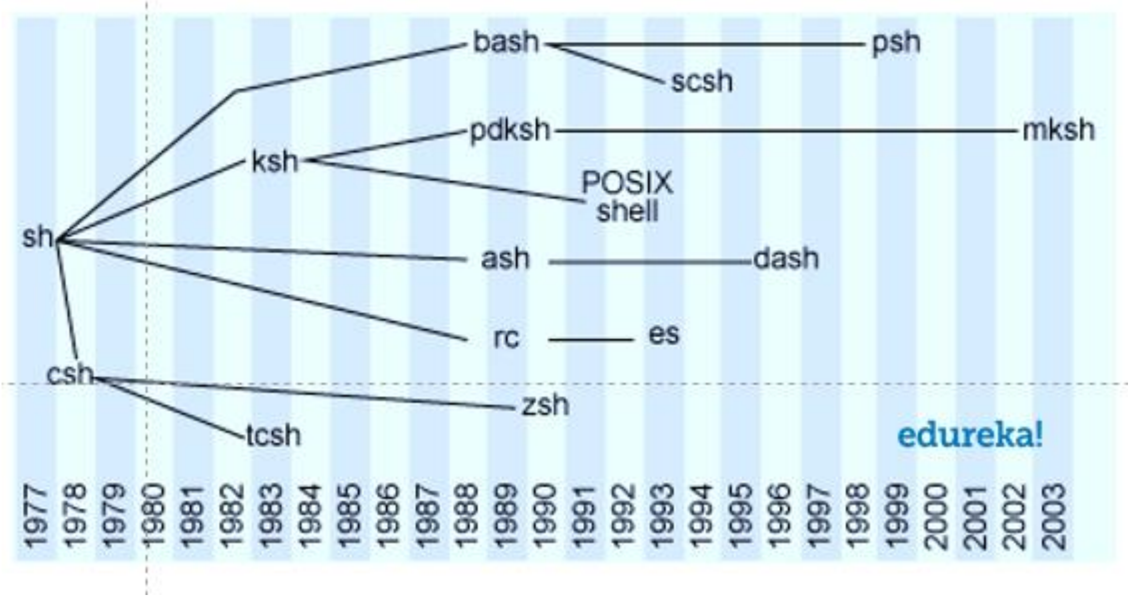
Programming Languages and Tools: Programming with C++ CS:3210:0003

Lecture/Lab #10

Definitions

- Kernel – core of the OS
- Terminal – program that provides command-line interface
- Shell - program that executes commands using the kernel
- Many Linux shells:
  1. sh – Bourne shell
  2. csh – C shell
  3. ksh – Korn shell
  4. bash – bash shell
- `echo $0` to print shell being used



Commands

Command	Description
`cd destination`	Change directory
`ls`	List contents
`mkdir dirname`	Make directory
`rm filename`	Remove
`chmod`	Change permissions
`cat`	Concatenate files and print
`touch filename`	Create file
`man command`	Show command manual
`which app`	Show location of app

Caution!

- Some commands might be irreversible
- There is no recycle bin, so `rm` will permanently delete files
- Make sure you know what you’re doing

Environment Variables

- Linux variables work just like C++ variables
- Environment variables are special variables (they exist in all OSs)
- Used to set up the Linux environment
- Use env command to show all environment variables

Variable	Description
$HOME	Stores home directory
$SHELL	Stores name of Linux shell
$PATH	Stores directories to look for applications in

PATH Variable

- Specifies directories to be searched to find a command
- As, we’ve seen with our binaries, applications are executed using: `./appname`
- However, if the shell knows where to look for `appname`, we can call it from anywhere in the system
- The PATH environment variable stores the locations of all directories that the shell will look in for an application

PATH Variable

- Updating PATH variable
  1. Temporarily:
     `export PATH=“$PATH:newdir”`
  2. Permanently:
     Add `export` command to the end of `~/.bashrc`

Activity

1. Add ~/bin to PATH

2. Create alwaysfails.cpp that always fails; compile to alwaysfails; move alwaysfails to ~/bin

3. Create alwayssucceeds.cpp that always succeeds; compile to alwayssucceeds; move alwayssucceeds to ~/bin

4. Create testredirect.cpp that prints “This is an output line\n” to stdout and “This is an error line\n” to stderr; compile to testredirect; move testredirect to ~/bin

Command-Line Operators

- Exit status 0 indicates success, non-zero indicates failure
- Execute command1 and only execute command2 if the first one succeeds:

  ```
  command1 && command2
  ```
- Execute command1 and only execute command2 if the first one fails:

  ```
  command1 || command2
  ```
- Execute command1, then command2 (regardless of success/failure):

  ```
  command1; command2
  ```

Pipe (|)

- Used to combine commands
- Applications have 3 streams:

Stream	Function	File Descriptor
stdin	Standard input	0
stdout	Standard output	1
stderr	Standard error	2

- File descriptors are unique IDs for files/resources
- The following redirects `stdout` of `command1` to `stdin` of `command2`:

```
command1 | command2
```

Redirection

- To redirect output of command to file:
  ```
  command > file
  ```
- To redirect stdout of command to file:
  ```
  command 1> file
  ```
- To redirect stderr of command to file:
  ```
  command 2> file
  ```
- To redirect both to different files:
  ```
  command 1> file 2> file
  ```
- To redirect both to same file:
  ```
  command > file 2>&1
  ```
  Here, we’re redirecting stream 2 to the same destination as stream 1

Redirection

- To get rid of redirected data:
  `command > /dev/null`
- `/dev/null` is a null device file, acts as a vacuum
- To redirect stdin from file:
  `command < file`

Bash Scripting

- At the top of the file, put command:

  ```
  #!/bin/bash
  ```

  to let the OS know this is a bash script

- Bash is quite particular about whitespace formatting

- To execute a script you need to give it execute permission (either line works):

  ```
  chmod 700 scriptname
  chmod +x scriptname
  ```

Hierarchy of Linux Developer Geekiness

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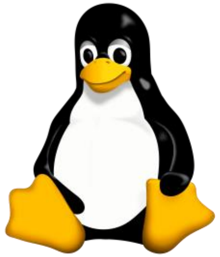
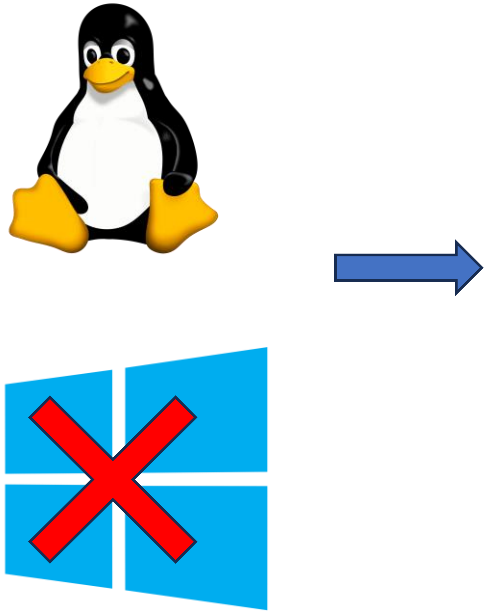
Step 1 : Eliminate
Windows

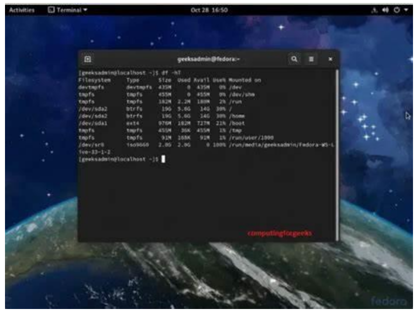


Hierarchy of Linux Developer Geekiness

Step 1 : Eliminate Windows

Step 2 : Eliminate GUI





```
[geeksadmin@localhost ~]$ df -hT
Filesystem     Type      Size  Used Avail Use% Mounted on
devtmpfs       devtmpfs  435M     0  435M   0% /dev
tmpfs          tmpfs     455M     0  455M   0% /dev/shm
tmpfs          tmpfs     182M  2.2M  180M   2% /run
/dev/sda2      btrfs      19G  5.0G   14G  30% /
/dev/sda2      btrfs      19G  5.0G   14G  30% /home
/dev/sda1      ext4      976M  182M  727M  21% /boot
tmpfs          tmpfs     455M   36K  455M   1% /tmp
tmpfs          tmpfs      91M  168K   91M   1% /run/user/1000
/dev/sr0       iso9660   2.0G  2.0G     0 100% /run/media/geeksadmin/Fedora-WS-Li
ve-33-1-2
[geeksadmin@localhost ~]$ 
```

Hierarchy of Linux Developer Geekiness

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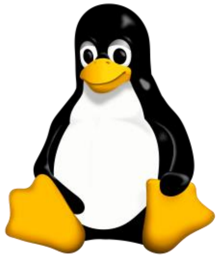

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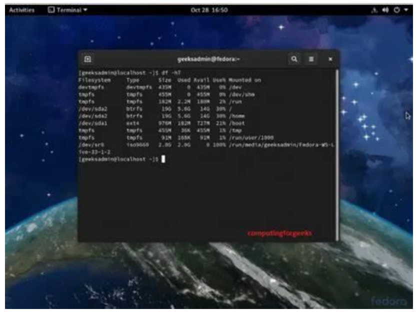

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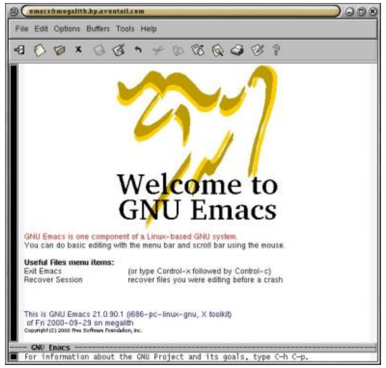
[geeksadmin@localhost ~]$ 
```

Step 3 : Eliminate Mouse



Welcome to GNU Emacs

GNU Emacs is one component of a Linux-based GNU system.
You can do basic editing with the menu bar and scroll bar using the mouse.

Useful Files menu items:

Exit Emacs	(or type Control-x followed by Control-c)
Recover Session	recover files you were editing before a crash

This is GNU Emacs 21.0.90.1 (i686-pc-linux-gnu, X toolkit)
of Fri 2000-09-29 on megalith
Copyright (C) 2000 Free Software Foundation, Inc.

```
-- GNU Emacs ----------------------------------------
For information about the GNU Project and its goals, type C-h C-p.
```

Hierarchy of Linux Developer Geekiness

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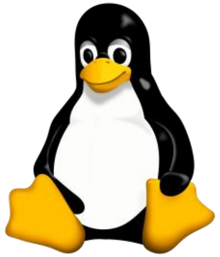

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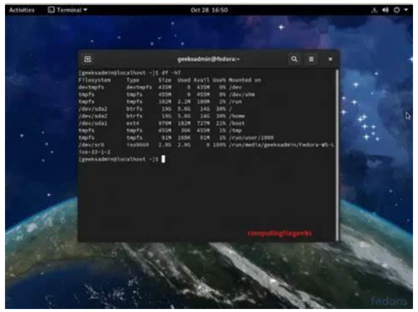

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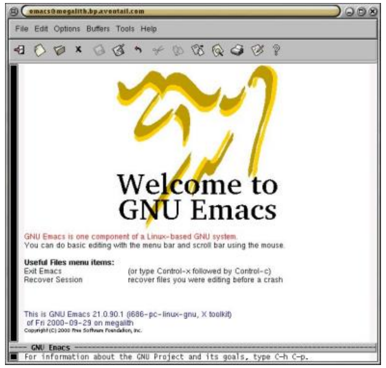

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Step 4 : Eliminate Keyboard