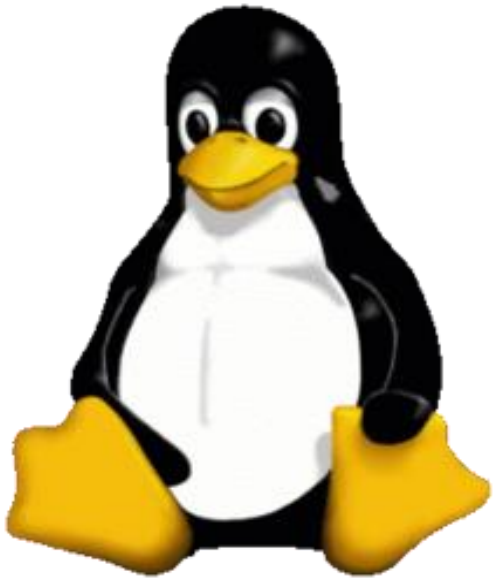
DAT151-OBLIG2

Database and Unix System Management



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Content

Part 1 – The filesystem

Task 1: Filesystem basics

1. Windows vs Linux/Unix filesystems

Describe some of the key differences between the Linux/UNIX filesystem and how files and folders are organied in windows.

In a windows file system you have the individual disks / partitions given their own drive letter and you have to navigate between these to enter the folders. In linux all drives and partitions can be mounted into the already defined tree-structure without having to deal with drive letters.

2. Mounting

What is a "mount point"? Create a new folder and use the mount command to let this be the mountpoint for another directory/filesystem. Explain what happens for the command "mount -t ntfs /dev/sda2 /opt"

A mount point can be imagined as a shortcut to a resource or folder. Say if you mount a new drive to the system the mountpoint would be where you can access this resource/drive.

Mounting folder:

```
$ mkdir MntPoint
$ mkdir MntFldr
$ touch MntFldr/fil1
$ sudo mount --bind MntFldr/ MntPoint/
$ ls MntPoint/
fil1
```

The command would mount a specific type (ntfs) located in sda2 (the resource) to the point /opt.

3. Files

In most Unix systems, there are seven types of files defined. What are these? Use the file command to display the information of a few files. In which of the even categories do these files belong.

The seven types of files are:

- Normal files
- Directories
- Hard links
- Symbolic links
- Sockets
- Named pipes
- Character device
- Block device

The files I tried where all normal files or directories.

4. Links

From a user perspective, hard links and symbolic links allow the same file to exist in more than one place. Find an empty directory and create a new file with some text in it. Create a hard link for this file in the same directory using the command ln. Now create a symbolic link for the file using ln -s. Then delete the original file, leaving only the links

```
$ touch fil.txt
$ ls / > fil.txt
$ ln fil.txt hardL.txt
$ ln -s fil.txt softL.txt
$ rm fil.txt
$ ls -al
total 4
drwxrwxr-x. 2 admo admo  40 Jan 31 13:16 .
drwxrwxr-x. 6 admo admo  84 Jan 31 14:11 ..
-rw-rw-r--. 1 admo admo 104 Jan 31 13:12 hardL.txt
lrwxrwxrwx. 1 admo admo   7 Jan 31 13:15 softL.txt -> fil.txt
(Red flashing warning on symbolic link)
$ cat hardL.txt
(outputs all directories in /)
$ cat softL.txt
cat: softL.txt: No such file or directory
```

a) The Hard link worked fine, because it points to the inode of the file. Not to the file that was deleted.

b) The Symbolic link did not work because it is linked to the file therefore it has no link to the inode without the file existing.

Task 2: File attributes and permissions

1. file attributes

In the traditional Linux/UNIX/ filesystem model, every file comes bundeled with a set of 16 bits. What are these bits, and why are they needed? Explain.

The 16 set of bits contain, nine permission bits. Three bits to show the special access privileges, the 3 bits are; setuid a bit that allows for uid outside of the normal permission bits access a file or such and the setgid bit that allows the same just for groups there is also “the stucky bit” a option for preventing a file or directory from being modified unless you are the owner. And four bits of file type information. They are needed to determine for instance permissions and what type of file it is.

2. Octal number permissions

The nine permission bits are often represented using octal numbers. Explain what these are, and how the permission bits 110 100 101 can be represented using octals. What permissions does a file with the octal value 745 have?

The numbers represent who has permission to what on a file. The order is shown in the figure below.

1 representing having permission to, and 0 representing not having permission.

Who	**Owner**			**Group**			**Everyone (others)**		
Permission	***Read***	***Write***	***Execute***	***Read***	***Write***	***Execute***	***Read***	***Write***	***Execute***
Binary	1	1	0	1	0	0	1	0	1
Octal	6			4			5		
Octal	7			4			5		
Binary	1	1	1	1	0	0	1	0	1

3. Setting permissions (chmod)

Chmod is a tool that allows users to change the permission of bits of a file, either by providing octal values, or by a mnemonic syntax where you can combine a set of targets (u,g,o for user, group and other, or a for all three) combined with an operator(+,-,= for add, remove or set) before providing the wanted permissions. For instance to add read and write permissions to the group and all other for a file the command chmod go+rw can be used

a) Create a new file and use chmod with the mnemonic syntax to add read and write permissions to the file owner, read and execute permissions for the group

```
Commands:
$ touch hei.sh
$ nano hei.sh
(Added some runnable code)
$ sudo chmod g=rx hei.sh
$ sudo chmod o-r hei.sh
$ ls -al
total 4
drwxrwxr-x. 2 admo admo 35 Jan 31 13:32 .
drwxrwxr-x. 6 admo admo 84 Jan 31 14:15 ..
-rw-r-x---. 1 admo admo 55 Jan 31 13:26 hei.sh
```

b) Create a new file with the same permissions, but now use chmod with octal numbers to set the permissions.

```
$ touch fil2.sh
$ sudo chmod 650 fil2.sh
$ ls -al
total 4
drwxrwxr-x. 2 admo admo 35 Jan 31 13:32 .
drwxrwxr-x. 6 admo admo 84 Jan 31 14:15 ..
-rw-r-x---. 1 admo admo  0 Jan 31 13:32 fil2.sh
-rw-r-x---. 1 admo admo 55 Jan 31 13:26 hei.sh
```

c) Can you think of any reasons why octal numbers can be preferred over mnemonic syntax

I find it faster and easier to keep control over, because it is shorter to write and you set the permissions as you want them. Having the Owner, group and everyone on one digit each makes it faster to see (once you know the digits) what persmissions are given to what and lets you do different permissions for each of the categories.

Part 2 – Software installation and management

Task 3: Package management systems and lower level package management

1. Package management system

What is a package management system, and why do we need one? What is the package fromat used by the package management system on your machine?

The package management system on the centos system by default is RPM (RedHat Package Manager). And the high level package manager is yum. We need a package manager to help keep programs and packages up to date on the system. Aswell as makes in a lot easier to install new programs. This would be a lot harder without a package manager and in bigger businesses impossible due to the amount of work it would take an IT department to keep packages up to date.

2.Lower level package management

Package management can often be considered to have two layers, where lower level package management contains tools used to install, uninstall and query packages.

a) *Use the package management tool available on your system to list all installed packages. How many are installed on your system? Select one package and use the tool again to display all its dependencies.*

```
$ sudo yum list installed
Outputs a long list of packages
$ sudo yum deplist zip.x86_64
```

b) *Use wget to download the package for the application called openvpn*

```
$ sudo wget https://dl.fedoraproject.org/pub/epel/8/Everything/x86_64/Packages/o/openvpn-2.4.8-1.el8.x86_64.rpm
```

It downloads.

c) *Install with RPM*

```
[admo@s1 ~]$ sudo rpm -U openvpn-2.4.8-1.el8.x86_64.rpm
[sudo] password for admo:
error: Failed dependencies:
        libpkcs11-helper.so.1()(64bit) is needed by openvpn-2.4.8-1.el8.x86_64
[admo@s1 ~]$
```

Fails because of a missing dependency.

Task 4: High-level package management

1.Installing software

Explain how these systems can locate and install software. What is the high-level package management system on your machine?

The high level package manager on the CentOs machine is yum. High level package managers usually point to multiple web/ftp servers with repositories of software. This is how the package management system finds the software. Some repositories are there by default with some operating system installations. Others you will have to add the pointer to by yourself. You check the updated list of packages and updates by running a update function. (apt-get update, yum update)

2.Software repository

What is a software repository? If you are using tum as your high-level package management system, add the epel software repository to your system.

A software repository stores software packages. Some of the things the repositories can store is up-to-date versions of the packages, binaries for other hardware architecture, source code and the formal releases + security updates.

Enabling the epel software repository on CentOs 8:

```
yum install epel-release
```

3.Installing programs with high-level package manager.

Try using yum or apt to install the openvpn package. Does this differ in any way from task 3? If it installs, remove the package afterwards.

```
yum install openvpn
yum remove openvpn
```

(all yum commands were run as sudo)

It differs in the way that you don't need to first download the package, start the installation and then find out if you have the dependencies.
With the high level package manager it finds the package from the repository (in this case "epel") and installs it with the required dependencies.

Therefore the installation went without any problems.

4.Updating / upgrading all packages

```
yum update
yum upgrade
```

Version 2 Edits.

T1:

1. I think you should also mention that in a Linux/UNIX filesystem, there is no explicit division into different drives, but a unified hierarchy, starting with the root directory and continuing downwards with a number of subdirectories.

2. ok

3. hard links should be counted as regular files or directory entries, which map names to inode (does it make a difference if you use ls -l ?)

4. ok

T2:

1.[redo] the nine permission bit, together with other 3 bits for special access privileges, specify the “mode” of a file (they are also called mode bits). Could you elaborate a bit more about them?

Elaborated about the mode bits

2. ok

3. a) ok

b) ok

c) Perhaps another possible reason could be that people sometimes confuse “o” as owner, but not others.

T3:

1.[redo] Why is it easier? Can you elaborate a bit more?

Attempted to describe my thinking more in depth.

2. a) you can use “yum list installed | wc -l” to find the number of packages installed on your machine. (You may have problem with that because the output from yum list is not pretty print, or you can use “rpm -qa | wc -l” instead

b) ok

c) [redo] missing

Added

T4:

1.[redo] Do these systems check the online software repo right away, and automatically download the package by itself?

Attempted to fill out.

2.[redo] Can you say a bit more about

Elaberated abit more.

3. ok

4. [redo] missing

Added