

<http://zeus.cs.pacificu.edu/chadd/CSLabFAQ.html>

CS Lab

- The Lab is clean
 - keep it that way
 - clean up your food
 - throw away your trash
 - clean out the refrigerator
- The Lab is friendly
 - moderate your volume
 - don't scare the freshmen
 - don't harass the seniors

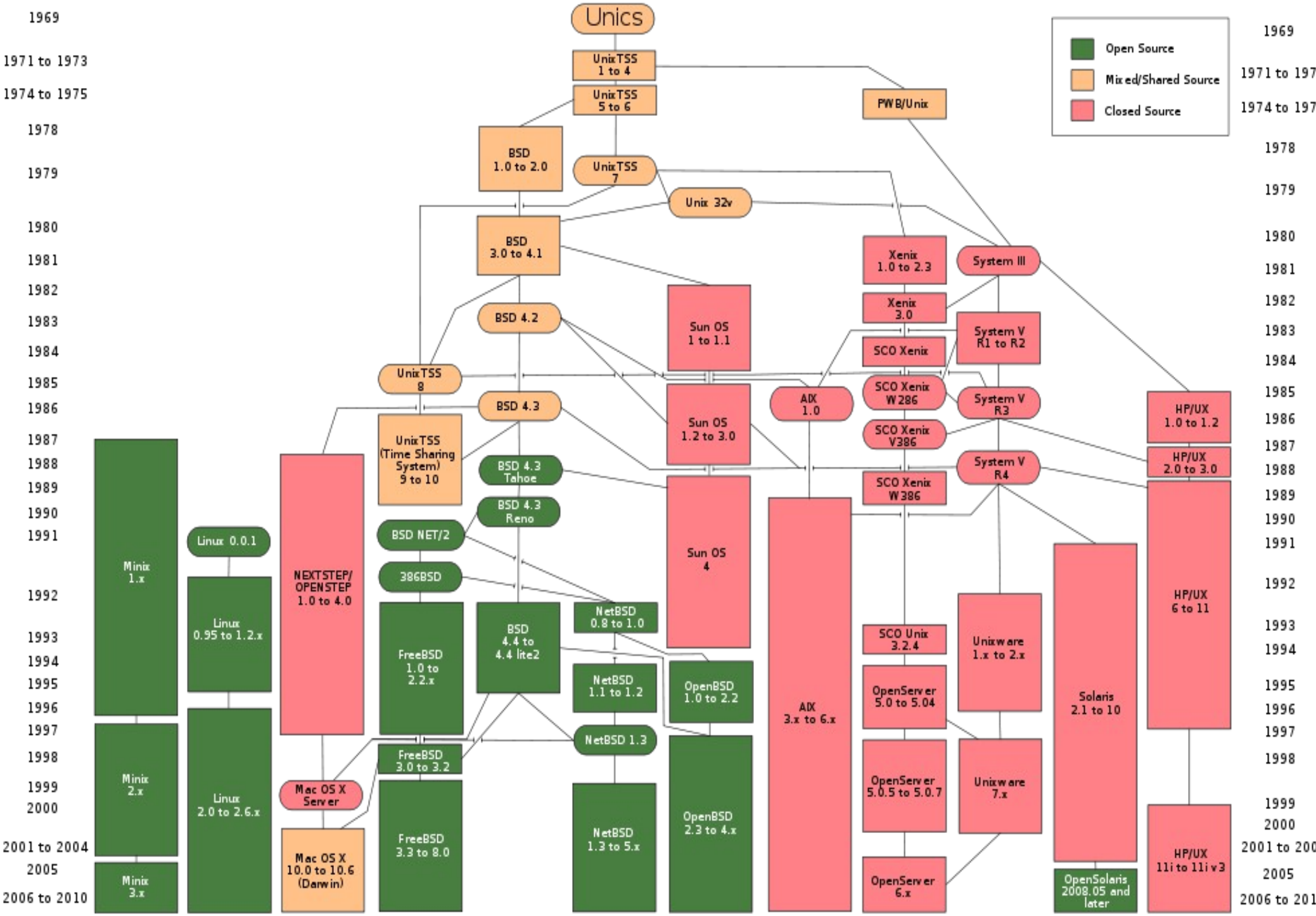
Topics

- Data Structures
- Linux
- C Programming
- Software Development Tools/Methods

UNIX Introduction

- UNIX is an Operating System (OS)
 - 1969 at Bell Labs
 - Thompson/Ritchie/Kernighan/McIlroy/Ossanna
 - Also a specification (Single UNIX Specification)
- GNU/Linux is “Unix-Like”
- Other operating systems are more directly related
 - MacOS X
 - Sun Solaris
 - OpenBSD
- We will be using a server called zeus
 - zeus runs OpenSUSE 11.3 64-bit OS

What we discuss in this lecture applies to UNIX and Linux unless otherwise stated.



http://en.wikipedia.org/wiki/File:Unix_history-simple.svg

GNU/Linux Distribution Timeline

Version 11.6

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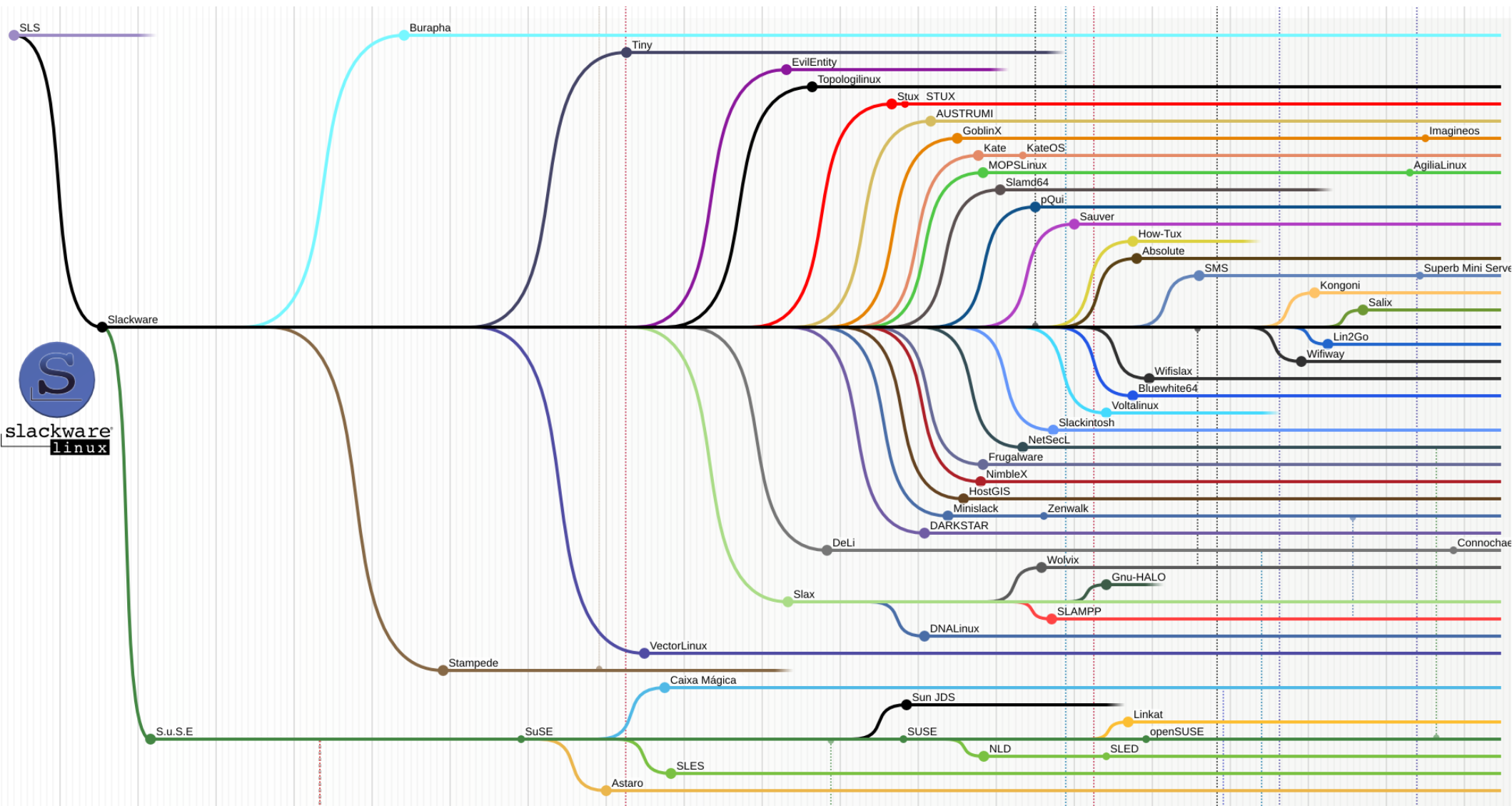


<http://futurist.se/gldt/>

Slackware Family

- Influence, developer switching
- Rebasing, substantial code flow, project overtaking
- Developer & code sharing, project merging

1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011



More Linux Heritage

- https://wiki.archlinux.org/index.php/Arch_Compared_to_Other_Distributions

- OpenSUSE



- Arch Linux



- Source-based

- Rolling-release

UNIX OS

- UNIX OS is made up of:

- the kernel
- the shell
- the programs

GNU/Linux
Linux Kernel
GNU Tools (ls, bash, gcc)
Programs (Firefox, Chrome, Eclipse, KDE)

- Unix Philosophy

“Write programs that do one thing and do it well. Write programs to work together. Write programs to handle **text streams**, because that is a universal interface” - Doug McIlroy

Peter H. Salus. A Quarter-Century of Unix. Addison-Wesley. 1994. ISBN 0-201-54777-5.

Processes and Files

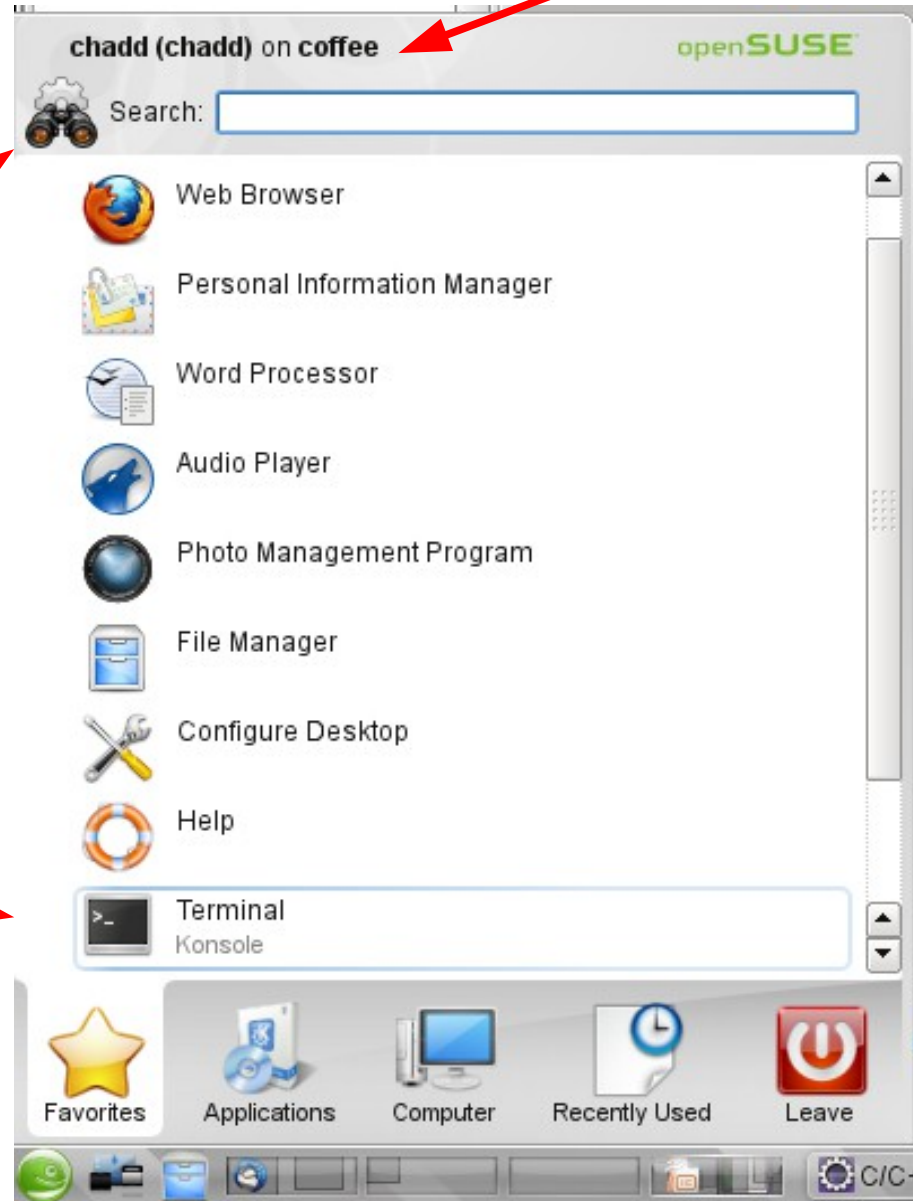
- Everything in UNIX is a process or file
- process – executing program
- file – collection of data

- directory is a hierarchical structure that groups files
 - Windows = folder
 - UNIX = directory

Login!

Machine Name

- Start a terminal



Is the time correct on your machine?

Type terminal here

OR

scroll down in your Favorites

The kernel

- kernel – code that manages access to shared resources
 - CPU/network/hard drive/RAM
- kernel is responsible for managing system resources through system calls
 - process management
 - memory allocation
 - hardware access

More info about the kernel is in files in /proc!

```
chadd@ralph: ~ > uname -a
```

The shell

- Interface between the user and kernel
 - command line interface (CLI)
- The shell interprets commands
- Many different shells exist such as bash, tcsh,..
 - each has slightly different commands
- My examples use bash
- Your environment is customizable by editing
.bashrc .profile

```
chadd@ralph:~> alias ls='ls -al'
```

Window Manager

- KDE
 - default in the lab
- GNOME
 - main competitor to KDE
- Lightweight window managers
 - LXDE
 - XFCE

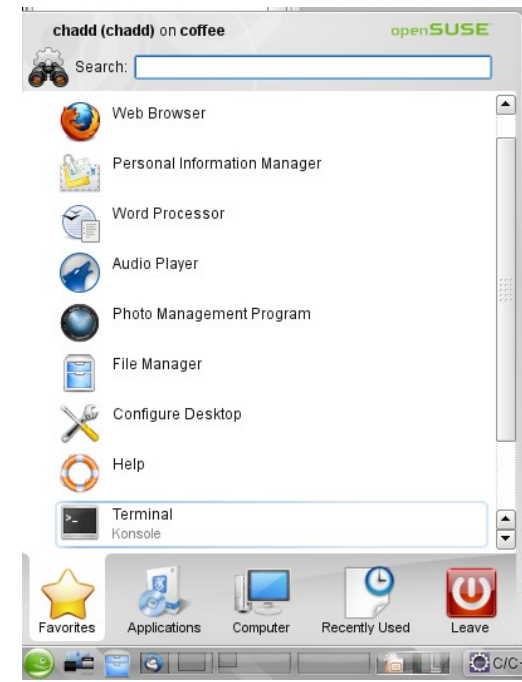
Let's add an Icon

- Right Click **Desktop** widget
- Create new | Link to Application
- Geany
- Application
 - Command : `/usr/bin/geany`
- General
 - wrench | Click icon box on left
 - choose Icon

If the icon does not stick,
right click the icon | Properties
click the icon on the Left.

File System

- The file system is arranged in a hierarchical structure where the top of the hierarchy is called the root
- The root is signified by `/` (forward-slash)
- `ls /`



File and Directory Commands

Command	Type	Meaning
pwd	program	display present working directory
which	program	display which program provides a command
ls	program	list contents of present directory less special files beginning with a .
ls -al	program	show an extended list of all files and directories
cd ..	shell builtin	change to parent directory
cd	shell builtin	change to home directory
cd ~	shell builtin	change to home directory
mkdir backup	program	make a directory called backup
rmdir backup	program	removes an empty directory
passwd	program	change your current password

Problems

- 1) Change your password
- 2) Create a directory called CS300 (Linux is case-sensitive)
- 3) Other than your directory, name two other directories at the same level as yours

Change to the root of the file system by `cd /`

- 4) What do you think is the meaning of `ls ~/..`

Write your answer down before testing

Specific File Commands

Command	Meaning
cp file1 file2	makes a copy of file1 and names the copied file file2
mv file1 file2	moves (or renames) file1 to file2
rm file1	removes (or deletes) file1 DANGER DANGER DANGER rm -i
rmdir directory	removes (or deletes) an empty directory
clear	clears the display screen
cat file1	displays the contents of a file to the screen
less file1	displays the contents of file1 to the screen one screen at a time spacebar – advances another page q - quits
diff file1 file2	display the differences between file1 and file2
Which are programs and which are shell commands? How do you know?	

Problems

On Zeus, in the directory
/home/CS300Public/2011 is a file called message.

1) `ssh zeus.cs.pacificu.edu`

`ls /home/chadd`

`ls /home/CS300Public`

2) Copy this file to the directory CS300 in your home directory *on your local machine*.

`scp message punetid@machinename:CS300`

3) List the contents of this file

4) Make a backup of this file and call the backup message.bk

5) Remove message.bk

Again.

- **Unix Philosophy**

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- /home/CS300/pi-10million.txt contains the first 10 million digits of pi (all on one line)
- how many times does each digit occur?
 - answer next time

<http://www.grymoire.com/Unix/Sed.html>

Again

- /home/CS300/Hound.txt contains the text of THE HOUND OF THE BASKERVILLES By A. Conan Doyle
 - from Project Gutenberg
 - How many lines in the book contain the word hound?
 - `grep -i hound Hound.txt | wc -l`

File System Security

- In the directory that contains the file message, type the command `ls -al`

```
chadd@zeus:/home/CS300Public/2011> ls -al
```

```
total 9780
```

```
drwxrwxr-x 2 chadd faculty      4096 Aug 26 09:18 .
```

```
drwxrwxr-x 5 ryand faculty      4096 Aug 26 09:16 ..
```

```
-rw-r--r-- 1 chadd users         24 Aug 26 09:18 message
```

```
-rw-r--r-- 1 chadd users 10000000 Aug 26 09:13 pi-10million.txt
```

```
chadd@zeus:/home/CS300Public/2010>
```

Permissions

```
-rw-r--r-- 1 chadd users 13 2011-08-29 19:56 message
```

- The first – is either – for file or d for directory
 - rw- is the user's permissions
 - -r- is the group's permissions
 - r-- is the other's permissions
-
- Note : Every file or directory has read, write, and execute permissions

chmod

- **chmod** is used to change the permissions of a file or directory

Symbol	Meaning
u	user
g	group
o	other
a	all
r	read
w	write
x	execute
+	add permission
-	subtract permission

- **groups** will tell you what groups you belong to

Problems

- 1) What is the meaning of `chmod g+rx` file ?
- 2) Set the permissions for message to `-rwxr-xr-x`
- 3) What are the permissions of your home directory?
- 4) What are the permissions of the file `/etc/passwd` ?
- 5) Who owns the file?
- 6) Are you a member of the group that owns the file? Why or why not?

Homework

- Practice!
 - Using the Lizard menu, find a program to take screenshots
 - what does man man do on zeus?
 - what does the -h option to ls do?
 - how can you count the number of characters in the text file message?
 - how can you count the number of lines in the file text message?
 - what does the command cal do?
 - where does the command cal live? is it a shell command?