

# Project: Shell

**Purpose:** The purpose of this project is to familiarize you with the mechanics of process control through the implementation of a shell user interface. This includes the relationship between child and parent processes, the steps needed to create a new process, shell variables, and an introduction to user-input parsing and verification.

## Task 1.1: Shell interface.

The shell (command line) is just a program that continually asks for user input, perhaps does something on the user's behalf, resets itself, and again asks for user input. *Design and implement a basic shell interface that supports the execution of other programs and a series of built-in functions.* The shell should be robust (e.g., it should not crash under any circumstance beyond machine failure).

**Basic:** The prompt should look like this:

```
prompt$
```

**Advanced:** The prompt should look like this:

```
machinename@username:~$
```

where **machinename** and **username** should change depending on the machine and user.

## Task 1.2: Shell programs/commands.

**Basic:** Implement the basic functionality of the following programs: **rm**, **cat**, **clear**, **cowsay**.

**Intermediate:** Provide a few options and/or arguments for at least two programs. Additional points for creativity (e.g. implementing something that does not exist in bash, or differently than it is done in bash).

**Advanced:** Allow piping or at least redirecting output to a text file.

## Task 1.3: System calls.

**Basic:** Within the C-programming example of your choice, implement the following system calls: **fork()**, **wait()**, and **exec()**.

**Intermediate:** Within the C-programming example of your choice, implement `kill()`, `execv()`.

**Additionally:** Carefully explore and then implement the `forkbomb`.

**Task 1.4:** Add some colors to your shell and name it.

**Task 1.5:** Provide a concise and descriptive answer to the following questions.

**Question 1.5.1:** What does the `mmap()` function do?

**Question 1.5.2:** What happens during a context switch? Do we want the OS to perform many or few context switches? Explain.

**Question 1.5.3:** What is the output of the following code snippet? You are given that the `exec` system call in the child does not succeed.

```
int ret = fork();
if(ret==0) {
    exec(some_binary_that_does_not_exec);
    printf("`child\n`");

}
else {
    wait();
    printf("`parent\n`");
}
```