ICS Homework 3

March 9, 2023

1 System Software

1.1 Fork & Execve

Read the C program and answer the question below. **NOTE:**/bin/echo is an executable file that will print its arguments on the screen.

```c
#include  <stdio.h>
#include  <stdlib.h>
#include  <unistd.h>
#include  <sys/types.h>
#include  <sys/wait.h>

char ch;

int main()
{
    ch = 'A';
    if (fork() == 0) {
        ch = 'B';
        printf("%c\n", ch);
        if (fork() == 0) {
            printf("C\n");
        }else {
            exit (0);
        }
    } else {
        while (waitpid(-1, NULL, 0) > 0);
        char *my_argv [] = {"/bin/echo", &ch, 0};
        execve(my_argv[0], my_argv, 0);
    }
    return 0;
}
```

What is the possible output of this program? Is the output deterministic? Please explain why.

B A C or B C A

No. Because the child process for fork line 15 do not block the waitpid in line 21. So the output of line 16 may appear at a random time after B is printed.

2 Organization

2.1 Pipeline 1

Suppose Alice, Bob and Cathy each have one load of clothes to wash, dry, and fold. The machine washer takes 40 minutes, dryer takes 50 minutes, and folder takes 30 minutes to deal with one load of clothes. If they worked sequentially, how long would the whole process take? What if they use Pipelining? Please indicate the Speedup (old/new).

SEQ: 8 hours (480 minutes)
PIPE: 4.5 hours (270 minutes)
Speedup: 8/4.5 = 1.78

SEQ: 360 minutes
PIPE: 220 minutes
Speedup: 360/220 = 1.64