07-131 Great Practical Ideas in Computer Science

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https://www.cs.cmu.edu/~07131

Dog tax

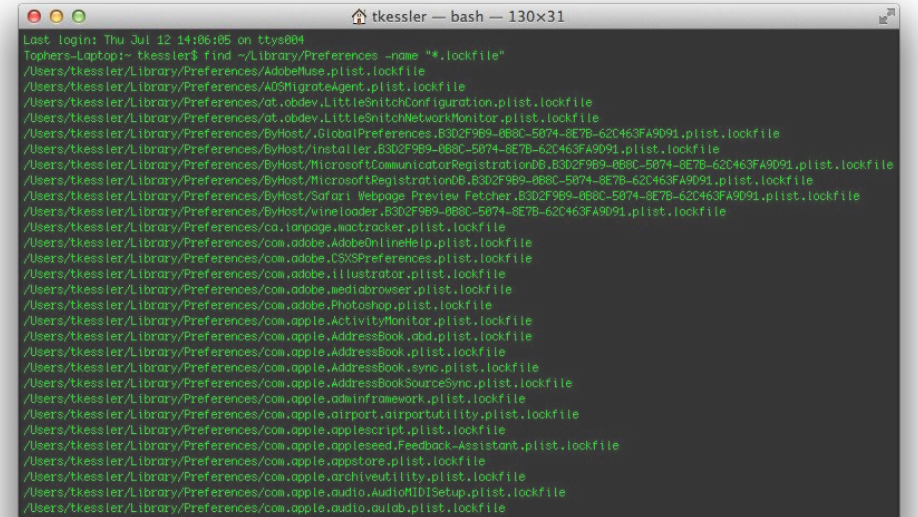
Terminal 101

What is a terminal?

Used to be a solid hunk of hardware

Program that captures input, and displays output from commands

It’s a text input/output environment



What is a shell?

A terminal interacts directly with the **shell**.

A shell is an interface that executes **custom commands** which directly affect the computer. (file/process management, processing, monitoring)

Most computers use **bash.**

Different Shells

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1) **Bourne-again (bash):** popular & default
2) **Bourne Shell (sh):** first UNIX shell
3) **C Shell (csh):** with C-like features
4) **Korn Shell (ksh)**
5) **Z Shell (zsh):** a modern shell

What are commands?

You can start programs, move files around, and a lot more with the shell using **commands.**

A typical command structure:

```
Command_name <flags/options> <arguments>
```

Demo

---

1. Just command name **cal**
    a. **Enter to run the command**
2. With options **cal -h**
3. With options **cal -3**
4. With arguments **cal 1997**

For Info

man cal

deeptea@Venkat-Dell-XPS: ~

```
CAL(1)                    BSD General Commands Manual                    CAL(1)

NAME
     cal, ncal — displays a calendar and the date of Easter

SYNOPSIS
     cal [-31jy] [-A number] [-B number] [-d yyyy-mm] [[month] year]
     cal [-31j] [-A number] [-B number] [-d yyyy-mm] -m month [year]
     ncal [-C] [-31jy] [-A number] [-B number] [-d yyyy-mm] [[month] year]
     ncal [-C] [-31j] [-A number] [-B number] [-d yyyy-mm] -m month [year]
     ncal [-31bhjJpwySM] [-A number] [-B number] [-H yyyy-mm-dd] [-d yyyy-mm] [-s country_code] [[month] year]
     ncal [-31bhJeoSM] [-A number] [-B number] [-d yyyy-mm] [year]

DESCRIPTION
     The cal utility displays a simple calendar in traditional format and ncal offers an alternative layout, more
     options and the date of Easter.  The new format is a little cramped but it makes a year fit on a 25x80 terminal.
     If arguments are not specified, the current month is displayed.

     The options are as follows:

     -h      Turns off highlighting of today.

     -J      Display Julian Calendar, if combined with the -o option, display date of Orthodox Easter according to
             the Julian Calendar.

     -e      Display date of Easter (for western churches).

     -j      Display Julian days (days one-based, numbered from January 1).

     -m month
             Display the specified month.  If month is specified as a decimal number, appending ‘f’ or ‘p’ displays
             the same month of the following or previous year respectively.

     -o      Display date of Orthodox Easter (Greek and Russian Orthodox Churches).

     -p      Print the country codes and switching days from Julian to Gregorian Calendar as they are assumed by
             ncal.  The country code as determined from the local environment is marked with an asterisk.

     -s country_code
             Assume the switch from Julian to Gregorian Calendar at the date associated with the country_code.  If
             not specified, ncal tries to guess the switch date from the local environment or falls back to September
             2, 1752.  This was when Great Britain and her colonies switched to the Gregorian Calendar.

     -w      Print the number of the week below each week column.

     -y      Display a calendar for the specified year. This option is implied when a year but no month are specified
             on the command line.

     -3      Display the previous, current and next month surrounding today.
Manual page cal(1) line 1/111 50% (press h for help or q to quit)
```

Command structure

Flags / Options

Man (manual) pages:

- Documentation of commands
- Sections: Name, Synopsis, Description, Options, Exit Status, Return Values, Errors, Files, Versions, Examples, Authors and See Also.
- Most commands have a --help or -h option
- Save time Googling!

SSH'ing into the Andrew Machines

This is also covered in the initial setup directions:
http://www.cs.cmu.edu/~07131/f21/initial-setup/

```
~ $ ssh andrew
```

```
~ $ ssh ashekar1@unix.andrew.cmu.edu
```

Enter password when prompted. Same password you use to log into SIO, Gmail, etc.

Wait, what is SSH?

SSH stands for “Secure SHell”. It’s a fancy way to get a shell on a computer over the internet.

When you use SSH, you are running commands on a computer that is not your laptop.

Remotely Transfer Files (SCP)

SCP (for “secure copy”) is a program for copying files from one machine to another.

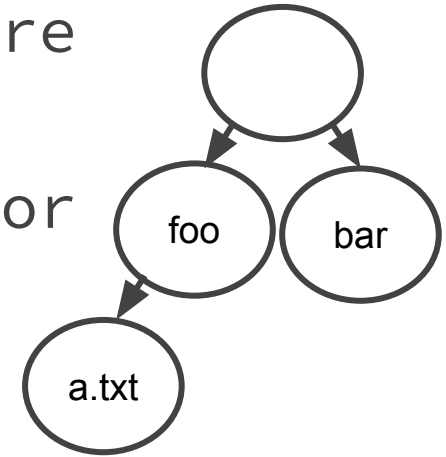
It uses the same authentication and provides the same security as ssh. scp will ask for passwords if they are needed for authentication.

scp [-r] <source> <destination>

Ex: scp school/slides.pdf andrew:~/private/myfile.txt

The Filesystem

The filesystem is a **tree**, where all **files** are leaves, and **folders** may be either leaves or not.



Interacting with Files and Directories

---

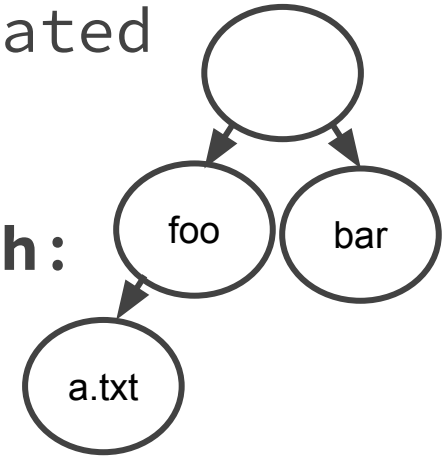
	file	directory	
create/make	touch	mkdir	<target>
copy	cp	cp -r	<src> <dst>
rename/move	mv	mv	<src> <dst>
delete/remove	rm	rm -r	<target>

The Filesystem

In Unix, file paths are separated with the **forward slash**, “/”.

So a.txt has the **absolute path**:

/foo/a.txt

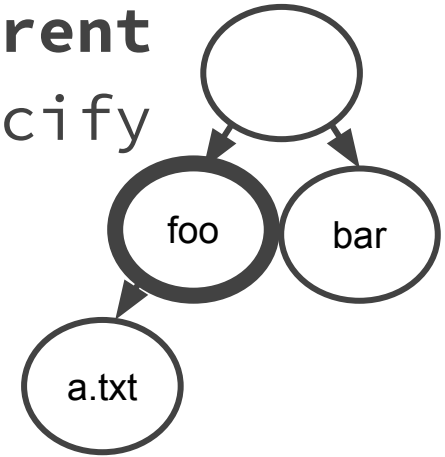


The Filesystem

In Unix, we also have the **current working directory**. We can specify **relative paths** around this.

If the CWD is /foo, a.txt is at:

./a.txt

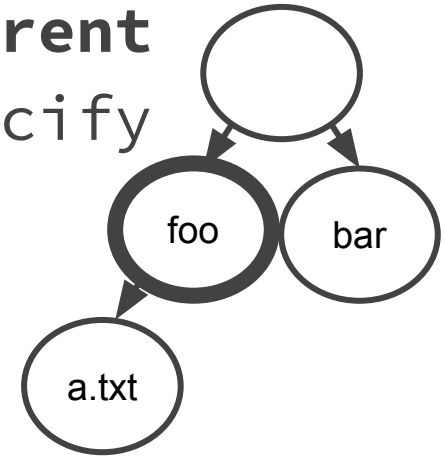


The Filesystem

In Unix, we also have the **current working directory**. We can specify **relative paths** around this.

If the CWD is /foo, bar is at:

../bar

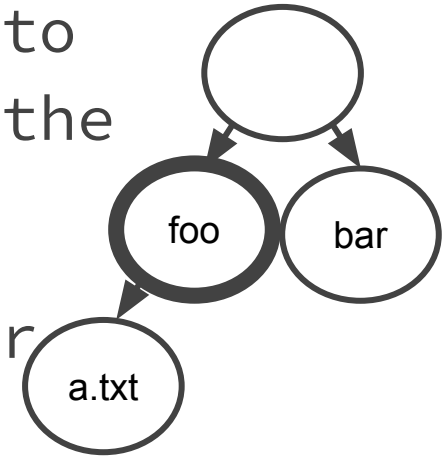


The Filesystem

For relative paths, . refers to the CWD, and .. means “go to the parent”.

As a shortcut, .. is short for ./..

~ is a shortcut for your home directory



Seeing where you are in the Filesystem

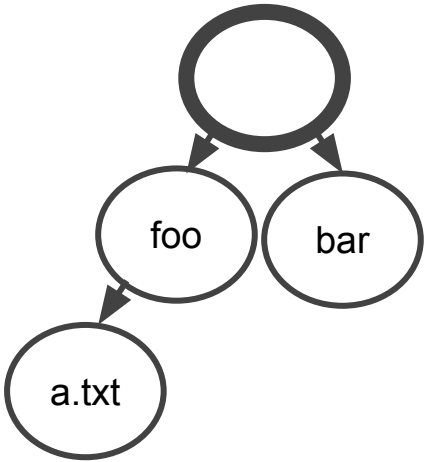
```
---

/ $ ls

foo  bar

/ $ tree

.
├── bar
└── foo
    └── a.txt
```



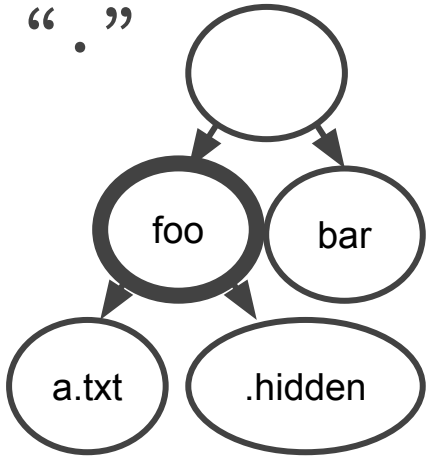
Hidden Files

In Unix, files beginning with “.” are considered “hidden”, and don’t show up by default.

Use the -a flag to ls to see hidden files:

```
/foo $ ls -a

a.txt   .hidden
```



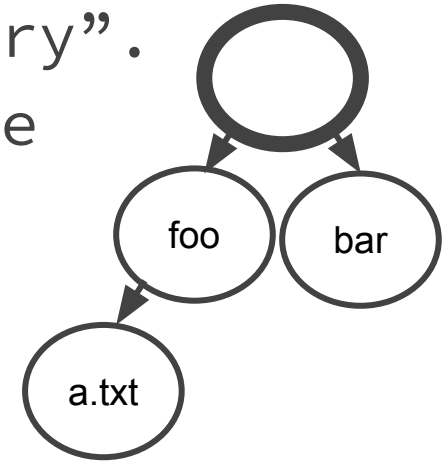
Ex: pagefile.sys,appdata on Windows OS-related files that you’re not supposed to change, access, or move around; temporary files

Moving around in the Filesystem

---

cd stands for “change directory”. Give it a relative or absolute path to change where you are.

/ $ cd ./bar

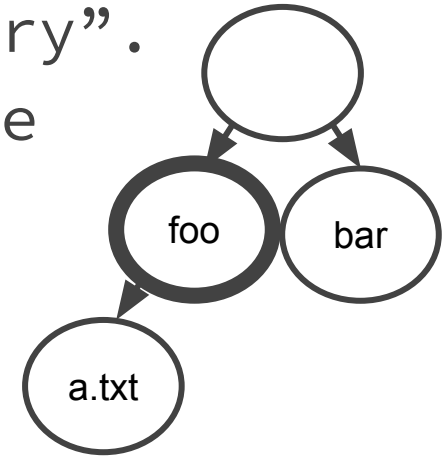


Moving around in the Filesystem

---

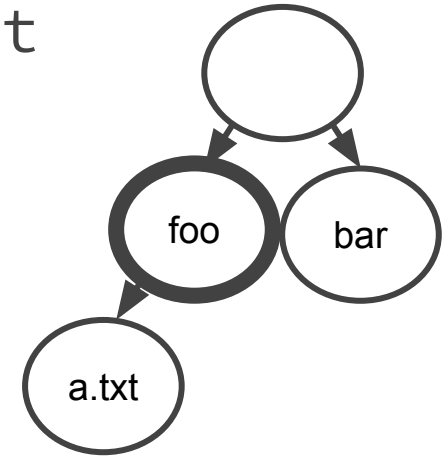
cd stands for “change directory”.
Give it a relative or absolute
path to change where you are.

/bar $



Example: Copying a file

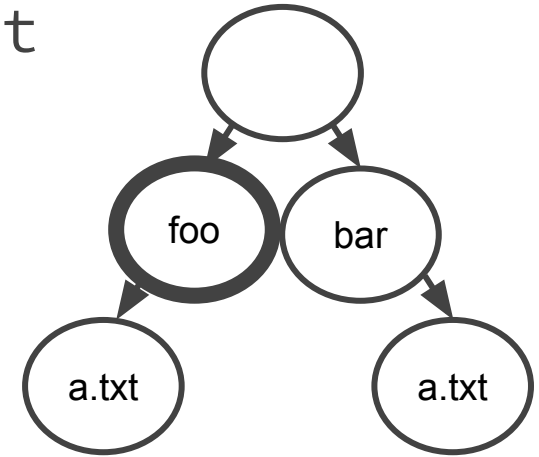
```
/foo $ cp ./a.txt ../bar/a.txt
```



Example: Copying a file

```
/foo $ cp ./a.txt ../bar/a.txt

‘./a.txt’ -> ‘../bar/a.txt’
```



SCP versus CP

Scp (secure copy) is for transferring files between machines.

Cp is good for transferring files between directories on your laptop/a local machine.

IMPORTANT!!!

Unix is like a honey badger, **it don’t care** if you make a mistake.

There is no undo.

Please “rm -r” responsibly.

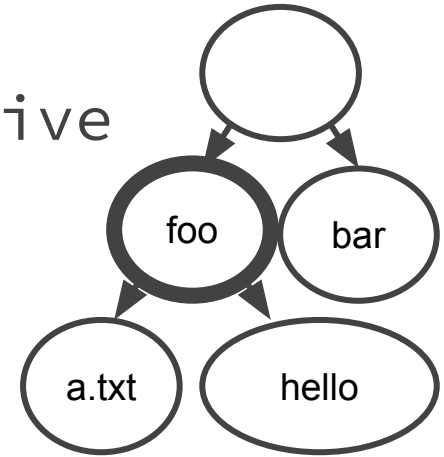
Executing programs

You can run programs by just using their absolute or relative path.

```
/foo $ ./hello

hello world!
```

NOTE: The ./ is required.

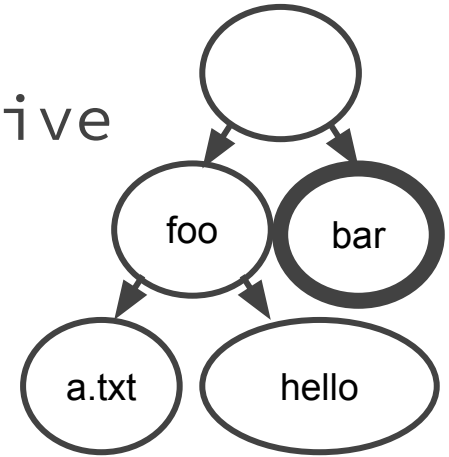


Executing programs

You can run programs by just using their absolute or relative path.

```
/bar $ ../foo/hello

hello world!
```



Why use a text-based terminal instead of a GUI?

Lots of reasons:

More efficient!

Moving batch stuff around!

Street cred!

Only way to do 15-122,15-150,...

AFS (Andrew File System)

A distributed file system that was invented at CMU. You have a quota of space and a home directory where you can put your files. Can access these files from any Andrew Unix server or cluster computer on campus.

AFS Quota - Can use fs lq (or fs listquota) to see how much of your allotted AFS space you’re using.

You have a private directory where you can do your work: ~/private. If you don’t change its permissions, no one will be able to access it besides you.

By default, AFS also has a ~/public directory, where you can put things that you want other people to be able to see. Other users will be able to read files that you put there (and make copies of them), but not change them, delete them, or add their own files.

Recovering Lost Files

AFS has a feature called OldFiles that keeps a backup of your home folder from the previous day.Look for accidentally deleted files in ~/OldFiles and copy them back to where they should be (using the cp command)

If ~/OldFiles is missing, try the following commands:

```
$ cd ~

$ fs mkmount OldFiles user.ANDREW_ID_HERE.backup
```

Now you can look in ~/OldFiles to find your backed up files.

NOT A GUARANTEED METHOD. DO NOT rm / rm -r recklessly!
OldFiles only backs up your files once a day. It's also a feature of Andrew Unix systems and most machines do not have such a system.

Recap

The shell is cool, don’t be scared

It’s a way to interact with the underlying system

How to Access Labs

Labs starter files are distributed through a git repository. Steps to get started:

1. **Use ssh to log into Andrew.**

$ ssh andrew, or ssh ANDREWID@unix.andrew.cmu.edu

2. **Clone the GPI repo:**

$ git clone https://github.com/cmugpi/gpi-labs.git ~/private/gpi-labs

3. **Use cd to change into your GPI directory:**

$ cd ~/private/gpi-labs

How to Submit

After finishing, scp the lab back to your computer to submit it on Autolab:

For those not using Windows:

```
$ scp ANDREWID@unix.andrew.cmu.edu:~/path/to/handin.zip ~/Downloads/
```

Or, if you set up the SSH shortcut in the Initial Setup:

```
$ scp andrew:~/path/to/handin.zip ~/Downloads/
```

For Windows:

```
$ scp ANDREWID@unix.andrew.cmu.edu:~/path/to/handin.zip
/mnt/c/Users/USERNAME/Downloads/
```

Common Questions from Last Year

– – –

- Make sure you capture pokemon with your pokeball….not yourself. Pokeballs don't work on humans
- Be careful! If you mv <src> <dst> and if <dst> is not a directory, it will rename the file.
- What can do to make pidgey unhidden? What makes a file hidden? Maybe try renaming?
- When you finish the lab, make sure to run the scp command from your local computer, not Andrew. You can exit the Andrew machine by typing the command 'exit' or pressing ctrl-d
- When you run the `make` command, make sure you current working directory is trainerlab, not gates-hillman-center
- If you're using Ubuntu for Windows the Downloads folder on your local drive is /mnt/c/Users/<username>/Downloads
    - You would have to cp it again so that it is accessible

Extratation on Summer Opportunities!

Where: GHC 4211

When: Saturday (9/11) from 1-2 pm

We'll share info on ways you can spend your summer like research, classes, internships, individual projects, vacationing, etc. as well as other related tips.

Feedback

Please give feedback:

tinyurl.com/f21-gpi-feedback