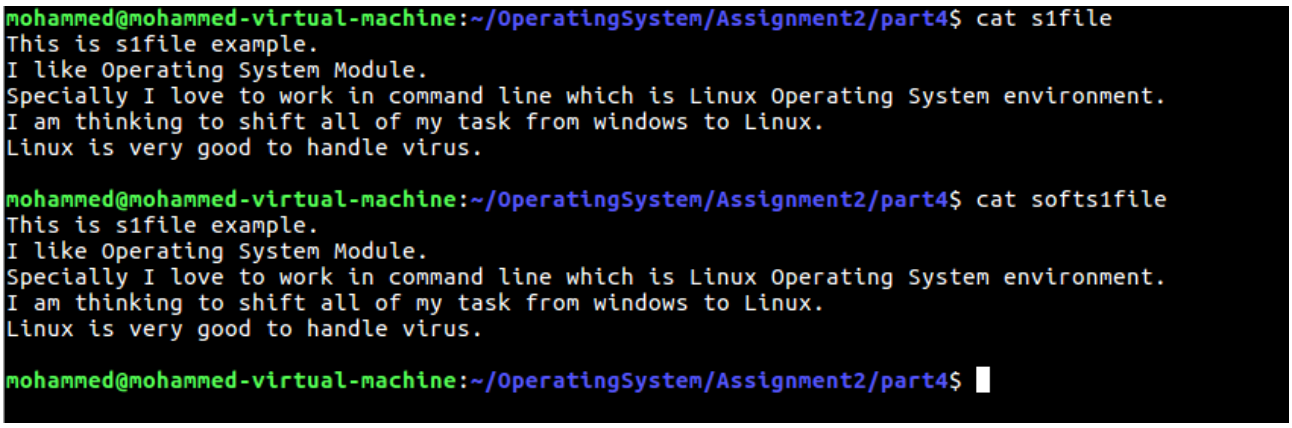
•Create a soft link to the file by typing ln–s s1file softs 1file
•Display both files by typing cat s1file followed by cat softs1file
•Type ls –il s*

```
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$ ln -s s1file softs1file
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$ ls -il s*
1579712 -rw-rw-r-- 1 mohammed mohammed 216 Apr 16 21:07 s1file
1579708 lrwxrwxrwx 1 mohammed mohammed   6 Apr 16 21:09 softs1file -> s1file
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$
```

•Describe what you notice about the inodes displayed by the ls command.

Ans: with ls -il s* there is special Id infornt of the file which is 1579712. its also called index number of the file.

•Edit s1file by typing nano s1file, and change line 1 and save the file.
•Display both files by typing cat s1file followed by cat softs1file



•In your own words, describe what is a soft link?

Ans: In computing, a **symbolic link** (also symlink or **soft link**) is the nickname for any file that contains a reference to another file or directory in the form of an absolute or relative path and that affects pathname resolution.

Question 2

Modify the following bash script if necessary which displays the contents of your directories.
•Open a terminal.
•Go to the home directory (i.e. type cd ~). Check with the pwd command. Type ls -l and note the names of the directories you have created to date (Part1..Part4).
•Using nano, type the follow program called DisplayD. Save the file. Caution: Spaces and no spaces are important with a Bash file, also, the double quotes is " and not [“ or”], also, use -and not –. Therefore, caution is required regarding choice of editors.

```
#!/bin/bash
# Initialise the choice variable
choice=5
# Print Menu to the screen
echo "1. Part1"
echo "2. Part2"
echo "3. Part3"
echo "4. Part3"
echo-n "Please choose [1..4] to select the directory to display
> "# Loop until the user chooses a value between [1..4]
```

```
while [ $choice -eq 5 ]; do
# read user input
read choice
# bash nested if/else
if [ $choice -eq 1 ] ; then
echo"You have chosen directory: Part1"
echo $(ls Part1)
        else
                if [ $choice -eq 2 ] ; then
                echo "You have chosen directory: Part2"
                echo $(ls Part2)
                else
                        if [ $choice -eq 3 ] ; then
                        echo "You have chosen directory: Part3"
                        echo $(ls Part3)
                else
                        if [ $choice -eq 4 ] ; then
                echo "You have chosen directory: Part4"
                echo $(ls Part4)
                else
                        echo -n "Please choose [1,2, 3 or 4]for Part1..Part4? "
                        choice=5
                        fi
                fi
        fi
fi
done
```

```
#!/bin/bash
#Initiallise the choice variable
choice=5
#Print Menu to the screen
echo "1.Part1"
echo "2.Part2"
echo "3.Part3"
echo "4.Part4"
echo -n "Please choose [1..4] to select the directory to display > "
#Loop until the user chooses a value between [1..4]
while [ $choice -eq 5 ]; do
#read user input
read choice
#bash nested if/else
if [ $choice -eq 1 ]; then
        echo "You have chosen directory: Part1"
        echo $(ls  part1)
        else
                if [ $choice -eq 2 ];  then
                        echo"You have chosen directory: Part2"
                        echo $(ls part2)
        else
                if [ $choice -eq 3 ]; then
                        echo"You have chosen directory: Part3"
                        echo $(ls part3)
        else
                if [ $choice -eq 4 ]; then
                        echo"You have chosen directory: Part4"
                        echo $(ls part4)
        else
                echo -n"Please Choose [1,2,3 or 4 for Part1 .. Part4?] >"
                choice=5
                fi
            fi
        fi
   fi
done
```

•Make the file a program by changing the permissions using octal formatting. Type chmod 750DisplayD.Type ls –lto check the change.
•Run the program by ./DisplayD

```
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2$ ./DisplayD
1.Part1
2.Part2
3.Part3
4.Part4
Please choose [1..4] to select the directory to display > 1
You have chosen directory: Part1
A2Part1.pdf bar.txt geditFile.txt MohammedAlomA2Part1.odt MohammedAlomA2Part1.pdf nanoFile.txt Part1Pictures viFile.txt
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2$
```

•You must testthe program fully.
•Note: you should understand the bash script read, if and while statements.

Question 3

Explore and compare the find and grep commands.
•Open a terminal.
•Go to the home directory (i.e. type cd ~).
•We previously use the grep command, for example type ps aux | grep cron. We can use the find command to search for files in directory, for example find Part1.
1.Using the man commands and searching on the internet, describe the grep command, and give 3 different examples that you can get working on your terminal.You must clearly explain each example.

grep

grep which stands for “global regular expression print,” processes text line by line and prints any lines which match a specified pattern.
grep searches the named input FILEs (or standard input if no files are named, or if a single hyphen-minus (-) is given as file name) for line containing a match to the given PATTERN. By default, grep prints the matching lines.

Grep syntax

grep [OPTIONS] PATTERN [FILE..]

grep is a powerful tool for matching a regular expression against text in a file, multiple files, or a stream of input. It searchs for the PATTERN of text that gyou specify on the command line, and outputs the results for you.

Example Usages

Lets say want to quickly locate the phrase “out products” in HTML files on your machine. Lets start by searching a single file. Here, our PATTERN is “our products” and out FILE is product-listing.html.

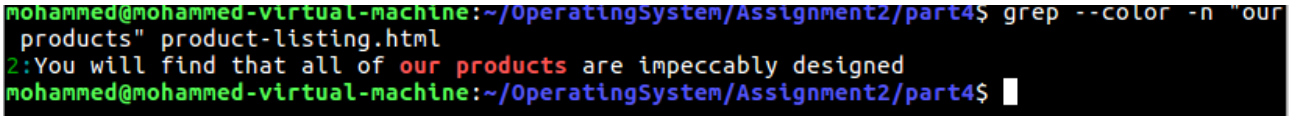
```
  GNU nano 2.5.3                File: product-listing.html

<p>
You will find that all of our products are impeccably designed
and meet the highest manufacturing standards available<em>anywhere.</em>
</p>
```

```
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$ nano product-listing
.html
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$ grep "our products"
product-listing.html
You will find that all of our products are impeccably designed
mohammed@mohammed-virtual-machine:~/OperatingSystem/Assignment2/part4$
```

A single line was found containg our pattern, and grep outputs the entire matching line to the terminal.

Viewing line numbers of successful matches

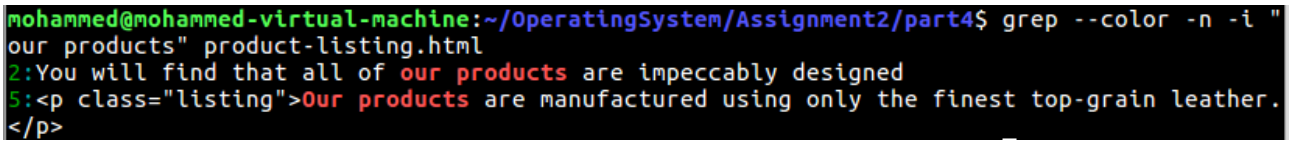
it will be even more useful if we know where the matching line appears in our file. If we specify the -n option, grep will prefix each matching line with the line number:



our macting line is prefixed with “2:” which tells us this corresponds to line 2 in our file.

Perform case-insensitive grep searches

What if “our products” appears at the beginning of a sentence, or appears in all uppercase? We can specify the -i option to perform a case-insensitive match:



Using the -i option, grep finds a match on line 5 as well.

I can use searching multiple files using a wildcard

2.Using the man commands and searching on the internet, describe the find command, and give 3 different examples that you can get working on your terminal. You must clearly explain each example.

find

find searchs for files in a directory hierarchy

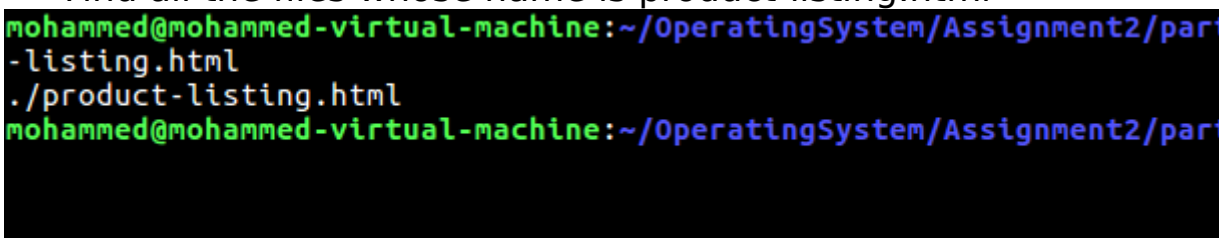
find locates files on your system. Within each directory tree specified by the given paths, it evaluates the given expression from left to right, according to the rules of precedence until the outcome is known.
Find is a fundamental and extremely powerful tool for working with the files on our linux system. It can be used on its own to locate files or in conjuction with other programs to perfomr operations on these files.

find systax

find [-H] [-L] [-P] [-D debugopts] [-O level] [path...] [expression]

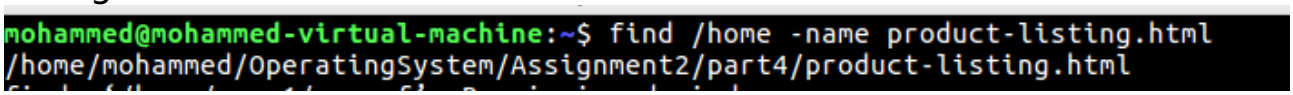
1.Find files using Name in Current Directory

Find all the files whose name is product-listing.html



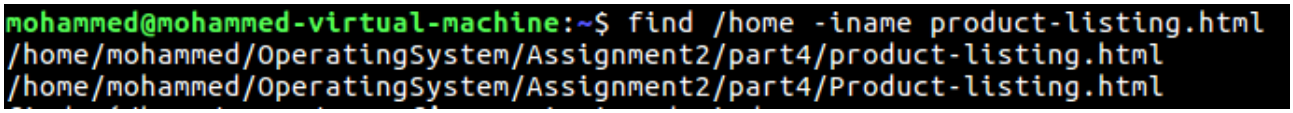
2. Find Files Under Home Directory

find all the files under /home directory with name product-listing.html



3. Find Files Using Name and Ignoring Case

Find all the files whose name is product-listing.html and contains both capital and small letter in a /home directory.



3.In your own words, compare the grep and find commands.

Ans: The grep command is case sensitive; it distinguishes between Science and science. FIND is an utility for searching file and folders based on size , access time , modification time. ... The basic difference is FIND is for searching files and directories at system level while GREP is for searching a pattern inside a file.