PTfS-CAM: Shell Basics

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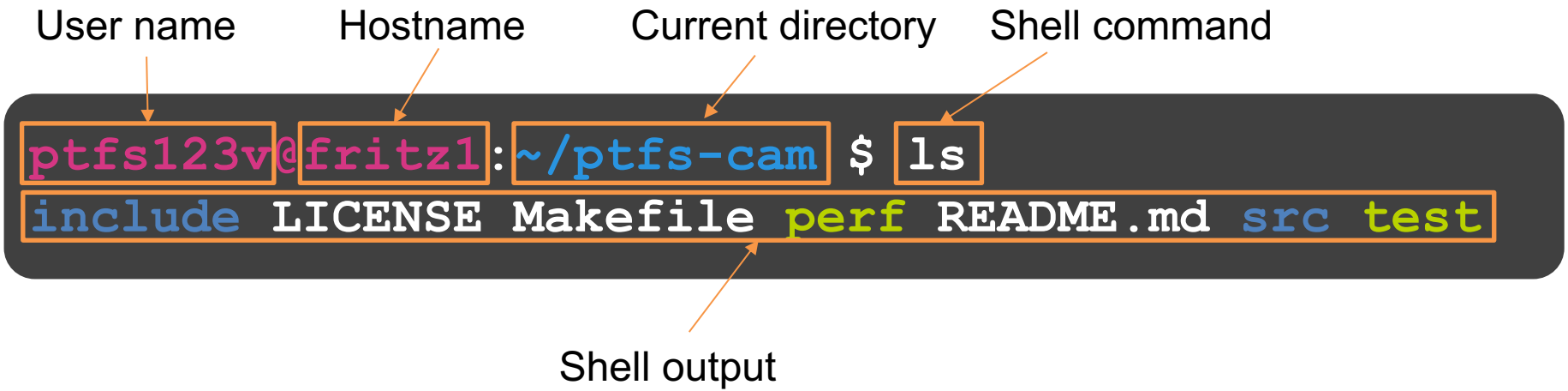
Shell

What is a shell?

- Text oriented (command line) mediator between user and system.
- Waits for commands, interprets them and starts programs.
- Supervises and controls program execution (e.g., scripts).



Shell commands – part 1

Some **basic** shell commands you should know

- `echo` – prints the string it is being passed
- `ls` – list all files and folders
- `cd` – change directory
- `cp` – copy files and folders (use `-r` for folders)
- `mv` – move files and folders
- `mkdir` – making a new directory
- `rm` – remove files and folders (use `-r` for folders)
- `ssh` – connect and execute commands on remote host
- `scp` – copy files to or from remote host (use `-r` for folders)
- `man` – print manual or get help fo

There are many many commands available.
Google is your friend.

Environment variables

- Name values pairs in a program's environment.
- They can control the program's behaviour.

```
ptfs123v@fritz1:~/ptfs-cam $ echo $HOME
/home/hpc/ptfs/ptf123v
```

- See defined environment variables using `env` shell command.
- To set environment variables use:
  - **`export VARNAME=<value>`** (on bash/zsh shell)
  - **`setenv VARNAME <value>`** (on csh shell)
- Important characters with special meaning:

  `~` → HOME expansion **`*`** → wildcard **`./`** → current directory

Scripts

- Shell scripts are a sequence of commands written to a file.
- Using scripts allows you to automatize tasks.

Example file **`script.sh`**:

```
#!/bin/bash
echo "Your home is ${HOME}"
echo "Your 2nd argument is $2 and your 1st argument is $1"
```

- Now convert the **`script.sh`** file to an executable using **`chmod`** command.

```
$ chmod u+x script.sh
```

- Run the script. Pass in arguments if required.

```
$ ./script.sh abc 1
```

Scripts

- Use scripts wisely.
- Use scripts to run and collect results. This avoids human errors and documents your run settings.
- There are control flow loops/statements like **`for, while, if`**
- **Always validate the correctness of your script.**
- Output redirection (**`>`**, **`>>`**, and **`tee`**) can be handy.
- You can use pipe operator (**`|`**) to pass the output of one command to another command.
- Some of my favorite shell commands for string parsing : **`grep, cat, cut, find, head, tail, bc , awk ...`**

Shell commands – part 2

- `vim` – text editor (requires tutorial for its own)
- `grep` – print lines matching a pattern (use `-R` for reverse search)
- `cat` – concatenate files and print on standard output
- `cut` – print selected parts of lines
- `find` – find file in directory
- `head / tail` – print the N first / last lines of file/output
- `bc` – calculator for basic arithmetic
- `awk` – pattern scanning and processing language

Hands on: running and collecting results

- Copy the program (square) from `/home/hpc/ptfs/ptfs100h/shell/square` to your home
- The program squares a number and returns the results.

```
ptfs123v@fritz1:~/ptfs-cam $ ./square 4
Lots of
lines
of text
Square = 16
End
```

- Now use a shell script to collect the squares for 1…10 and report the result in a csv file format such that:

```
#val, square
   1, 1
   2, 4
   3, 9
…
```

Hands on: Solution

```
#!/bin/bash
echo "#val, square" > out.csv
for (( i=1; i<=10; i++ )); do
    square=$(./square $i | grep "Square =" | cut -d"=" -f2)
    echo "$i,${square}" >> out.csv
done
```

Shell commands – part 3

- `sed` – stream editor for filtering and transforming text
- `less` – view the content of a file/output (q → quit, /text → search for “text,” n → next match, b → scroll back)
- `pwd` – print current directory path
- `htop` – interactive process viewer

- `<Ctrl+c>` – close process
- `<Tab>` – auto-complete commands
- `<Up> / <Down>` – go element-wise through history
- `<Ctrl+r>` – reverse search of history

Useful links

- bash cheatsheet
- text editors: vim tutorial or nano tutorial
- terminal multiplexer: tmux or screen