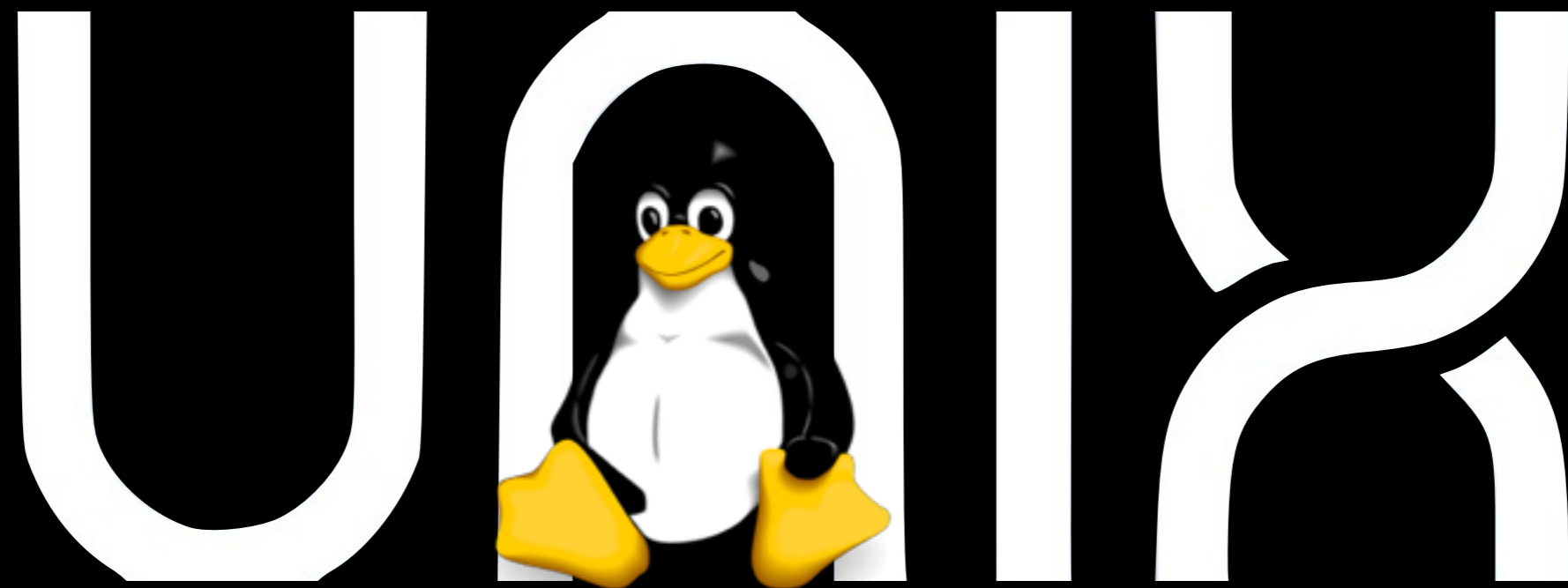


# Introduction To



**Barry Grant**

bjgrant@umich.edu

<http://thegrantlab.org>

# Introduction to Biocomputing

<http://bioboot.github.io/web-2015/>

Monday	<b>Introduction to UNIX*</b>
Tuesday	<b>Introduction to Programming</b>
Wednesday	<b>Data Formats &amp; Visualization</b>
Thursday	<b>Version Control &amp; Cluster Computing*</b>
Friday	<b>Group Projects</b>

HELLO  
my name is

*BARRY*

HELLO  
*HIS* my name is

*HUI*

# Today's Menu

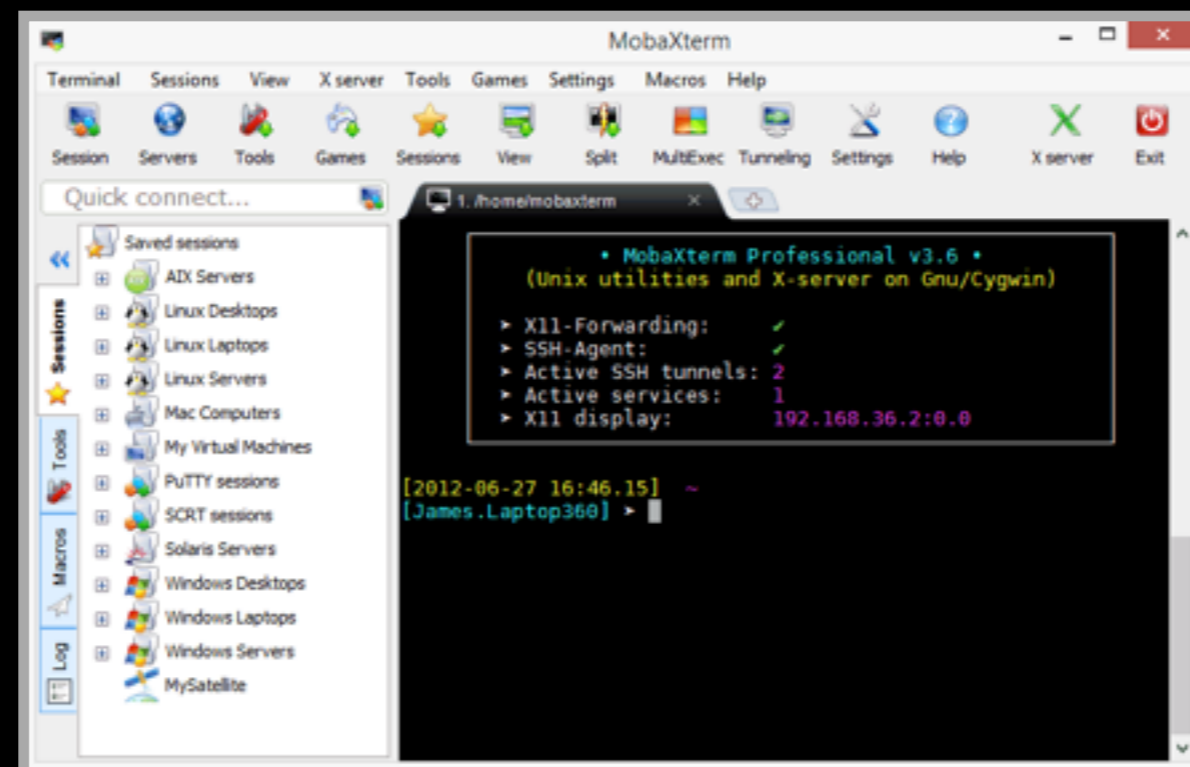
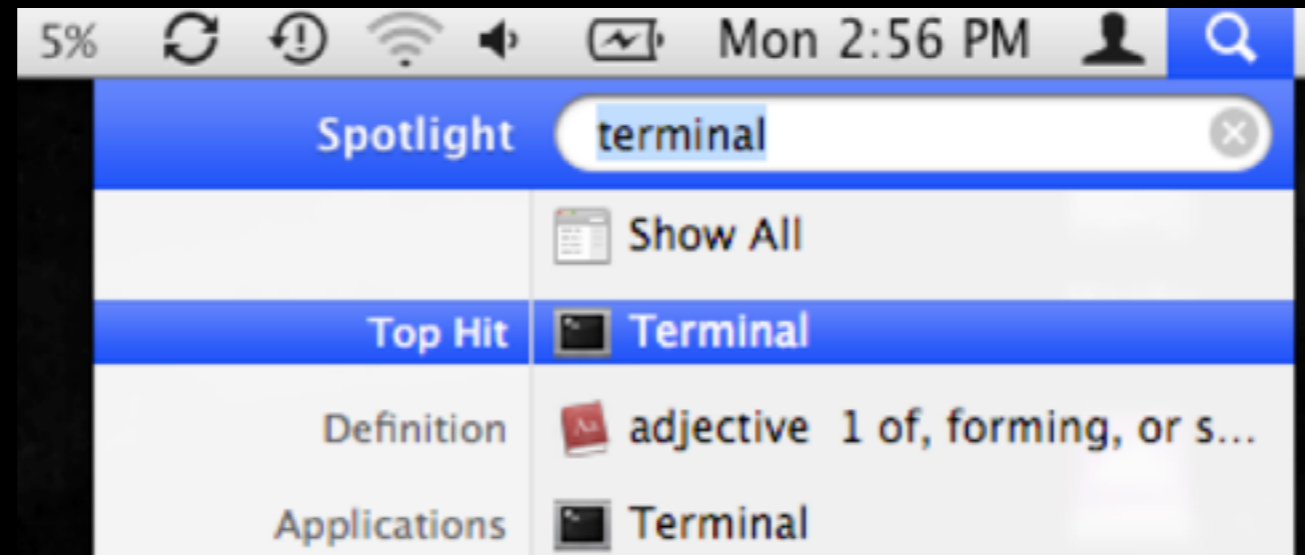
	Time	Topics
I	9:00-10:15 AM	<b>Setup</b> and Motivation
	10:15-10:30 AM	Coffee Break
II	10:30-12:00 AM	<b>Beginning Unix</b>
	12:00-1:00 PM	Lunch
III	1:00-2:15 PM	<b>Working with Unix</b>
	2:15-2:30 PM	Coffee Break
IV	2:30-4:00 PM	<b>How to Get Working</b>

<http://bioboot.github.io/web-2015/setup/>

# Lets get started....

Do it Yourself!

**Mac**  
Terminal

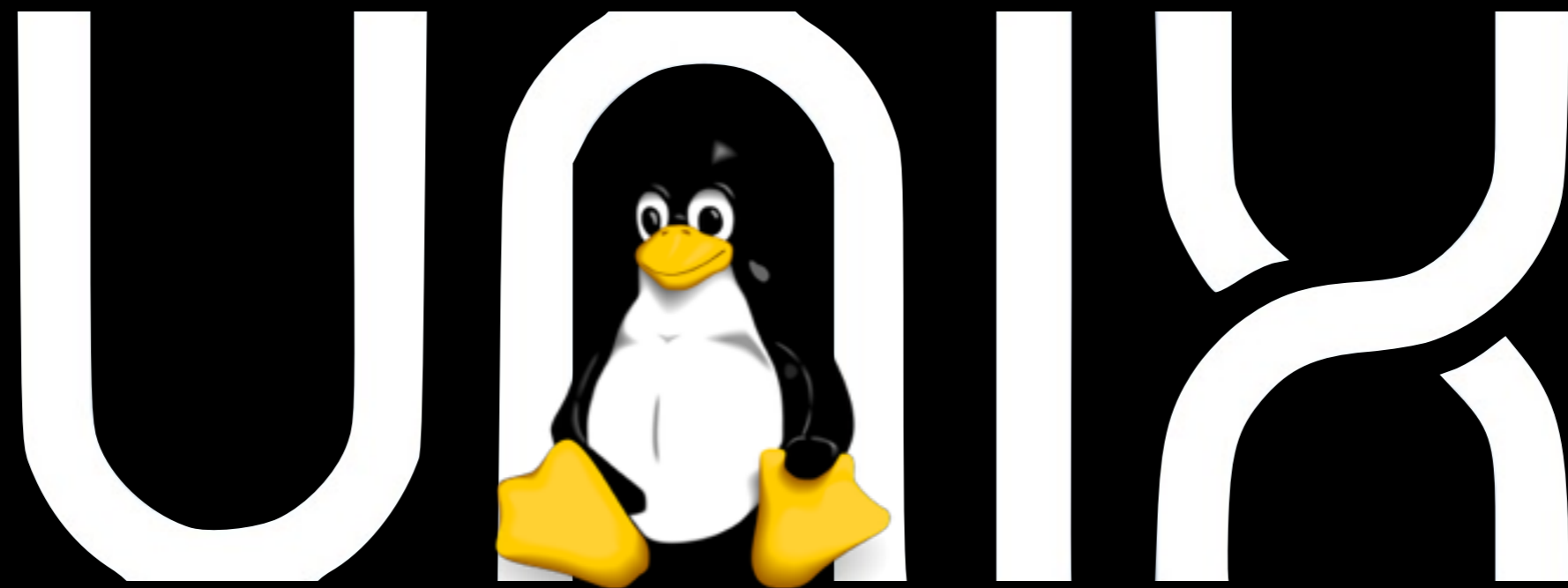


**PC**  
MobaXterm

# Checklist

- Mac:** Terminal *or* **PC:** MoblXterm
- Mac:** Git install *or* **PC:** “mobapt” (MoblXterm)
- Python Anaconda install
- Flux access form submitted
- MToken obtained
- Example data: <http://tinyurl.com/day1-unix>

# Introduction To



**Barry Grant**

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# Motivation

Why do we use Unix?



<b>Modularity</b>	Core programs are modular and work well with others
<b>Programmability</b>	Best software development environment
<b>Infrastructure</b>	Access to existing tools and cutting-edge methods
<b>Reliability</b>	Unparalleled uptime and stability
<b>Unix Philosophy</b>	Encourages open standards

<b>Modularity</b>	Core programs are modular and work well with others
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# Modularity

The Unix shell was designed to allow users to easily build complex workflows by interfacing smaller **modular programs** together.



An alternative approach is to write a **single complex program** that takes raw data as input, and after hours of data processing, outputs publication figures and a final table of results.



Which would you prefer and why?



Modular

vs



Custom

# Advantages/Disadvantages

The 'monster approach' is **customized to a particular project** but results in **massive, fragile** and difficult to modify (therefore **inflexible, untransferable, and error prone**) code.

With **modular workflows**, it's easier to:

- **Spot errors** and figure out where they're occurring by inspecting intermediate results.
- **Experiment** with alternative methods by swapping out components.
- **Tackle novel problems** by remixing existing modular tools.

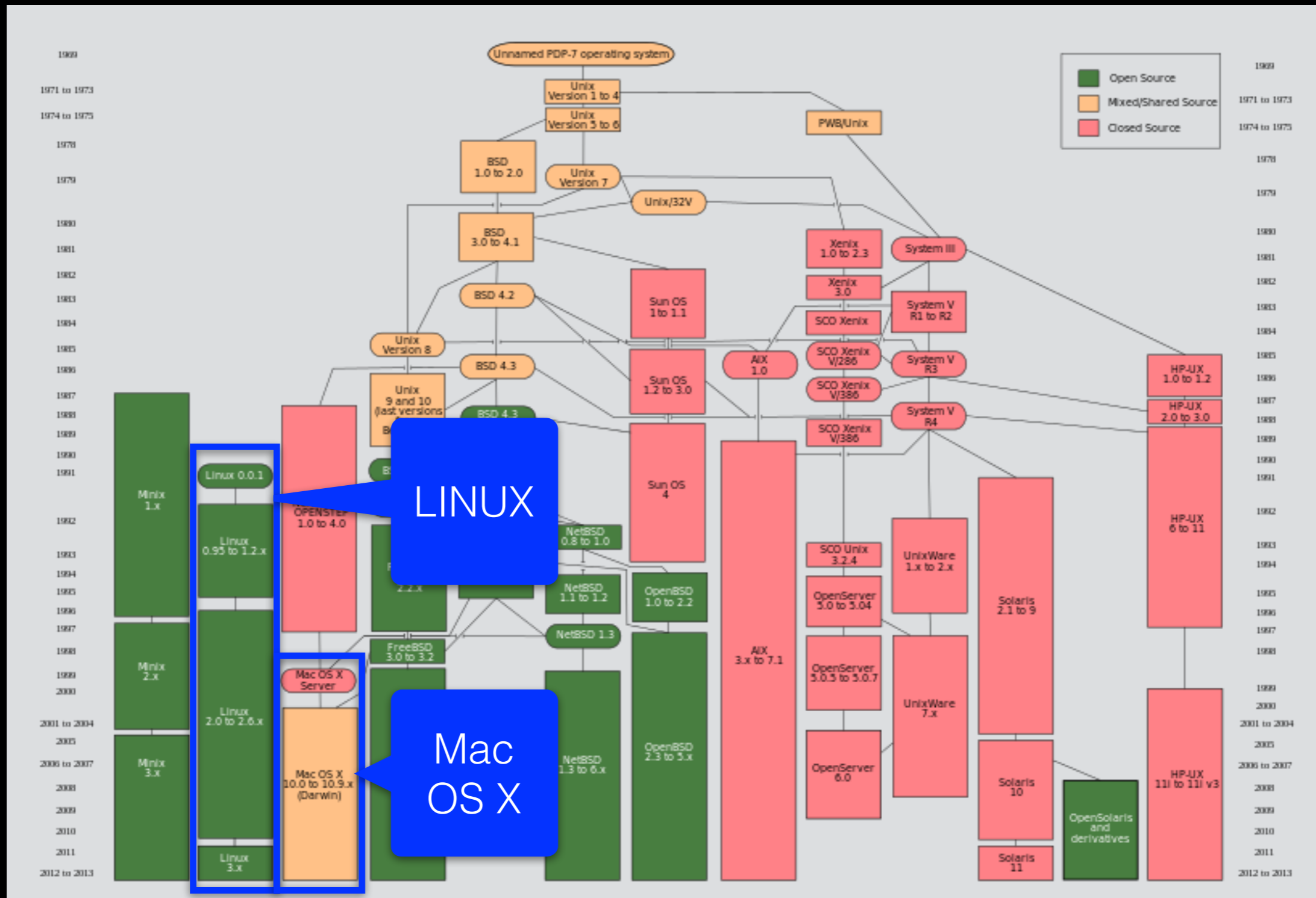
# Unix 'Philosophy'

“Write programs that do one thing and do it well. Write programs to work together and that encourage open standards. Write programs to handle text streams, because that is a universal interface.”

— Doug McIlory



# Unix family tree [1969-2010]



Basics	File Control	Viewing & Editing Files	Misc. useful	Power commands	Process related
<b>ls</b>	<b>mv</b>	<b>less</b>	<b>chmod</b>	<b>grep</b>	<b>top</b>
<b>cd</b>	<b>cp</b>	<b>head</b>	<b>echo</b>	<b>find</b>	<b>ps</b>
<b>pwd</b>	<b>mkdir</b>	<b>tail</b>	<b>wc</b>	<b>sed</b>	<b>kill</b>
<b>man</b>	<b>rm</b>	<b>nano</b>	<b>curl</b>	<b>uniq</b>	<b>Ctrl-c</b>
<b>ssh</b>	<b> </b> (pipe)	<b>touch</b>	<b>source</b>	<b>git</b>	<b>Ctrl-z</b>
	<b>&gt;</b> (write to file)		<b>cat</b>	<b>R</b>	<b>bg</b>
	<b>&lt;</b> (read from file)			<b>python</b>	<b>fg</b>

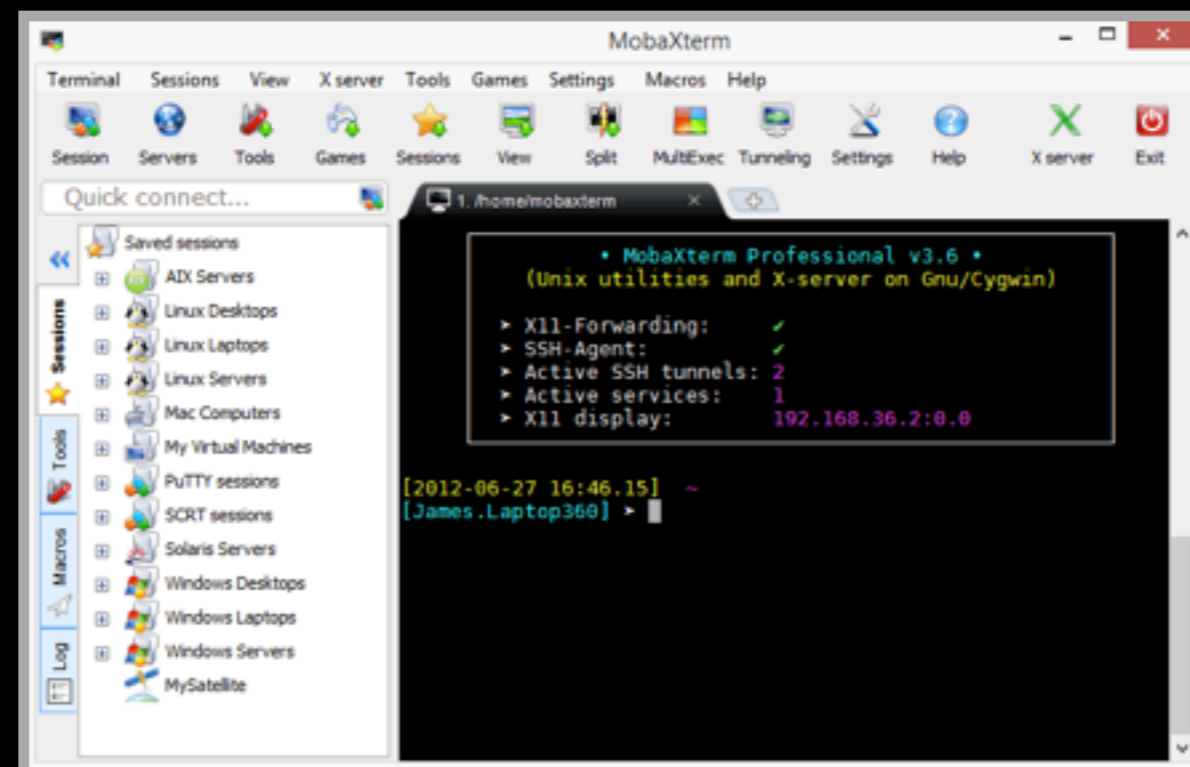
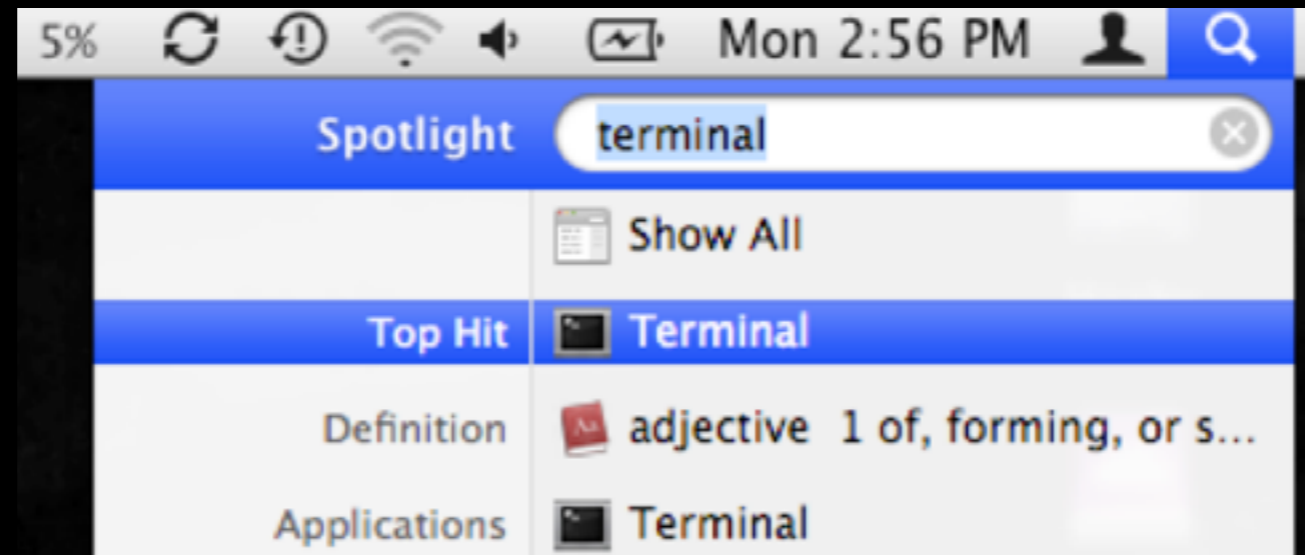


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	< (read from file)			<b>python</b>	fg

# Lets get started....

Do it Yourself!

**Mac**  
Terminal



**PC**  
MobaXterm

# **Test:** Connecting to remote machines (with **ssh**)

- Most high-performance computing (HPC) resources can only be accessed by **ssh** (Secure SHell)
  - > ssh [user@host.address]
  - > ssh barry@scs.gpcc.itd.umich.edu
  - > ssh -X barry@flux-login.engin.umich.edu