Introducing Linux CLI

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What is CLI?

CLI stands for **C**ommand **L**ine **I**nterface, and it is usually shortened to *command line* or, by historical reasons, into the *terminal*.

The former dates back to the days when **UNIX** ran on large mainframes accessed via remote terminals.

https://www.righto.com/2019/04/

What is shell?

Shell is a program which serves as an *interface* between you and the **o**perating **s**ystem, and passes instructions from you to your OS.

Shell is a *program* running in your *terminal emulator* and it allows you to issue commands *interactively* or *non-interactively*.

There is no one shell, but several programs that can be qualified as shells:

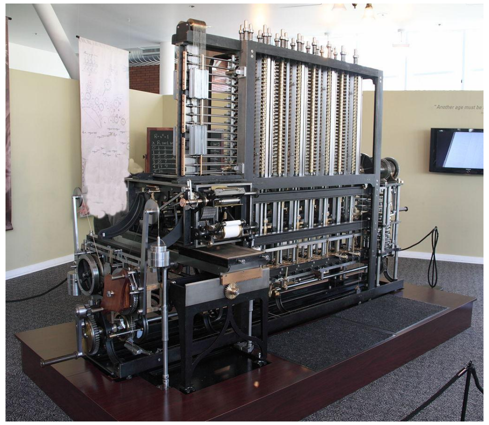
- **GUI**;
- **sh** shell;
- **csh** shell;
- **ksh** shell;
- **zsh** shell;
- **c** shell;
- **bash** shell;

Human is giving the *commands* to the *shell*, which translate it and instruct the *kernel* to demand the *physical devices* to do their job.

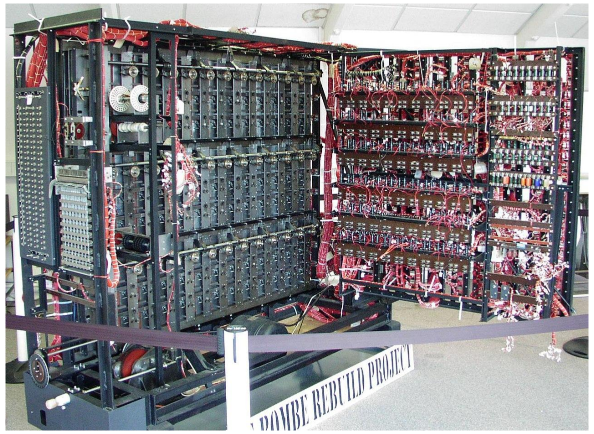
History of shell

We can see the history of shell as a part of the history of the *interface* between the human and the machine.

1. Mechanical interface (*Difference Engine,* of Charles Babbage);
2. Wire-plug era (Bombe);
3. Punch-card era;
4. Command line interpreter or shell (present);



Charles Babbage Difference Engine
https://commons.wikimedia.org/w/index.php?curid=4807331



BOMBE functional model
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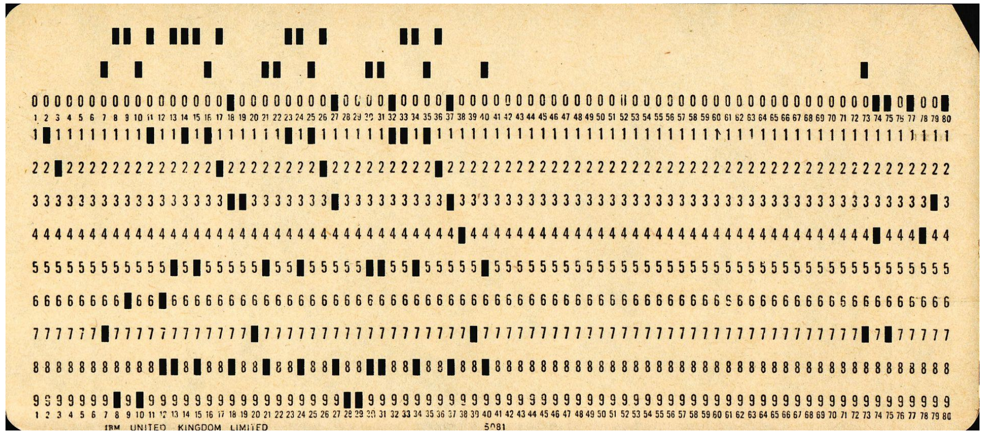

UK - Used Punchcard,
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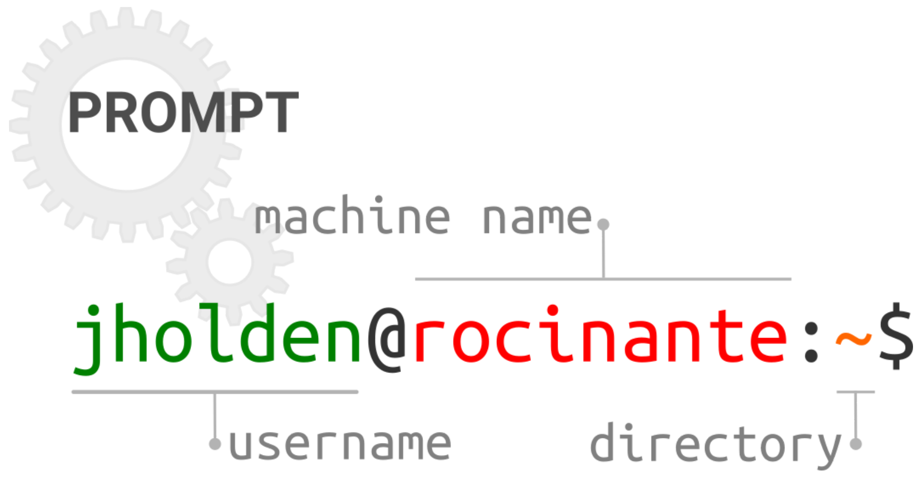
History of shell

- **Thompson shell** (November 19, 1971) or simply **sh** the first shell written for *UNIX* system by *Ken Thompson*;
- **Bourne shell** (1979, confusingly it was abbreviated again as **sh**) was written by *Stephen Bourne*, as a more advanced comparing to the *Thompson shell*;
- **bash** or **B**ourne-**a**gain **sh**ell replaced the *Bourne shell* after another decade of usage. It was originally released in 1989, as a free version of *Bourne shell* for *GNU* (**G**NU **N**ot **U**nix) project. It went through the long series of updates, upgrades and revisions. Rich of powerful tools, and new features borrowed from other shells;

What is prompt?

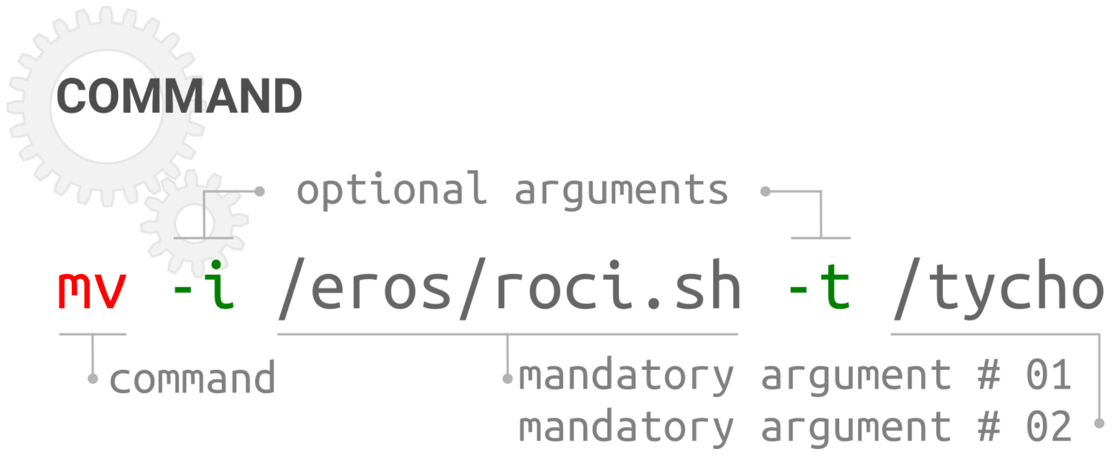
The *prompt* is what you see after you've logged into the server. The prompt is called *prompt* because it *prompts* you for your *command*:



~ *is a shorthand for the user's* ***home*** *directory*

What is command?

Command is a single-purpose *tool*, a *program* which is designed to do a *single task*, and do it well.



Command accepts zero or more *mandatory* and zero or more *optional arguments* which allows you to *get the desired result*, and *fine-tune the output* of the command.

Echo and a brackets expansion

`echo` is simply *echoing* anything you type into it:

```
echo Hello, MOBA!
echo echo
```

Comments

Whatever you print after the hash symbol (`#`) will be ignored by bash:

```
# Just ignore me
```

Print working directory

There are moments when you want to know where (in which directory) you are.

`pwd` stands for **p**rint **w**orking **d**irectory. When you enter this command **bash** will print your *current or working directory*.

```
pwd
# /home/jholden/
```

Compare it to your prompt, you are probably seeing `~` (*tilde*) symbol instead of the path to your home directory. In Linux CLI `~` is a short-hand for your home directory.

Move between directories

`cd` commands stands for **c**hange **d**irectory. With `cd` you can move from your *current directory* to any directory you want, if you provide a *path* to that directory.

```
cd /data3    # change your working directory to data3
pwd          # print your working directory
cd ~         # return to your home directory
pwd          # print your working directory
```

List files and directories

Now, when you are at your *home directory* you can use a command `ls` to explore the directory content. The command accespts a *path* as it's argument (your *current working directory* as default if not specified) and a tones of *optional* arguments or *switches*.

```
ls          # default representation
ls -l       # long format representation
ls -lha     # long representation, human-readable, all files
```

If you accidently typed `sl` instead of `ls`: pray to the Old Gods and run away.

Clean your screen

Use `Ctrl` + `L` keystroke to clear your terminal window.

Making directories

Now, when we are in our working directory we are going to create a new project we call *sandbox*.

We can do it with `mkdir` command (stands for **make dir**ectory). It accepts the *path* to the directory you are going to create, and several optional arguments.

```
mkdir sandbox                # create a new directory 'sandbox'
ls -lh                       # list files and directories
cd sandbox                   # change directory to 'sandbox'
pwd                          # print working directory
mkdir -p ./data/raw01        # create subdirectory
mkdir -p ./data/raw02        # create subdirectory
tree                         # explore the dir structure
```

Creating files

You can create an empty file with `touch` command. The command accept several optional arguments, and mandatory argument(s) -- a file name(s) you are going to create:

```
touch ./data/raw01/dataset01.txt
touch ./data/raw02/dataset02.txt
tree
```

Copying files

`cp` stands for **co**py, and is designed for copying files and directories. It accepts the path to the file or directory you want to copy, the destination path, and several optional arguments. For example `-R`, `-r`, or `--recursive` allows you to copy the content of your *source* directory *recursively*. Specifying switch `-t` before your *destination* path will instruct `cp` to copy all *source* files / directories into the *destination directory*.

```
cp /data3/sandbox/data/dataset03.txt -t ./data/raw02/
ls -hl ./data/raw02
```

Moving files

Now we realized that we have wrong directory structure: we don't need two sub-directories for our raw data, instead we want to store all our input datasets in `./data/raw` directory. Lets move our files.

To move a file (or directory) we use `mv` command. This command accepts path(s) to the files (directories) you are going to move, and destination path(s).

```
mv -v ./data/raw02/dataset.txt -t ./data/raw01/
tree
```

Notice how we use `-v` switch to make `mv` verbose, `-t` switch to specify *target* directory, and `*` wildcard to copy both datasets.

Renaming files and directories

The fact that we can specify the name of our *destination file* allows us not ony *move* but also *rename* files and directories with `mv`. Lets rename our `~/data/raw01` directory into just `~/data/raw/`:

```
mv -v ./data/raw01/ ./data/raw
tree
```

Notice that we use `-v` switch to make `mv` verbose.

Removing files and directories

Since we successfuly copied files, and renamed our target directory, we can remove `~/sandbox/data/raw02` directory we do not need anymore.

We are going to use command `rm` which removes *files* or *directories*. To remove directories containing other files and directories, use `-r` or `-R` switch.

```
rm -rv ./data/raw02
tree
```

Above we use `-v` switch to make `rm` verbose and `-r` switch to recursively remove the content of the directory.

Symbolic links

The command `ln` accepts to arguments *a target* and a *link_name*. When called with a `-s` switch it will create a *symbolic link* which points from *link* to *target*. You can use it as a regular file. The only difference - it is small, and if you delete it, it will not affect the *target* file.

There is a big dataset located at `/data3/sandbox/` directory, it is too heavy, and we don't want to copy or move it around. Using `ln` command, we can create a symbolic link to this file in our working directory.

```
ln -s /data3/sandbox/data/big_dataset.txt ./data/raw/
ls -lh ./data/raw
```

Reading the files

The simplest command you can use for reading the content of the files is `cat`. Supply the `cat` with the path to your file, and read the content of the file on the screen. Other commands you can use are `more` and `less`.

```
cat ./data/raw/big_dataset.txt    # read the data file
```

Clean your workspace

To clean our workspace, we are going to remove our `sandbox` project. We already know that to remove directory we can use `rm` command:

```
cd ~                  # Return to your home directory
rm -r sandbox         # Remove your sandbox directory
ls -ahl               # List the content of the current directory
```

Notice how we use `-r` switch to remove all subdirectories of `sandbox` directory.

Getting help, examples

```
# show manual pages for man command, press Q to exit
man man
# short single-line description for cd command
whatis cd
# see the help pages for man
help ls
# the same but using switch instead of command
man --help
```

Thank you

The `wall` command will accepts a text strign wrapped with double quotes `"`, and sends it to everyone who is logged into the server.

```
wall "Thanks MOBA!"
```