Today

• More on Shell Scripting

Login Open your favorite text editor Open a terminal

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Review

- What is Unix?
 - > What are its goals?
- What is a shell?
- What are some of your favorite commands?
- What is the difference between an absolute path and a relative path?

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Our Heroes: UNIX Developers



Ken Thompson

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Dennis Ritchie

Review: Why Unix?

- Open source = easier to study
 - Windows is proprietary & closed
 - OSX is proprietary and is built on top of Unix
- Historic: developed in the 60s & 70s
 - > One of the oldest OS's in use today
- Most serious programmers & hackers know their way around Unix/Linux
- Linux is a Unix-like OS

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Review: Unix Philosophy

- Make each program do one thing well
 - More complex functionality by combining programs
 - ➤ Make every program a filter
 - > More efficient
 - Better for reuse
- Portability
- No GUIs

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Only error feedback

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Quotes

- "Unix is simple. It just takes a genius to understand its simplicity." – Dennis Ritchie
- "UNIX was not designed to stop its users from doing stupid things, as that would also stop them from doing clever things." – Doug Gwyn
- "Unix never says 'please'." Rob Pike
- "Unix is user-friendly. It just isn't promiscuous about which users it's friendly with." – Steven King
- "Those who don't understand UNIX are condemned to reinvent it, poorly." – Henry Spencer

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Review: What is a Shell?

- User interface to the operating system
- Command-line interpreter
- Functionality:
 - > Execute other programs
 - Manage files
 - Manage processes
- A program like any other
- Basic form of shell:
 while <read command>:
 parse command
 execute command



hides details of underlying operating system

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Directory Management

- How do you know what directory you're in?
- How do you make a new directory?
- How do you delete an empty directory?

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Directory Management

- How do you know what directory you're in?
- How do you make a new directory?
 - > mkdir
- How do you delete an empty directory?
 - > rmdir

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File Management Review

- How do you copy a file?
 - A directory and its contents?
- How do you move/rename a file?
- What is the short cut for the current directory?
- How do you delete a file?
- How do you delete a whole directory?

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File Management Review

- How do you copy a file?
 - ▶ cp
 - A directory and its contents?
 - cp -r
- How do you move/rename a file?
- What is the short cut for the current directory?
- How do you delete a file?
 - rm
- How do you delete a whole directory?
 - > rm -r

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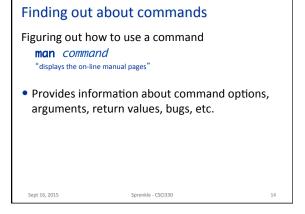
Some useful file commands

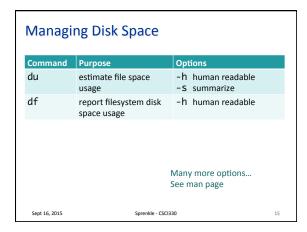
- grep pattern [file]
 - > select lines in the input that match pattern
- head -n [file]
 - > show the first *n* lines of the input
- **tail** –*n* [file]
 - > show the last *n* lines of the input
- cp file₁ file₂
- copy file₁ to file₂
- mv file₁ file₂
 - move file₁ to file₂

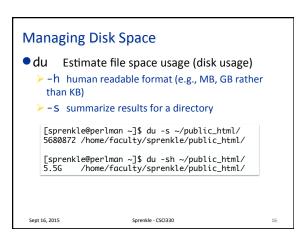
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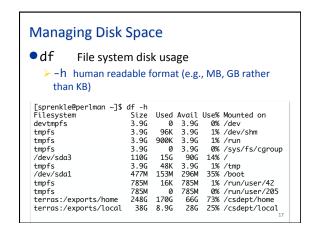
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Other File-Related Commands Purpose file Determine file type basename Strip directory and suffix from file names dirname Strip non-directory suffix from file name WC Print number of newlines, words, and bytes in -1: lines -m : chars -W: words Sept 16, 2015 Sprenkle - CSCI330 13











Useful Shortcuts

- Up arrow
- !command-prefix
 - > ! = bang
 - Repeat most recent command that begins with prefix

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Useful Shortcuts: {}

- Examples:
 - ▶mv file{,.bak}
 - Expands to
 - mv file file.bak
 - > tar cfz myDir{.tar.gz,}
 - Expands to

tar cfz myDir.tar.gz myDir

- > cp index.{html,php}
 - Expands to
 - cp index.html index.php

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ENVIRONMENT

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The PATH environment variable

- Colon-separated list of directories
- Non-absolute pathnames of executables are only executed if found in the list
 - Searched left to right
- Example:

\$ example.sh

-bash: example.sh not found \$ PATH=\$PATH:.

\$ example.sh

hello!

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Shell Variables

- Shells have several mechanisms for creating variables. A variable is a name representing a string value. Example: PATH
 - > Shell variables can save time and reduce typing errors
- Allow you to store and manipulate information
 - > Ex: ls \$DIR > \$FILE
- Two types: local and environmental
 - Local are set by the user or by the shell itself
 - Environmental come from the operating system and are passed to children

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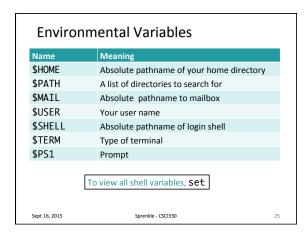
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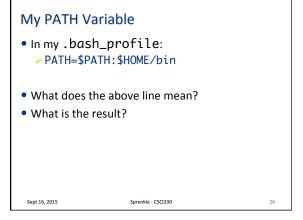
Shell Variables

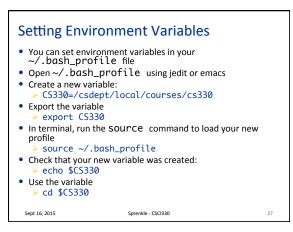
- Syntax varies by shell
 - > varname=value # sh, ksh, bash
 - > set varname = value # csh
- To access the value: **\$varname**
- Turn local variable into environment:
 - > All child processes from this terminal
 - > export varname # sh, ksh, bash
 - > setenv varname value # csh

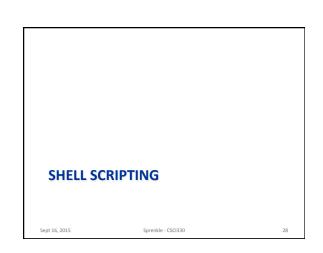
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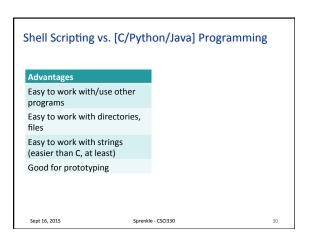








What is a shell script? A shell script is a list of commands to be run by a shell basically a program uses shell commands instead of C or Java statements Why? automate repetitious tasks e.g.: testing a program on a large set of test inputs package up commonly executed command sequences create our own commands



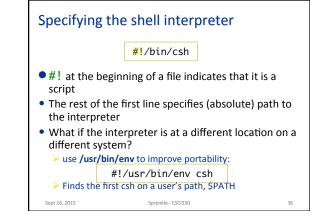
Shell Scripting vs. [C/Python/Java] Programming Advantages Easy to work with/use other programs Easy to work with directories, files and data structures Easy to work with strings (easier than C, at least) Good for prototyping Scripts won't be long In some ways, we'll love it; in some ways, we'll hate it. Sept 16, 2015 Sprenkle - CSCI330 31



Invoking a Script • A script can be invoked as: > sh scr_name [arg ...] Where sh is whatever > sh < scr_name [args ...] shell you want > path/scr_name [arg ...] • Before running it, it must have execute permission: > chmod +x scr_name We'll typically use either the 1st or 3rd execution option and we'll use the bash shell sept 16, 2015 sprenkle - CSC1330 33

Creating and executing a shell script 1. Create a file, say "foo", containing the commands to be executed by the script 2. Execute the script: invoke the appropriate shell with foo as argument, e.g.: bash foo csh foo chmod a+x foo ./foo

Writing Your First Bash Script Bash: Bourne-again shell Unix shell and command language Open your favorite text editor Write a simple bash script: In your favorite UNIX text editor, type echo "Hello World" and save as hello.sh Type bash hello.sh to run



Example Bash Script

 With little background info, tell me what these scripts do

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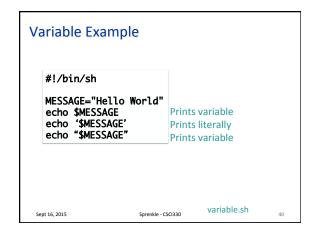
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Comments Comments begin with an # Comments end at the end of the line Comments can begin whenever a token begins Our text editors should help you with syntax highlighting Examples: # This is a comment # and so is this grep foo bar # this is a comment grep foo bar # this is not a comment

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#!/bin/bash echo I am \$USER echo "I live at \$HOME" Both statements would work either with or without quotes

Shell Scripting Practice Problem: Iterate over the files in a given directory (as CL arg): for each file, express its size in human-readable form (i.e., using KB and MB where appropriate) functionality similar to Is −Ih Requirements: Iist files in a directory [valid directory? ⇒ if-then-else] iterate over these files obtain the size of each file & display Do not display the full Is −Ih listing, just the size

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Assignment 0a

- Write a bash script that takes one or more file names on the command line and prints out:
 - > The name of the file
 - ➤ The number of lines & words in the file (NOT characters)
 - A list of all the words in the file and how many times they occur (ideally, the words should all be lower cased)
- Hint: you you will probably need to use/learn about pipe, loops, variables, echo, wc, cat, tr, sort, and uniq.

Due Friday, before class

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