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# ----------PRACTICAL 04----------

## ❖ ***Experiment-4 :***

## Demonstration of process management system calls for multi-processing.

### ▪ Question-1 :

1. Create chain of processes where one parent have exactly one child as per sample chain given by Instructor.

Sequence:1

PROCESS 0 --> PROCESS 1 --> PROCESS 2 --> PROCESS 3 --> PROCESS 4--> PROCESS 5 --> PROCESS 6

Display PIDs of all processes.

Sequence:2

Output:

Input :5

Output:

[son] pid 28519 from [parent] pid 28518

[son] pid 28523 from [parent] pid 28518

[son] pid 28520 from [parent] pid 28518

[son] pid 28521 from [parent] pid 28518

[son] pid 28522 from [parent] pid 28518

## ✓ Source Code :

```c
#include <stdio.h>
#include <unistd.h>
#include <stdlib.h>
int main(int argc, char *argv[])
{
    int i, num_processes;
    pid_t pid;
    if (argc != 2)
    {
        printf("Usage: %s num_processes\n", argv[0]);
        return 1;
    }
    num_processes = atoi(argv[1]);
    for (i = 0; i < num_processes; i++)
    {
        pid = fork();
        if (pid < 0)
        {
            perror("fork");
            return 1;
        }
        else if (pid == 0)
        {
            printf("[son] pid %d from [parent] pid %d\n",
                   getpid(), getppid());
            break;
        }
        else
        {
            sleep(1);
        }
    }
    return 0;
}
```

## ✓ Output :

```
> ./1 5
[son] pid 4720 from [parent] pid 4719
[son] pid 4721 from [parent] pid 4719
[son] pid 4722 from [parent] pid 4719
[son] pid 4723 from [parent] pid 4719
[son] pid 4724 from [parent] pid 4719
 ~/Documents/4                                                    5s  06:02:53 PM
```

```
> ps -al
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S  1000    1533    1521  0  80   0 - 57921 do_pol tty2     00:00:00 gnome-session-b
1 S  1000    3664    1478  0  80   0 -  5691 sigsus pts/0    00:00:00 zsh
1 S  1000    3833    1478  0  80   0 -  5863 do_sel pts/0    00:00:00 zsh
1 S  1000    3834    1478  0  80   0 -  5859 do_sel pts/0    00:00:00 zsh
0 S  1000    3836    3664  0  80   0 -   724 do_sel pts/0    00:00:00 gitstatusd-linu
1 S  1000    4418    1478  0  80   0 -  5574 sigsus pts/1    00:00:00 zsh
0 S  1000    4591    4418  0  80   0 -   724 do_sel pts/1    00:00:00 gitstatusd-linu
1 S  1000    4597    1478  0  80   0 -  5863 do_sel pts/1    00:00:00 zsh
1 S  1000    4600    1478  0  80   0 -  5859 do_sel pts/1    00:00:00 zsh
4 R  1000    4917    4382  0  80   0 -  5331 -      pts/1    00:00:00 ps
 ~/Documents/4                                                    06:04:57 PM
```

## ▪ Question-2 :

2. Jack want to sort out coins of various values as per below input. Design program to sort the coins in parent process and print the reversely sorted coins in child process. For example:

Input : 10, 5, 1, 20, 2

Output :

Parent process:

Sorted coins are : 1, 2, 5, 10, 20

Child process

Reversely sorted coins are: 20, 10,5,2,1

## ✓ Source Code :

```c
#include <stdio.h>
#include <unistd.h>
#include <sys/wait.h>
#include "reverse.h"
#include "sort.h"
int main()
{
    int num = 0;
    printf("Enter the number of coins: ");
    scanf("%d", &num);
    int coins[num];
    for (int i = 0; i < num; i++)
    {
        scanf("%d", &coins[i]);
    }
    int n = sizeof(coins) / sizeof(coins[0]);
    pid_t pid = fork();
    if (pid < 0)
    {
        perror("Fork failed");
        return 1;
    }
    else if (pid == 0)
    {
        printf("Child process\n");
        printf("Reversely sorted coins are: ");
        sort(coins, n);
        reverse(coins, 0, n - 1);
        for (int i = 0; i < n; i++)
        {
            printf("%d ", coins[i]);
        }
        printf("\n");
    }
    else
    {
        int status;
        waitpid(pid, &status, 0);
```

```
        printf("Parent process:\n");
        printf("Sorted coins are : ");
        sort(coins, n);
        for (int i = 0; i < n; i++)
        {
            printf("%d ", coins[i]);
        }
        printf("\n");
    }
    return 0;
}
```

## Reverse.h :

```
void reverse(int arr[], int start, int end)
{
    while (start < end)
    {
        int temp = arr[start];
        arr[start] = arr[end];
        arr[end] = temp;
        start++;
        end--;
    }
}
```

## Sort.h :

```
void sort(int a[],int n)
{
    int i,j,temp;
    for(i=0;i<n;i++)
    {
        for(j=i+1;j<n;j++)
        {
            if(a[i]>a[j])
            {
                temp=a[i];
                a[i]=a[j];
                a[j]=temp;
            }
        }
    }
}
```

## ✓ Output :

- **Question-3 :**

3. Demonstrate Zombie and Orphan state of processes using fork().

✓ **Source Code :**

```c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
int main()
{
    pid_t pid = fork();
    if (pid == 0)
    {
        // Child process
        printf("I am a child process and my PID is %d.\n",
               getpid());
        sleep(10);
        printf("I am a child process and my parent PID is %d.\n",
               getppid());
    }
    else if (pid > 0)
    {
        // Parent process
        printf("I am a parent process and my PID is %d.\n",
               getpid());
        printf("I am a parent process and my child PID is %d.\n",
               pid);
        sleep(2);
    }
    else
    {
        // Error
        perror("Fork failed");
        return 1;
    }
    return 0;
}
```

## ✓ Output :

```
❯ ./3
I am a parent process and my PID is 5811.
I am a parent process and my child PID is 5812.
I am a child process and my PID is 5812.
 ~/Documents/4   I am a child process and my parent PID is 1478.                    06:11:23 PM
```

When i check my pid is created or not then i press below command

Command is :-

**ps -al**

```
❯ ps -al
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S  1000    1533    1521  0  80   0 - 57921 do_pol tty2     00:00:00 gnome-session-b
1 S  1000    3664    1478  0  80   0 -  5691 sigsus pts/0    00:00:00 zsh
1 S  1000    3833    1478  0  80   0 -  5863 do_sel pts/0    00:00:00 zsh
1 S  1000    3834    1478  0  80   0 -  5859 do_sel pts/0    00:00:00 zsh
0 S  1000    3836    3664  0  80   0 -   724 do_sel pts/0    00:00:00 gitstatusd-linu
1 S  1000    5040    1478  0  80   0 -  5625 sigsus pts/1    00:00:00 zsh
1 S  1000    5209    1478  0  80   0 -  5841 do_sel pts/1    00:00:00 zsh
1 S  1000    5210    1478  0  80   0 -  5837 do_sel pts/1    00:00:00 zsh
0 S  1000    5212    5040  0  80   0 -   724 do_sel pts/1    00:00:00 gitstatusd-linu
1 S  1000    5545    1478  0  80   0 -  5575 sigsus pts/2    00:00:00 zsh
1 S  1000    5720    1478  0  80   0 -  5864 do_sel pts/2    00:00:00 zsh
1 S  1000    5721    1478  0  80   0 -  5860 do_sel pts/2    00:00:00 zsh
0 S  1000    5723    5545  0  80   0 -   724 do_sel pts/2    00:00:00 gitstatusd-linu
1 S  1000    5876    1478  0  80   0 -   693 hrtime pts/2    00:00:00 3
4 R  1000    5879    5504  0  80   0 -  5331 -      pts/2    00:00:00 ps
```

## Zombie Process :

```
 ~/Documents/4   I am a child process and my parent PID is 1478.                    06:13:23 PM
```

Also i check using : `ps -a`

```
❯ ps -a
    PID TTY          TIME CMD
   1533 tty2     00:00:00 gnome-session-b
   3664 pts/0    00:00:00 zsh
   3833 pts/0    00:00:00 zsh
   3834 pts/0    00:00:00 zsh
   3836 pts/0    00:00:00 gitstatusd-linu
   5040 pts/1    00:00:00 zsh
   5209 pts/1    00:00:00 zsh
   5210 pts/1    00:00:00 zsh
   5212 pts/1    00:00:00 gitstatusd-linu
   5545 pts/2    00:00:00 zsh
   5720 pts/2    00:00:00 zsh
   5721 pts/2    00:00:00 zsh
   5723 pts/2    00:00:00 gitstatusd-linu
   5978 pts/2    00:00:00 ps
 ~/Documents/4                                                                     06:16:29 PM
```