OSL640: INTRODUCTION TO OPEN SOURCE SYSTEMS

WEEK1: LESSON 1

COURSE INTRODUCTION / UNIX AND LINUX BACKGROUND
ACCESSING YOUR LINUX MATRIX SERVER ACCOUNT

LESSON 1 TOPICS

Why I am Taking This Course? (Course Introduction)

- Instructor Information / Purpose of Course

- Foundations For Future Courses

- Course Resources / Course Outline / Course Policies

Background and Features of UNIX and LINUX OS

- Purpose of an OS / History of Unix & Linux OS

- Features of Unix / Linux OS

Matrix Linux Server

- Purpose / Layout

- How to Access your Matrix Linux Account:

  - From Seneca Lab Workstation

  - From Laptop or Home Computer (Windows, Mac OSX, Linux)

- How to Logout of your Matrix Linux Account

COURSE INTRODUCTION

Why am I Taking This Course?

Unix and Linux are commonly used operating systems in the IT industry. You are required to learn **important technical skills** in order to be successful in future courses and your career.

In this course, you will learn **core utilities** to work productively in a **Unix / Linux** operating system environment including the following topics:

- **Issuing Linux commands** and **utilities**
- **Manipulating data stored in regular text files**
- **Managing files and directories (including access & permissions)**
- **Writing basic shell scripts**
- **Configuring login accounts**

COURSE INTRODUCTION

Foundation for Future Courses

The following table shows the various courses that require Linux skills for the **Business Information Technology** program.

Business Information Technology
OSL740 (Administration of Open Source Systems)
OSL840 (Advanced Administration of Open Source Systems)
ADM950 (Enterprise Project)
SEC935 (Security Operations and Administration)
SOA915 (Service Oriented Architecture)

COURSE INTRODUCTION

Course Resources

Resources	Purpose
OSL640 WIKI: **https://wiki.cdot.senecacollege.ca/wiki/OSL640**	• **Course Outline** / **Course Policies** • Weekly Schedule (**notes**, **tutorials, practice questions**) • **Tutorial** Instructions
Learning Content Management System (Blackboard) **https://my.senecacollege.ca/**	• **Course Marks (**located in **My Grades)** • Link to the **OSL640 WIKI** • **Online Quizzes / Online Tests**
The Linux Documentation Project http://en.tldp.org/	• Vast online Linux Documentation • **HOWTOs**, **Guides**, **FAQ**s

COURSE INTRODUCTION

Faculty Information

Please note and record the following information in class:

- **Instructor's Full Name**

- **Instructor's Office Location**

- **How to Contact OSL640 Instructor:**

  - **E-mail Address**

  - **Web Presence**

COURSE INTRODUCTION

**Blackboard: Course Documents
(Jason Carman's OSL640 Sections)**

In the **Course Documents** section of your **Blackboard OSL640** course, there are several resources which include:

- **Virtual Classroom** will take you into our **synchronous** (meaning we are all online together) Lab sessions.

- **Lecture Videos** contains the lecture recordings. All except the first week will be delivered **asynchronously** (meaning you will watch a pre-recorded video before your Lab session).

- A **Link** to the **OSL640 WIKI** that contains weekly lesson **slides** and **tutorials**.

- **Quizzes & Tests** can be found under Course Documents (in the main navigation).

COURSE INTRODUCTION

OSL640 WIKI

Main WIKI Page (Quick Links)

The **Quick Links** section on the top-right corner provide links to the **weekly schedule**, **course outline**, **course policies** and **assignment instructions**

Weekly Schedule Page

The weekly Schedule provides **lecture notes** (under **Reference** section in both **PDF** and **PowerPoint** format).

The **Tutorials** section contains a weekly **hands-on tutorial** that provide the student guided practice to become familiar with working in the Linux environment. These make up 30% of your final grade.

NOTE: The areas highlighted in **YELLOW** are important (either lecture content or tutorial) for each week.

OSL640

Welcome to OSL640! Content under development.

Contents [hide]

1 Welcome to OSL640 - *Introduction to Open Source Systems*
    1.1 What This Course is About
    1.2 Accessing Your Linux Computer Account
    1.3 Course Resources

Quick Links
Weekly Schedule
Course Outline
Course Policies

Reference	Tutorial (Lab)
Week 1 Lecture Notes: PDF	PPTX	• Tutorial 1: Using Your Matrix Account
Resources:	
• HOWTO: Access Your Matrix Account (Platforms: Windows, Linux, Mac OSX)	
Links to Windows SSH clients (Access Matrix from home):	
• SSH/SFTP	Putty	Bitvise SSH Client	MovaXterm	

COURSE INTRODUCTION

Course Outline

Link: https://ict.senecacollege.ca/course/osl640/

Topics

- Course Description

- Modes of Instruction

- Evaluation / Promotion Policy

- Learning Outcomes / Topic Outline

COURSE INTRODUCTION

Course Policies

Link: https://wiki.cdot.senecacollege.ca/wiki/Course_Policies_for_OSL640

Topics

- Tutorials

- Quizzes, Test, and Project

- Cheating & Plagiarism

- What constitutes cheating?

- General Information

UNIX AND LINUX BACKGROUND AND FEATURES

Purpose of an Operating System

An operating system basically performs 2 major tasks:

1. **Manages Resources** to provide a **platform** for application to run
2. **Interface** to allow the OS to communicate with the end-user (**Humans**)

Over time, operating systems used a **command line interface**, then evolved into a **menu-driven interface**, then finally a **graphical user interface** (GUI).

Depending on the OS installation setup, modern operating systems can provide **ALL** of the above-named types of interfaces to help accommodate all users' preferences.
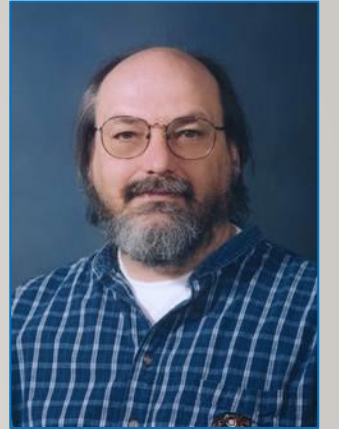
UNIX AND LINUX BACKGROUND AND FEATURES

History of Unix

Although Unix was not the first operating system, it made a huge impact in the 70's and is still a popular OS today.

Interesting Facts:

- The UNIX OS was developed in the early 70's by **Ken Thompson** as a platform to play a crude network strategy-based game called "**space travel**".

- UNIX was developed at **AT&T Bell labs**, but it took the company a few years to realize that this OS would be popular and marketed proprietary version that became **Unix System V** (**release 4**).

- While Ken Thompson took a break from work and taught at University of Berkley California, he provided students source code to OS and Shell (interface) which branched into a **free version** of the OS that became **BSD (Berkley Software Distribution) Unix**.

UNIX AND LINUX BACKGROUND AND FEATURES

History of Unix / Continued…

- Unix was developed to incorporate the following features:

    - Allows for **multiple users** – this is performed by assigning each user a "small slice of time" to give illusion that computer is paying total attention to that user.
    - Allows for **multi-tasking** – allows for more than one task to be executed at the same time (e.g. via a "time-slice").
    - Supports **multi-processing** (allows tasks to be performed on multiple processors).
    - Simplifies **sharing of data and programs among users**.

- Unix also evolved at the time that **ARPANET** (an ancestor to the **Internet**) was evolving which made it easier to setup computer networks and use networking and eventually **Internet related utilities**.

UNIX AND LINUX BACKGROUND AND FEATURES

History of Unix / Continued…

- Unix was re-written using the **C programming language** to make the OS more portable to install and operated on other types of computers.

- Hardware manufacturers modified UNIX to run on their systems and added enhancements.

- Versions of Unix (both propriety and free) became **standardized** to be accepted and used by industry and government organizations (e.g. **POSIX** standard).

UNIX AND LINUX BACKGROUND AND FEATURES

History of GNU / Linux

Richard Stallman published the **GNU Manifesto** in 1984, which described the need for Free Software ("*Free in the sense of free speech, not free beer*"). The resulting **GNU project** developed free, open-source replacements for most of the Unix programs, but not for the Unix kernel (the core program that interacted with and controlled the hardware).

These programs were released under the **GNU General Public License (GPL),** which permits anyone to copy, use, and modify the software, as long as these rights are preserved for anyone receiving a subsequent copy of the software.

Under the GNU project, there were many free utilities that were available for a Unix-Like OS, but the Unix-like OS for PCs that Richard was developing was not stable and another Unix-like OS for the PCs became available called **Linux**.

UNIX AND LINUX BACKGROUND AND FEATURES

History of GNU / Linux (Continued…)

In 1991, **Linus Torvalds**, a Finnish computer programming student, released the **Linux kernel**, eventually placing it under the **GPL**.

The Linux kernel, GNU software, and some other components were **combined** into a powerful, **Unix-like** operating system.

This OS can't technically be called Unix, because it has never been certified to be Unix, but virtually everyone in the industry regards it as such.

The combined GNU and Linux system is called "**GNU/Linux**" by some but just **"Linux"** by others (much to the dismay of **Richard Stallman**) who feels that the simple name Linux downplays the tremendous **contribution** made by the **GNU Project**.

UNIX AND LINUX BACKGROUND AND FEATURES

Linux Distributions

Today there are many different distributions (or versions) of Linux. Some of them have specialized uses while others are more of a general-purpose Operating System. Linux can be found all around us – powering websites we access, the cloud and even the mobile devices we use. Android Smart Phones and Tablets are powered by the Android Operating System, which is based on a modified version of the Linux kernel.

All of these different Linux distributions can be traced to a few base parent distributions or families (depicted on the next slide). These are:

- Ubuntu / Debian

- Arch

- Red Hat / Fedora / Mandriva

- Slackware

- Gentoo

- Additionally, there are several Linux distributions that exist independently of these families

PERIODIC TABLE OF LINUX DISTRIBUTIONS (DISTROS)

Periodic Table of Linux Distros
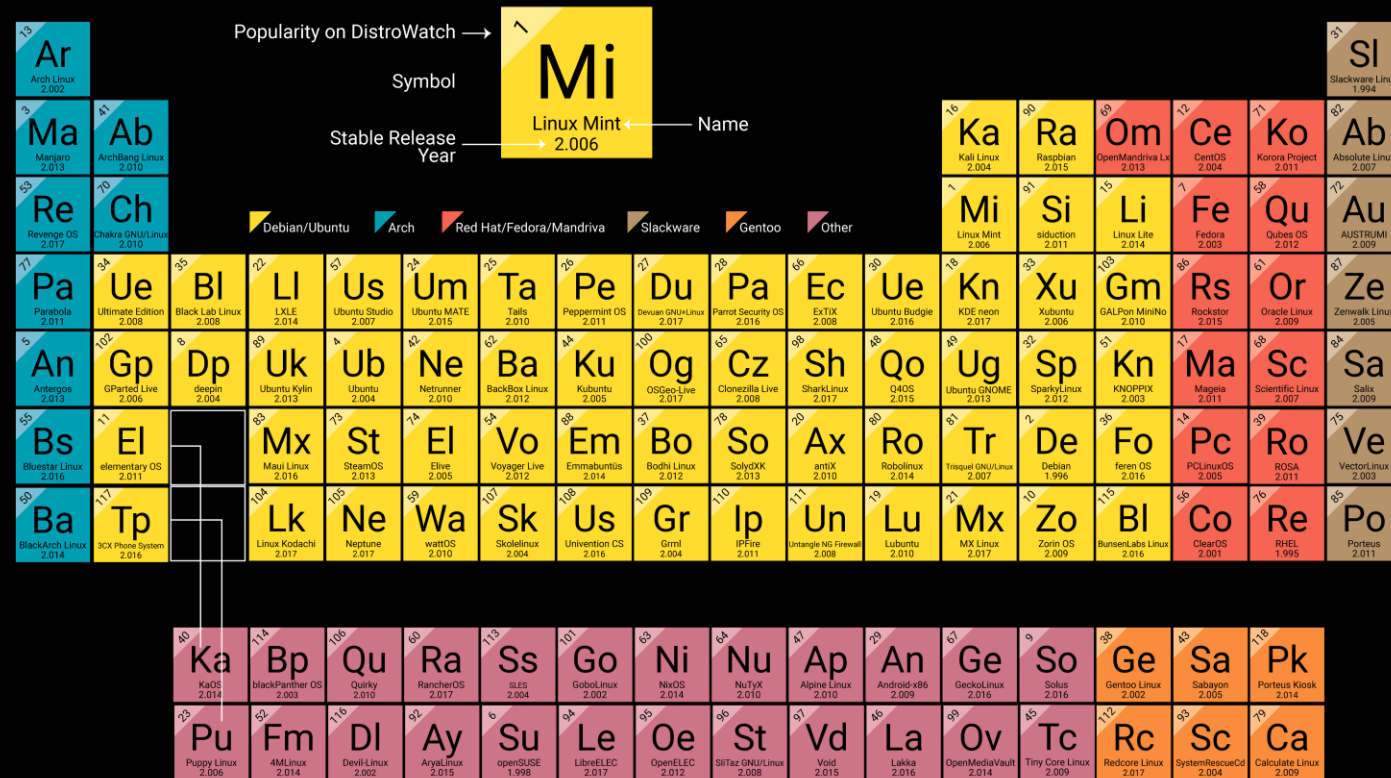
MATRIX LINUX SERVER

While attending Seneca College, you will be using many different **computer systems** to perform various operations. Below is a listing of a few of these servers:

my.senecacollege.ca   **Learning Content Management System (Student Grades / Notes / Online Quizzes)**

ict.senecacollege.ca   **Main ICT Webserver**

wiki.cdot.senecacollege.ca   **Course WIKIs for Seneca College Students**

→ **matrix.senecacollege.ca**   **Linux Account for Student Practice and Assignment submission**

Students will mainly use a **web-browser** to interact with those listed servers.

An exception is the **Matrix** server which requires that students run an application to **connect** to their server account to practice **Linux commands**, perform **tutorials** and submit their **online assignments**.

MATRIX LINUX SERVER

The **Matrix** server consists of **several Virtual Computers connected** to form a **cluster**. A cluster is a cost effective <u>alternative</u> to buying larger servers.

All registered students in this course have access to an account on the Matrix server. You will be using this account for the following reasons:

- Issuing **Linux commands**
- Practicing Linux commands at the **Linux shell** to be more productive
- Performing **Linux Online Tutorials (12)**
- Practice Issuing **Linux Command Review Questions**
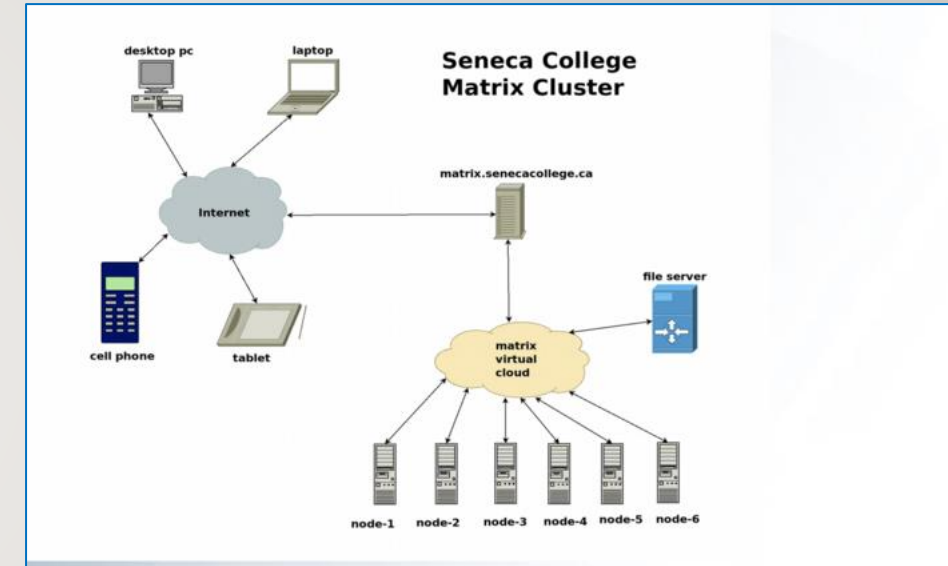
MATRIX LINUX SERVER

Communicating with Matrix Server

In UNIX / LINUX, a **shell** refers to an **interface** that allows a user to communicate with the OS.

UNIX / LINUX has the ability to install a **GUI** (**Graphical User Interface**)
that allows the user to launch applications via icons, graphically manage files, etc.

On the other hand, due to **bandwidth issues** and the **large number** of Seneca students
that remotely connect to the **Matrix** server, it is **NOT** feasible to connect via a GUI.

Therefore, it is only possible to interface with your **Matrix** account via a
CLI (**Command Line Interface**), where students issue Linux commands
to launch applications, manage files, etc..

MATRIX LINUX SERVER

Accessing Matrix from Within College:

You can access your Matrix Linux account from a workstation located in any Seneca lab, or from your own computer (e.g. laptop or home computer).

Accessing Matrix from Lab Workstation:

MyApps is an application streaming service that lets you run software on any Seneca Workstation on demand. Any software application on the MyApps menu can be used on computers in classrooms, labs, and the Computing Commons.

Reference: https://inside.senecacollege.ca/its/software/myapps/
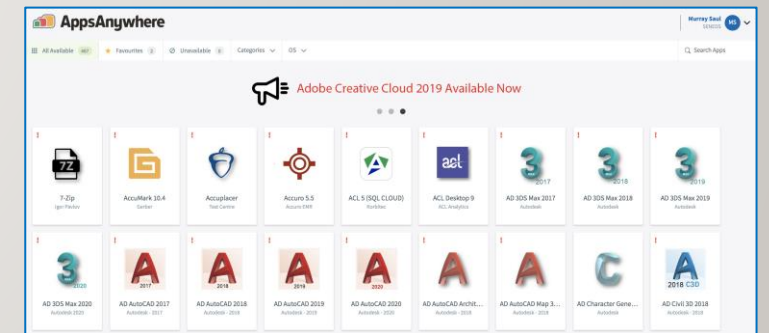
MATRIX LINUX SERVER

Accessing Matrix from Remote Computer:

Due to the **COVID19 Pandemic**, ICT students are required to learn **remotely** (i.e. <u>not</u> at Seneca College).

You can also do this by command-line (eg. **ssh** command) or by running a **graphical SSH application** (eg. **SSH Secure Shell Client**).

MATRIX LINUX SERVER

Connecting to the Seneca GlobalProtect Student VPN

As of **September 2020**, all Seneca College students are required to **FIRST** connect to the
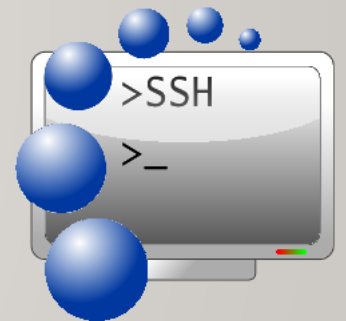**Seneca GlobalProtect Student VPN** in order to be able to connect to their **Matrix** Linux account.
Seneca College are "rolling-out" additional measures to improve **network security**. One of these
measures are to implement **multi-factored authentication**.

*Multi-factor authentication is an electronic authentication method in which a computer user is granted access to
a website or application only after successfully presenting two or more pieces of evidence (or factors) to an
authentication mechanism: knowledge (something the user and only the user knows).*

Reference: https://en.wikipedia.org/wiki/Multi-factor_authentication

NOTE: If you haven't done this yet, please perform the steps provided in the following link:
https://employees.senecacollege.ca/spaces/77/it-services/wiki/view/3716/vpn
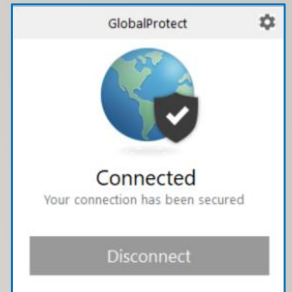
MATRIX LINUX SERVER

Accessing Matrix Using New Windows 10, Mac OSX or Linux Computer:

SSH from Windows 10 OS (Newer Version)

- From the start menu, type **cmd** and **click** on *cmd* icon to launch.

- In the command line, enter the following command: **ssh senecausername@matrix.senecacollege.ca**

- Enter your password when prompted., answer **yes** to any questions it may ask you.

SSH from macOS

- Click Launchpad icon and type **terminal** and press **ENTER**

- On the command line, type: **ssh senecacusername@matrix.senecacollege.ca**

- Enter your password when prompted. Answer *yes* to any questions it may ask you.

SSH from Linux

- From the main menu, choose **Applications** > **System Tools** > **Terminal**

- On the command line, type: **ssh senecac username@matrix.senecacollege.ca**

- Enter your password when prompted. Answer *yes* to any questions it may ask you.

MATRIX LINUX SERVER

Accessing Your Matrix Account:

You will need to provide the **domain (host) name** of the Matrix server,
your **username** and **password** to access the Matrix server.

Your Matrix username and password is **identical** to your **myseneca** *username* and *password*.

NOTE: You can use the hostname **matrix** since you are located **inside** Seneca's network.

If you were located **outside** Seneca's network, then you would need to enter the
full domain name: **matrix.senecacollege.ca**

MATRIX LINUX SERVER

Instructor Demonstration:

Your instructor will demonstrate how to connect to the
Matrix server by issuing a **command**.

MATRIX LINUX SERVER

Alternative Method: Accessing Matrix Using SSH Application (MS Windows)

You can also install and run a free **graphical SSH application** in order to connect to your Matrix account. You may find it useful when running a graphical SSH application to **copy and paste text**.

- **Click** the following **link** to download and install application on your Windows computer:
  http://www.sfsu.edu/ftp/win/ssh/SSHSecureShellClient-3.2.9.exe

- After the application has been installed, it should appear as an application icon on your desktop. **Double click** the **SSH Secure Shell Client** application icon.

- The main SSH Client window will appear. Click on the **Quick Connect** button.

MATRIX LINUX SERVER

Instructor Demonstration:

Your instructor will demonstrate how to connect to the
Matrix server by and installing and running an **SSH application**.

MATRIX LINUX SERVER

Accessing Your Matrix Account:

When connecting securely for the **first time**, a dialog box will appear to share a **"public key"** with your Matrix account in order to make your interaction between your workstation and the remote Linux server secure within the network (i.e. encrypted to prevent unauthorized access by other users).

Matrix has only a Command Line Interface (CLI)

The **Matrix** server has been configured to allow users to **only interact with the Linux OS by issuing commands**. There are various reasons for this, but the main 2 reasons are to **force students to learn how to issue Linux commands** as well as learning to combine Linux commands in a file called a **shell** script to **automate common tasks**.

Later in the course, your instructor may demonstrate other ways of accessing **graphical versions of Linux**, and how to launch a shell terminal.

MATRIX LINUX SERVER

Logging Out of Your Matrix Linux Account:

When you want to log-out of your Matrix server account, you can enter the **commands exit**, **logout**, or press the **shortcut key**: **<ctrl><d>**

NOTE: You should exit by issuing a **command** or **shortcut key** as opposed to closing the SSH application window.

HANDS-ON TIME / HOMEWORK

1. Get Acquainted with the **OSL640 WIKI**, **notes**, **tutorials** and **resources**.

2. Perform the following investigations in **Tutorial 1**:

   INVESTIGATION 1: USING YOUR MATRIX LINUX ACCOUNT

OSL640: INTRODUCTION TO OPEN SOURCE SYSTEMS

WEEK1: LESSON 2

ISSUING LINUX COMMANDS / LINUX COMMAND HELP
COMMAND LINE EDITING
ONLINE TUTORIALS / STUDENT LEARNING GROUPS
PERFORMING ONLINE ASSIGNMENTS

LESSON 2 TOPICS

Using Your Matrix Account

- Issuing Linux Commands / Arguments / Options

- Command Help / Command Line Editing

- General Linux Commands

Getting Practice Issuing Linux Commands

- Tutorials with Linux Practice Questions

- Student Learning Groups

- Performing Online Assignments

Homework

- Perform **Tutorial 1 – Investigation #2**

USING YOUR MATRIX ACCOUNT

Linux Command Structure

command argument1 argument2 ...

Some Linux commands can be issued by entering the Linux command line **without arguments** (e.g. **pwd**, **date**, **ls**, **cal**), but some Linux commands can be issued with arguments (e.g. **cal 2002**, **cd /bin**, **ls -la**).

An **argument** can be a file **pathname**, **text**, or an **option**.

Examples:

- The **ls** command displays a listing of just filenames in the **current** directory

- The **ls /bin** command displays a listing of filenames in the **/bin** directory
  (as opposed to your current directory)

- The **ls -l** command displays a **detailed** listing of filenames in the **current** directory

- The **ls -l /bin** command displays a **detailed** listing of files in the **/bin** directory

USING YOUR MATRIX ACCOUNT

Getting Help with Linux Commands

With the Linux OS containing over **2500** commands and utilities, it is good for a Linux user or Linux System Administrator (i.e. sysadmin) to learn about how to use commands *"on-the-fly"*.

The **man** command can provide information on how to use a command
(i.e. **usage**, **arguments**, **options**, **examples**).
The commands are classified into sections or "**volumes**".

Example:
man ls

If you do not know the name of a Linux command, the **man** utility can be used with the **-k** option to help list Linux commands that match a text pattern that is contained within the help screen for a Linux command.

Example:
man –k copy

USING YOUR MATRIX ACCOUNT

Getting Help with Linux Commands / Continued...

You can use the following short-cut keys within the **man** command to help navigate throughout this utility to get help with the specific command (refer to table below):

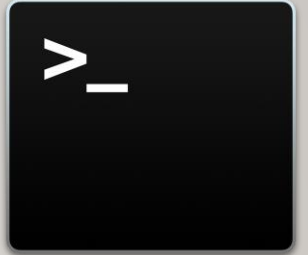| Keyboard Shortcut	Purpose
ENTER	Move down one line
SPACEBAR	Move one screen down
<ctrl><b>	Move one screen up
/pattern	Search for Pattern
q	quit man utility

MANAGING DIRECTORIES

Instructor Demonstration

Your instructor will demonstrate how to use the **man** pages command.

USING YOUR MATRIX ACCOUNT

General Linux Commands

Your instructor will demonstrate several basic Linux commands to get practice how to issue **Linux commands** and using **arguments** and **options**.

Shortcut Key(s)	Arguments / Options	Purpose
pwd		Display Current Working Directory
cd	**dir-pathname**	Change Directory
ls	**-l, -a, -R, -d, dir-pathname**	List Files of Directory
cal	**month, year**	Display calendar
date		Display date and time
who		List users logged into server
whoami		Display username of user logged in
clear		Clear Screen
passwd	**username**	Change user's password

USING YOUR MATRIX ACCOUNT

Command Line Editing

Learning **shortcut keys** in any OS terminal will allow you to be more productive as a sysadmin. We will only focus on a few command line editing keyboard shortcut keys.

Shortcut Key(s)	Purpose
`<ctrl><l>`	Clear Screen
`<ctrl><u>`	Clear Command Line
`<Up Arrow> ,<Down Arrow>`	Scroll Up / Down Command History
`<backspace> ,<ctrl><backspace> ,<ctrl><h>`	Delete character before the cursor
`<ctrl><w>`	Delete word before the cursor
`<ctrl><a>`	Move cursor to beginning of command line
`<ctrl><e>`	Move cursor to end of command line
`<alt>f/<alt>b` (Mac: OPTION+Right/Left-Arrow)	Move Forward/Backward one word

NOTE:

If you are using a **Graphical SSH application**, you would need to configure the application (META settings) to NOT bring up menus by mistake when you issue some of these shortcuts.

MANAGING DIRECTORIES

Instructor Demonstration

Your instructor will demonstrate how to **issue general Linux commands** and perform **command line editing**.

GETTING PRACTICE ISSUING LINUX COMMANDS

Tutorials / Linux Practice Questions

There are **tutorials** that are available for students to get "hands-on" practice issuing Linux commands. These tutorials contribute to 30% of your final grade if completed **by the due date**.

It is **highly recommended** that you perform them and answer the Linux Practice Questions at the end of the tutorials. Weekly tutorials are highlighted in **yellow** (like weekly slides).

The best way to pass this course is to complete the **tutorials** and submit them **on time**. All of the assessments will derive from the **tutorials** and **lecture** content.

HOW TO BECOME SUCESSFUL IN THIS COURSE

Performing Tutorials

At the end of each lesson, you will be directed to perform **section(s)** of the **weekly tutoria**l (link contained in the **OSL640 WIKI's Weekly Schedule**).

The tutorials are designed to provide you **guided hands-on practice** with Linux commands and operations that will help you get practice prior to performing your assignments. Depending on your instructor, these tutorial <u>may</u> be worth **marks** (and assigned a **due date**).

Linux Practice Questions are located at the <u>bottom</u> of each tutorial.

Students that take the time to perform this tutorials tend to **complete the online assignments faster** and **perform better on quizzes and tests**!

Reference
Week 1 Lecture Notes: PDF⧉ I PPTX⧉
Tutorials:
• Tutorial 1: Access Your Matrix Account⧉

HOW TO BECOME SUCESSFUL IN THIS COURSE

Project

You are required to complete a final project (in place of a final exam) in the second half of this course. This project is based heavily on Tutorial 7 and will include both a:

- Presentation (including live demonstration)

- Documentation Report

This can be completed individually or optionally in groups of two.

GETTING PRACTICE ISSUING LINUX COMMANDS

Need Additional Help? Try the Learning Centre:

https://www.senecacollege.ca/ce/info/services/learning-centre.html

ONE-ON-ONE TUTORING
Appointments focused on your individual needs that explain course concepts.

ENGLISH LANGUAGE SUPPORT
Offered through individual appointments or group learning sessions to focus on grammar,
 academic writing, conversation, and pronunciation.

STUDY SKILLS
Learn time management, exam preparation, critical thinking, note-taking, and reading.

HANDS-ON TIME / HOMEWORK

1. Get Acquainted with the **OSL640 WIKI**, **notes**, **tutorials** and **resources**.

2. Perform the following investigations in **Tutorial 1**:

   INVESTIGATION 2: USING THE LINUX SHELL / ONLINE ASSIGNMENTS

   LINUX PRACTICE QUESTIONS **1 – 9** (will be taken up at beginning of next class)