

# Programmierpraktikum

## Exercise Sheet 1

WS, 2012/2013

**You should try the exercises before the lesson. For this first sheet, you do not need to send us anything back (but you may contact your tutor if you have questions). During the practice lessons we will check personally what you have done and understood, answer your questions and give you a mark for the exercise. Notice presence at the practice lessons is obligatory.**

For all the commands below, be sure to check its man page, using `man <command>`. If there is something you want to do and you don't find a command, you should search in the internet, chances are there is a unix command that does what you want, or someone had already the same problem.

### Filesystem

- Use the commands `cd`, `pwd` and `ls` to explore the filesystem. Try:
  - `cd <dir>` (change to dir)
  - `pwd` (print working directory)
  - `ls` (list files in current directory)
  - `ls -all` (list all properties)
  - `cd .` (change to here)
  - `cd ..` (change one level down)
  - `cd ~` (change to home directory)
  - `cd` (change to home directory)
  - `cd /` (change to the root directory - the equivalent to "C:" in windows)
  - change to some other user directory, for instance to "username" with `cd ~username`
- Go to the `/etc` directory and see what is there, check the rest of the filesystem tree using `cd`, `ls`, `pwd` and `cat`. Look in `/bin`, `/usr/bin`, `/sbin`, `/tmp` and `/boot`.
- Go to your home directory and generate a directory called "uni" and "notuni". Change to `notuni` and generate a file with `touch newfile`.
- Copy the file `newfile` to `copyofnewfile` in the directory "notuni" using the command `cp`. Then rename the file by moving the file with the command `mv`.
- Now go back one level try to delete both directories using `rm` and its options (check `man rm`). What happens if the file "newfile" is not generated?
- What is the difference between listing the contents with `ls -ltr` and `ls -l`, or `ls` (check some of the options listed in `man ls`).

### Permissions

- Create a file and a directory with permissions `r--r--r`. Can you change to the directory you created now? (hint: `man chmod`)
- Modify the permissions on your home directory to make it completely private. Check with some other user that he can't access your directory. Then put the permissions back to how they were. Choose a directory in your home and make all the files on it read only.

## More complex tasks

- Use the command `wget` to download the file:
  - <http://itp.uni-frankfurt.de/~gros/Vorlesungen/ProgPrak/linux-intro.html>
- Make a file called `line773.dat` with the only contents being the line number 773 of the file you've just downloaded in the previous item, using for instance `vim`, `sed`, `nano`, `emacs` or `gedit`. Then print the contents of the file to standard input.
- How many times does the word "program" appears in that file? Can you state a one-line command with that output? (hint: use `grep`, `wc`)
- print the number of words in the file `linux-intro.html` downloaded with `wget` (use `wc`)
- Generate a directory `./Test/test1/test2` with the command `mkdir`, but using only one command.
- Make a tar file of the directory `Test`, and then compress it using `gzip`. Decompress the resulting `.tar.gz` file to check that the compression was successful.
- Repeat the process using `zip/unzip` and `tar` to generate a zip file. Notice you can also compress to `.bzip2` and `xz` files.
- Find all the files finishing with the extension `.conf` under the directory `/etc` and all its subdirectories (use the command `find`)
- Use `grep` to isolate the line in `/etc/passwd` that contains your login details.

## More advanced commands (optional)

- Calculate the time in seconds since the January 1st, 1970, using the command `date`.
- Print the size of all files in your home directory (use the command `du`)
- Print the ten biggest directories/files in your home directory (piping `du` through `sort` and `tail`)
- Print all your currently running processes
- Make only and only one ping to the server in <http://itp.uni-frankfurt.de/> What is the IP of that server?
- Use the command `cut` to find all usernames in your system (check `/etc/passwd`).
- Paste the contents of `/etc/profile` and `/etc/passwd` into two different files, one side by side (`sideby-side.txt`) and one after another (`concatenated.txt`) (hint: `man cat`, `man paste`).
- Change all the occurrences of the word "linux" by the word "GNU/linux" in the previously downloaded file `linux-intro.html` with one command. How would you avoid changing the links? (hint: `man sed`, search regular expressions)
- Use `find` to display the names of all files in the `/home` subdirectory tree. Can you do this without displaying errors for files you can't read?
- Use `find` to display the names of all files in the system that are bigger than 1MB.

## Process handling (optional)

- Run the command `sleep 5` in foreground and background using `&` at the end of the command (see `man bash`).
- Run `sleep 15` in the foreground, suspend it with `Ctrl-z` and then put it into the background with `bg`. Type `jobs`. Type `ps`. Bring the job back into the foreground with `fg`.
- Use `ps`, `w` and `top` to show all processes that are executing.
- Startup a number of `sleep 60` processes in the background, and terminate them all at the same time using `ps`, `kill` and `pkill` command.
- Multiple jobs can be issued from the same command line using the operators `;`, `&&` and `||` (newline, and, or - check `man bash`). Try combining the commands `cat nonexistent` and `echo hello` using each of these operators. Reverse the order of the commands and try again. What are the rules about when the commands will be executed?