

ULI101: INTRODUCTION TO UNIX / LINUX AND THE INTERNET

WEEK 1: LESSON 1

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

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LESSON I 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 Evaluation) / 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 Home (Windows, Mac OSX, Linux) / From Seneca Computer Lab (via MyApps)
 - How to Logout of your Matrix Linux Account / Getting Assistance (ITS HelpDesk)

Homework

- Perform **Weekly Tutorial I – Investigation #1**

COURSE INTRODUCTION



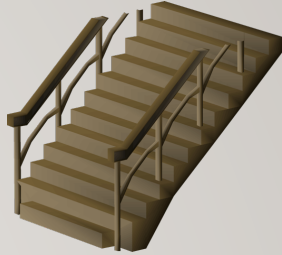
Why Am I Taking This Course?

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 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 **networking & tech support / programming** streams.

Networking / Tech Support Stream	Programming Stream
OPS245 (Intro to Linux Admin) OPS345 (Network Admin) OPS435 (Linux Admin Automation) CSN500 (Capstone Project, formerly NDD430) OPS535 (Advanced Network Admin) OPS635 (Enterprise Management) + Pro-Option Courses	IPC144 (Intro to Programming) OOP244 (Object Oriented Programming I) OOP345 (Object Oriented Programming II) WEB322 (Web Programming Tools) WEB422 (Web Programming Apps & Services) JAC444 (Intro to Java) + Pro-Option Courses

COURSE INTRODUCTION



Course Resources

The following table shows resources that students can use to learn topics for this course. The first two resources are considered critical for successful course completion.

Resources	Purpose
Blackboard (Learning Content Management System) https://learn.senecacollege.ca	<ul style="list-style-type: none">• Course Marks (located in Gradebook)• Link to the UL1101 WIKI• Online Quizzes / Online Tests
UL1101 WIKI: https://wiki.cdote.senecacollege.ca/wiki/UL1101	<ul style="list-style-type: none">• Course Outline / Course Policies• Weekly Schedule• Course notes,• Tutorials (weekly, review)• Practice questions
The Linux Documentation Project http://en.tldp.org/	<ul style="list-style-type: none">• Vast online Linux Documentation• HOWTOs, Guides, FAQs

COURSE INTRODUCTION

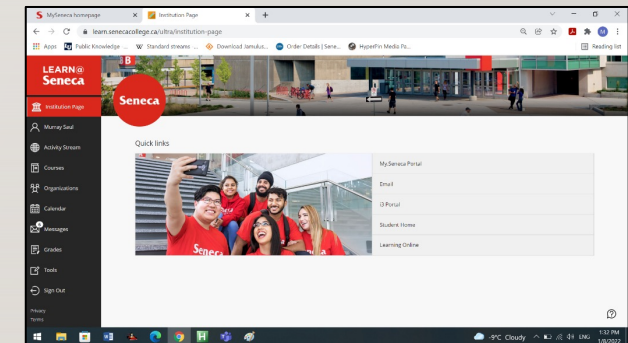
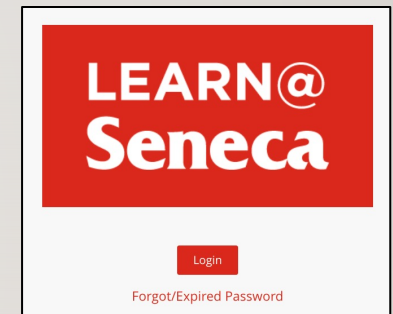


Blackboard

The **Blackboard** online application is used to view notes and recorded lectures, perform optional online tutorials, perform tests and quizzes.

To access course materials in Blackboard:

- Enter the following in a web-browser:
learn.senecacollege.ca
- Enter your username and password
(You should have been provided a **username** and **password** to gain access to this resource by the College)



COURSE INTRODUCTION



Faculty Information

Please note and record the following information in class
(Select **Course Orientation** from **Blackboard's landing page**):

- **Instructor's Full Name**
- **Instructor's Office Location**
- **How to Contact UL1101 Instructor:**
 - **E-mail Address**
 - **Video Classes / Meetings**
(eg. MS Teams, Zoom, etc)

Faculty Contact Information

Faculty name: Chris Johnson

Faculty contact information: chris.johnson@senecacollege.ca

Expected response time: Within 48 business hours.

Office Hours: Fridays 2:30pm-4:00pm | [Click here to book an appointment.](#)

Office Location: A3058

Announcement schedule: As needed; on-going basis. (All announcements are automatically e-mailed to your Seneca account when posted.)

Questions: We have a Microsoft Teams group! Questions outside of class are best asked there.

COURSE INTRODUCTION



Blackboard: Learning Content

In the **Learning Content** section of your **Blackboard ULI101** course, there are several resources which **might** include:

- **Course Information** is your detailed introduction to the course and includes important information on grading, expectations, and faculty contact details.
- A **link** to the **ULI101 Wiki** that contains weekly lesson **slides** and **hands-on tutorials** along with additional learning material.
- **Lectures** are recorded live and saved as a streaming video which becomes available a few hours after the lecture. (*Hybrid and Online* courses)
- **Quizzes and Tests** contain the frequent quizzes and tests (Midterm and Final) for this course.
- **Weekly Schedule** displaying weekly content and due dates for evaluation.

The screenshot shows the 'Course Content' page in Blackboard. It features a search bar at the top right. The content is organized into several sections:

- Course Information - Important Details**: A document icon followed by the text 'READ THIS FIRST! Information on how this course is organized, expectations, and where to find everything.'
- ULI101 Wiki**: A link icon followed by the text 'Slides, Weekly Tutorials & Review, Practice Questions'.
- Lectures**: A folder icon followed by the text 'Lecture videos and slides covering each week's course topics.' and a dropdown arrow.
- Quizzes and Tests**: A folder icon followed by the text 'You weekly quiz or test will appear here on Fridays during class time (usually the first 30 minutes). You must be physically present in our lab class to take the assessment.' and a dropdown arrow.
- ULI101 Weekly Schedule - Summer 2023**: A document icon followed by the text 'Weekly schedule of lecture topics, tutorial due dates, and quiz/test dates for this course section (NDE).' and a share icon and a three-dot menu icon.

COURSE INTRODUCTION



ULI101 WIKI

Main WIKI Page

The **Quick Links** section on the top-right corner (in yellow) provide links to the **weekly schedule**, **course outline**, and **course policies**.

Weekly Schedule Page

The Weekly Schedule contains weekly **lecture notes** (in yellow) in both **PDF** and **PowerPoint** format in the *References* column.

It also contains a weekly **hands-on tutorial** (in yellow) that provides guided practice to become familiar with working in the Linux environment. These tutorials require successfully completion within a **deadline** to obtain **marks**.

NOTE: It is **REQUIRED** to perform the areas that are 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](#)

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

Week	Objectives and Tasks	Reference	Evaluation
Week 1:	Objectives: <ul style="list-style-type: none">• Course introduction• Course Resources/Evaluation/Policies• Unix/Linux Background• Open source philosophy• Linux GUI and the terminal• The Matrix server• Accessing your Matrix Account	Week 1 Lecture 1 Notes: PDF PPTX Week 1 Lecture 2 Notes: PDF PPTX Tutorials: <ul style="list-style-type: none">• Tutorial 1: Using Your Matrix Account• Connect to Seneca's Student VPN• HOWTO: Access Your Matrix Account (Platforms: Windows, Linux, Mac OSX)• Using a Linux Desktop	Tutorial 1: 2% (Due Week 2: Friday @ midnight) <ul style="list-style-type: none">• INVESTIGATION 1: Accessing Your Matrix Linux Account• INVESTIGATION 2: Using The Linux Shell

COURSE INTRODUCTION



Course Outline

Link:

<https://apps.senecacollege.ca/ssos/findOutline.do?schoolCode=SICT&subjectCode=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

- Online Tutorials (weekly and review)
- Quizzes, Midterm Test, and Final Test
- 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. Provides an **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.



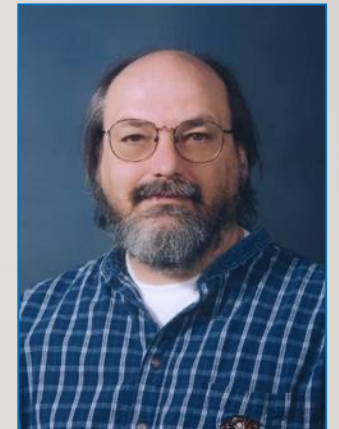
UNIX AND LINUX BACKGROUND AND FEATURES

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 Berkeley California, he provided students source code to OS and Shell (interface) which branched into a **free version** of the OS that became **BSD (Berkeley 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...

There are other factors that lead to the popularity of using Unix including:

- Unix was re-written using the **C programming language** to make the OS more portable to install and operated on other types of computers.
- Unix was considered an inexpensive method of creating a local computer network.
- 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).

Although the UNIX OS had many popular features, you still required an **expensive computer** to run UNIX; therefore, UNIX was NOT available to run on the majority of PCs

UNIX AND LINUX BACKGROUND AND FEATURES

Push to Create a Unix-like OS for All Computers

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

Push to Create a **Unix-like OS** for All Computers

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:

learn.senecacollege.ca	Learning Content Management System (Student Grades / Notes / Online Quizzes)
wiki.cdot.senecacollege.ca	Course WIKIs for Seneca College Students
matrix.senecacollege.ca	Linux Account for Student Practice and tutorial 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** and submit their weekly **tutorials**.

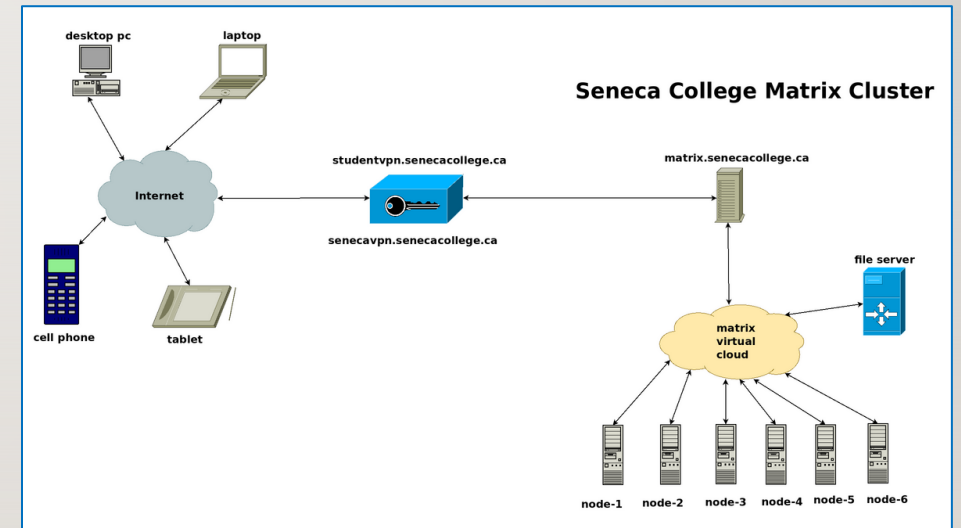


MATRIX LINUX SERVER

The **Matrix** server consists of **several virtual machines connected** to form a **cluster**. A cluster is a cost effective alternative 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 **Weekly Tutorials (11)**
- Practice Issuing **Linux Command Review Questions**
- Performing **Review Tutorials (1)**



MATRIX LINUX SERVER

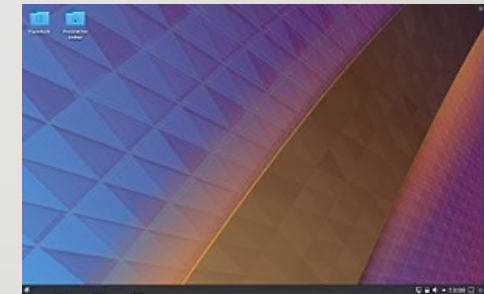
Communicating with Matrix Server

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...



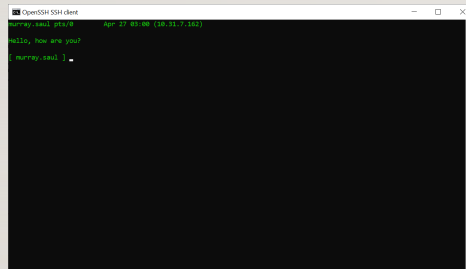
```
OEMU
$ uname -a
OpenBSD berkeley.my.domain 5.3 GENERIC#53 amd64
$ pwd
/
$ ls -l
total 2112
-rw-r--r-- 1 root  wheel   112 Jun 20  2013 .Xauthority
-rw-r--r-- 1 root  wheel   22 Mar 13  2013 .Xdefaults
-rw-r--r-- 1 root  wheel   578 Mar 13  2013 .cshrc
-rwxr-xr-x 3 root  wheel   512 Jun 24  2013 .gnss
-rw-r--r-- 1 root  wheel   125 Mar 13  2013 .klogin
-rw-r--r-- 1 root  wheel   328 Mar 13  2013 .login
-rw-r--r-- 1 root  wheel   552 Jun 24  2013 .profile
-rw-r--r-- 1 root  wheel   63 Jun 20  2013 .serverauth.18088
-rw-r--r-- 1 root  wheel 1014692 Jun 20  2013 mbox
$ whoami
root
$ ls -l $(which vi)
-r-xr-xr-x 3 root  bin  361496 Mar 13  2013 /usr/bin/vi
$ echo $SHELL
/bin/ksh
$
```

MATRIX LINUX SERVER

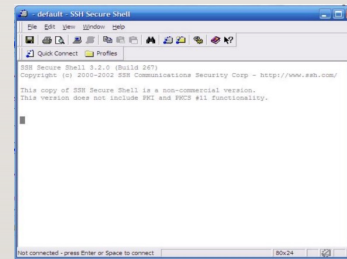
Accessing Matrix from your Home Computer:

Based on the type of course delivery method, students may be required to learn **remotely** or a **hybrid** method of remote and in-class instruction.

Students have an option to connect to their Matrix accounts via command-line (eg. **ssh** command) or by running in the Seneca computer lab a **graphical SSH application** (eg. **SSH Secure Shell Client**).



ssh command in command prompt



ssh graphical application
in Windows

MATRIX LINUX SERVER

Connecting to the Seneca GlobalProtect Student VPN

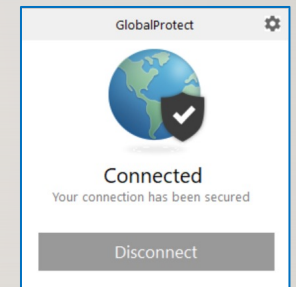
All Seneca College students are required to **FIRST** connect to the **Seneca GlobalProtect Student VPN** in order to be able to connect **remotely** to their **Matrix** Linux account. Seneca College are "rolling-out" additional measures to improve **network security**. One of these measures are to implement **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 10/11, macOS or Linux:

Open a terminal on Windows 10/11

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



Windows 10

Open a terminal in macOS

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



Mac OS

Open a terminal in Linux

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



NOTE: Regardless of the operating systems, in the command line:

- Enter the following command: **ssh senecausername@matrix.senecacollege.ca**
 - For example, a student with an e-mail address of cjohnson30@myseneca.ca: **ssh cjohnson30@matrix.senecacollege.ca**
- Enter your password when prompted. (Answer **yes** to any questions it may ask you.)

MATRIX LINUX SERVER



Accessing Your Matrix Account / Continued...

Your Matrix username and password is **identical** to your **myseneca** *username* and *password*. If you were located **outside** Seneca's network, then you would need to enter the full domain name:

matrix.senecacollege.ca

If this is the **first time** that you are connecting to your Matrix account from your computer, you will be prompted to accept Matrix's fingerprint. This is a security precaution to ensure you're connecting to the right system. Simply type **yes** and press **ENTER**.

NOTE: When using the **ssh** command, as you type your password, the characters do NOT echo back (e.g. Like showing "dots"). That is **normal** for this command and just continue entering your password. (It may take you a few tries to get used to this.)

NOTE: If you encounter an **error message**, this can occur for several reasons:

1. You misspelled the **name of the server**.
2. You misspelled your Matrix **username** (same username that you connect to my.senecacollege.ca).
3. You have **CAPS LOCK** on by mistake (your username should be **lowercase** only).
4. You misspelled your **password** (same password that you connect to my.senecacollege.ca).

If you continue to experience the same problems, click on the following link for **IT service desk** contact info: [IT service desk](#)

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.

MATRIX LINUX SERVER



Instructor Demonstration:

Your instructor will demonstrate how to connect to the **Matrix** server by issuing a **command** from the **OS command prompt** on your home computer.

MATRIX LINUX SERVER

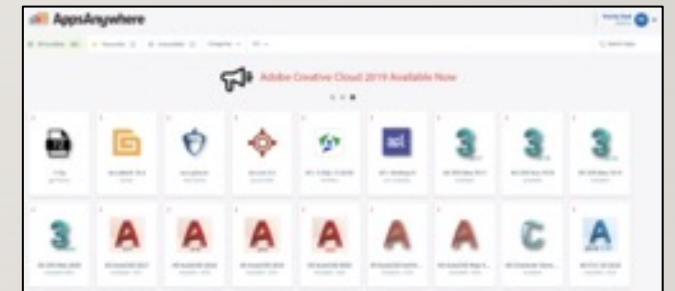


Accessing Matrix in Seneca Computer Lab (via MyApps)

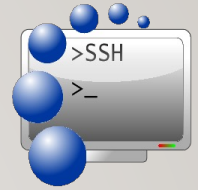
You can also connect to your Matrix server account in the **Seneca Computer lab** via **MyApps**.

One advantage of this method is that you're at the college; therefore, **you do NOT have to worry about connecting to the Seneca VPN**. Another advantage of using this method is to introduce you to a **graphical program** to allow you connect to your Matrix account as opposed to using the **ssh** command (shown in the previous section).

This method would also be useful if you do **not** have a home (notebook) computer and have access to a Seneca computer lab workstation.



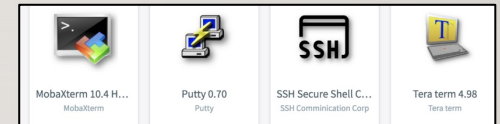
MATRIX LINUX SERVER



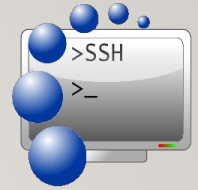
Accessing Matrix in Seneca Computer Lab (via MyApps) / Cont....

Perform the Following Steps:

1. Start your workstation in your lab and login to Windows with your Seneca account.
2. Make certain that the **MyApps** window is open. This window should have opened shortly after you logged into your Windows workstation. If the application windows is not open, click on the **MyApps** icon on the desktop to launch).
 - **NOTE:** If a banner appears at the top labelled “**Requires Validation**”, click the banner and use your username and password.
3. Click on the **Search Apps** area located in the top right corner of the MyApps window and type the word: **ssh**
4. Several SSH applications will appear.
 - **NOTE:** All of these applications allow you to connect to your Matrix account. We will use the application called **SSH Secure Shell Client** for this practice tutorial.
5. Launch the **SSH Secure Shell Client** application icon to launch this program.
 - **NOTE:** Prior to launching the application, you can add this to your **favourites** which will make it faster to access this application in the future.



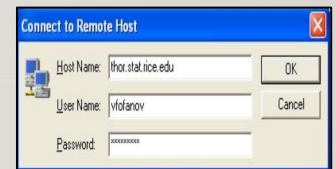
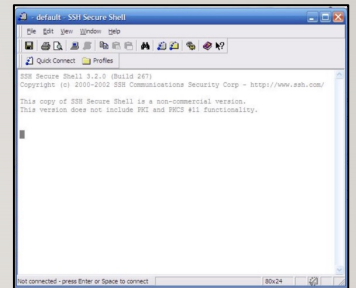
MATRIX LINUX SERVER



Accessing Matrix in Seneca Computer Lab (via MyApps) / Cont....

Perform the Following Steps:

- The main SSH Client window will appear. Click on the **Quick Connect** button.
 - NOTE:** The Connect dialog box allows the user to specify the **server name** and your **account name** to allow you to connect to the server.
- Click on the textbox labelled Hostname and enter the text: **matrix**
 - 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
- Follow the same steps discussed in previous slides to connect and then disconnect to your Matrix account.



MATRIX LINUX SERVER



Instructor Demonstration:

Your instructor will demonstrate how to connect to the **Matrix** server running an **SSH application** via MyApps in a Seneca computer lab.

NOTE: If your professor does not have a face-to-face class, but you have access to Seneca computer labs, then perform this method in Weekly Tutorial #1.

Later in the course, your instructor may demonstrate other ways of accessing your Matrix account by launching a **graphical versions of Linux** and run **ssh** command from the Linux shell.

HOMEWORK



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1. Get acquainted with the **ULI101 WIKI**, notes, tutorials and resources.
 - [ULI101 Wiki - Main Page](#)
 - [ULI101 Wiki - Weekly Schedule](#)
 2. Perform the following investigations in **Weekly Tutorial I**
(**Due: Friday Week 2 @ midnight for a 2% grade**):
 - [INVESTIGATION 1: ACCESSING YOUR MATRIX LINUX ACCOUNT](#)