Operating Systems

Lab 07 Exercise – Thread creation and join

Learning goals: this laboratory activity is useful to understand how to create threads using pthread_create(), how to wait the termination of a thread, and how to pass data between treads.

Exercise 1

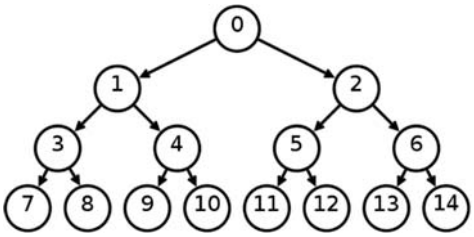
Implement a C program that creates another thread **T**.

1. Thread **T** has to display its **thread identifier**, its **PID**, and sleep for **n** seconds (**n** is passed as command line parameter)
2. Before thread **T** exits, it asks the user to digit a number that will be used as its return code.
3. The main thread waits thread **T** termination. It retrieves and displays the thread exit code. The main thread must also prints thread **T** identifier, and terminate.

Exercise 2

Implement a C program, **thread_generation**, which that receives a command line parameter **n**. The parent thread creates two threads and waits for their termination. Each thread creates another two threads, and waits for their termination.

Tread creation stops after 2^n leave threads have been created. For example, if **n=3**, the main thread creates two threads, and each thread creates another two threads for a total number of 8 leaves treads. At this point, thread creation stops.



Only the leaf threads print their thread identifier.

```
> thread_generation 3
3077876592
3035790192
3052575600
3027397488
3060968304
3019004784
3044182896
3010612080
```

Exercise 3

Implement a C program, **thread_generation_tree**, which receives a command line parameter: **n**. It behaves exactly as the solution of Exercise 1, but each leaf thread must print its generation tree, i.e., the sequence of thread identifiers from the main thread. Example:

```
> thread_generation_tree 3
Tread tree: 3077879488 3069483888 3052575600 3077876592
Tread tree: 3077879488 3069483888 3052575600 3035790192
Tread tree: 3077879488 3069483888 3060968304 3052575600
Tread tree: 3077879488 3069483888 3060968304 3027397488
Tread tree: 3077879488 3077876592 3044182896 3060968304
Tread tree: 3077879488 3077876592 3044182896 3019004784
Tread tree: 3077879488 3077876592 3069483888 3044182896
Tread tree: 3077879488 3077876592 3069483888 3010612080
```

Summary

You should have understood:

- how does **`pthread_create() and pthread_join()`** work
- how to identify treads
- how to exchange information between treads by means of
    - Shared memory
    - Thread function arguments