

## Exercise Sheet 1

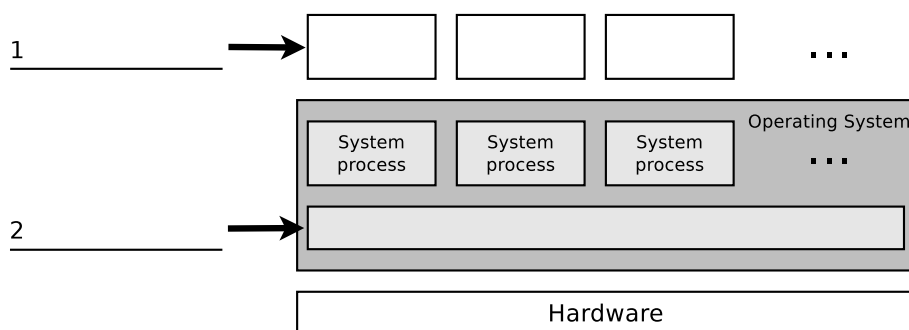
The exercise sheets of the operating systems course contain theoretical and practical exercises. To solve the practical exercises, you need a UNIX shell. Widely used shells include `bash` (Bourne-Again SHell), `fish` (Friendly Interactive Shell), `ksh` (KornShell), `csh` (C Shell), `tcsh`, and `zsh` (Z Shell). The Apple Mac OS X Terminal is sufficient for most practical exercises. Mac OS X from version 10.3 to 10.14 uses the `bash` by default and newer versions use the `zsh`. The Windows Command Prompt and Windows PowerShell are not sufficient for the exercises! However, installing the `bash`, or another shell in Windows 10 and 11 is trivial.

For preparation, it is recommended that you install the Linux operating system on your system. An installation in a container or a virtual machine is sufficient. Easy-to-use distributions include Debian, Ubuntu, Manjaro, Mint, Pop!\_OS, Elementary OS, or Fedora.

On a system with a Windows operating system, the Windows Subsystem for Linux (WSL) is often the best choice for installing a Linux guest system. If WSL does not work properly on your system, the free virtualization solution VirtualBox is a good choice. VirtualBox is also available for systems with Mac OS X. A free alternative virtualization solution for devices with Mac OS X is UTM.

### Exercise 1 (Operating System Structure)

1. The diagram shows the basic structure of an operating system.  
Fill in the lines the name of the components marked by the arrow.



### Exercise 2 (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 3 (Time-Sharing)**

1. Describe the objective of time-sharing.
2. Describe how time-sharing distributes the computing time among the processes.
3. Give the name of the quasi-parallel program or process execution.
4. Describe the objective of the quasi-parallel program or process execution.
5. Describe what scheduling is.
6. Describe what swapping is.
7. Describe how memory protection works.
8. Describe the purpose of memory protection.

### **Exercise 4 (Files and Directories)**

1. Create in your home directory a directory `BTS`.
2. Navigate to the directory `BTS` and create inside an empty file with the filename `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 `BTS_new_semester`.
  9. Copy the files `File1.txt` and `File2.txt` from the directory `BTS` into the directory `BTS_new_semester`.
  10. Erase the directory `BTS`.