Exercise Sheet 1

The exercise sheets of the operating systems course contain theoretical and practical exercises. For solving the practical exercises you need a UNIX shell. A very popular one is the Bash [1]. The Apple Mac OS X Terminal or WSL [2] for MS Windows are sufficient for most practical exercises. The Windows command prompt and the Windows PowerShell are not sufficient for the exercises.

You can do the practical exercises during the exercise sessions in the lab and use the computers there. They have the Linux distribution Debian [3] installed. If you want to also work on the practical exercises outside the lab hours, you can install Linux on your own machine. An installation in a virtual machine is sufficient. Easy to use distributions are, for example, Debian [3], Ubuntu [4], Manjaro [5] and Mint [6]. A free virtualization solution is VirtualBox [7]

Alternatively, you can work with a live system on CD, DVD, or USB flash memory drive. In this case no local installation is required. A powerful live distributions KNOPPIX [8].

[1] https://tiswww.case.edu/php/chet/bash/bashtop.html
[2] https://learn.microsoft.com/en-us/windows/wsl/install
[3] https://www.debian.org
[4] https://www.ubuntu.com
[5] https://manjaro.org
[6] https://www.linuxmint.com
[7] https://www.virtualbox.org
[8] https://www.knopper.net/knoppix

Exercise 1   (Batch Processing)

1. Describe the objective of batch processing.

2. Describe why batch processing causes an acceleration effect, when multiple tasks are executed.

3. Name the preconditions that must be satisfied for batch processing before the execution of a task can begin.

4. Name tasks for which batch processing is well suited.

5. Batch processing is always. . .
   ☐ interactive   ☐ non-interactive

6. Name an application of batch mode, which is still popular today.

7. Describe what spooling is.

Exercise 2   (Classifications of Operating Systems)

1. At any given moment, only a single program can be executed. What is the technical term for this operation mode?

2. What are half multi-user operating systems?

3. What is the difference between 8 bit, 16 bit, 32 bit and 64 bit operating systems?

4. What is the essential criteria for a real-time operating systems?

5. Name the two types of real-time operating systems.

6. Name four typical application areas of real-time operating systems and assign each application area to one of the categories of subtask 5.

7. Describe the structure of a monolithic kernel.

8. Describe the structure of a microkernel.

9. Describe the structure of a hybrid kernel.

10. GNU HURD implements a. . .

   ☐ monolithic kernel   ☐ microkernel   ☐ hybrid kernel

11. Linux implements a. . .

   ☐ monolithic kernel   ☐ microkernel   ☐ hybrid kernel

12. MacOS X implements a. . .

   ☐ monolithic kernel   ☐ microkernel   ☐ hybrid kernel

13. Windows NT4/Vista/XP/7/8/10 implements a. . .

   ☐ monolithic kernel   ☐ microkernel   ☐ hybrid kernel

14. Name one advantage and one drawback of monolithic kernels.

15. Name one advantage and one drawback of microkernels.

16. Name one advantage and one drawback of hybrid kernels.

17. Your colleague recommends you to relocate frequently used server daemons, such as web server, email server, SSH server and FTP server, from user mode to kernel mode. How do you feel about this idea? Give reasons for your answer. Explain a benefit and one drawback.

Exercise 3   (Files and Directories)

1. Create in your home directory a directory `OpSys`.

2. Navigate to the directory `OpSys` and create inside an empty file with the file-name `File1.txt`.

   - Do not use an editor application to create the file, but a command line command.

3. Check the file size of the file `File1.txt`.

4. Change the modification time of the file `File1.txt` to your birth date.

5. Create a new file in the shell `File2.txt` and insert any text with more than just a single line as content into the new file.

   - Do not use an editor application to insert the text into the file, but a command line command.

6. Print out the first line of the file `File2.txt` in the shell.

7. Append the content of `File2.txt` to `File1.txt`.

   - Do not use an editor application, but a command line command.

8. Create in your home directory, a directory with the directory name `OpSys_new_semester`.

9. Copy the files `File1.txt` and `File2.txt` from the directory `OpSys` into the directory `OpSys_new_semester`.

10. Erase the directory `OpSys`.