

# Lab 0

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## Objectives

- Intro to Labs
- Intro to Operating Systems
- Why programming languages?
- Start Lab #0
  - UNIX/Linux intro, worksheet
  - Portal account (Blog for "Broader CS Issues")
  - Create Web page
  - Use jEdit (Text Editor), IDLE
  - Use Python interpreter in interactive mode
  - Write Python programs

A lot of different things but doable!

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## Intro to Labs

- Introduce our Student Assistants
- 3 hours to get started on labs
  - Often will need to finish lab after lab period
  - Use this lab (P405), preferably, or P413

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## Operating Systems

- Manage hardware resources
- Three popular operating system variations:

Mac	PC/Windows	UNIX
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  - Compare in terms of cost, popularity, available software, security
- Learn Linux (a UNIX variation) in this class

Note: "PC" for Windows is a misnomer because all of these OSs are for "personal computers".

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## P405 Machines

- Run both Linux and Windows
  - Linux natively
  - Windows virtually
- To switch between OSs use
  - Ctl-Alt-F7 for Linux
  - Ctl-Alt-F9 for Windows
  - (May be backwards sometimes)
- P413 - Linux-only

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## Pause While You Log In

- Follow handout's instructions
- Open browser
- Navigate to Lab 0, from course's "Schedule" page
  - We're starting on the first objective "Learning to Use the Linux Machines" on paper
  - Return to Web page for rest of lab
- How different is the UI than Windows or Mac?

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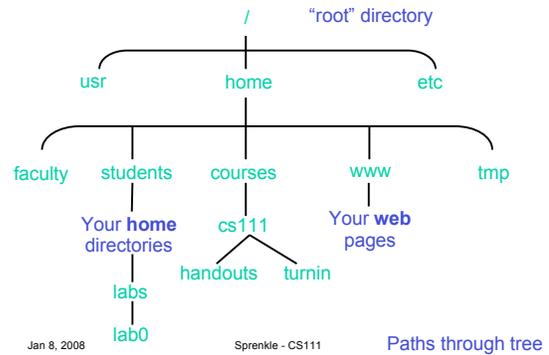
## Intro to UNIX

- Can execute operations by typing commands in terminals or using GUIs
  - We will use terminals most of the time
  - Today: learn essential UNIX commands
- File structure
  - Organize our files
  - Hierarchy of directories ("folders" in Windows world)

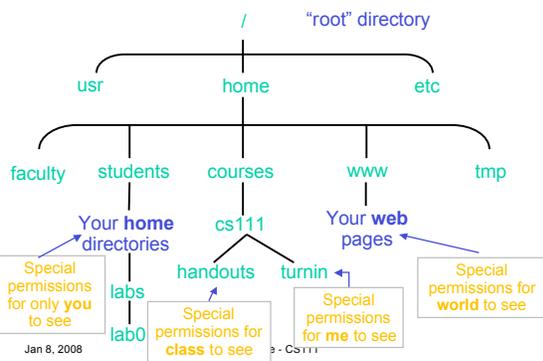
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## (Partial) Linux File Structure



## (Partial) Linux File Structure



## Intro to UNIX: Essential Commands

- Manipulating Files
  - **ls** - list the files, directories in a directory
  - **mkdir** - make a directory
  - **cp** - copy a file/directory
  - **mv** - move a file/directory
  - **rm** - remove (delete) a file/directory
- Navigating Directories
  - **pwd** - "print working directory"
  - **cd** - "change directory"

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## Intro to UNIX: Shortcuts

- **.**
    - Current directory
  - **..**
    - Parent directory
- Often used with **cp**, **mv**, **cd** commands
- 
- ```
graph TD
    root["/"] --> home
    home --> courses
```
- **cd** or **cd ~**
    - Change to your HOME directory

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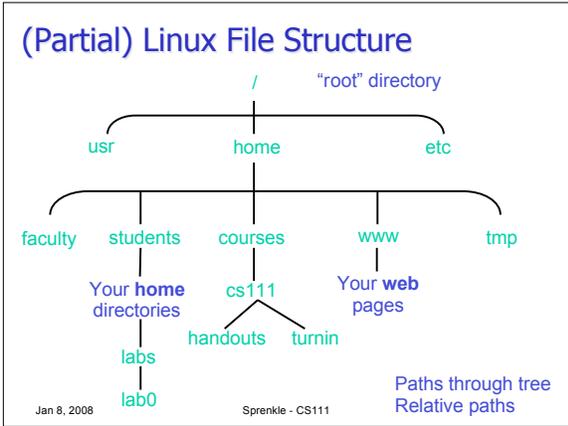
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## Synchronizing ...

- Everyone started Linux worksheet
- Open a new terminal using your shortcut in the top bar

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### Why Do We Need Programming Languages?

- Computers can't understand English
  - Too ambiguous
- Humans can't easily write machine code

Problem Statement (English)

Machine code/Central Processing Unit (CPU)

000000 00001 00010 00110 00000 100000

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### Why Do We Need Programming Languages?

- Computers can't understand English
  - Too ambiguous
- Humans can't easily write machine code

Programmer (YOU!) translates from problem to algorithm (solution) to program

Python interpreter translates into bytecode

Problem Statement (English)

Algorithm/Pseudocode

High-level Programming Language (Python)

Bytecode

Machine code/Central Processing Unit (CPU)

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### Why Do We Need Programming Languages?

- Computers can't understand English
  - Too ambiguous
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Problem Statement (English)

Algorithm/Pseudocode

High-level Programming Language (Python)

Bytecode

Machine code/Central Processing Unit (CPU)

Python interpreter executes the bytecode in a "virtual machine"

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### Python Is ...

- A programming language
- An interpreter (which is a program) that executes Python code

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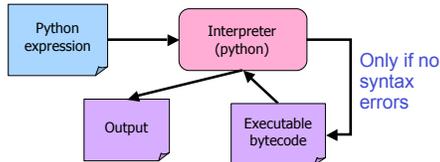
### Python

- A common *interpreted* programming language
  - Runs on many operating systems
- First released by Guido van Rossum in 1991
- Named after *Monty Python's Flying Circus*
- Minimalist syntax, emphasizes readability
- Flexible, fast, useful language
- Used by scientists, engineers, systems programmers

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## Python Interpreter

- Validates Python programming language expression(s)
  - Enforces Python syntax rules
  - Reports syntax errors *Have a lot of these early on!*
- Executes expression(s)



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## Two Modes to Execute Python Code

- Interactive:** using the interpreter
- Batch:** execute *scripts* (i.e., files containing Python code)

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## Interactive Mode

```

    Sara-Sprengle-Computer: ~/Documents/cs111 sarsprengle@ python
    Python 2.4.4 (11: Oct 19 2006, 10:56:39)
    [GCC 4.0.1 (Apple Computer, Inc. build 5341)] on darwin
    Type "help()", "copyright()", "credits()" or "license()" for more information.
    >>> 3+1
    4
    >>> 4+5
    9
    >>> 1-7
    -6
    >>> "word"
    'word'
    >>> word
    Traceback (most recent call last):
      File "<stdin>", line 1, in ?
    NameError: name 'word' is not defined
    >>> print 4+5
    9
    >>>
    
```

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## Your Turn...

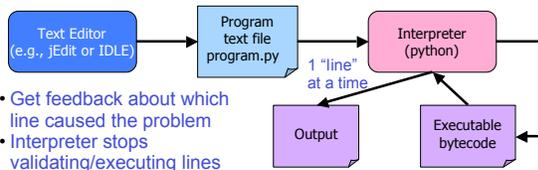
- Run the Python interpreter
- Enter the following expressions and see what Python displays:
  - > 3
  - > 4 \* -2
  - > -1+5
  - > 2 +
  - > print "Hello!"
- To quit the shell, use Control-D

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## Batch Mode

- Programmer types a **program/script** into a **text editor** (jEdit or IDLE).
- An **interpreter** turns each expression into **bytecode** and then executes each expression



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## Example Python Script

- What does this program do?

Text file named: `hello.py`

```

# Program that prints out "Hello, world!"
# by Sara Sprengle
# Last modified: 01/08/2008

print "Hello, world!"
    
```

Print statement

- Validate your guess by executing the program
  - Go into labs/lab0 directory
  - `python hello.py`

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## Example Python Script

```
# Program that prints out "Hello, world!"
# by Sara Sprenkle
# Last modified: 01/08/2008

print "Hello, world!"
```

} Documentation  
-- good style

- Only "Hello, world!" is printed out
- Python ignores everything after the "#"
  - Known as "comments" or, collectively, as **documentation**
- Your program should always start with a high-level description of what the program does, your name, and the date the program was written

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## Practice in Interactive, Batch Modes

- Open the IDLE development environment
  - Command: **idle &**
  - **&** Runs command in "background" so you can continue to use the terminal
  - Given that our programming language is named after Monty Python, any ideas what the development environment is named after?

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## Lab 0 Checklist

- Linux Worksheet
- Portal access
- Web Page
- Python practice, programs
- Print lab

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