

OSL640: INTRODUCTION TO OPEN SOURCE SYSTEMS

WEEK2: LESSON I

UNIX & LINUX FILE MANAGEMENT CONCEPTS MANAGING DIRECTORIES

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LESSON I TOPICS

Unix / Linux File Management Concepts

- Purpose of Directories
- Directory Pathnames / Tree Diagrams
- Filename Rules

Managing Directories

- Creating / Viewing Contents of / Manipulating / Removing Directories:
`mkdir -p, rmdir, rm -r -i, ls -l -d -R, tree, cp -R, mv`
- Demonstration

Homework

- Perform **Tutorial 2: Unix / Linux File Management (Investigation I)**
Perform LINUX PRACTICE QUESTIONS (1 – 8)

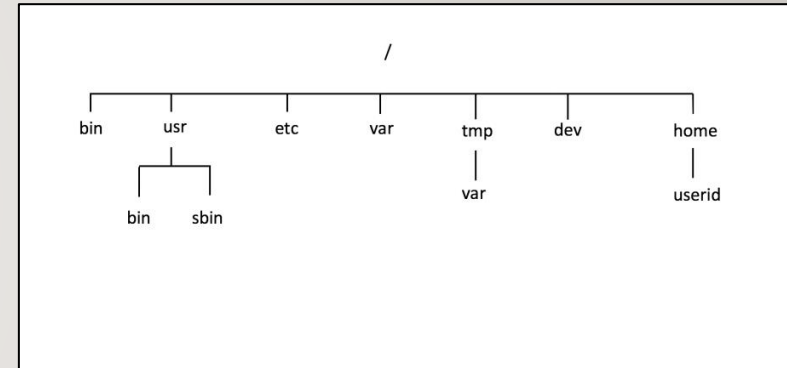
LINUX FILE MANAGEMENT CONCEPTS

Purpose of Unix / Linux Directories

To better **organize** files (eg. text, images, documents, spreadsheets, programs) within your Matrix account, they should be stored in **directories**.

To further organize many files, directories may contain **sub-directories**.

Learning how to issue Linux commands for **navigating** and **manipulating** directory and files within the the Linux filesystem are **essential skills** for Linux users and Linux system administrators (i.e. *sysadmins*).



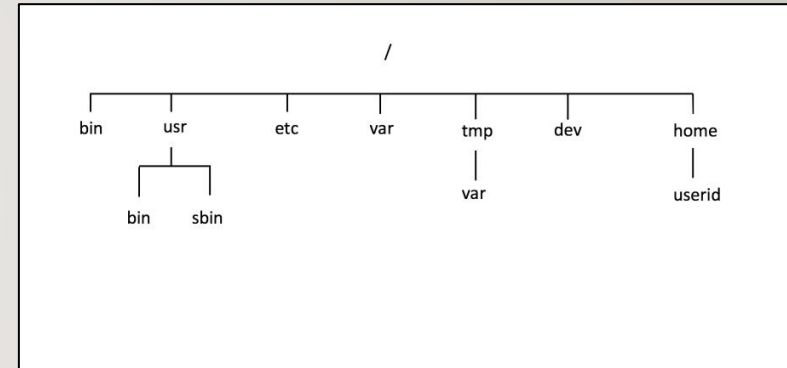
LINUX FILE MANAGEMENT CONCEPTS

Purpose of Unix / Linux Directories

The Unix/Linux file system is **hierarchical**, like other operating systems such as **Windows**, **Mac OSX**, etc. In Unix / Linux (as opposed to MS Windows), there are no drive letters such as **C:**, or **D:**

All files and directories appear under a single ancestor directory called the "**root directory**".

In the Linux (Unix) OS, the "**root directory**" **/** is the starting directory, and other "*child directories*", "**grandchild directories**", etc. can be created as required. The hierarchical structure resembles an "*upside-down tree*". There is actually a command called **tree** that displays a "**directory tree diagram**"!



```
tree linux
linux
├── uli101
│   ├── notes
│   ├── practice
│   └── samples
```

LINUX FILE MANAGEMENT CONCEPTS

Directory Pathnames

A **pathname** is used to specify the **location** of a file within the file system.

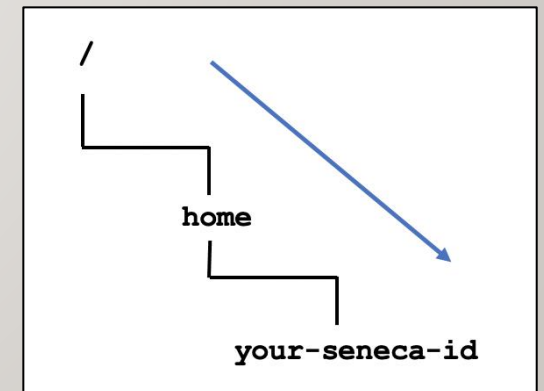
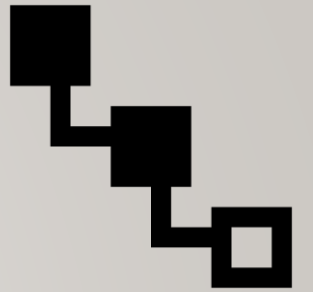
A pathname **points** to a file system location by **following the directory tree hierarchy** expressed in a string of characters in which path components, separated by a delimiting character, represent each directory.

The **delimiting character** is most commonly the slash character ("/").

Reference: [https://en.wikipedia.org/wiki/Path_\(computing\)](https://en.wikipedia.org/wiki/Path_(computing))

Example:

`/home/your-seneca-id`

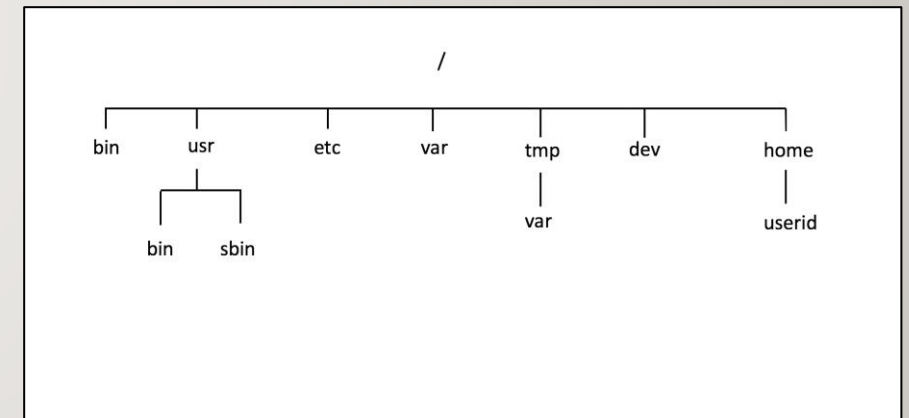


LINUX FILE MANAGEMENT CONCEPTS

Common Unix / Linux Directories

Below are several common Unix / Linux Directories and their purpose:

Directory Pathame	Purpose
/	Root directory (ancestor to all directories)
/home	Used to store users' home directories
/home/username	A <u>specific</u> User's Home Directory
/bin , /usr/bin	Common system binaries (commands)
/usr/sbin	Common utilities for system administration
/etc	System administration files (eg. passwd)
/var	Dynamic files (log and mail files)
/tmp , /var/tmp	Temporary files for programs
/dev	Device driver files (terminals, printers, etc.)



LINUX FILE MANAGEMENT CONCEPTS

Directory File Naming Rules

Before learning to **create** directories, it is important to understand what represents an appropriate directory filename. Here are some **rules**:

Unix / Linux File Naming Rules

- ✓ Unix/Linux characters are **case sensitive** (e.g. always use lowercase letters)
- ✓ Adopt a **consistent directory naming scheme** (this will help you to better navigate within your directory structure)
- ✓ Make your directory names **meaningful** (short but descriptive)
- ✓ **Avoid using spaces** for directory names (consider **periods**, **hyphens**, and **underscores** instead)
- ✓ **Avoid non-alphanumeric characters**, as they may have a special meaning to the system that will make your work more difficult when changing to directories, etc.

MANAGING DIRECTORIES

Managing Directories

Below are some common Unix / Linux commands to manage Directories:

Directory Pathame	Purpose
<code>mkdir -p</code>	Creates a directory.The -p option creates parent directories then directory pathnames specified.
<code>rmdir</code>	Removes <u>empty</u> directories.
<code>rm -r -i</code>	Removes files, but when used with -r option, will remove <u>non-empty</u> directories and their contents.The -i option is used to prompt user to confirm deletion of directory contents
<code>ls -l -d -R , tree</code>	List directory contents. Useful to verify if directory was created. The -d option lists the directory itself (not contents) The -R option displays directories and subdirectory contents. The tree command displays diagram of directory structure.
<code>cp -R</code>	Copies directory and its contents (recursive) to a different directory
<code>mv</code>	Moves directory and its contents to a different directory

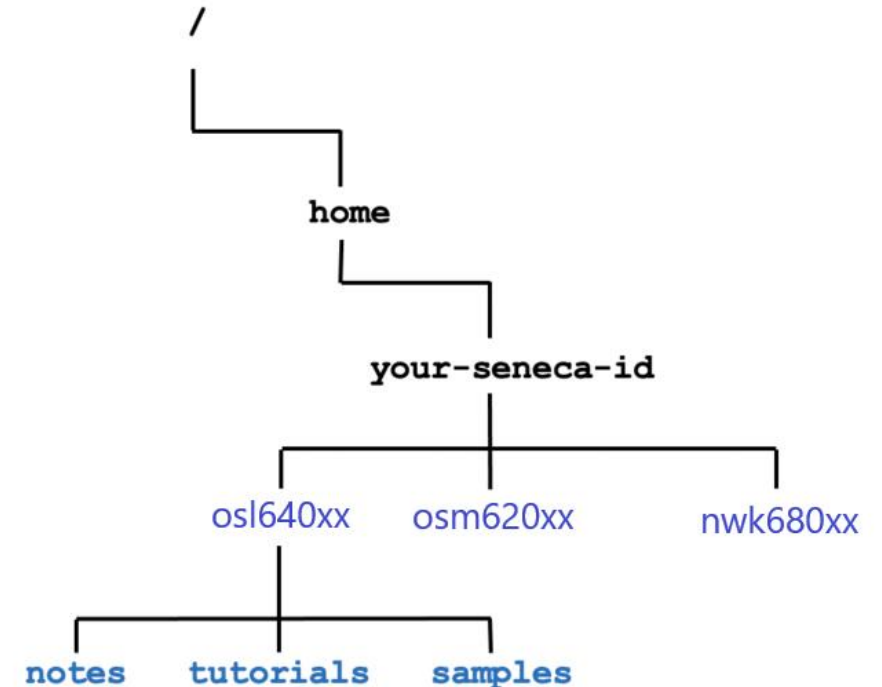
MANAGING DIRECTORIES



Managing Directories Demonstration

Your instructor will demonstrate how to manage directories by issuing Unix / Linux commands:

- Create directory structure as shown in diagram to the right
- View / Verify created directories
- Copy directories
- Move directories
- Remove empty directories
- Remove non-empty directories



MANAGING DIRECTORIES

Determine Type of File

When issuing the `ls` command to view directory contents of viewing a directory, the `-l` option can be used to help determine it file type.

```
ls -l
```

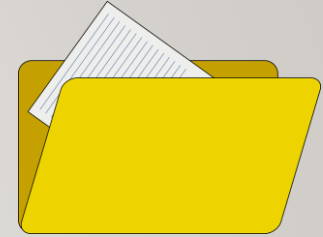
```
drwxr-xr-x 2 murray.saul users 6 Jan 11 09:42 documents
-rw-r--r-- 1 murray.saul users 0 Jan 11 09:42 file.txt
crw-rw-rw- 1 root root 1, 3 Dec  2 07:25 /dev/null
```

The first character on the **left** of the output indicates the type of file:

d: directory file

-: regular file

b or **c**: device file



MANAGING DIRECTORIES

Hidden Files

A file is hidden if its name starts with a period “.”
This can hide both regular files and directory files.



Why make files hidden?

- To clean up directories
- To hide backups
- To protect important files from accidental deletion

If you issued the `ls` command without arguments, hidden files do NOT appear.

The `ls` command with the `-a` option will show all files including hidden and non-hidden. Current and Parent directories (`.` and `..`) are displayed

The `ls` command with the `-A` option will show all files including hidden and non-hidden. Current and Parent directories (`.` and `..`) are NOT displayed

HANDS-ON TIME / HOMEWORK

Getting Practice

Perform the online tutorial **Tutorial 2: Unix / Linux File Management** (ctrl-click to open link):

- [INVESTIGATION 1: MANAGING DIRECTORIES](#)
- [LINUX PRACTICE QUESTIONS](#) (Questions 1 – 8)

OSL640: INTRODUCTION TO OPEN SOURCE SYSTEMS

WEEK2: LESSON 2

MANAGING TEXT FILES:
USING TEXT EDITORS TO CREATE & EDIT A TEXT FILE
MANAGING TEXT FILE CONTENT

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LESSON 2 TOPICS

Creating Text Files

- Purpose of a Text Editor
- Using the `nano` Text Editor / Demonstration
- Using the `vi` Text Editor / Demonstration

Managing / Manipulating Text Files

- Linux Commands: `touch`, `cat`, `more/less`, `cp`, `mv`, `rm`, `diff`, `file`, `find`
- Demonstration

Homework

- Perform **Tutorial 2: Unix / Linux File Management (Investigation 2)**
Perform LINUX PRACTICE QUESTIONS (9 – 16)

CREATING TEXT FILES

Text Editors

A **Text Editor** allows users to **create, modify** and **save** editing changes of text files.

Although **programming students** can use **graphical IDE's** to code and compile programs, students can **create source code** using a text editor and **compile their source code** in their Matrix account to generate **executable programs**.

```
#include <stdio.h>
#include <stdlib.h>
#include <sys/types.h>
#include <arpa/inet.h>

void serveur1(portServ ports)
{
    int sockServ1, sockServ2, sockClient;
    struct sockaddr_in monAddr, addrClient, addrServ2;
    socklen_t lenAddrClient;

    if ((sockServ1 = socket(AF_INET, SOCK_STREAM, 0)) == -1) {
        perror("Erreur socket");
        exit(1);
    }
    if ((sockServ2 = socket(AF_INET, SOCK_STREAM, 0)) == -1) {
        perror("Erreur socket");
        exit(1);
    }

    bzero(&monAddr, sizeof(monAddr));
    monAddr.sin_family = AF_INET;
    monAddr.sin_port = htons(ports.port1);
    monAddr.sin_addr.s_addr = INADDR_ANY;
    bzero(&addrServ2, sizeof(addrServ2));
```


CREATING TEXT FILES

Text Editors

Networking and Tech Support students use a text editor to **edit configuration files**.

Throughout their program, students will become familiar with the process of **installing, configuring, and running** network services on their Linux servers.

Text editors are an important tools to help setup but also **"tweak"** or make **periodic changes in networking services configuration**.

```
# .bashrc

# Source global definitions
if [ -f /etc/bashrc ]; then
    . /etc/bashrc
fi

# Uncomment the following line if you don't like systemctl's auto-paging feature:
# export SYSTEMD_PAGER=

# User specific aliases and functions
PS1='\e[0;36m[\u @ \h \W] \e[m '
PS2="/Finish command/ "
export LC_ALL=C
export LC_COLLATE=C
who
echo
mesg n
PATH=$PATH:~/scripts

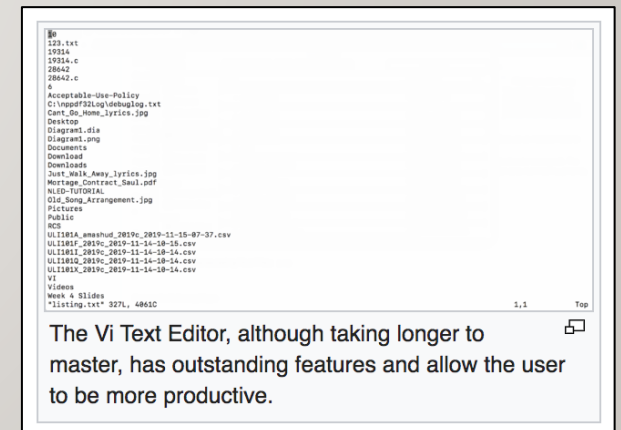
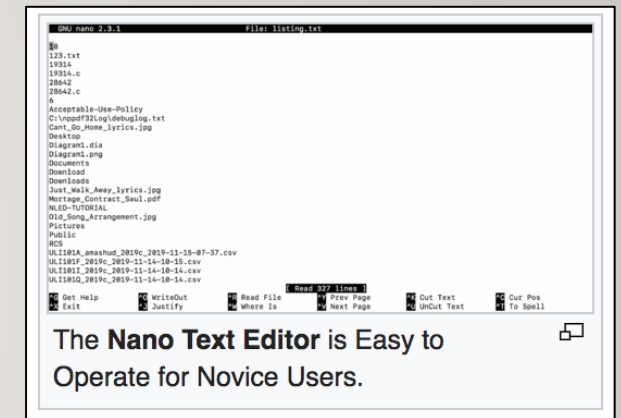
umask 077
```

CREATING TEXT FILES

Text Editors

Regardless of the IT stream that they are in, it is useful for students to **expose themselves to different text editors and then use one that they feel most comfortable working with.**

The two most readily-available command line text editors in Linux are **nano** and **vi**.



CREATING TEXT FILES

Nano Text Editor

The **nano** text editor is considered to be an easy-to-use text editor. When using the nano text editor, you are placed in **INPUT** mode, to enter text immediately.

Nano editing **commands** typically consist of the **^** symbol which represents the **<ctrl>** key followed by a character

NOTE: There is no **undo** command in Nano!

The table on the right lists a few Nano commands and their purpose. Refer to **week 2 notes** for a **nano reference sheet**.

NOTE: In the Nano reference sheet, the letter **M** represents the **<esc>** key

```
GNU nano 2.3.1      File: mytext.txt
This is the first line
This is the second line
This is the third line
```

Key Combination	Purpose
<ctrl>space , <esc>space	Move forward / backward one word
<ctrl>a , <ctrl>e	Move to beginning / end of line
<ctrl>k	Cut line
<esc>6	Copy Line
<ctrl>u	Paste Cut / Copied Text
<ctrl>g	Display help screen
<ctrl>x	Save and exit editing session

MANAGING DIRECTORIES



Instructor Demonstration

Your instructor will demonstrate how to create and edit a text file using the nano text editor.

CREATING TEXT FILES

vi Text Editor

The **vi** (**vim**) text editor (although taking longer to learn) has outstanding features to increase coding productivity..

The major different between nano and vi is that **vi starts in COMMAND LINE mode**. You need to issue letter commands to perform text editing or press colon “:” to enter last line mode to issue more complex commands.

To make it easier to learn how to use this text editor, an **online tutorial** was created (two decades ago) to provide you "hands-on" experience in command editing techniques.

To run this tutorial, issue the following command in Matrix:
[/home/murray.saul/vi-tutorial](https://home.murray.saul/vi-tutorial)

You can refer to your **week 2 notes** for a **vi command reference sheet**.

```
This is the first line
This is the second line
This is the third line
~
~
~
~
~
~
~
~
```

Key Combination	Purpose
i	Enter INSERT mode
<esc>	Return to COMMAND mode
B , W	Move forward / backward one word
0 , \$	Move to beginning / end of line
dd	Cut line
yy	Copy Line
p , P	Paste below / above line
:help	Display help screen
:x	Save and exit editing session

MANAGING DIRECTORIES



Instructor Demonstration

Your instructor will demonstrate how to create and edit a text file using the **vi** text editor.

MANAGING TEXT FILES

Purpose

It is **essential** for students in this course not only to create text files but also to learn how to **manage** text files.

Students need to learn how to **create** empty files, **copy** files for backup purposes, **move** or **rename** incorrectly spelled filenames, **edit** files as well as **view** text file contents without the danger of editing or corrupting those files.

Students also need to learn how to **remove** files, check for **differences** between a couple of files as well as **obtain information** regarding the status of a file and information regarding the file's content.



MANAGING TEXT FILES

Text File Management Commands

Here are common text file management commands:

Linux Command	Purpose
<code>touch</code>	Create empty file(s) / Updates Existing File's Date/Time Stamp
<code>cat</code>	Display text file's contents without editing (small files)
<code>more</code> , <code>less</code>	Display / Navigate within large text files without editing
<code>head</code> , <code>tail</code>	View lines at top/bottom of file
<code>grep</code>	Display lines in file that match a pattern
<code>cp</code>	Copy text file(s)
<code>mv</code>	Move / Rename text files
<code>rm</code>	Remove text file(s)
<code>diff</code>	Displays differences between 2 files

MANAGING TEXT FILES

Text File Management Commands

Here are some **additional** text file management commands:

Linux Command	Purpose
<code>sort</code>	Display contents of file in sorted order
<code>uniq</code>	Display identical adjacent lines only once
<code>file</code>	Gives info about the contents of the file (e.g. file with no extension)
<code>find</code>	<p>To find files matching specified characteristics:</p> <pre>find . -name "file*" lists pathname of any filenames beginning with "file", from the current directory and any subdirectories find . -size +50k lists pathname of any files larger than 50 kb, from the current directory and any subdirectories find . -mmin -5 lists files modified less than 5 minutes ago</pre>

MANAGING DIRECTORIES



Managing Manipulating Text Files

Your instructor will demonstrate how to **manage / manipulate** text files

- Create empty files
- View small and large text files
- Sort files
- Display matched pattern file content
- Remove duplicate lines
- Compare files for differences
- Obtain file information / List file pathnames



HANDS-ON TIME / HOMEWORK

Getting Practice

Perform the online tutorial **Tutorial 2: Unix / Linux File Management** (**ctrl-click** to open link):

- [INVESTIGATION 2: MANAGING TEXT FILES](#)
- [LINUX PRACTICE QUESTIONS](#) (Questions 9 – 16)