ULI101

Week 01

Week Overview

- Introduction to ULI101

- Introduction to Operating Systems/Unix/Linux

- Using Linux/Unix at Seneca

- The Matrix Server

- Obtaining your Matrix Account

- User Names and Passwords

- Interacting With Unix/Linux

- Secure Communication

Welcome to ULI101!

- The Internet has become part of our daily lives.

- Although we use it every day, few of us have a real understanding of the underlying technologies.

- This course introduces you to the **Linux/Unix operating system** that underlies much   of the Internet.

Important Information

- The website for this course is: https://itas.senecac.on.ca/~uli101 — it contains weekly slides, assignment details, and other important information for the course.

- Please make certain that you read through the course outline, which states what this course will cover, how you will be evaluated, and the course policies relating to late assignments or missed tests.

Important Information

- Your professor will give you additional details which may override or supplement the information on the course website (for example, your section's test and assignment dates may vary).

- Topics such as course introduction, evaluation policies, student conduct, and where to obtain notes/resources are usually discussed in the first class.

Definition - Operating Systems

- A computer can't do anything useful without a program — a program is defined as data and a list of instructions to follow.

- An operating system (OS) is a collection of programs which manage and control the basic operation of the computer, including:

    - Allocating resources
      (memory, disk space, network bandwidth, access to devices)
    - Managing files
    - Starting, stopping, and controlling other programs
    - Enforcing basic system security

Evolution – Unix OS

Unix is an operating system originally developed at Bell Labs starting in 1969. **Unix is:**

- a *portable, interactive, multitasking, multiuser* operating system.
- *written in a language that can be used on different types of computers* (the C language)
- *interactive* – i.e. users can use the computer directly, and immediately see the results of their actions
- *a multitasking environment* - the operating system creates the illusion of performing multiple tasks at the same time by rapidly switching between them

Evolution – Unix OS

- **Unix is also:**

  - *a Multi-user environment* - it provides features necessary to support multiple users, including file security and the ability to interact with several people at once

    Unix became very popular because Bell Labs (AT&T) distributed it at almost no cost to colleges and universities, which then taught students operating system programming using the Unix source code; these students later entered the industry and wanted to continue to use this powerful, familiar operating system.

Evolution – Unix OS

- Hardware vendors appreciated an operating system which could easily be configured for new hardware, rather than reinventing the wheel each time a new family of computers was introduced. **In fact, Unix/Linux now runs on systems ranging from watches to huge mainframes.**

- Unix and the Internet grew up hand-in-hand. The DARPANET project, precursor to the Internet, was approved in April 1969 — the same month that Bell pulled out of the Multics project and began the development of Unix. Throughout the history of the Internet, the Unix OS has provided its platform.

Linux and GNU

- Although Unix source code was widely distributed at low cost to educational institutions, it was still controlled by AT&T and was therefore never completely free (cost) nor free (unrestricted freedom to modify and use it).

- 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).

Linux and GNU

- 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.

The GNU Operating System

Free as in Freedom

Linux and GNU

- In 1991, Linus Torvalds, a Finnish computer programmer, released the *Linux* kernel, eventually placing it under the GPL. The Linux kernel, GNU software, and some other components can be combined into a powerful, Unix-like operating system (it 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).

Using Linux/Unix at Seneca

- Throughout your studies at Seneca you will use a variety of Unix/Linux systems, including:

  MATRIX – Practice & perform Linux commands

  ZENIT – Used for some advanced courses

  ICT – Main ICT web server

  MY.SENECACOLLEGE.CA (Blackboard) – College LMS

  (Learning Management System)

- Most college servers are available under servername.senecac.on.ca and/or servername.senecacollege.ca

Matrix Server

The Matrix server consists of several Virtual Computers running CentOS all connected together to form a cluster. A cluster is a cost effective alternative to larger servers.
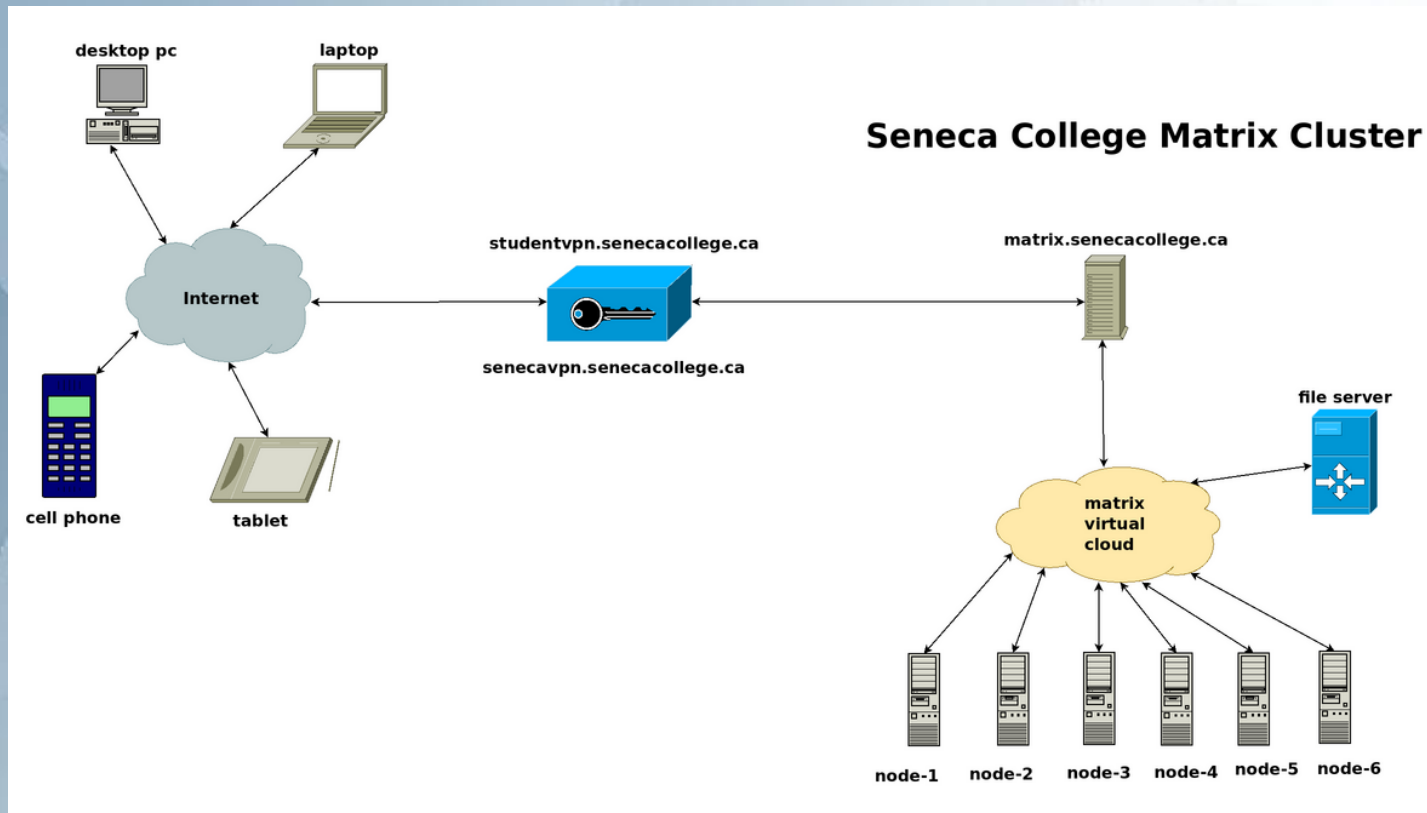
Matrix Server

- Note that the workstations in the labs can connect to the Matrix cluster. When you boot (startup) a PC in a Seneca lab, you can use the ssh or Putty app in Windows to open a connection to Matrix.

- An alternative method to connect to Matrix from the Windows desktop is to use the Knoppix VM. Knoppix is a Linux virtual machine. Once you start it you can open a terminal window and issue the

- ssh command like this

  ssh username@matrix.senecacollege.ca

Obtaining Your Matrix Account

- If you have never logged into Matrix before and you are new to Seneca, check your email for confirmation that your Matrix account has been automatically created.

- Your Matrix account should be the same userid and password as your Seneca Email and Blackboard accounts.

- Email servicedesk@senecacollege.ca in case of problems with your Matrix account.

User Names and Passwords

- Most servers at Seneca are accessible using your "My Seneca" user name and password

    - Your Seneca password must be changed periodically as per college policy

    - Use the appropriate link at: https://my.senecacollege.ca

- The college Password Service enforces certain rules when creating passwords – please read the instructions on the password creation/change page

- It is extremely important to guard your accounts from unauthorized access – make sure that you password is hard to guess (but easy to remember for you) and always log off whenever leaving the lab

Interacting with Unix/Linux

- Traditionally, interaction with Unix and Linux servers is conducted using terminals (sometimes called shells), which connect remotely to the server

    - This provides users with a command-line interface

    - Users can use the server from other operating systems

- With a more advanced setup, or in case of desktop Linux installations, users can interact with the OS using a Graphical User Interface (GUI) similar to Windows

    - It is important to know that such a GUI (Window Manager) is not essential to the OS operation

    - A local terminal window offers an efficient way to interact with the system, especially for advanced users

Interacting with Unix/Linux

- You will be shown the use of a telnet application (such as ssh or putty) to connect to your Matrix account.

- When the telnet application runs and connects to the server, it acts like a terminal that is physically connected to the computer. In this case, the monitor is the telnet window on your PC, and accepts keyboard entry.

Interacting With Unix/Linux

- The original Telnet application was invented in 1972, and many versions of this application are still available for many operating systems (eg. Windows, Linux, Unix, Apple-Macintosh).

- A major weakness of Telnet is the lack of security. Another individual could easily view or capture a user's keystrokes when using the telnet application including passwords!

- Today, Telnet is a legacy application, used rarely or for testing purposes – you should always communicate with servers using encrypted connections.

Secure Communication

- SSH or "secure shell" application allows data (i.e. keystrokes) to be encrypted to prevent other people intercepting this information.

    - Other than that, the functionality is similar to telnet

- In the Seneca Labs in MS Windows, there is an application on the desktop called SSH Client. You are advised to use this application. You can download SSH applications for your PC at home.

- On a Unix/Linux host ssh is available on the command line, for example:

    `ssh ` [`user@matrix.senecacollege.ca`](mailto:user@matrix.senecacollege.ca)