

# 08 – Your shell and working remotely

CS 2043: Unix Tools and Scripting, Spring 2019 [1]

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February 8, 2019

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As always: Everybody! ssh to wash.cs.cornell.edu

- Quiz time! Everybody! run **quiz-02-08-19**
- You can just explain a concept from last class, doesn't have to be a command this time.

## More on shell customization

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# Aliases

## Creating Aliases

`alias <new-name> <old-name>`

- Aliases `new-name` to be `old-name`, e.g. `alias ..='cd ..'`
  - Can now type `..` to go up one directory.
- Should not ever be used in scripts.
  - Disabled by default, battle to use them — **very** bad practice.
  - I don't have your aliases, so now I can't run your script.
- Usually stored in `~/.<shell>rc` file, though `~/.<shell>_aliases` is slowly gaining traction.
  - Make sure you `source ~/.<shell>_aliases` from `~/.<shell>rc` or else they won't be available!!!
  - E.g. `bash: ~/.bashrc` sources `~/.bash_aliases`, or
  - `zsh: ~/.zshrc` sources `~/.zsh_aliases`

# Modifying your Terminal Prompt

- The **\$PS1** variable controls what shows up when you type in your terminal.
  - In **zsh** this is **\$PROMPT**.
- List of all options [here](#).
- Common: **export PS1="\u@\h:\w> "**
  - **usr@hostname:current/working/directory>**
- Try changing your **\$PS1** using **export** right now to see how you can modify it.
- Play with colors after, since they are tedious to type in the format needed.

## Storing Customizations

- There are many such places that people put things, but generally speaking...
- Your **bashrc** should have things like aliases and functions. Limit the **export** calls to just things related to coloring the terminal.
- Your **bash\_profile** should contain any special environment variables you need to define.
  - Typically when you are exporting things like **\$PATH** or **\$LD\_LIBRARY\_PATH** for something you have installed on your own.
- You should source your **bash\_profile** from your **profile**, and you should source your **bashrc** from your **bash\_profile**.

# Working Remotely

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## Some Terminology

- The server you are logging into is called the **remote** (host).
- The user (you) are referred to as the **client**.
- If you obtain access to a *cluster* (many individual nodes presented together), you may encounter terms such as:
  - The **head** node (sometimes called **master**).
  - The **worker** nodes (sometimes called the **slaves**).
    - While **master** and **slave** are common terms, we prefer (and encourage adoption of) the terms **head** and **worker**.
  - You often are only allowed to log into the **head** node directly.
  - There is usually a queueing system (e.g., **qsub**) that submits **jobs** that get farmed out to the **workers**.
  - In most scenarios, you get charged by the number of cores / resources being used.

## ssh Examples

- On `ugclinux` (CS Undergraduate servers) I am `mpm288`:
  - v1: `ssh mpm288@ugclinux.cs.cornell.edu`
  - v2: `ssh -l mpm288 ugclinux.cs.cornell.edu`
- Sweet! `ugclinux` has Matlab, can I use it?

```
$ /usr/local/MATLAB/R2012a/bin/matlab
Warning: No display specified. You will not be able to
display graphics on the screen.
>> exit()
# exit() left Matlab
$ exit # close the ssh connection
```

- Now do: `ssh -X mpm288@ugclinux.cs.cornell.edu`

```
$ /usr/local/MATLAB/R2012a/bin/matlab
# Matlab displays on my screen now!
```

## CS Servers: More Information

- More info:

<https://it.cornell.edu/coecis/linux-ugc-lab-computing-and-information-science-cis>

### Important Excerpt from Above Article

Students should copy or delete their files in home directories at the end of each academic year. Home directories for students not currently enrolled in a CS course will be purged to reclaim server storage space. If you need assistance copying files off the server, please submit a Help Desk ticket.

# Transferring Files

## Secure Copy

`scp [flags] <from> <to>`

- It's exactly like `cp`, only you are transferring over the web.
- Can transfer *from* the **client** to the **remote** host.
- Can transfer *from* the **remote** host to the **client**.
- Copy directories just like before using the `-r` flag.
- Must specify the **user** on the **remote** host.
- **Remote** syntax (for `<from>` component):  
`user@host.name:/path/to/file/or/folder`
  - You need the `:` to start the **path**.
- If you don't have permission...you can't get it!
- More modern systems may even let you **TAB** complete across the **remote** directories :)

## scp Examples

- Transfer from **remote** to local computer:

```
$ scp mpm288@blargh.ru:/home/mpm288/colorize.sh ~/Desktop/  
colorize.sh                                100% 3299      3.2KB/s   00:00
```

- Transfer from **remote** to local computer (using ~ is only difference):

```
$ scp mpm288@blargh.ru:~/colorize.sh /usr/share/  
colorize.sh                                100% 3299      3.2KB/s   00:00
```

- Transfer from the **client** to the **remote** (just reverse it):

```
$ scp /usr/share/colorize.sh mpm288@blargh.ru:~/Desktop/  
colorize.sh                                100% 3299      3.2KB/s   00:00
```

- As with regular **cp**, can give a new name at same time:

```
$ scp /usr/share/colorize.sh mpm288@blargh.ru:~/new_name.sh  
colorize.sh                                100% 3299      3.2KB/s   00:00
```

More Git stuffs!

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## Staging and you

- Go to a git repo, create **file**
- run **git status**

```
$ git status
```

```
On branch master
```

```
No commits yet
```

```
Untracked files:
```

```
(use "git add <file>..." to include...
```

```
file
```

```
nothing added to commit but untracked files present
```

# Tracked and untracked

- files are *tracked* when they have been committed to the repo at some point
- files are *untracked* when they have *never* been committed to the repo
- files are *staged* when they are *about* to be committed to the repo

```
$ git add file
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    new file:   file
```



## staging files

```
$ git commit -m 'new file'
[master (root-commit) b68fe41] new file
 1 file changed, 1 insertion(+)
 create mode 100644 file
$ echo more text >> file
$ git status
On branch master
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes ...)

        modified:   file

no changes added to commit (use "git add"/"git commit -a")
```

## staging files

- Files you edit are *not automatically* staged
  - `git commit -m` won't include them
- `git commit -a -m` says "stage everything, then commit"
- `git add <file>` says "stage this one file"
  - can `git add` everything, then `git commit -m` when done

## Working remotely with git

- you and your partner want to collaborate *with* wash
  - Easy! **clone** your partner's repo, then **pull** updates from each other!
- you and your partner want to collaborate *without* wash
  - Problem: where do you **pull** from?
- solution 1: SSH URLs!
  - can **pull** from **username@machine:path**
  - only works if you can reach the machine
- problem! I have a laptop! It's behind a firewall.
  - there's no stable URL or IP address to pull from...

# Bare git repos and the glory of github

- Solution: find *one* machine with a URL
  - put a **bare** repository on there
  - have everyone synchronize via that repository with **git push**

Send repo contents to bare remote

```
git push <url>
```

- A **bare** repository acts as a *mirror*
  - **push** leaves some data there,
  - **pull** finds the data later.
- **git init --bare** to create

## An example: working remotely via wash

- initialize a bare repository on wash...

```
$ git init --bare ~/course/cs2043/repo  
Initialized empty Git repository in repo/
```

- and clone this repository to your local computer

```
$ git clone milano@wash.cs.cornell.edu:course/cs2043/repo/  
Cloning into repo...  
warning: You appear to have cloned an empty repository.  
done.  
$ touch file && git add file && git commit -m 'msg' file  
$ git push
```

# Terminal Multiplexing

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# What is Multiplexing?

- Complex combinatorial logic meant to be studied with rigor and painful effort.
  - But not in this class!
- Terminal multiplexing is just the ability to:
  - Split your terminal into multiple *panes*.
  - Be able to *detach* and re-*attach* to a **shell** without having to close it.
  - A whole lot more, but we will focus on these.
- You can leave your multiplexed terminal running on the **remote**, and connect to it from any **client** you want, whenever you want.
- Extremely convenient if you want to be able to work effectively with **ssh**.
- Available on **ugclinux**!

# Suggested Multiplexer: **tmux**

## Terminal Multiplexer

**tmux** [options]

- **tmux** (with no options) starts a new multiplexed instance.
- Can split into *panes* horizontally and vertically.
- Can **tmux detach** (put in “background”, it’s still running).
- Can **tmux attach** to bring to “foreground” again.
- Can open new windows, sessions, panes, and more.
  - Use **tmux list-\*** commands for active info:
    - **list-buffers**, **list-clients**, **list-commands**,  
**list-keys**, **list-panes**, **list-sessions**,  
**list-windows**.
- Use **ctrl+D** to close current *in-focus* pane / window.
  - If you close the last pane of a session, that session ends.



## Brief Notes on Multiplexing with **tmux**

- Learn the hotkeys: <http://tmuxcheatsheet.com/>
- After you **ssh** in, just **tmux attach** to open top-level session.
  - Not sure which session? **tmux ls**, then  
**tmux attach -t <num>**
- Where is my mouse?!!!
  - Use **shift+click** to highlight with your mouse.
  - May want to bring the current *pane* to full-screen temporarily with **<cmd-seq>+Z**.
    - **<cmd-seq>** is **ctrl+B** by default, but can change it.
    - Un-fullscreen with another **<cmd-seq>+Z**.

## Further **tmux** Customization

- Configurations go in a “dotfile”: `~/.tmux.conf`
- Save your layouts with **teamocil**!
  - `gem install teamocil`
  - See <http://www.teamocil.com/> for more information.
- First run **tmux**, then launch **teamocil** `<name>`

## References

- [1] Stephen McDowell, Bruno Abrahao, Hussam Abu-Libdeh, Nicolas Savva, David Slater, and others over the years. “Previous Cornell CS 2043 Course Slides”.