NET 260: Linux/UNIX Systems Administration I
Fall 2008 (Skiff Annex)
Thursday – 2:00 to 4:45

Instructor: **Zach Tanko**
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Office Hours: M 12:30-1:30, T 2-3, W 12:30-1:30, TH 11-12
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Description

This course will introduce the student to some of the key components of the Linux/UNIX operating system. The student will obtain a working knowledge of the Linux operating system. The student will also become familiar with the selection criteria for Linux/UNIX as an alternative (or cooperative) operating environment in the business world. Subject matter is reinforced by hands-on laboratory exercises and assignments.

Outline:

- History and overview of Linux/UNIX including historical context
- Linux operating system server configuration installation
- Configuration of the GNOME, KDE, and X-Windows GUI, and the command shell
- Learn and use common Linux/UNIX commands
- Implement user accounts and perform user administration tasks
- Create user and system-wide scripts
- Implement system utilities, performance monitoring and tuning tools, and security measures
- Configure and secure key Internet and intranet services, such as name service, file transfer, Web, e-mail, host configuration, and Windows file and print sharing

Assumed Prior Knowledge/Prerequisites

CIT130 (Networking and Security, Intro), and NET 140 (Operating Systems).

Learning Objectives

- Compare and contrast Linux and UNIX, and cite relative advantages and disadvantages of the different implementations.
- Select appropriate hardware for the installation of the operating system.

- Install and configure the following key services and applications: File Transfer Protocol (FTP), Apache Web Server, SAMBA file and print services for

Microsoft Windows, Network File System (NFS), and the Sendmail client and server applications.

- Distinguish the differences between using the command language interface versus using more automated Graphical based tools (including tools available from third party vendors).

- Determine (through a wide array of available resources) the mechanisms for which technical support can be obtained ranging from general questions to the resolution of complex technical issues.

- Per site requirements, demonstrate the ability to:
    - Install the operating system and server software
    - Add user accounts and groups & directory structure
    - Prepare logon scripts
    - Assign file permissions to users and groups
    - Set up network printers
    - Set up a Linux system to employ Windows file and print sharing
    - Manage applicable TCP/IP-based Internet/intranet services
    - Discuss security from the perspectives of:
        - Operating system vulnerabilities
        - Operating system security features
        - Operating system security tools from third-party vendors
        - Sources of security information and tools
- Install and configure the following key services and applications: File Transfer Protocol (FTP), Apache Web Server, SAMBA file and print services for Microsoft Windows, Network File System (NFS), and the Sendmail client and server applications.

Materials

Note: Texts are subject to change in future semesters. This syllabus is accurate only for the semester listed at the top page of the document.

Textbook: **Fedora Unleashed, 2008 Edition** by Andrew Hudson and Paul Hudson, Sams Publishing. ISBN: 0672329778

Instructional Approach

This course will consist of both lecture and lab. In the lecture portion of the class, students will be provided with the information necessary to build a functioning Linux server for a variety of business environments with varying requirements (please refer to the Learning Objectives section above).

Lectures

Each class will commence with a lecture outlining the Linux topic to be solved in the lab for the latter part of the class. The instructor will supplement some lectures by providing hands on demonstrations of the topic to be covered (using a Linux system and projector in class). The importance here is to demonstrate the "how to" as well as make the student begin thinking about the real life applicability of the particular topic.

Labs

The lab exercises will provide the actual "hands-on" experience in the implementation of the technologies. During the lab exercises, students will work independently (or in pairs) to implement the technology covered for the week. Students will be encouraged to seek the assistance of their peers in the resolution of implementation requirements and issues. In addition, students will also be encouraged to use a variety of provided resources to assist them in their tasks. Though the labs do contain relevant information in order to successfully complete the lab, it is the responsibility of the student to take it a step further by obtaining additional supportive information through the use of research and available resources. This is required to solve the problem presented in the lab exercise.

Homework Assignments

In addition to textbook readings, students will be given homework assignments geared toward the successful completion of a given task. Of primary importance is the planning necessary for the implementation of a technology, and the documentation of available resources. The homework assignments are research oriented, and will be submitted in written form. The inability of a student to complete an assignment could jeopardize the successful implementation of a lab exercise (which could also have an adverse impact on his/her lab partner). Students are asked to present (and sometimes implement) their homework assignments, and hopefully generate interesting discussions around a myriad of approaches that solve a similar problem.

Project

A project is assigned where students get to work independently to simulate an "as real as possible" business environment where they have to successfully implement (in more detail) one or more of the technologies NOT covered throughout the semester. In addition to written documentation of the project, students must both present (orally) and demonstrate (computer) their results.

Exams / Quizzes

Students are also given two quizzes and two exams aimed specifically at testing their understanding of the technology rather than their ability to memorize facts for a particular exam. Testing includes multiple choice, matching, short answers, and essays. Most of the questions are designed to have the student think about what they have learned, and answer accordingly. Testing is on paper, but for a small portion of the exam period, students may use their system, notes, tests, and other reference material. With any technology, it is crucial for administrators to be able to obtain answers through reference material.

Assessment

Weekly Attendance / Labs	15%
Midterm Exam	20%
Final Exam	20%
Quizzes (2)	15%
Homework (3)	15%
Project	15%

Satisfaction of Core Competencies

The course is structured in such a way as to provide experiences associated with the five core competencies as outlined by Champlain College. These core competencies are as follows:

- Technology Competence
- Critical & Creative Thinking
- Global Studies Awareness
- Written / Oral Communication
- Quantitative Literacy
- Ethical Reasoning

The manner in which this course addresses these competencies is outlined in the sections that follow.

Technical Competence

Linux and UNIX, by nature, are operating systems that require more technical expertise than most of the other operating systems currently in widespread use. It is very command driven with most of these commands being very cryptic in nature. This course addresses almost all of the available commands and their appropriate usage.

Students are responsible to learn these commands, as well as use them to implement the solutions presented in their lab exercises (these commands are demonstrated by the instructor, and appear in the various materials used in the course including the help features of the operating system).

Linux / UNIX servers maintain a significant (and ever growing) stronghold in today's business environment. They can be utilized for a variety of mission critical applications. This course focuses on a number of these applications (file and print sharing, FTP Servers, Web Servers, Electronic Mail Servers, and integration into the Microsoft Windows Environment). Included here are all the required system administration tasks that will result in a successful and stable systems environment (security, scripts, profiles, the file system, and user account administration). The lectures and the labs provided in this course serve to provide the knowledge and experience necessary to accomplish the above mentioned tasks.

Students are made aware of the necessary tools, technical resources, and documentation that will assist them in their administrative and / or troubleshooting tasks. When they enter the "real" technical world, this ability to use available resources is key to their success. It is important that students utilize these resources during lab exercises for successful completion (as opposed to relying on the instructor all the time). In addition, more technically astute students in each class are called upon to provide assistance when others have difficulty.

Finally, students obtain the technical expertise necessary to make valid choices as to the appropriate environment for each specific topic covered. This also includes choosing Linux or UNIX over other available operating systems (like MS Windows).

Critical Thinking

Once again, due to the highly technical nature of the Linux and Unix operating systems, students must, from the information provided (labs & lectures), successfully implement functioning systems. Working with a set of commands, utilities, manuals, and other resources, students implement functioning systems in a simulated business environment. Technical issues arise along the way where students are highly encouraged to use theses available resources (internet, peers, documentation, and instructor) to quickly arrive at a resolution. Troubleshooting is as much an art as it is a science!

Taking it a step further, students are also repeatedly instructed that proper planning, testing, and documentation are a necessity. Students must be able to distinguish that a stable business systems environment is a lot different than playing around with systems at home. User satisfaction and "uptime" are critical. Improperly stabilized systems with significant downtime, can have an adverse financial impact on an organization. Though there are students that are more technically astute than others in the class, a key learning

comes from deriving a methodology that is more appropriate for a business environment (rather than a non-disciplined approach with a "play" machine in their dorm, or home).

There are "many ways to skin a cat" as the saying goes. As it pertains to this course, there are many ways to solve a specific business problem or application need. Students are encouraged to understand these approaches and their significance in the satisfaction of a task. For example, a user account can be added through the command line, through a host of menu driven-utilities, or through provided system management tools. Students are demonstrated these approaches, and apply them in the lab exercises. It is up to each individual student to develop their own level of comfort with the use of these varied approaches which includes deriving the specific instance where one may be more appropriate over an alternative.

In addition to the lecture and labs, students are given homework assignments and a project that assist them in researching a topic in more detail, or assist in the preparation for the successful completion of a lab. Most important of all, these serve to take their combined course experiences and apply them where appropriate (even if it includes material from other courses).

Finally, students obtain the knowledge that this course, as well as others, require a life long learning process. Students are encouraged to load the operating system on a system at home (dorm). Where this is not possible, students are provided an account on an instructor provided server (that they can use from anywhere). Students are also encouraged to investigate additional resources outside the scope of this course.

International Awareness

Though global awareness is not a major focus of this course, there still exists the need to understand where the operating system fits as it pertains to the global enterprise. There are many instances throughout the course where global relevance is discussed. The following items are either highlighted or brought to the attention of the students in this course:

- The Linux and UNIX operating systems maintain a global presence. In addition, in order to allow for interoperability, adherence to standards is key. These standards are global in nature.

- Linux was invented by Linus Torvalds in 1991. He was a Finish computer science student. He currently "oversees" the wealth of international developers responsible for making the product what it is today, and what it will be in the future. It is a global operating system with ever increasing usage.

- The Linux and UNIX operating systems also contain the functionality to provide multi-language support. Students are briefly exposed to where this may be applicable.

- The world-wide web, is as it states…world wide. Linux and UNIX are systems of choice for applications pertaining to the Internet (Web Servers and Mail Servers). The systems they administer, will, for sure, have global interoperability.

- With Linux (as opposed to UNIX) the licensing is free. There is no cost for the operating system distribution, the documentation, and the source code. There is no per user costs as well. It is free. This has implications for some countries in that the can have the technology advantages of other countries at no cost. This is also a major consideration for it being widely adopted in the United States.

- Finally, Linux in particular is an "Open Source" operating system. It is not a product of one vendor. The developers are from all over the world, and work together in an effort to provide bug fixes and enhancements for existing as well as future versions. It would not be uncommon at all for a student in the search of a technical resource to be communicating with a developer from another country.

Oral / Written Communications

In order for students to be successful in the business world, their ability to communicate in both written and oral form is also of primary importance to their success. The course does focus on the technical issues of the operating system, however, through their interaction with their peers (during class), through homework exercises, essays on an exam, and the labs, students are required to clearly communicate what they have learned. This occurs both in writing, and in the form of orally communicating these results to the class.

The successful technical person can communicate effectively with people at all levels (not just at the technical level). This makes them effective. In this class, students are made aware of these different levels. The following is what is specifically highlighted:

- Students must be able to communicate with each other, at the technical level. They must understand the concepts, and apply these concepts in an effective manner. Using proper language to do so is important. Students are made aware of the appropriate technical terms and applicability as it pertains to this class. They must speak and write the "lingo"

- Students must be able to explain technical concepts in a manner appropriate for the non technical user. Again, this must be done both orally as well as in written form. A successful "technologist" must be able to effectively communicate a user's issues or business needs in a common language, and then translate these needs into a technical solution. This appears to be the most challenging portion of their development. The labs in this course outline a business need; the students must technically solve these needs. When unable to do so immediately due to insufficient information, they must ask the appropriate business questions (as well as the technical) to come to a resolution.

- Students must be able to communicate at all levels in an organization, as well as at all levels of understanding. This can be from upper management, to a supervisor, to a peer, or to a real "techno-phobic" individual. In all essays, and written assignments, students must use proper literary composition that clearly states the required results. In addition to a formal short presentation, students are highly encouraged to participate, express themselves clearly, and demonstrate proper translation from business need to technical solution.

- Finally, rather than "scooting out early" the more technically astute students are highly encouraged to serve as mentors for those not at the same level (or having difficulty with an assignment / lab). This must be effectively communicated (without intimidation). This not only enhances their communication skills, but also serves to enhance both their leadership as well as "mentoring" capabilities.

Quantitative Literacy

Though this is not a math class, students must apply some basic quantitative reasoning to succeed in several of the lectures and assignments. In particular, students must understand the decimal, octal, binary, and hexadecimal numbering systems. Students must also be able to demonstrate the ability to make conversions between these systems as it is an integral part of the technology.

Ethical Reasoning

As with any powerful technology, computers can be used for both good and bad intentions. The standards that determine whether an action is good or bad are known as ethics. Computer ethics are the moral guidelines that govern the use of computers and information systems. The following areas are discussed throughout the course: unauthorized use of computers and networks; software theft (piracy); information accuracy; intellectual property rights; codes of conduct; and information privacy.

Course Policies

Attendance

If the student is unable to attend class, the student is responsible for any assignment or material missed during the absence. Contact the instructor for handouts, announcements or changes to the course calendar. Contact a classmate for notes. Missing 3 classes in a row subjects the student to being withdrawn from the class. Any student missing 3 classes (non-consecutive), **for any reason,** will be subject to a 10 point deduction after final grade is calculated. Missing more than 3 non-consecutive classes may result in withdrawal from the class (or additional point reduction).

Homework

Homework assignments are due in the class following their assignment. Late homework **will** receive a lower grade. Partial assignments will be graded as incomplete. Due to the nature of this class, it may not be possible for a student to make-up a missed lab. Class attendance is a must!

Exams/Quizzes

Students are required to take all quizzes and exams at the appointed time unless arrangements prior to the test are made with the instructor. Make-up tests will be more rigorous than the regular tests, and will be scheduled at a time convenient for the instructor.

Academic Honesty Policy

The Champlain College Student Handbook (*The Rudder*) describes the College's Academic Honesty policy. It basically says that if I think you've cheated on an assignment — i.e., to either actually or attempt to knowingly give, receive, or use work that is not your own — I can give you a zero on that assignment. I will strictly adhere to this policy. You may trick me, but it will catch up to you somewhere once you enter the workplace. In addition, it is very common for prospective employers to call professors for references. It is really not worth taking the chance of jeopardizing your future as a result of cheating. If you are experiencing any difficulties with the subject matter, or experiencing any personal difficulties, talk to me. I am committed to help make you successful. You must be committed to your own success as well!

This in no way suggests that I am opposed to your collaboration with fellow students and others; in fact, I encourage as much collaboration as possible. The point of this policy is that work that you submit as your own *has* to be your own! If you work with another person or other resource that helps you learn an answer to something, that's fine — what I see, however, should be in your own words and clearly demonstrate **your** understanding. If you're unsure, tell me that you worked with others.

Special Needs: If you believe that you have a disability requiring accommodations in this class, please contact the Coordinator of Support Services for Students with Disabilities as soon as possible. After you receive your accommodation form, please see me so I can work with you to implement them in a timely fashion.

NET 260 – Linux System Administration I

Section 01 – Thursday, 2:00 P.M. – 4:45 P.M.

Course Calendar – Fall 2008

NOTE: Additional homework assignments may be distributed that deal with preparation for upcoming labs.

No.	Date	Topic	Reading Assignments
1	Sep 04	Introductions / Course Overview Lecture: What is Linux – Origins to Current **Homework 1 Distributed**	Chapter 1, 36
2	Sep 11	Lecture: Installing Linux, Disk structure, Network Configuration, Startup, KDE & GNOME GUI familiarization, SHELL command familiarization, logging in/out, system startup and shutdown. Lab: Fedora 9.0 Installation and preliminary configuration. Using the GUI(s). **Homework 1 Due**	Chapters 2, 3
3	Sep 18	Lecture: Basic and Advanced System Administration concepts. System initialization and configuration files. X-Windows and Windowing Systems. System initialization and shutdown sequence. More on file systems.	Chapter 11, 12, 35
4	Sep 25	**Quiz 1** Lecture: Working with Linux commands Lab: Working with Linux commands (the bash shell).	Chapters 4, 32
5	Oct 02	Lecture: Users Groups, and file permissions. Lab: Configuring Users and Groups. Also, students will finish up lab from last week as it was a long one. **Homework 2 Distributed**	Chapter 10
6	Oct 09	Lecture: Software / package management. Use of rpm, tar, vtar, gzip, gunzip, etc. Lab: Software package installation / update. **Homework 2 Due**	Chapter 34
7	Oct 16	Midterm Exam	

8	Oct 23	Lecture: Networking	Chapter 14
9	Oct 30	Lecture: Samba and NFS. Printing in Linux. Lab: Implement NFS and SAMBA **Homework 3 (Project) Distributed**	Chapter 19
10	Nov 06	Lecture: Telnet and SSH. Brief discussion about FTP Lab: setting up telnet clients and server, using SSH, and issuing commands on a remote server	Chapter 15, 20
11	Nov 13	**Quiz 2** Lecture: Electronic Mail – Servers and Clients Lab: Setting up a mail server **Homework 3 (Project) Due**	Chapter 21
	Nov 20	Lecture: APACHE web server discussion, setup and configuration Lab: Web server setup **Homework 4 Distributed**	Chapters 17
12	Nov 27	No Classes – Thanksgiving Holiday	
13	Dec 04	Lecture: Advanced System Management; managing multiple systems, Webmin. Lab: Students will install Webmin, and perform some more advanced system management functions. The project piece is to be able to manage any of the servers from any workstation and/or server. **Homework 4 Due**	Chapters 34
14	Dec 11	Lecture: Linux System Security & firewalls. Lab: Students will implement some security features on their servers.	Final exams distributed
15	11/18	Final Exam (actual date/times TBD)	Finals exam due