Unix-like Operating Systems
Filesystem.

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Contents

Discussion of homework

- Set values 3 and 5 to local shell variables `A` and `B`, respectively.

```
A =3 ; B =5
```

- How to calculate the sum of the values of `A` and `B` by the shell and print the result to the standard output?

```
echo $(( A + B ))
```

- How to calculate the product of the values of `A` and `B` by the shell and print the result to the standard output?

```
echo $(( A * B ))
```

- Set octal value 10 and hexadecimal value F1 to local shell variables `A` and `B`, respectively. Hint: see manual page of bash.

```
A = " 010 " ; B = " 0 xF1 "
```

- How to calculate the decimal sum of the values of `A` and `B` by the shell and print the result to the standard output?

```
echo $(( A + B ))
```

Discussion of homework

- Define local shell variables A and B in the following way

```
A="01010" ; B="AA"
```

- Assume that the variable A contains the binary number and variable B contains hexadecimal number.

- How to calculate the sum of the values of A and B by the shell and print the result like decimal number to the standard output?
  Hint: see manual page of bash.

```
echo $((2#$A+16#$B))
```

Discussion of homework

- Create a subdirectory PS1_3 in your home directory by the following command

```
mkdir "$HOME/PS1_3"
```

- Change the current directory by the following command

```
cd "$HOME/PS1_3"
```

- Crate files by the following command

```
touch {,.}{,.,a,b,c,d,e,f,A,B,C,D,E,F}\\
{,.,a,b,c,A,B,C}.{txt,c,cpp,txt,C}
```

- Print the number of all files, that were created by previous command touch, on standard output.

```
ls -a | tail +2 | wc -l
```

- How many non hidden files (filename doesn't begin with the dot) with extension ".txt" have been created by command touch?

```
ls *.txt | wc -l
```

Discussion of homework

- How many files with extension ".txt" have been created by command touch?

```
ls *.txt .*.txt | wc -l
```

- How many filenames contain string "aa" ?

```
ls *aa* | wc -l
```

- How many filenames begin with string "Fb" or "aC" ?

```
ls Fb* aC* | wc -l
```

Getting information about filesystem

- How to get information about the filesystem?
  - Using commands: df or mount.
- How to determine the size of the root file system on server fray1.fit.cvut.cz?

  - ```
    df -h
    ```

- How to determine free space of the file system on the server fray1.fit.cvut.cz, where your home directory is located?

  - ```
    echo "$HOME" ; df -h
    ```

- How to determine the IP address of server, where the contents of your home directory from server fray1.fit.cvut.cz is located? Hint: use command ping to get IP address of server.

  - ```
    echo "$HOME" ; df -h ; ping -a fsun
    ```

Getting information about directory/file

- How to get information about the directory/file?
  - Using commands: `pwd`, `ls`, `stat` or `du`.
  - Using shell variables: `PWD` or `HOME`.
- Login to the server `fray1.fit.cvut.cz` and change working directory to directory `/bin`. Explain output of the following commands.

```
echo "$PWD"
```

```
pwd
```

```
pwd -P
```

- How to list names of all directories/files in you home directory?
  - `ls -a "$HOME"`
- How to list names and attributes of all directories/files in you home directory? Explain the meanings of attributes.
  - `ls -al "$HOME"`

Getting information about directory/file

- How to list attributes of the root directory?

  - `ls -ld /`

- Login to server `fray1.fit.cvut.cz`. How to determine i-node numbers of the following files
  - `/etc/init.d/pppd`,
  - `/etc/rcS.d/K50pppd`,
  - `/etc/rc0.d/K50pppd`,
  - `/etc/rc1.d/K50pppd`.

  - `ls -i /etc/init.d/pppd /etc/rc?.d/K50pppd`

- Why the previous files have the same i-node number?
  What does it mean?
  - They are hard links.

- How much disk space is allocated for contents of these files totally?
  - 1836 B

Getting information about directory/file

- What kind of information about your home directory can be display by commands `ls` and `stat`. Compare these commands.
  - `man ls`
  - `man stat`
- How to determine number of kilobytes which are allocated for your home directory?

  - ```
    du -ks "$HOME"
    ```

Getting information about file contents

- How to get information about file contents?
  - Using commands: `file`, `ldd` or `nm` .
- Login to the server `fray1.fit.cvut.cz`. Determine type of the following commands:
  - `pkgdiff`
  - `7z`
  - `firefox`

  If the command is an ELF dynamically linked file, then determine shared libraries used by this command.
  If the command is a script, then determine script interpreter.

```
type pkgdiff ; file /usr/bin/pkgdiff
less /usr/bin/pkgdiffhead
```

```
type 7z ; file /usr/bin/7z
ldd /usr/bin/7z
```

```
type firefox ; file /opt/local/bin/firefox
less /opt/local/bin/firefox
```

Viewing the file contents

- How to display the file contents?
  - Using commands: `cat`, `more/more` or `od` .
- Command `ls -l` print several columns to the standard output. How to determine the column separator?

```
ls -l / | od -c
```

- How to determine the number of nonempty lines in manual page of bash? Hint: use command `cat`.

```
man bash | cat -b
```

- How to determine the number of empty lines in manual page of bash? Hint: use command `cat`.

```
man bash | cat -b
man bash | cat -n
```

Creation of directory/file

- How to create directory/file?
  - Using commands: `mkdir`, `touch`, `ln`.
  - Using metacharacters: `>` or `>>` .

- Login to the server `fray1.fit.cvut.cz`.
  How to create the following directories/files in your home directory?
  - `PS1␣lab05/A/B/C` ... directories

    ```
    mkdir -p "$HOME/PS1 lab05/A/B/C"
    ```

  - `PS1␣lab05/java` ..... link to /opt/java

    ```
    ln -s /opt/java "$HOME/PS1 lab05/java"
    ```

  - `PS1␣lab05/.hl-profile` ..... hard link to $HOME/.profile

    ```
    ln "$HOME/.profile" "$HOME/PS1 lab05/.hl-profile"
    ```

- How to add line PS1="$PATH:$HOME/bin" to file $HOME/.profile?

  ```
  echo 'PATH="$PATH:$HOME/bin"' >> "$HOME/.profile"
  ```

Manipulation with directories/files

- How to manipulate with directories/files?
  - Use commands: cp, mv, rm, rmdir.
- Login to the server fray1.fit.cvut.cz.
  How to create the following directories/files in your home directory?
  - PS1␣lab05/group ... copy of /etc/group

  ```
  cp /etc/group "$HOME/PS1 lab05"
  ```

  - PS1␣lab05/init ..... copy of /etc/init.d

  ```
  cp -r /etc/init.d "$HOME/PS1 lab05/init"
  ```

- How to rename PS1␣lab05/init to PS1␣lab05/init.d?

  ```
  mv "$HOME/PS1 lab05/init" "$HOME/PS1 lab05/init.d"
  ```

- How to delete PS1␣lab05/init.d?

  ```
  cd "$HOME/PS1 lab05/init.d" ; rm -r *
  cd .. ; rmdir "$HOME/PS1 lab05/init.d"
  ```

Homework

- Create shell script, which
  1. creates the following directory tree temp-RRMMDD
     where RR are the last two digits of the current year (00..99),
     MM is the number of the current month (01..12)
     and DD is the number of the current day (01..31),
  2. copies to this directory any three files s1..s3,
  3. lists files in directories and determines their type,
  4. removes this directories.