Processes in Linux/Unix

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A program/command when executed, a special instance is provided by the system to the process. This instance consists of all the services/resources that may be utilized by the process under execution.

- Whenever a command is issued in Unix/Linux, it creates/starts a new process. For example, pwd when issued which is used to list the current directory location the user is in, a process starts.
- Through a 5 digit ID number Unix/Linux keeps an account of the processes, this number is called process ID or PID. Each process in the system has a unique PID.
- Used up pid's can be used in again for a newer process since all the possible combinations are used.
- At any point of time, no two processes with the same pid exist in the system because it is the pid that Unix uses to track each process.

Initializing a process

A process can be run in two ways:

Method 1: Foreground Process : Every process when started runs in foreground by default, receives input from the keyboard, and sends output to the screen. When issuing pwd command

```
$ ls pwd
```

Output:

```
$ /home/geeksforgeeks/root
```

When a command/process is running in the foreground and is taking a lot of time, no

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Got It !

the program finishes processing and comes out.

Method 2: Background Process: It runs in the background without keyboard input and waits till keyboard input is required. Thus, other processes can be done in parallel with the process running in the background since they do not have to wait for the previous process to be completed.
Adding & along with the command starts it as a background process

```
$ pwd &
```

Since pwd does not want any input from the keyboard, it goes to the stop state until moved to the foreground and given any data input. Thus, on pressing Enter:
Output:

```
[1]   +   Done                    pwd
$
```

That first line contains information about the background process – the job number and the process ID. It tells you that the ls command background process finishes successfully. The second is a prompt for another command.

Tracking ongoing processes

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```
$ ps

PID       TTY      TIME        CMD
19        pts/1    00:00:00    sh
24        pts/1    00:00:00    ps
```

For more information -f (full) can be used along with ps

```
$ ps –f

UID      PID  PPID C STIME    TTY        TIME CMD
52471     19     1 0 07:20    pts/1  00:00:00f     sh
52471     25    19 0 08:04    pts/1  00:00:00      ps -f
```

For single-process information, ps along with process id is used

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```
$ ps 19

PID       TTY      TIME        CMD
19        pts/1    00:00:00    sh
```

For a running program (named process) **Pidof** finds the process id's (pids)

Fields described by ps are described as:

- **UID**: User ID that this process belongs to (the person running it)
- **PID**: Process ID
- **PPID**: Parent process ID (the ID of the process that started it)
- **C**: CPU utilization of process
- **STIME**: Process start time
- **TTY**: Terminal type associated with the process
- **TIME**: CPU time is taken by the process
- **CMD**: The command that started this process

There are other options which can be used along with ps command :

- **-a**: Shows information about all users
- **-x**: Shows information about processes without terminals
- **-u**: Shows additional information like -f option
- **-e**: Displays extended information

Stopping a process:

When running in foreground, hitting Ctrl + c (interrupt character) will exit the command. For processes running in background kill command can be used if it's pid is known.

```
$ ps –f

UID      PID  PPID C STIME    TTY        TIME CMD
52471     19     1 0 07:20    pts/1  00:00:00      sh
52471     25    19 0 08:04    pts/1  00:00:00      ps –f

$ kill 19
Terminated
```

If a process ignores a regular kill command, you can use kill -9 followed by the process ID.

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Other process commands:

bg: A job control command that resumes suspended jobs while keeping them running in the background
Syntax:

```
bg [ job ]
```

For example:

```
bg %19
```

fg: It continues a stopped job by running it in the foreground.
Syntax:

```
fg [ %job_id ]
```

For example

```
fg 19
```

top: This command is used to show all the running processes within the working environment of Linux.
Syntax:

```
top
```

nice: It starts a new process (job) and assigns it a priority (nice) value at the same time.
Syntax:

```
nice [-nice value]
```

nice value ranges from -20 to 19, where -20 is of the highest priority.

renice : To change the priority of an already running process renice is used.
Syntax:

```
renice [-nice value] [process id]
```

df: It shows the amount of available disk space being used by file systems
Syntax:

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Output:

```
Filesystem     1K-blocks      Used Available Use% Mounted on
/dev/loop0      18761008  15246876   2554440  86% /
none                   4         0         4   0% /sys/fs/cgroup
udev              493812         4    493808   1% /dev
tmpfs             100672      1364     99308   2% /run
none                5120         0      5120   0% /run/lock
none              503352      1764    501588   1% /run/shm
none              102400        20    102380   1% /run/user
/dev/sda3      174766076 164417964  10348112  95% /host
```

free: It shows the total amount of free and used physical and swap memory in the system, as well as the buffers used by the kernel
Syntax:

```
free
```

Output:

```
             total       used       free     shared    buffers
cached
Mem:       1006708     935872      70836          0     148244
346656
-/+ buffers/cache:     440972     565736
Swap:       262140     130084     132056
```

Types of Processes

1. **Parent and Child process :** The 2nd and 3rd column of the ps –f command shows process id and parent's process id number. For each user process, there's a parent process in the system, with most of the commands having shell as their parent.
2. **Zombie and Orphan process :** After completing its execution a child process is terminated or killed and SIGCHLD updates the parent process about the termination and thus can continue the task assigned to it. But at times when the parent process is killed before the termination of the child process, the child processes become orphan processes, with the parent of all processes "init" process, becomes their new pid.
   A process which is killed but still shows its entry in the process status or the process table is called a zombie process, they are dead and are not used.
3. **Daemon process :** They are system-related background processes that often run with the permissions of root and services requests from other processes, they most of the

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daemon.

When ps –ef is executed, the process with ? in the tty field are daemon processes.

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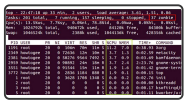
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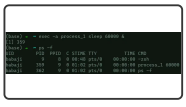
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