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Website: <http://www.mpi-magdeburg.mpg.de/2802004/sc1/>

Scientific Computing 1 1st Homework

Handout: 22nd Oct. 2014

Return: 5th Nov. 2014

Hint: If you are not sure what a command does, or what the right parameters are, use `man command`, `apropos` or `info` to get help.

Exercise 1:

(2 Points)

- a.) `find` and `locate` are two powerful tools to search for files. Search for a file called `GPL-2` beginning in the root of the file system employing both tools. If you found a file copy it to your home directory.
- b.) Search for a directory named `common-licenses` beginning in the root of the file system. Check in the man page of `find` how it is possible to search only for directories.
If you found a directory create a hard- and a soft-link to it in your home directory. What happens in the case of the hard-link? What does `ls -l` display when it recognizes a link. Describe the result.

Exercise 2:

(4 Points)

Access rights and permissions to files are managed using `chmod`, `chown` and `chgrp`. The current permissions and owner are displayed by `ls -l`. Try the following operations and comment what happens on your system. In the case of an error explain why this error occurs.

- a.) Allow only yourself to read and write a file.
- b.) Allow yourself to read and write a file and the group to only read it.
- c.) Set the group access rights to the same as the user has.
- d.) Change the group of a file to `adm`.
- e.) Check if it is possible to remove all permissions from a file and reassign them later.
- f.) Try to change the owner of a file to `root`. Why is this behavior useful?
- g.) Set the executable bit for all users and leave all other bits untouched. What changes in the `ls` output.

Exercise 3:**(4 Points)**

- a.) Use `grep` to find the string "copyright" in some of the license files in `/usr/share/common-licenses/`. Which option must be added to `grep` such that also the line numbers of the matching lines are displayed?

Search for a program which can count lines of a file using `apropos`. Use this program and `grep` to count how many lines contain the string "copyright" in the `/usr/share/common-licenses/` directory.

- b.) The `#` sign is used as comment identifier in many configuration files. Use `grep` to display all lines of a file which are not a comment. An example file which uses `#` for comments is `/etc/resolv.conf`¹.
- c.) In MATLAB® the `tic` and `toc` commands can be used for time measurement. They produce a characteristic output like:

```
Elapsed time is XXXX seconds
```

Write a `grep` command which searches for such lines in a file and displays the match together with five lines before and two lines after it.

Exercise 4:**(6 Points)**

Write a regular expression which matches:

- all strings ending with a dot.
- all strings beginning with a `#` symbol.
- a floating point number in the standard notation (e.g.: 19.456).
- a floating point number in scientific notation (e.g.: $3.123e + 4$).

Exercise 5:**(2 Points)**

A data set is given in a whitespace separated table:

```
value11 value12 value13 value14 value15
value21 value22 value23 value24 value25
```

Write an `awk` command line to fetch the first and the fourth column. Use `cat` and the pipe operator to supply the input data. A data file is available on: http://www2.mpi-magdeburg.mpg.de/mpcsc/lehre/2014_WS_SC/tutorial/easy_awk.txt

Exercise 6:**(3 Points)**

The `date` command displays the current time and the date. Use `awk` to filter the output and

- display only the time.
- display the time zone.
- get the day, the month, and the year and rearrange them to the German format.

¹This file specifies the DNS server address for the name resolution in network applications, such as browsers.

Exercise 7:**(2 Points)**

Write a `sed` command to replace all multiple spaces in a string by only one space.

Exercise 8:**(2 Points)**

A single-line comment in C is introduced by the sequence `//`. Alternatively the comment can be enclosed by `/*` and `*/`. Write a `sed` command which transforms the `//` comments to the enclosed ones.

Overall Points: 25