UNIX Shell Cheatsheet

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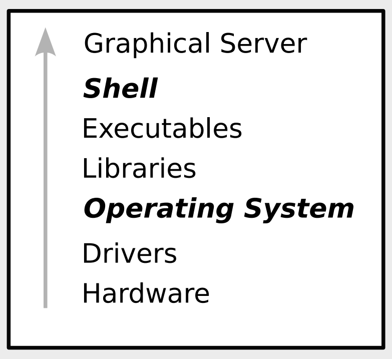

Graphical Server
Shell
Executables
Libraries
Operating System
Drivers
Hardware

Flavors of UNIX:
- Linux
- FreeBSD
- Darwin (MacOSX)
- Cygwin
- WSL (Windows)
- …

Flavors of Shell:
- Bash
- Zsh
- Fossil
- …

UNIX wisdom: **everything is a file**.

Shell wisdom: **everything is a text stream.**

Script wisdom: **everything is a string**

bash interactivity:

```
Ctrl-D  exit
Ctrl-L  clear
Ctrl-R  recover command (history)
Ctrl-U  erase line before cursor
Ctrl-W  erase word before cursor
Ctrl-←  move one word left
Ctrl-XX move at beginning and back
Ctrl-_  undo last edit
```

Basics

Everyday commands:

```
man
ls
cp
mkdir
cd
mv
rm
```

less:

```
q  quit
/  search
n  next
↑↓ move
```

Options convention:

- cmd [options] ARG [OPTARG]
- Short: -h -v [or] -al
- Long: --help --verbose
- Arguments: --opt[=]<value>

Examples: $ ls -a -l ..
$ ls -al ~

List files:

```
ls -l  long listing format
ls -a  all files (even hidden)
ls -h  human-readable
ls -t  sort by modification date
ls -S  sort by size
```

Remove files

```
rm -r  recursive
rm -f  force
rm -i  interactive
```

Change directory:

```
cd ..  above
cd /   file system root
cd ~   home directory
```

Wildcards:

```
 *.txt  ending with .txt
 *A*    containing A
A*.txt  between A and .txt
A?.txt  one character after A
```

Copy files

```
cp -r  recursive
cp -a  archive
cp -i  interactive
```

Misc files:

```
rename "s/X/Y/" *.ext  rename files
ln -s <target> <link>  symbolic link
```

Examples:

```
history|cut -d " " -f 5|sort|uniq -c|sort -n -r|head -n 10|sed "s/^\s*//"
                                                    10 most used commands

head -n 1 A.csv > out.csv && tail -n+2 -q *.csv >> out.csv
                              merge two CSV files, not duplicating headers

(cmake .. && make) ; zenity --info --text "Ended at $(date)"
                        notify when some (here C/C++) build command ended
```

Streams

Display files:

```
cat   concatenate
less  pager
head  beginning of file
tail  end of file
```

Look at files:

```
wc     word (and line & char) count
grep   filter matching text
find   search for files
locate search for file names (fast)
```

Count:

```
wc -w  number of words
wc -l  number of lines
wc -m  number of characters
```

Text streams:

```
cat A   > B      redirect
cat A   >> B     append
cat A B >  C     concatenate
cat A|grep stuff pipe

cat ~/.bashrc | grep alias | less
    display bash aliases in the pager
```

Filter:

```
grep [OPTIONS] PATTERN [FILE·S…]
grep -v  filter out matching lines
grep -E  use regexp
grep -n  show line numbers
grep -A  show n lines after
grep -B  show n lines before
```

Search:

```
find . -name "x"  by name from current directory
find .. -type f   files from directory above
find ~ -type d    directories from home
```

Standard outputs:

```
cmd  > out.txt  redirect standard output
cmd 1> out.txt  idem
cmd 2> err.log  redirect standard error
cmd &> all.txt  redirect all
cmd 2>&1 |…     redirect before piping
…|tee -a out    print and redirect

cmd 2> /dev/null 1> out.txt
          suppress errors and redirect output
```

Manipulate streams:

```
uniq  remove duplicates
sed   replace text
cut   extract columns
sort  order lines
```

Sort lines:

```
sort -r  reverse order
sort -n  numeric order
sort -f  ignore case
```

Execute on content:

```
xargs        run cmd for each item of piped stream
find -exec   run cmd on each matching file
```

Execute on each file:

```
find -exec cmd {} \;  execute cmd on found file
find -print0          print found filenames
find -delete          delete found files

find /tmp -depth -name core -type f -delete
                  delete files named "core" in /tmp

find ~ -type f -name *.sh -exec ls -l {} \;
 find shell scripts under home and show their state
```

Get columns:

```
cut -d<c>    use "c" as delimiter
cut -f<n>    get the nth field
cut -f<n-m>  get fields nth to mth
```

Replace text:

```
sed "s/X/Y/g"  replace matching
sed "s,X,Y,g"  regexp "X" by "Y"
sed -i         replace in-place
sed -e         multiple replace
```

Execute on each item:

```
xargs -L 1   for each line of input stream
xargs -I {}  replace {} with input argument
cat /etc/passwd|cut -d: -f1|sort|xargs -L1 echo
cat /etc/passwd|cut -d: -f1|sort|xargs -I{} echo {}
                     display users registered in the system
```

Execute

Shell interactivity:

```
cmd     run a command
./scr   run a script (forgets changes)
. scr   run a script (keep changes)
Ctrl-C  stop a running command
Ctrl-Z  pause a command
  fg    foreground a paused command
```

Processes:

```
ps aux   show running processes
kill     ask to stop
kill -9  force kill
nice     run with +/- priority
renice   change priority
at       run at a date
sleep    wait before next command
```

Detach processes:

background=depends on the session
detached =does not depends on session

```
Ctrl-Z, bg   pause, run in background
cmd &        run in background
nohup cmd    run detached
tmux         run detachable shell(s)
  Ctrl-b d   detach the shell(s)
tmux attach  get back the detached shell(s)
```

Chain commands:

```
A ;  B   A then B
A && B   if A successful, then B
A || B   if A on error, then B
```

Logical tests:

```
&&  logical AND
||  logical OR
!   logical NOT
```

Returned information:

```
$?  returned code (0=OK, >0=error)
$!  Process ID
```

Shell basic syntax:

```
# Comment
x="A"              put "A" in variable x
printf "${x}"      print content of x
z="${x:-B}"        if x is unset, put "B" in z
declare -a x=()    declare x as an array
x+=("A" "B")       put two elements in x
printf "${x[0]}"   access the array
```

Shell calls:

```
#!/bin/bash  run this script with bash
cmd          call cmd
x=$(cmd)     capture cmd standard output
x=$((1+2))   integer arithmetics
```

Script

Binary conditions:

```
if [[ "$x" == "$y" ]]; then
    # Strings are equals
fi
if [[ "$x" -eq "$y" ]]; then
    # Numeric values are equals
fi

-ne  not equal
-gt  greater than
-ge  greater or equal
-lt  lesser than
-le  lesser or equal
```

Special variables:

```
$0    program name
$1    1st argument
…     …
$*    all arguments
$#    number of arguments
$IFS  Internal File Separartor
```

Functions:

```
alias f="cmd -opt"   cmd shortcut
function f() {…}     function definition
f "A" "B"            function call
if f "A" "B";then…   test exit code

function g() {
    local str="${1}"
    if [[ -z "$str" ]]; then
        return 1 # error
    else
        # return by var
        ret="$str"
        # return by stdout
        printf "$str"
        return 0 # OK
    fi
}
printf $(g "First")
if g "Second"; then
    printf "$ret"
fi
```

Unary conditions:

```
if [[ -n "$x" ]]; then
    # string is not empty
    # variable is not unset
fi

-z  string is empty
```

Loops:

```
for x in "$X"; do
    # iterate over split X
done

for ((i=0; i<10; i++)); do
    # numeric counter i
done

i=0
while [[ "$i" -ne 10 ]]; do
    i=$((i+1)) # same
done
```

Useful commands:

```
date -I     sortable date
mktemp      temp file
mktemp -d   temp dir
```

File conditions:

```
if [[ -w "$fname" ]]; then
    # file is writable
fi

-r  is readable
-f  is a file
-d  is a directory
-x  is executable
```

Read file line by line:

```
while IFS='' read -r line || [[ -n "$line" ]]; do
    printf "$line\n"
done<"$filename"
```

Environment

Environment variables:

```
printenv    show current config
export      configure an env. variable

PATH        where the shell finds commands
HOME        path to user's directory
PWD         current working directory
LOGNAME     current user name
SHELL       current shell
LANG        current language
HISTIGNORE  command not saved in history
EDITOR      default text editor

export PATH="$PATH:/my/path"
    add a directory to the default path
```

~/.bashrc

```
. ~/.bashrc reload config
alias       shortcuts
function    complex cmd
PATH        exported env. var.
PYTHONPATH
…
```

Sysadmin

Core sysadmin:

```
sudo          execute as root
chmod         change permissions
chown         change owner
time          measure execution time
curl          download from the web
sha256sum     file fingerprint
ifconfig      ethernet interfaces
iwconfig      wifi interfaces
hostname      current host
df -h         disk free
free -m       free memory
du -h -d <n>  disk usage
```

Archives:

```
zip -r f.zip *
unzip -d f f.zip
tar cfz f.tgz *
tar xfz f.tgz
  … j f.tar.bz2
  … J f.tar.xz

dtrx
```

chmod/chown:

```
                       user
chmod [ugoa][+-][rwx]  group  read
chmod -R               other  write
                       all    execute

chown user[:group]
chown -R                      recursive
```

Remote

SSH:

```
ssh [<user>@]<host>[:/<path>] [cmd]
ssh -X  allows graphical apps
ssh -L  setup a tunnel
scp -r  copy across network
ssh-keygen   generate keys
ssh-copy-id  copy public key on host
```

~/.ssh/config:

```
Host brocante
    Hostname la.brocante.fr
    User louis
    IdentityFile ~/.ssh/id_louis

Host derriere
    Hostname vieille.local
    ProxyJump brocante
```

Interface

Python scripts as pipes:

```
def write(something, stream=sys.stdout):
  try:
    stream.write(something)
    stream.flush()
  except IOError:
    try:
      stream.close()
    except IOError:
      pass

def pipe(in, out, callable, *args):
  while True:
    try:
      item = in.readline()
    except UnicodeDecodeError:
      continue
    except KeyboardInterrupt:
      break
    if not item:
      break
    write( callable(item, *args), out )
```

Useful config in ~/.bashrc:

```
alias ..="cd .."" # go one dir up
alias ll="ls -al"  # list all
alias lk="ls -lSr" # list by size
function md() {    # create directory,
  mkdir $1         # then move in
  cd $1 }
# use up/down to search history
# (instead of Ctrl-R)
if [[ $- == *i* ]]; then
  bind '"\e[A": history-search-backward'
  bind '"\e[B": history-search-forward'
fi
alias upgrade="sudo apt update &&
  sudo apt dist-upgrade -y &&
  sudo apt --purge autoremove -y &&
  sudo apt autoclean -y"
export PATH="$PATH:$HOME/.local/bin/"
```

Additional tools:

```
liquidprompt     smart prompt
exa              better "ls"
rsync            better "scp"
colout           add colors to text streams
autojump         smart "cd"
bash-completion  for common commands
```