Homework #4 — M1522.000800 System Programming

Sample Solution

Question 1

Process State

The lecture slides “Process Management” on page 8 show a diagram of a process’ state.

(a) apparently, in Linux there are 'zombie' processes. Explain when a process becomes a zombie and also zombie processes are killed (ended) in Linux.

=> When a process isn't terminated yet, its child process is terminated, this child would be a zombie process. Before a parent process reaps its child process, its zombie child still consumes system resources.

If a parent process terminates and reaps its all children, then a zombie process would be able to be ended.

(b) Write a small program that creates a zombie process.

```
#include <unistd.h>

void main(void)
{
      pid_t pid;

      if (pid = fork()) // parent
            while(1) {}
      else              // children
            exit(0);









}
```

Question 2

Process Creation

Consider the following code. How many times is “Hello world” printed?
Solve this problem without actually executing the code!

```
int main()
{
    pid_t pid;

    pid = fork();
    if (pid == 0) {
        pid = fork();
        if (pid == 0) {
            printf(“Hello world\n”);
        }
    } else {
        printf(“Hello world\n”);
    }

    pid = fork();
    if (pid > 0) {
        printf(“Hello world\n”);
    }

    return 0;
}
```

“Hello world” is printed 5 times.

Question 3

Interprocess Communication

There are two well-known IPC methods for client-server communication: sockets and pipes. Compare the two, what are the advantages/disadvantages of each method?

< Sockets >
- advantages : a server can handle multiple clients at the same time.
  It can be used with well-made structures of data.
- disadvantages : It would be slower than pipes because of preparation of its complex structures.

< Pipes >
- advantages : It would be faster than sockets.
  Simple structures and easy to use.
- disadvantages : It doesn't support multiple clients. It must make multiple nodes for each of them.