

## Objective:

The objective of these pre-training exercises is to make you familiar with the tools that you will be using during your training. It is highly recommended that you complete these prior to the traineeship week at Fermilab.

## Pre-training Exercises

We will be using Alma Linux 9 and HTCondor for our training. There will be no graphical user interface (GUI) to work with during this training so everyone is expected to be comfortable working with a command line interface. Some key concepts and commands for the training are as follows:

### 1. Linux manual pages

A Linux manual page (or man page) is a system administrator's best friend. Man pages are a crucial resource for understanding how to use and configure different aspects of the system. They also provide detailed instructions on how to use different commands and the options they support.

The `man` command is used to display the manual pages for commands, functions and file formats. For example, to know about `ls` command:

```
...  
$ man ls  
...
```

Almost every command in Linux provides a summarized version of the manual page that can be generally accessed by specifying `--help`. For example:

```
...  
$ ls --help  
...
```

You can always start with a summarized help section before moving onto the detailed manual page.

### 2. Filesystem navigation

You are expected to be comfortable navigating the Linux file system. The following are some of the commands you should get familiar with:

- `cd` - used to navigate directories
- `mkdir` - used to create directories
- `touch` - used to create an empty file (among other things)
- `rm` - used to delete files and directories
- `ls` - used to list files and directories
- `cp` - used to copy files and directories
- `mv` - used to move or rename files and directories

### 3. Working with files

Working with files is an important part of managing a system. There are configuration files that you have to tweak to control system functionality, there are log files that you look at for troubleshooting and finally, you may have to write a program or two to automate frequent tasks.

Below are some of the Linux commands you should be familiar with for working with files:

- `less` or `more` - used to read files
- `vi`, `gedit`, `emacs` or `nano` - all of these commands launch text editors that can be used to modify files
- `cat` - used to dump contents of a file on the screen. Not suitable for large files but comes in handy
- `grep` - used to search file contents

### 4. Processes

Services and applications end up running as processes. It is important to be able to inspect processes and take necessary actions. Take a look at the following two commands to gain some familiarity with Linux processes:

- `ps` - command to display process status
- `kill` - command to signal a process

### 5. Installing software

Software can be packaged and distributed in multiple ways. You probably had to install a package on your laptop at some point in your life. The type of package format to use depends largely on the system and its use case. In our compute training, we will be using RPM package format. RPM stands for RPM Package Manager (just one of many recursive acronyms in the nerdy world of computer science!).

RPM package can either be managed directly through `rpm` command, or through an operating system level package management tool like `dnf` or `yum`. We will be using `dnf` for our exercises so familiarity with this command is recommended.

## 6. Package repositories

`dnf` lets us install packages, but where does it get them from? Packages in RPM formats are fetched from package repositories hosted all over the world. The configuration files directing `dnf` to these locations can be found under `/etc/dnf` or `/etc/yum.repos.d`.

`dnf` can also be used to install RPM packages directly by downloading them onto a system instead of fetching from a remote repository.

## 7. HTCondor Software Suite (HTCSS)

HTCondor software suite, or just HTCondor, is one of the leading batch systems in the world. It is developed by the center of high throughput computing (CHTC) at University of Wisconsin, Madison. We will be using HTCondor extensively in our training so going through the following YouTube training videos for familiarity is highly recommended.

- Introduction to HTCondor: <https://youtu.be/8jadQkAdU1k?si=4z6guwucl-urwJx>
- Organizing and submitting HTC workloads: [https://youtu.be/1fhnr\\_Bh0w8?si=6frh\\_ZMmMfs6tuzQ](https://youtu.be/1fhnr_Bh0w8?si=6frh_ZMmMfs6tuzQ)
- What are my jobs doing? [https://youtu.be/P73bcp6\\_FQA?si=pw4-RIsCMQzhqVnt](https://youtu.be/P73bcp6_FQA?si=pw4-RIsCMQzhqVnt)
- IDToken authentication in HTCondor: <https://youtu.be/8fh6SLavDi8?si=LL5ZfydAGhSpAOhD>

## Additional resources

HSF provide excellent tutorials for high energy physics that can be found here: <https://hsf-training.org/training-center/>

The Unix Shell tutorial (<https://swcarpentry.github.io/shell-novice/>) goes over many important concepts in depth.

## Knowledge check

Wondering if you are well prepared for the training exercises? Try your hand at the following tasks:

1. Can you navigate to your home directory, create a subdirectory named `physics` and create an empty file named `computing`?

2. How do you tell files and directories apart on the command line? Can you remove the directory named `physics`? Can you tell what time you created the file `computing` at by using `ls`?
3. Create a file named `intro.txt` and add a two line introduction of yourself. Save the file and `cat` it to make sure it has what you wrote.
4. On your terminal, run `sleep 600 &` (& is not a typo). This will create a sleep process of 600 seconds and send it to the background. Can you use `ps` to identify the process ID (or PID) of this process? Can you use `kill` command to terminate it?
5. Can you install a package using `dnf`? A couple of example packages to try the command on are `iotop` (utility that lets you see how stressed your disk is) and `htop` (a utility that lets you see CPU and memory consumption)
6. Can you find three packages installed on your system using `rpm` or `dnf` command?
7. Can you tell the difference between HTCondor access point, HTCondor central manager and HTCondor execute point? What HTCondor processes/daemons run on these types of machines?