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Shell Scripting Basics

What is a shell?

- A user interface to the operating system’s services - file system, process management, system configurations, etc.

- Called a shell because it is the outer layer of the os kernel and the shell normally runs in user space like other applications, not in kernel space.

- Shells are another example of a REPL - Read Evaluate Print Loop
- Most shells are CLIs - Command Line Interfaces (text based).
- Shells can operate on remote machines via ssh and other protocols as well as operate on the local machine.

What is Bash?

- Bash stands for the Bourne Again Shell (there was a predecessor to Bash called the Bourne Shell)

- There are other shells out there you can use as well but bash comes installed as the default shell on most non-Windows systems.

- Windows uses the DOS or command line window as its shell. But Windows 10 does come with a new bash subsystem - highly recommend installing

- I like to use a shell called zsh or the “z shell” on my mac. Zsh has various features that make using the command line easier and more fun.

Some basic shell commands

- pwd - present working directory => where am I?
- ls - list directory contents => what is here?
- cd - change directory => go someplace else
- cp - copy => copy files/folders around
- mv - move => move files/folders around
- mkdir - make a new directory
- touch - create a new file
- rm - delete a file (But be very careful when using rm -rf)
- rmdir - delete a directory
- A single dot (.) refers to the current directory
- Double dots (..) refer to the parent directory

What is a shell script?

- A shell script is a file containing shell commands that can be run as a batch process (all at once) from the command line or called from other programs.

- A shell script is like a programming language because there is support for things like conditionals, loop, arrays, etc.

- Using a shell script is like automating your command line because instead of typing in the commands yourself one at a time, you can run the script and that makes you more efficient at completing tasks.

- You can even call perl and python scripts and run them from a shell script

Why would we use shell scripts?

- Automate repetitive tasks - Ex: renaming lots of files at once
- Batch processing - Ex: backing up a database every 24 hours
- Compile and deploy your code! - think makefiles
- Combine commands in unique ways to solve a specific problem
- Generalize a solution to work with various data sets
- To increase productivity - put the machine to work instead of you!

How to shell script

- Shell scripts are simply text files that contain a series of commands, just like all the other code you have written so far in this class.

- We use the .sh file name extension as simply a convenience to us so we know what kind of code the file contains. The OS does not care about the .sh

- We also include a sh-bang in the first line of the file, similar to how we did for our perl and python scripts. The bash sh-bang is simply #!/bin/bash

- Any command line can be run in the script file as well - i.e. echo “hello world”

File Permissions

- Unix/Linux/MacOS use the idea of file permissions. This is for security.
- In order to make your script file executable you have to change its permissions using the chmod program. 4 = read, 2 = write, 1 = execute
- For example: $ chmod 755 my_script.sh will make our script file executable
- Then to run the script: $ ./my_script.sh
- https://linuxacademy.com/howtoguides/posts/show/topic/12593-understanding-linux-permissions

Additional Resources

- Unix Shells - https://en.wikipedia.org/wiki/Unix_shell
- Shell comparison matrix - https://en.wikipedia.org/wiki/Comparison_of_command_shells
- Installing the Linux subsystem on Windows 10 - https://www.techrepublic.com/article/how-to-install-linux-bash-on-windows-10/
- More info on the Linux subsystem on Windows 10 - https://msdn.microsoft.com/en-us/commandline/wsl/about
- Basic bash scripting video tutorial - https://www.youtube.com/watch?v=hwrnmQumtPw
- Text tutorial to accompany the video - http://www.newthinktank.com/2016/06/shell-scripting-tutorial/