# CSL Unix Orientation Hands-on Guide

## 1. Introduction

Welcome to the Computer Systems Lab Unix Orientation. This short introduction is intended to acclimate new and novice users the Unix computing environment at the Computer Sciences Department. In this tutorial, you will learn how to use Gnome, execute commands, navigate the file system via the shell, and use some of the CSL supported software.

## 2. Overview of X / Gnome

Unix uses what is called the "X Windows system" and a "window manager" to provide a graphic user interface (GUI). The default CSL supported window manager is GNOME (the **G**NU **N**etwork **O**bject **M**odel **E**nvironment), a powerful, easy-to-use, fully-featured window manager. It is similar in many respects to the window managers and interfaces used by Windows and Mac OS. Users familiar with these operating systems and interfaces may find GNOME very familiar and intuitive. In addition to the following information about GNOME, there is a wealth of information available on the Web and in its manual page (in a terminal, type, **`man gnome`**).

### a. The Screen

Once you have logged in you should see your desktop. There should be three icons on the desktop; Computer, which will open up a file browser, your home, which will open a file browser of your home directory, and Trash, where files deleted via the file browser go.

At the top and bottom of your screen are "panels" which can contain menus, program launchers, and a host of other goodies. By default, the top panel contains the Applications and Actions menus, which allow you to access commonly used programs, change certain settings, log out, and do many other useful things. To the right of these are program launchers, which run the CSL supported web browser, email client, and office software when clicked. On the far right side of the top panel lie a clock and an icon for volume control.

The bottom panel contains a list of currently open programs. Clicking on any of these icons will bring that program's window to the top and make it the primary focus of the window manager. On the right side of the bottom panel is the "Workspace Switcher". This allows you to have windows open on multiple desktops. For instance, if you wanted to open your email on one desktop, a web browser in another, your programming projects in yet another, and other random programs in the last one, you can click on the small "screens" on the right side of the bottom panel to switch between your desktops, launch these programs, and change between them.

### b. Window Controls

- **Title Bar**: On the top center of windows in X you will find an area with a small amount of text. This is called the Title Bar. It serves to remind you what the window contains, usually the name of the program which is running. By clicking and dragging the title bar with the left mouse button, you can move the window around the desktop. Double-clicking the window will maximize the window, or restore it to its original size if it was already maximized.

- **Window Menu**: In the upper left corner of each window is a button with a small “v” or picture of a window in it. By clicking your left mouse button on this, a menu is displayed. This menu is called the Window Menu. It has options for managing the size, location, and focus of the window, or simply to close the window.
- **Min/Max/Close Buttons**: In the upper right corner of each window is a set of three buttons. Clicking the button with the underscore (“_”) will minimize the window and hide it, placing is in the bottom panel. Click on its respective entry in the bottom panel to restore it. Clicking the button with the box will maximize the window so it takes up the entire desktop. Click this button again to restore the window to its original size. Clicking on the button with the “x” will close the window.
- **Window Frame/Border**: The top (just above the title bar), bottom, sides, and corners of a window can be used to resize the window. Simply put your mouse cursor over these parts of the window (also called the window's “frame” or “border”) until the mouse cursor turns into a double-ended arrow. Then, click and drag with the left mouse button until the window is the size you want.
- **The Window**: The window itself contains a number of different things needed to run the program, including text prompts, menus, and additional buttons. These vary from program to program. Clicking anywhere within the window or on its frame or title bar will raise it to the front and give focus to it.

### c. Root Menu

By clicking on the desktop (anywhere there's not a window) with the right mouse button, you will bring up a menu that can perform various actions, from opening a shell terminal to changing your desktop background.

- **Open Terminal**: Opens a text-based shell terminal to run other programs and commands (see the Shell).
- **Create Folder/Launcher/Document**: Creates a folder/directory, program launcher (which will run a program when double-clicked), or document/file on your desktop. These objects will be placed in the “Desktop” folder in your home directory.
- **Miscellaneous**: The other root-menu options will organize your desktop or change your desktop background. Right-clicking in a window will likely bring up a different menu. Right-clicking on the title bar or frame of the window will bring up the window menu.

### d. Screen Saver

After 20 minutes of inactivity, a screen saver will activate. This will also lock the computer. In order to use the computer again, you will need to re-enter your password at the prompt.

Be aware that you are not allowed to have an instructional computer locked, intentionally or otherwise, for more than 10 minutes unless you are physically sitting at the computer. Repeat offenses may result in your account being suspended because of potential problems related to cheating.

### e. Logging Out

To log out (end your session), click the “Action”' menu in the top panel and select “Log out”. Click OK to log yourself out. Please wait until the orientation ends before trying this. Note that selecting “Shut Down” or “Restart” from this command will simply log you out and spit an error message at you, so please only use logout.

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*NOTE: The more files, launchers, and folders that are on your desktop, and the more you add to your panels and environment, the slower GNOME will become, especially for logins. These also count against your disk quota.*

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## 3. The Shell

In the CS Unix environment, a text-based shell is used inside of the X windows GUI. The shell is another user interface to the Unix operating system. It is a program that takes input from you, the user, and translates it into commands that the operating system can understand. It then conveys the operating system's output back to you. Remember that neither the shell nor X windows are themselves Unix, just user interfaces to Unix.

Specifically, the CSL default supported shell is bash (the GNU **B**ourne-**A**gain **SH**ell). There are various types of user interfaces. Shells such as bash belong to the category known as text-based interfaces. These interfaces accept lines of textual commands that the user types in and usually produce text-based output. Another type of interface is the Graphic User Interface, or GUI, which adds the ability to display graphics and to accept input from mice and other devices.

### a. Simple Commands

NOTE: where you see text like **`this`** it is showing you what to type at the shell prompt, or the output from the command you just typed. Many commands take *command line options/arguments*.

```
[bbadger@demo] (1)$ ls      ("ls" lists files in the current directory.)
                    Desktop/ mail@ private/ public/
[bbadger@demo] (2)$ ls -l (This will give you a listing of the files, along with some other useful information, including
                           the size of the file. This is an example of using command line options.)
                    total 7
                    drwxr-x--- 2 bbadger bbadger 2048 Jun 2 13:21 Desktop/
                    lrwxr-xr-x 1 bbadger root 12 Jun 1 17:36 mail -> private/mail/
                    drwx------ 4 bbadger bbadger 2048 Jun 1 17:36 private/
                    drwxr-xr-x 3 bbadger bbadger 2048 Jun 1 17:36 public/
```

### b. Basic file and directory commands

```
[bbadger@demo] (3)$ cd private        ("cd" takes you into another directory, in this case your "private" directory)
[bbadger@demo] (4)$ ls
[bbadger@demo] (5)$ cp /etc/motd .    ("cp" copies a file from one place [source = /etc/motd] to another
                                       [target = the local directory].  Don't forget the "." at the end, it tells cp
                                       to copy the file to the current directory.)
[bbadger@demo] (6)$ ls
                    motd
[bbadger@demo] (7)$ mv motd myfile    ("mv" can be used to rename a file from <source> to <target>)
[bbadger@demo] (8)$ ls
                    myfile
[bbadger@demo] (9)$ mkdir project1    ("mkdir" creates a new directory)
[bbadger@demo] (10)$ ls
                     myfile project1/
[bbadger@demo] (11)$ mv myfile project1 ("mv" can also move files to another directory)
[bbadger@demo] (12)$ cd project1
[bbadger@demo] (13)$ pwd              ("pwd" prints the "working directory", which is the path to directory you are
                                       currently in. It's useful in case you forget where you are and need to get
                                       your bearings in the shell. Note that /u/b/b/bbadger will be replaced by your
                                       path and login.)
                     /afs/cs.wisc.edu/u/b/b/bbadger/private/project1
[bbadger@demo] (14)$ ls
                     myfile
```

### c. Viewing files

```
[bbadger@demo] (15)$ cat myfile        ("cat" prints the whole file all at once into the terminal)
                     .
                     .
                     .
[bbadger@demo] (16)$ less myfile       ("less" prints the file one page at a time, allowing you to scroll using the
                                        arrow keys – uses 'q' to quit and '/' to search for text)
                     .
                     .
                     .
```

### d. Removing files and directories

```
[bbadger@demo] (17)$ rm myfile         ("rm" permanently removes a file. This does not use Trash folder and cannot
                                        be un-deleted.)
[bbadger@demo] (18)$ ls
[bbadger@demo] (19)$ cd ..             (Remember that ".." refers to the parent directory of the directory you are in,
                                        "private" in this case.)
[bbadger@demo] (20)$ ls
                     project1/
[bbadger@demo] (21)$ rmdir project1    ("rmdir" removes a directory, but only if it is empty.)
[bbadger@demo] (22)$ ls
[bbadger@demo] (23)$ cd                ("cd" alone takes you to your home directory.)
[bbadger@demo] (24)$ ls
                     Desktop/ mail@ private/ public/
```

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Useful Abbreviations:

| | |
|---|---|
| `.` | Your current directory |
| `..` | The parent of your current directory |
| `~` | Your home directory |
| `~bbadger` | bbadger's home directory |

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### e. Remote Logins: SSH

In order to remotely work on your projects or to upload files, SSH (**S**ecure **SH**ell) is available. Linux has a command line version installed. Graphical SSH clients available for Windows or Macs covered in the CSL FAQs.

```
[bbadger@demo] (25)$ ssh <machine>     (Look to your left or right during orientation – use the name of the machine
                                        next to you.)
[bbadger@demo2] (1)$ w                 (See who else is logged in to the machine.)
                     .
                     .
[bbadger@demo2] (2)$ exit
```

### f. For More Information

Type **`man bash`** in the terminal and search the shell man page to learn about the file name completion and command history mechanisms available in the shell. Also read the man pages on the commands "**`ls`**", "**`cd`**", "**`cp`**", "**`mv`**", "**`mkdir`**", "**`pwd`**", "**`cat`**", "**`less`**", "**`rm`**", "**`rmdir`**", "**`ssh`**" and "**`w`**".

## 4. A Sample Project

Now that you know how to get around using the shell and simple commands, we will now illustrate how you might use them to do your coursework or work on a project. We will copy files from a project directory, edit them, compile them into a program, and run the program.

### a. Copying the Files

Your instructor will, in some cases, provide you with some partially finished files that you will need to complete, or some extra files needed to run your projects that you do not need to edit. Your instructor may tell you to copy the files from a specific directory. We're going to set up a project directory, and copy the files into that directory.

```
[bbadger@demo] (26)$ cd ~/private      (Go to your private directory, recall that "~" refers to your home directory.)
[bbadger@demo] (27)$ mkdir project1    (Create the project directory.)
[bbadger@demo] (28)$ cd project1
[bbadger@demo] (29)$ cp /p/lab/unix-orientation/project1/*.java .  (Copy the project files to your own
                                       project directory. "*" is a "wildcard" which matches any number of
                                       characters. In this case, you will copy all the files ending in ".java" to your
                                       current directory.)
[bbadger@demo] (30)$ ls
                     TestProgram.java TestClass.java
```

### b. Editing the Files

You now have the files, but they won't compile as they are. You need to edit one of them to actually work. One way to do this is to run the "Emacs" text editor and load TestClass.java into it. See the Emacs section below for more details, and please pay attention to what changes need to be made to the file.

```
[bbadger@demo] (31)$ emacs TestClass.java
```

### c. Compiling and Running Your Program

You might be used to compiling and running your home-made programs using a graphical-based environment such as Eclipse. However, you can also compile and run them using the shell.

```
[bbadger@demo] (32)$ javac *.java      (javac is the Java compiler program.  Using the '*' wildcard compiles all
                                       files in the current directory ending in .java.  If javac produced any
                                       errors, you should fix them before proceeding to run java.)
[bbadger@demo] (33)$ java TestProgram  (java is the command in linux to run Java programs)
                     Hello, world!
```

Congratulations! You just ran your Java program using the shell. If this was a real project, you would now test and debug your program until it was just perfect. But since this is just a simple test project, you can end here.

## 5. Mozilla Firefox and Thunderbird

Mozilla is a powerful collection of free software. In the CSL, we make use of its web browser and email client.

### a. Firefox

Mozilla's web browser, "Firefox", was originally based on Netscape source code. Today, the features and functionality of Firefox (and Mozilla before it) as a web-browser has surpassed that of Internet Explorer. For instance, it has integrated search by default, a wide-array of plugins, and tabbed browsing (which IE did not have prior to IE 7). You can start Firefox by clicking on the Internet icon (the globe with the mouse) in the top panel or by typing firefox at a shell prompt.  Thunderbird is already configured to check your CS email when you get your CS account.

### b. Thunderbird

Mozilla's email client, "Thunderbird", is a powerful, easy-to-use email client quite similar to other graphical clients like Microsoft Outlook. You can start Thunderbird by clicking on the Email icon in the top panel (the envelope) or by typing thunderbird at the shell prompt.

### c. Other

By default your e-mail is stored in IMAP format. This means you can use multiple clients from multiple locations to view your e-mail messages. For example, at home you could use Microsoft Outlook or your own copy of Thunderbird to connect to your CS mail. Instructions on how to set this up are available online on the CSL's documentation webpage. For more information, please see the "Firefox and Thunderbird FAQs" page in the CSL documentation.

## 6. GNU Emacs

GNU Emacs is a very powerful and free text editor. It has a lot of bells and whistles to make programming easier. Emacs uses a windowing system. You can have several different files (also known as buffers) open at any given time. Keys are "bound" to certain events.

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M-x = press x while holding down the Alt key
C-x = press x while holding down the control (Ctrl) key
ESC-x = press and release escape (Esc), then press the x key

---

For example, pressing C-p will move the cursor up one line (the Up arrow key does this as well). This binding is called "previous-line". If there is a command that you would like to use and you don't know the key combination you can type in ESC-x followed by the command name. The Tab key does name completion. When you are unsure of a filename or of a command name, type in the first couple of characters of that command. When you press tab, another menu will appear with all of the possible choices.

A quick example:

1. Start up emacs from the "Programming" menu under the "Applications" menu in the top panel or by typing emacs at the shell prompt. Select the pull down menu "**File**", then select "**Open...**". This will bring up a prompt at the bottom of the screen where you can specify the filename. For this example, type in "**foo**" and press return.

**START HERE FOR JAVA TUTORIAL:**

2. You are now able to edit the file. Go ahead and type in something, your full name for instance. Press return after you have finished.
3. Insert a file by selecting "**File**" from the top menu, then "**Insert File...**". In the lower menu, press the backspace key until the cursor stops moving, then type in "**/etc/motd**" followed by return.
4. You can move around the file with the cursor keys. You can also use key combinations so you don't have to take your hands off the keyboard. Hold down **Ctrl** and press the "**p**" key. This will move you up one line. **C-n** will move you down one line, **C-f** will move you forward one character and **C-b** will move you back one character.
5. Do a search for the word "**the**". To start a search, select "**Edit**" from the top menu, then select "**Search...**". You will see the cursor is at the bottom of the screen now. Type in the word "**the**" followed by the return key.

6. Highlight an area of text (any area will do). Place your mouse cursor over a different part of the text and click the middle mouse button (scroll wheel in most cases). This pastes the text that was just highlighted. **This is how most programs under Unix choose to implement copy-paste.** Keep in mind that anytime you highlight a new region of text, it will overwrite whatever was previously copied.
7. To save this file, select the pull down menu "**File**", then "**Save (current buffer)**".
8. To quit emacs, select "**File**", then "**Exit Emacs**"
9. Use the shell "**`rm`**" command to remove the file **foo**.

For More Information, start the emacs tutorial. Select the "**Help**" menu, then select "**Emacs Tutorial**".

## 7. Getting Help

### a. Unix Manual Pages (the man command)

Over the years, Unix programmers and users have put together manuals for the operating system and pieces of software. The **`man`** command allows you to read these manuals and get specific information regarding these commands, programs, and operating system material. Simply type **`man`** followed by the command in question to bring up the command's manual page. You can even type **`man man`** to get more information on the man command.

Keep in mind that these are manuals and not tutorials. They give very specific, detailed information about functionality, but sometimes they do not teach you how to do specific tasks. Consider consulting another source of information, especially online tutorials.

[bbadger@demo] (33)$ **`man ls`**

```
NAME
      ls - list directory contents
SYNOPSIS
      ls [-CFRacdilqrtu1][-H | -L ][-fgmnopsx][file...]
DESCRIPTION
      For each operand that names a file of a type other than directory or symbolic link
      to a directory, ls shall write the name of the file as well as any requested,
      associated information. For each operand that
      .
      .
      .
```

[bbadger@demo] (34)$ **`man -k editor`** (Search man pages for terms)

```
                  vim(1) in std-14 - Vi IMproved, a programmers text editor
                  ed,red(1) in sys - text editor
                  ex(1) in sys - text editor
                  sed(1) in sys - stream editor
                  vi(1) in sys - screen-oriented (visual) display editor
                  .
                  .
                  .
```

### b. World Wide Web

The Computer Sciences Department and the Computer Systems Lab are using the internet for most of our documentation. We encourage you to become familiar with the Department, Systems Lab and course web pages early.

- UW Home Page: http://www.wisc.edu/
- CS Department Homepage: http://www.cs.wisc.edu/
- Current Semester Class Home Pages: http://www.cs.wisc.edu/classes.html
- Computer Systems Lab Homepage: http://www.cs.wisc.edu/CSDocs/
- Computer Systems Lab Authenticated Web Forms: https://www-auth.cs.wisc.edu/forms/
- Google: http://www.google.com

### c. More sources of help

Often other students working in the student instructional labs are good sources of help. In addition, there may be UNIX Consultants in the labs or in the printer room. Finally, you can visit the Computer Systems Lab in room 2350 CS, or send mail to lab@cs.wisc.edu for additional assistance. For programming, class, and project-related questions, you should ask your TA or professor. The Computer Systems Lab does not provide consulting services. Please make sure that you direct your questions to the appropriate places.

## 8. Question/Answer

Feel free to ask questions about anything you are not clear on, or topics that were not covered. We will do our best to answer any questions you may have. Remember that nobody learns Unix in a day. This orientation has only scratched the surface of the features and nuts and bolts of Unix. Fret not, gentle newbie, for Unix, like anything worthwhile, takes time to learn and even the most experienced users and hackers still have gaps in their knowledge. Be patient, have fun, and seek out help and answers where you can. Good luck this semester, and thank you for your time.

# Unix Quick Reference

## File commands

### *Editing*

| | |
|---|---|
| **emacs** | edit files using emacs |
| **oofice** | opens the Open Office suite |
| **pico** | edit files using pico |
| **vim** | edit files with vim |

### *Modifying*

| | |
|---|---|
| **chmod** | change the permissions mode of a file |
| **chown** | change the owner and/or group of a file |
| **cp** | copy a file |
| **mv** | move or rename a file |
| **rm** | remove a file |

### *Printing*

| | |
|---|---|
| **lpr** | send a file to the default printer |
| **lprm** | remove your last print job from the queue |
| **lpq** | check the status of print jobs |
| **lpquota** | show your current paper usage |

### *Viewing*

| | |
|---|---|
| **acroread** | opens pdf files for viewing |
| **cat** | display one or more files |
| **diff** | display differences between pairs of text files |
| **head** | display the first few lines of a file |
| **less** | browse a text file |
| **more** | display a text file |
| **tail** | display the end of a file |

## Directory commands

| | |
|---|---|
| **cd** | change the working directory |
| **ls** | list the contents of a directory |
| **mkdir** | make a directory |
| **pwd** | display the working directory pathname |
| **rmdir** | remove a directory |

## System commands

### *Command Line*

| | |
|---|---|
| **date** | print the date and time |
| **exit** | terminate a process |
| **find** | find a file by name or by other information |
| **fs listquota** | show your current disk usage |
| **grep** | search a file for a specific text string |
| **kill** | terminate or send a signal to a process |
| **man** | display a reference manual page |
| **passwd** | create or change your CSL password |
| **ps** | display the status of a process |
| **recover** | retrieve a file from last midnight's backups |
| **ssh** | connect to a remote system |
| **w** | lists users and system information |

### *GUI (Graphical User Interface)*

| | |
|---|---|
| **firefox** | open the Mozilla Firefox web browser |
| **gnome-calculator** | open gnome's calculator |
| **thunderbird** | open Mozilla Thunderbird email client |
| **xterm** | start an X Window terminal emulator |

# Emacs keyboard shortcuts

## File

| | |
|---|---|
| Open | Ctrl-X, Ctrl-F |
| Save | Ctrl-X, Ctrl-S |
| Save As | Ctrl-X, Ctrl-W |
| Save All | Ctrl-X, S |
| Revert to File | Ctrl-X, Ctrl-V |
| Revert Buffer | Meta-X, revert-buffer |
| Close Window/Buffer | Ctrl-X, K |
| Quit | Ctrl-X, Ctrl-C |

## Window

| | |
|---|---|
| Close | Ctrl-X, K |
| Next Window | Ctrl-X, B |
| Choose Window | Ctrl-X, Ctrl-B |
| Maximize | Ctrl-X, 1 |
| Split Horizontal | Ctrl-X, 2 |
| Split Vertical | Ctrl-X, 3 |
| Switch Focus Between Windows | Ctrl-X, O |
| Activate Menu Bar | Meta-` |

## Cursor Movement

| | FORWARD | BACKWARD |
|---|---|---|
| Word | Meta-F | Meta-B |
| Line | Ctrl-A | Ctrl-E |
| Paragraph | Meta-{ | Meta-} |
| Page | Ctrl-V | Meta-V |
| Document | Meta-< | Meta-> |
| C Function | Meta-Ctrl-A | Meta-Control-E |

## Macros

| | |
|---|---|
| Start Recording | Ctrl-X, ( |
| Stop Recording | Ctrl-X, ) |
| Play Macro | Ctrl-X, E |

## Edit

| | |
|---|---|
| Undo | Ctrl-_ |
| Begin Selection | Ctrl-SPC |
| Cancel Selection | Ctrl-G |
| Cut Selection | Ctrl-W |
| Cut Line | Ctrl-K |
| Paste | Ctrl-Y |
| Copy Selection to Numbered Clipboard | Ctrl-X R S *[#]* |
| Paste from Numbered Clipboard | Ctrl-X R I *[#]* |
| Delete | DEL |
| Fwd Delete | Ctrl-D |
| Delete Word | Meta-DEL |
| Fwd Delete Word | Meta-D |
| Delete Line | Ctrl-K |

## Search

| | |
|---|---|
| Incremental Search | Ctrl-S |
| Incremental Search Reverse | Ctrl-R |
| Regexp Inc Search | Meta-Ctrl-S |
| Regexp Inc Search Reverse | Meta-Ctrl-R |
| Interactive Search and Replace | Meta-% |
| Goto Line Number | Meta-X goto-line |
| Previous Matching Bracket | Meta-Ctrl-B (or ESC Ctrl-B) |
| Next Matching Bracket | Meta-Ctrl-F (or ESC Ctrl-F) |

M-x or Meta-x = press x while holding down the Alt key

C-x or Ctrl-X = press x while holding down the control (Ctrl) key