**Lesson 10 - Managing processes**

A *program* is a series of executable statements stored in a file.

A *process* is an instance of a program that is taking up RAM and CPU cycles.

Mutiple instances of a program can be running at the same time.

A *thread* is a process that shares memory with other related threads.

*Foreground process*: a process that has a visible precence on the screen and typically requires user input.

*Background process*: a process that has no visible precence on the screen and does not require user input.

To execute a process in the backgound, add an & to the end of your command line.

Shell commands that control processes:

* CRTL-Z suspend the currently running process. It is now a background process (but stopped).
* bg make the most recently suspended process run as a background process.
* fg resumes the most recently suspended background process in the foreground
* jobs list the user's background processes
* fg *jobspec* make a specific job be the active foreground process
* bg *jobspec* make a specific job run in the background

**ps [OPTIONS]** – "process status": a snapshot of the current processes. (also **top**)

ps OPTIONS (options and output vary on different systems and there are too many options to list them all)

|  |  |
| --- | --- |
|  | List your processes. (Only fields PID TTY STAT TIME COMMAND) |
| -e | "Every process" for every user. |
| -F | Extra Full-format listing (11 values per process) |
| -u *user* | List the processes of a particular user |
| -l | Long format (includes the priority (PRI) and niceness (NI) values.) |
| -o pid,pri,cmd | "Output format"; e.g., list the process ID, priority, and command name |

ps Display Fields

|  |  |
| --- | --- |
| UID | User name that owns the process. |
| PID | Process ID. Use this to modify the process. |
| PPID | Parent process of the process. E.g., the process that started the process. |
| C | CPU usage (as a percentage) since the process started. |
| SZ | Size in physical pages of the core image of the process. |
| PRI | The scheduling priority of a process (0-99). |
| NI | Nice value [-20, +19]; higher numbers mean lower priority; use sudo to set values less than 0. |
| RSS | The non-swapped physical memory that a task has used (in kilobytes). |
| PSR | The processor the process is currently assigned to. |
| STIME | Start time (when the process started). |
| TTY | Controlling terminal for the process. |
| TIME | Accumulated CPU time. |
| CMD | Command name. |

**kill [OPTIONS] *PID*** – kill a process (actually sends a signal to a process)

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| --- | --- |
| -l | (small L) List all the signals that can be sent to a process. |
| -9 | Send a SIGKILL signal to a process, which terminates the process. (Default behavior.) |

**nice *value command*** –Start a process with a specific *nice* value.

**renice value *pid*** – Change the nice value of one or more processes.

Valid values [-20,19]. If you are "nice," you have less priority. You must be sudo to set negative values.

**whereis *[options] cmdName*** – find where a command is stored in the file hierachy

whereis OPTIONS

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| --- | --- |
| -l | (small L) List all of the directories that are searched. |

**which *[options] cmdName*** – find the specific program that is executed for a command.

which OPTIONS

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| --- | --- |
| -a | Print all matching executables in PATH, not just the first one. |

**Memory Usage**

**du *[options] [FILES]*** – "disk usage," list the amount of space used by the specified files.

du OPTIONS

|  |  |
| --- | --- |
| -b –k -m | Show the amount of disk space in bytes, or kilobytes, or megabytes |
| -h | Show the amount of disk space in human readable format (e.g., 4K or 2.3M) |

**df *[options]*** – "disk free," report the amount of available disk space on mounted file systems.

df OPTIONS

|  |  |
| --- | --- |
| -h | Show the amount of disk space in human readable format (e.g., 4K or 2.3M) |
| --total | Show a total of all free space on all file systems. |

**free *[options]*** – "free RAM," display the total amount of free and used physical and swap memory.

df OPTIONS

|  |  |
| --- | --- |
| -b –k –m -g | Display the values in bytes, kilobytes, megabytes, or gigabytes |
| -h | Show the amount of disk space in human readable format (e.g., 4K or 2.3M) |

**watch *[options] command options*** – execute a command on a specified interval

which OPTIONS

|  |  |
| --- | --- |
| -n *number* | Execute the command every *number* of seconds. |
| -d | Highlight the differences between successive updates |