

Tutorial 2–Processes

Operating Systems COMP SCI 3SH3, Winter 2024

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Q1) Using the program below explain what the output will be at LINE A and why?

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

int value = 5;

int main()
{
    pid_t pid;

    pid = fork();

    if (pid == 0) { /* child process */
        value += 15;
        return 0;
    }
    else if (pid > 0) { /* parent process */
        wait(NULL);
        printf("PARENT: value = %d",value); /* LINE A */
        return 0;
    }
}
```

Q2) Including the initial parent process, how many processes are created by the program shown below? Construct a tree of processes as explained in class for the processes created.

```
#include <stdio.h>
#include <unistd.h>

{
int main()
{
    int i;

{
    for (i = 0; i < 4; i++)
        fork();
{

    return 0;
}
```

Q3) Using the program below, identify the values of pid at lines A, B, C, and D. (Assume that the actual pids of the parent and child are 2600 and 2603, respectively.)

```

#include <sys/types.h>
#include <stdio.h>
#include <unistd.h>

int main()
{
    pid_t pid, pid1;

    /* fork a child process */
    pid = fork();

    if (pid < 0) { /* error occurred */
        fprintf(stderr, "Fork Failed");
        return 1;
    }
    else if (pid == 0) { /* child process */
        pid1 = getpid();
        printf("child: pid = %d",pid); /* A */
        printf("child: pid1 = %d",pid1); /* B */
    }
    else { /* parent process */
        pid1 = getpid();
        printf("parent: pid = %d",pid); /* C */
        printf("parent: pid1 = %d",pid1); /* D */
        wait(NULL);
    }
    return 0;
}

```

Q4) When a process creates a new process using the `fork()` operation, which of the following states is shared between the parent process and the child process?

- a. Stack
- b. Heap
- c. Shared memory segments

Q5) How are zombies and orphans created in UNIX systems?

Q6) Give 3 examples each of an I/O bound process and CPU-bound process?

Q7) What is IPC? What are the two models of IPC?