ULI101: INTRODUCTION TO UNIX / LINUX AND THE INTERNET

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 (Programming, Networking)
- 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?

Regardless of the IT program that you are currently registered in, there are **important technical skills** that you must learn in order to be successful in future courses for your program.

In this course, you will learn **core utilities** to work <u>productively</u> 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
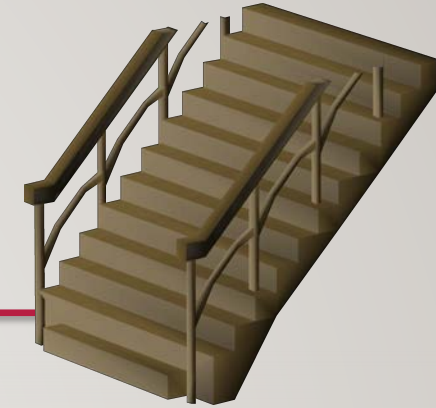
Foundation for Future Courses

The following table shows the various courses that require Linux skills for the **networking & tech support** / **programming** streams.

Networking / Tech Support Stream	Programming Stream
OPS245 (Intro to Linux Admin)	**IPC144** (Intro to Programming)
OPS345 (Network Admin)	**OOP244** (Object Oriented Programming I)
OPS435 (Linux Admin Automation)	**OOP345** (Object Oriented Programming II)
NDD430 (Network Diagnostics & Design)	**WEB322** (Web Programming Tools)
OPS535 (Advanced Network Admin)	**WEB422** (Web Programming Apps & Services)
OPS635 (Enterprise Management)	**JAC444** (Intro to Java)
+ Pro-Option Courses	+ Pro-Option Courses

COURSE INTRODUCTION

Course Resources

Resources	Purpose
ULI101 Website: https://ict.senecacollege.ca/~uli101/ **ULI101 WIKI (preferred):** **https://wiki.cdot.senecacollege.ca/wiki/ULI101**	• **Course Outline** / **Course Policies** • Weekly Schedule (**notes**, **tutorials**, **practice questions**) • **Assignment** Instructions
Learning Content Management System (Blackboard) **https://my.senecacollege.ca/**	• **Course Marks (**located in **My Grades)** • Link to the **ULI101 WIKI** • **Online Quizzes / Online Tests**
The Linux Documentation Project http://en.tldp.org/	• Vast online Linux Documentation • **HOWTOs**, **Guides**, **FAQ**s

COURSE INTRODUCTION
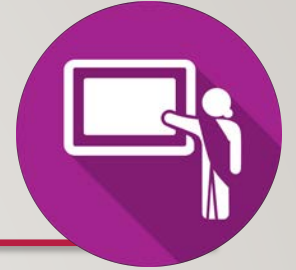
Faculty Information

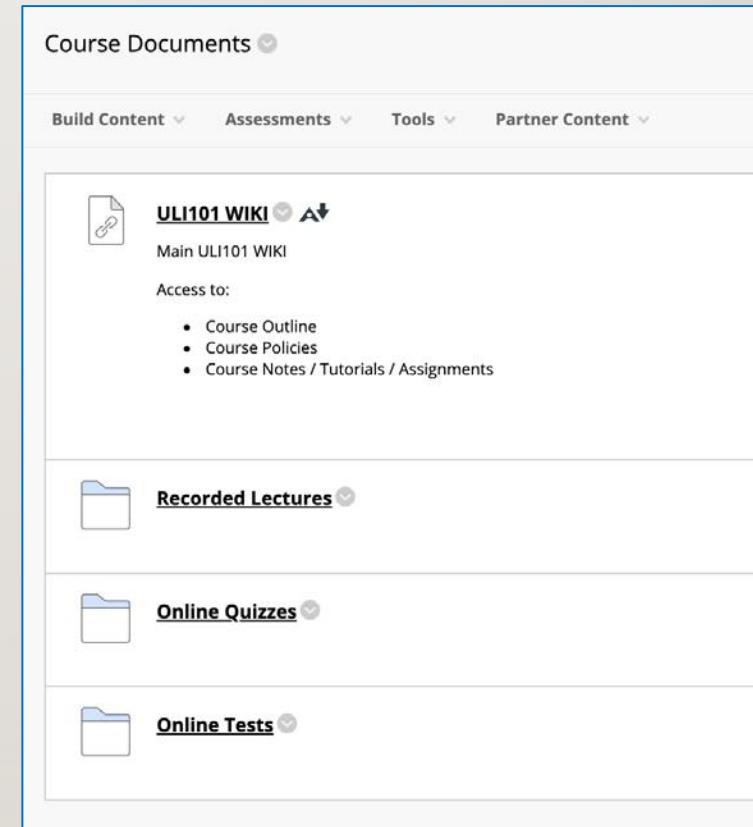Please note and record the following information in class:

- **Prof. John Smith**

- **How to Contact ULI101 Instructor:**
    - **Via E-mail: john.smith@senecacollege.ca**
    - **Via Teams – In Classroom Group or 1-on-1**

COURSE INTRODUCTION

Blackboard: Course Documents

In the **Course Documents** section of your **Blackboard ULI101** course, there are several resources which include:

- A **Link** to the **ULI101 WIKI** that contains weekly lesson **slides** and **hands-on tutorials**.

- **Recorded Lectures** are recorded live and saved as a streaming video which becomes available a few hours after the lecture.

- **Online Quizzes** contain online quizzes for this course.

- **Online Tests** contain the midterm (**test1**) and final exam (**test2**) for this course.

COURSE INTRODUCTION

ULI101 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. Depending on your instructor, these tutorials may require successfully completion within a **deadline** for **marks**.

NOTE: It is **RECOMMENDED** to perform areas highlighted in **YELLOW**

ULI101

Contents [hide]
1 Welcome to ULI101 - *Introduction to UNIX/Linux and the Internet*
  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
Assignments
Assignment 1
Assignment 2
Assignment 3

Welcome to ULI101 - *Introduction to UNIX/Linux and the Internet*

Reference	Assignment
Week 1 Lecture Notes: PDF	PPTX	**Assignment 1:**
Tutorials:	• Introduction to Unix Commands
• Tutorial 1: Access Your Matrix Account	• Basic Unix Commands (Parts 1 - 3)
• HOWTO: Access Your Matrix Account (Platforms: Windows, Linux, Mac OSX)	
• Les Czegel's Week 1 Notes (HTML)	

COURSE INTRODUCTION

Course Outline

Link: https://ict.senecacollege.ca/course/uli101/

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_ULI101

Topics

- Assignments

- Quizzes, Midterm Test, and Examination

- 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.
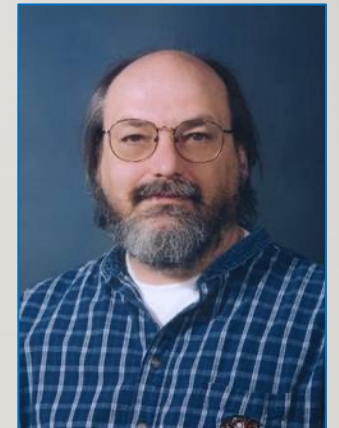
UNIX AND LINUX BACKGROUND AND FEATURES

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 resultant **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**.

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**.
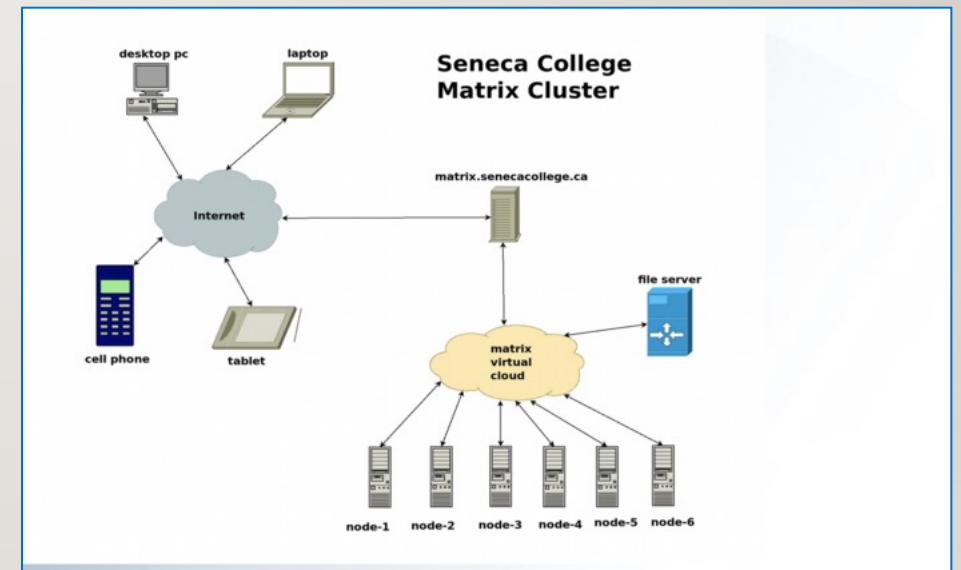
MATRIX LINUX SERVER

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)**
- Performing **Linux Online Assignments** (**3**)
- Practice Issuing **Linux Command Review Questions**

Seneca College Matrix Cluster
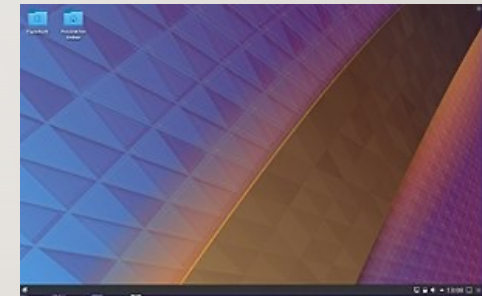
MATRIX LINUX SERVER

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 **<u>NOT</u>** 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...
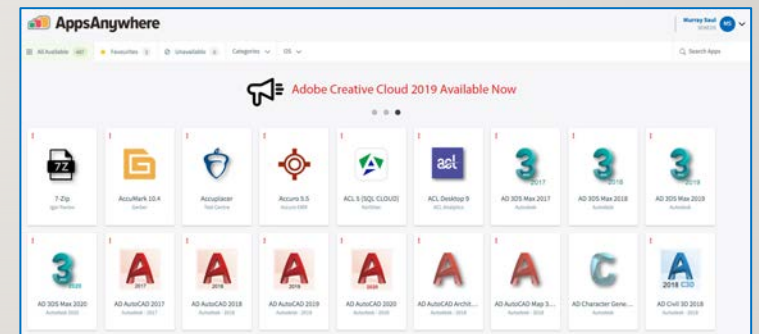
MATRIX LINUX SERVER

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.
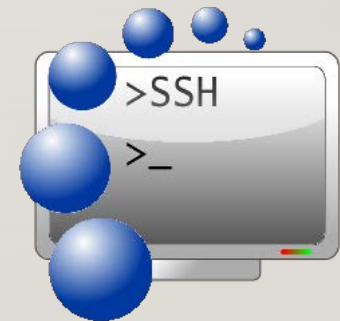
Reference: https://inside.senecacollege.ca/its/software/myapps/

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**).
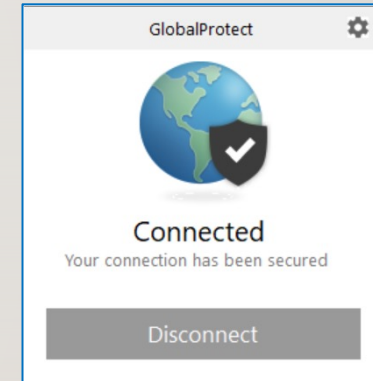
MATRIX LINUX SERVER

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://students.senecacollege.ca/spaces/186/it-services/wiki/view/1025/student-vpn

MATRIX LINUX SERVER

Accessing Matrix Using SSH on Windows 10, Mac OSX or Linux:

Open a terminal on Windows 10

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

Open a terminal in macOS

- Open Finder, go to **Applications > Utilities**, and click on the **Terminal** icon.

Open a terminal in Linux (CentOS)

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

<u>**In all three systems, on the command line**</u>:

- Enter the following command: **ssh senecausername@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 **<u>identical</u>** to your **myseneca** *username* and *password*.

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

If you were located **<u>outside</u>** Seneca's network, then you would need to enter the full domain name: **matrix.senecacollege.ca**
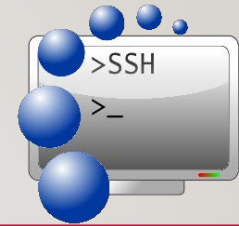
MATRIX LINUX SERVER

Instructor Demonstration:

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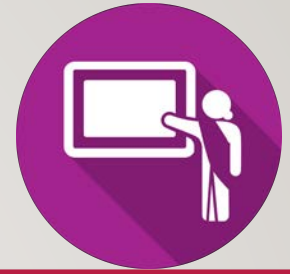
MATRIX LINUX SERVER

Alternative Method: Accessing Matrix Using SSH Application (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: https://the.earth.li/~sgtatham/putty/latest/w64/putty-64bit-0.76-installer.msi

- After the application has been installed, it should appear in your Start menu. Look for PuTTY and open.

- The main window will appear.

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 **ULI101 WIKI**, **notes**, **tutorials** and **resources**.

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

    INVESTIGATION 1: ACCESSING YOUR MATRIX LINUX ACCOUNT