VE482— Introduction to Operating Systems

Lab 2

Manuel — UM-JI (Fall 2017)

Goals of the lab

- Learn basics on Shell
- Secure remote server access
- Learn basics on Bash scripting

1 Basic shell

In this part only refer to the man-pages in order to answer the questions.

- Use the `mkdir`, `touch`, `mv`, `cp`, and `ls` commands to:
  - Create a file named `test`.
  - Move `test` to `dir/test.txt`, where `dir` is a new directory.
  - Copy `dir/test.txt` to `dir/test_copy.txt`.
  - List all the files contained in `dir`.
- Use the `grep` command to:
  - List all the files form `/etc` containing the pattern 127.0.0.1.
  - Only print the lines containing your username and root in the file `/etc/passwd` (only one grep should be used)
- Use the `find` command to:
  - List all the files from `/etc` that have been accessed less than 24 hours ago.
  - List all the files from `/etc` whose name contains the pattern "netw".
- In the `bash` man-page read the part related to redirections. Explain the following signs `>`, `>>`, `<<<`, `>&1`, and `2>&1 >`. What is the use of the `tee` command.
- Explain the behaviour of the `xargs` command and of the | sign.
- What are the `head` and `tail` commands? How to "live display" a file as new lines are appended?
- How to monitor the system using `ps`, `top`, `free`, `vmstat`?
- In Minix 3, how to manage softwares (install, remove, update...)?
- What is the purpose of the commands `ifconfig`, `adduser`, and `passwd`?

2 Working on a remote server

As system administrators seldom have a physical access to their servers they remotely connect using a tool called Secure SHell (SSH). It allows them to log into a remote server and launch a regular shell, while keeping all the network traffic encrypted.

- Setup an SSH server on Minix 3. From Linux (using `ssh`) or Windows (using Putty) log into Minix 3. Note: the network need to be properly setup on the Virtual Machine (VM).
- What is the default SSH port? Change this port for port 2222. Log into Minix 3 using this new SSH server setup.

- List and explain the role of each the file in the `$HOME/.ssh` directory. In `$HOME/.ssh/config`, create an entry for Minix 3.
- Briefly explain how key-only authentication works in SSH. Generate a key-pair on the host system and use it to log into Minix 3 without a password.
- On Canvas, submit your public key in a *separate file*. Name it "student-id.pub", e.g. "5143709219.pub". This public key will be used to grant you access to the VE482 course server. Note: always remember that the private keys should remain *private*, and as such should never be disclosed.

3 Basic Bash scripting

Answer the following questions:

- What should be the first line of a Bash script?
- What are the main differences between `sh`, `bash`, `csh`, and `zsh`?
- How to define and access variables?
- What is the meaning of `$0, $1,..., $?, $!`?
- How to define arrays and access or assign elements?
- How to perform `if` and `switch` statements? Provide an example.
- What are the various syntaxes of a `for` loop? For each type write a sample code.
- How to write a `while` loop?
- What is the use of the `PS3` variable? Provide a short code example.
- What is the purpose of the `iconv` command, and why is it useful?
- Given a variable `$temp` what is the effect of `${#temp}, ${temp%%word}, ${temp/pattern/string}`.
- Search what are "regular expressions" and how to use them in a `grep` or `find` command. Give some simple examples based on files and keywords used in exercise 2 of assignment 2.

Warning!

Students not familiar with scripting might need several hours to complete the following part.

Two programming languages often used in conjunction with Bash are `sed` and `awk`.

- Provide a brief introduction to both of them, explaining how to use them and when they reveal to be the most helpful.
- Using `curl` or `wget` retrieve information on shanghai air quality and pipe it to `sed` which should parse the output in order to display the information in the terminal following the format below `AQ: value Temp: value` °C (e.g. `AQ: 55 Temp: 24` °C).
- Pipelining the output of `ifconfig` to `awk` return only the ip address of your current active network connection (the active network interface can be passed to `ifconfig`).