Linux Overview

CPSC 235 - Computer Organization

Linux

- Linux is an operating system, like Windows or OSX.
- Linux and Kutztown University
  - The Computer Science department has a Linux server named csitrd 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 csitrd

- 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 `csitrd.kutztown.edu`
  - Example:

    `ssh abcde123@csitrd.kutztown.edu`

Connecting to csitrd (Continued)

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

```
The authenticity of host 'csit.kutztown.edu (156.12.127
ECDSA key fingerprint is SHA256:2oJ7zjD4/XbLbyWwWbv15+C
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 a 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 call 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.kuztown.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

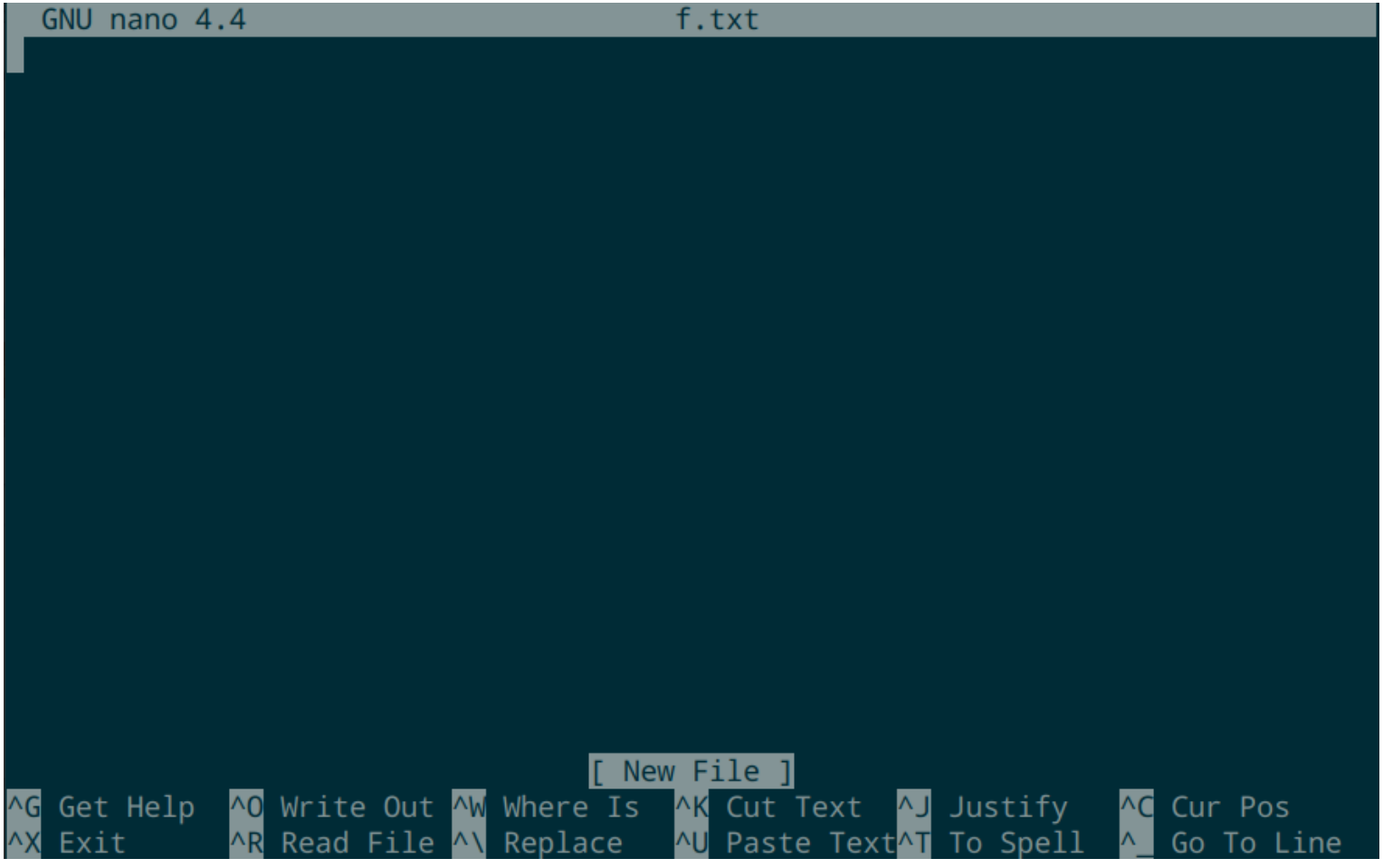
rm

- 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