

Linux Overview

CSC 310 - Programming Languages

Linux

- Linux is an operating system, like Windows or OSX.
- Linux and Kutztown University
 - The Computer Science department has a Linux server named `acad` that CS and IT students can access
 - This is where you will do your assignments for this class
 - The interface to the Linux server is a command line interface, not a graphical user interface

Connecting to acad

- Windows: Open the command prompt program
- OSX: Open the terminal program
- In the command prompt or terminal program
 - Run the command:
`ssh username@host`
 - Your username is the first part of your KU email address
 - The host name is `acad.kutztown.edu`
 - Example:
`ssh abcde123@acad.kutztown.edu`

Connecting to acad (Continued)

- The first time you connect to acad you may see something similar to:

```
The authenticity of host 'csit.kutztown.edu (156.12.127.12)' can't be established.  
ECDSA key fingerprint is SHA256:2oJ7zjD4/XbLbyWwWbv15+0...  
Are you sure you want to continue connecting (yes/no/[f]?)
```

- If you see this, type in "yes", then press enter.
- Then you will be prompted for password. Your password is the same password that you use to access other Kutztown resources. Type in your password, then press enter.
- On a successful login, you should see something similar to:

```
Last login: Sun Sep 26 12:16:10 2021 from kuvapcsitrd01  
[user@kuvapcsitrd01 ~]$
```

Command Line

- A command line is a text based interface to the operating system
- Commands are entered by typing the command on the keyboard then pressing enter
- The command line presents you with a prompt; as a command is typed it is displayed after the prompt.
- Example: in the previous slide, the prompt is:
`[user@kuvapcsitrd01 ~]$`

Directories and Files

- Linux uses directories (similar to Windows folders) to organize files
- Directories can contain files and other directories (called subdirectories)
- A directory is also a file; it is a special file that can contain other files
- A directory or file that has a name that starts with a . (dot) is called a hidden directory or file
- Directories and files should be named using the letters, digits, underscores, and dots; other names are possible, but are not as nice to deal with using the command line interface

Directory System Structure

- The Linux file system is hierarchical; all directories and files are organized in a tree-like structure with the directories corresponding to branches and the files corresponding to leaves
- The topmost directory is called the root directory and is denoted with / (slash)
- Subdirectories are located “under” the root directory
- The working directory is the current location in the file system
- When you first log in, your working directory is your home directory

Absolute Path Names

- Every directory or file has a full name called an absolute pathname
- An absolute pathname uniquely identifies a specific directory or file
- Absolute pathnames always start with a slash (/) followed by any subdirectories in its path separated by slashes and ending with the name of the directory or file

Absolute Path Name Example

- The following absolute path is similar to the absolute path of your home directory

`/home/students.kutztown.edu/username/f.txt`

- This can be read as:
 - There is a directory under the root directory named `home`
 - that contains a subdirectory named `students.kutztown.edu`
 - that contains a subdirectory named `username`
 - that contains a file named `f.txt`

Relative Path Names

- Directories and files can also be referred to using relative pathnames
- A relative pathname is a pathname relative to the working directory
- Example: If the working directory is `username` and contains a file named `f.txt`, then the relative path for `f.txt` is simply `f.txt`

Linux Commands

- A Linux command consists of three parts:
 - Command: name of the command; this always comes first
 - Options (or flags): an flag has a dash (-) in it; flags are usually optional and alter the way the command executes relative to its default behavior
 - Arguments: some commands need specific information to run, for example a file name, which are specified as command line arguments

Conventions for Command Descriptions

- The following conventions will be used in the command descriptions that follow:
 - [] (square brackets) are used to indicate that something is optional
 - <> (angle brackets) are used to indicate a path (relative or absolute)
 - \$ (dollar sign) indicates the prompt in examples

pwd

- Print the absolute pathname of the working directory
- Example:

```
$ pwd  
/home/students.kutztown.edu/username
```

ls

- List the contents of a directory

- `ls`: list the contents of the working directory
- `ls <directory>`: list the contents of the specified directory
- `ls -l [<directory>]`: list the contents in long format
- `ls -a [<directory>]`: list the contents including hidden directories and files

cd

- Change directory
 - cd: change to home directory
 - cd <directory>: change to the directory indicated by the path <directory>
- Special directory names
 - . (dot): the working directory
 - .. (dot dot): the parent of the working directory
 - ~ (tilde): your home directory

file

- Determine the file type
 - `file <path>`: determine the file type of the file at <path>
- Example:

```
$ file f.txt
f.txt: ASCII text
```

mkdir

- Make directory
 - `mkdir <dirname>`: create the directory at the path `<dirname>` if it does not already exist in the parent directory
 - `mkdir -p <dirname>`: create the directory at the path `<dirname>` and also create all non-existing parent directories in the path

rmdir

- Remove directory
 - `rmdir <path>`: remove the directory at `<path>` as long as it is empty
- Note: the `rmdir` command will permanently remove the directory; you cannot undo this action

touch

- Create an empty file
 - `touch <filename>`: create an empty file named `<filename>`

- Example:

```
$ touch a.txt
$ ls
a.txt
```

cp

- Copy files and directories

- `cp <source> <destination>`: copy the file at `<source>` to `<destination>`
- `cp -r <source> <destination>`: copy the directory at `<source>` to `<destination>`

mv

- Move (rename) a file or directory
 - `mv <source> <destination>`: move (rename) the file or directory at `<source>` to `<destination>`
- Note: unlike the `cp` command, the `mv` command does not need the `-r` flag when moving (renaming) a directory

rm

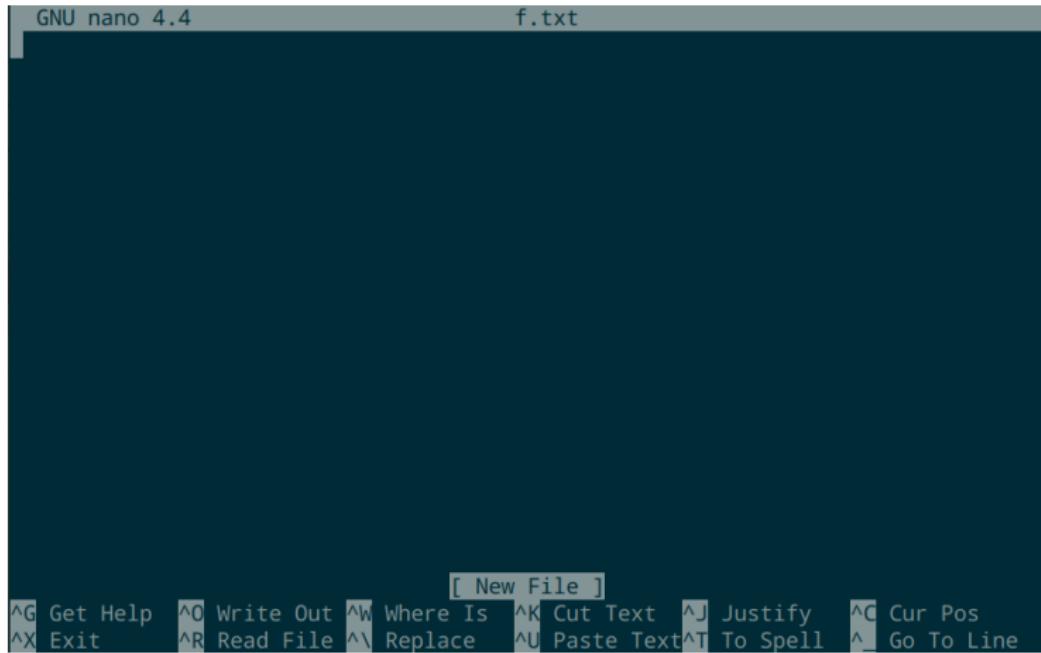
- remove files or directories

- `rm <file>`: remove the file at the path `<file>`
- `rm -r <directory>`: remove the directory at path `<directory>` and its contents
- `rm -i <file>`: (RECOMMENDED) remove the file at the path `<file>` in interactive mode; this will prompt the user before removing the file
- `rm -rI <directory>`: (RECOMMENDED) remove the directory at the path `<directory>` in interactive mode; this will prompt the user before removing the directory and all its contents
- Note: the `rm` command will permanently delete the file or directory; you cannot undo this action

nano

- nano is a command line text editor
 - `nano <filename>`: open the file `<filename>` in a nano interface; if the file `<filename>` does not exist, then it is created
- A text editor is a program that allows a user to edit the contents of a text file
- There are several text editor programs installed on the Linux server; nano is the simplest one for beginners

The nano interface



The nano interface (Continued)

- The top line of the interface has:
 - The name of the program and version number
 - The name of the file
 - An indicator that the file has been modified since it was last saved
- The third line from the bottom is a “system message”
- The last two lines are the shortcut lines; this is what makes nano more user-friendly compared to other Linux text editors

nano Shortcuts

- All nano shortcuts are prefixed with either ^ (caret) or M
- ^ refers to the control key; when typing a control sequence, you must hold down the control key and press the accompanying key at the same time
- M refers to the alt key; when typing a control sequence, you must hold down the alt key and press the accompanying key at the same time
- Example: ^G means hold down the control key and press g (not shift+g)

Common nano Shortcuts

- ^S: save
- ^O: save as
- ^X: exit (if the file is modified a prompt will appear)
- ^G: display the help text