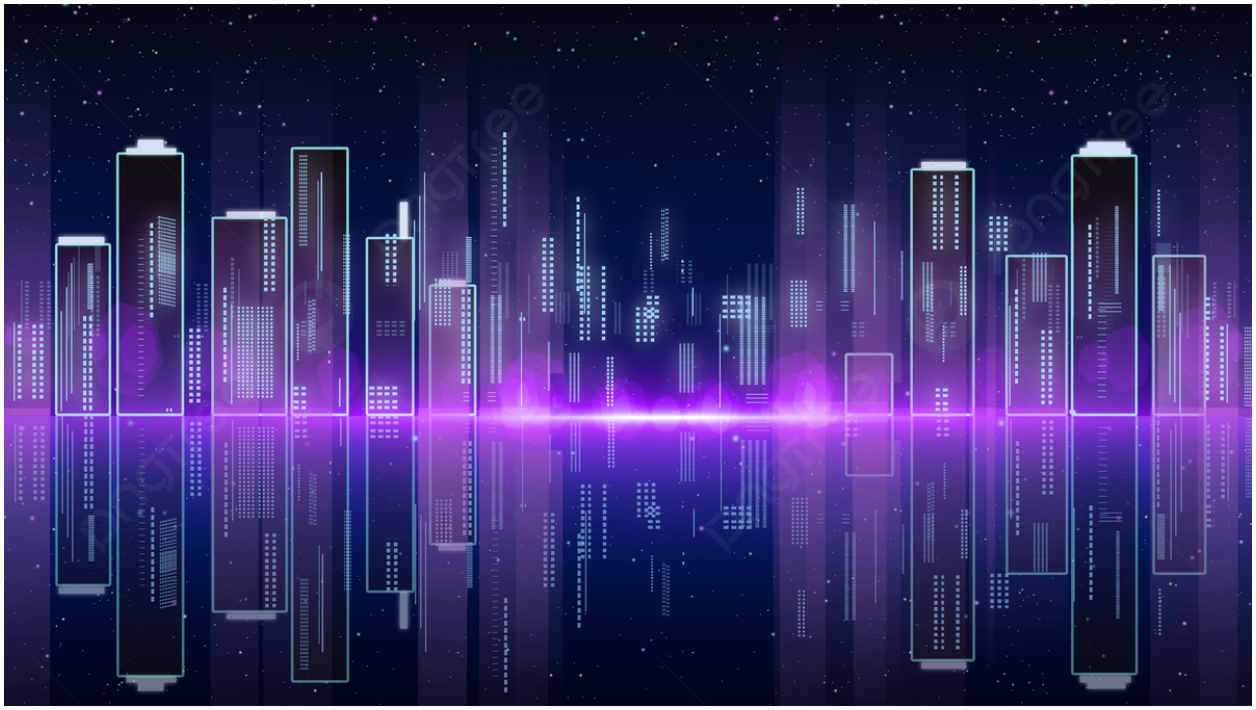
Unix (420-321-VA) - Fall 2023 Section 02 Zlatin Tsvetkov, Sereen Saaida, and Yousef Abdelnour



Unix Final Project

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Project description/goals:

Our project aims to develop and configure an operating system inspired by the Linux we have used throughout the semester and the pre-made Vanier OS (a debian 11 based linux distribution made by Vanier alumni), utilizing the Debian distribution. The personalized software would incorporate tailored features to enhance the productivity of dawson students. The goal is to create a user-friendly environment, streamlining essential tasks and providing a seamless experience for academic work. The aesthetic design is crafted to resonate with the preferences of dawson students, ensuring a visually appealing and intuitive interface that complements the technical aspects of the system. In order to make this, we plan to install and take inspiration from a previous project with similar intentions. In other words, base ourselves off their work to make a newer and updated Dawson OS by updating and reconfiguring the previous project to fit our exact needs. Considering that we are also in Computer Science, a lot of the pre-installed packages that come with the OS will be the same. We will use debian's "live-build" just like was done for Vanier OS. Our general purpose is to use the knowledge acquired in our Unix class, specifically the knowledge gained from working with Linux, in order to construct an efficient, proper and personalized operating system.

Platform of choice:

A Desktop platform would be the most efficient for our project as it is best tailored for the needs of dawson students. In other words, a desktop platform offers a graphical user interface, which makes it simpler for students to navigate and interact with the OS. Desktops also offer an excellent development environment with graphical tools and other software that can be essential to a student in the IT field. Desktops are also the better option when it comes to a high degree of customization. We would be able to tailor the environment to our own preferences and aesthetics. We would also have more resource availability, offering more flexibility for choosing what development tools and applications we would like to run in our project.

This choice would offer an overall better experience as a desktop would over ease of development considering we are the most familiar with it.

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Demonstration plan:

For the demonstration platform, we have decided that a **virtual machine** would be the best option, as it offers several benefits for showcasing our final project. It has an efficient level of portability that ensures a consistent showcase experience with a wide amount of compatible systems. The fact that it is an isolated environment reduces the risk of conflicts with the desktop/host system which can satisfy presentation standards. The main point as to why we find that a VM would be the preferred choice is its ease of distribution. Collaboration on the project using a VM becomes very simple as content is easy to share and snapshot features are easy to reproduce. Lastly, common research explains that the resource efficiency of the use of virtual machines is essential for showcasing performance in numerous environments.

That being said, a virtual machine serves as an efficient and secure option to demonstrate the features of our project

Requirements:

For developing the purpose-specific desktop system for students at dawson. We have created a list of requirements that our project should have in order to guide our focus.

- Define the specific needs of the desktop system to cater to students at dawson Identify essential applications and tools that could be emphasized in the system
- Achieve a proper user interface customization to enhance user experience for the dawson audience
- Make sure that the implementation of a linux-based system is functional for creating/managing user accounts
- Test out File System and Permissions on our custom OS
- Define/describe access controls aswell as system description
- Make use of systemd for efficient process/service management tasks
- Configure specific services to optimize performance and responsiveness to the needs of those at dawson
- Develop automated recurring tasks and maintenance activities
- Select a scripting language to create automated tasks
- Develop simple scripts that will be able to automate routine tasks to make the system more dawson student-friendly

- Enhance customization, software installations and repetitive processes by scripting.
- Our addition to a regular OS: Integrate an IDE like environment where a use can easily start writing their code/projects without worrying about losing their file or not being able to access their IDE application (built-in)

Major technical solutions compared:

1. Base Distribution: We will need to decide which version of Debian we will be using as the base for your customized OS. This will impact the stability, software availability, and hardware support.

   Solution: Vanier OS from 2 years ago uses Debian 11, but we now have Debian 12. To modernize our OS, it makes more sense to use the newer version. Nevertheless, a lot of our ambitious goals will be tested in the first week, so if we see that we are falling behind and struggling too much, we will revert back to the original Vanier OS as much as possible, including for the base distribution version.

2. Chip Architecture: Selecting whether to build for x86, x64, ARM, or another architecture will determine what hardware out OS can run on.

   Solution: x64 is the most common architecture and will support a wide range of modern computers. But, our ambitious minds picked ARM64 instead since Debian already has an ARM64 version available and mainly because there are many new ARM based chips like all of Apple's chips, the Snapdragon Elite, and many more in the future. Even Windows is making a huge leap in ARM, so to be more modern and representative of our era, we decided to go for the "newer" ARM. (needless to say, again, if in the first week we have major issues, we will just default back to Vanier OS's AMD64 plan and follow their steps).

3. Desktop Environment: We must choose a desktop environment (DE), such as GNOME, KDE, XFCE, etc. This will define the user experience of your OS.

   Solution: XFCE is lightweight and customizable, offering a balance between performance and user-friendliness, making it suitable for educational purposes and in case the students have older machines. The other option we really considered was GNOME because first, it has a more modern feel and we're trying to make the software look updated, but also mainly because all three team members used GNOME so we are used to things like the Nautilus File Manager

compared to XFCE's Thunar.XFCE is also more customizable with less need for extensions than GNOME. Nevertheless, the main reason we went for XFCE rather than GNOME is because that's also what the previous team for Vanier OS did. Due to lack of time this semester, we do not believe that we will have time to change that many things, so if it isn't broken, and it suits our needs, we will not change it and XFCE is a legitimate option.

4. Package Selection: Decide on the default set of applications and tools to include in your OS. You must balance functionality with resource usage and user needs.

   Solution: Including a standard set of office, internet, and multimedia applications like LibreOffice, Firefox, and VLC can cater to common user needs without overloading the system. With that, we wish to also add pretty much the same software as packages as Vanier OS for computer science students:

5. Custom Kernel or Stock: You can use the stock Debian kernel or customize your own. A custom kernel allows you to optimize performance and hardware support but increases complexity.

   Solution: Using the stock kernel from Debian is typically more straightforward, ensuring broad hardware compatibility and security updates without the need for deep technical knowledge.We really do not have the time for a custom Kernel so this is very straightforward. We are neither at that level of understanding yet, nor do we have the time.

6. Hypervisor/Virtualization: Since we plan to test our OS in a virtualized environment to not break our machines, and so that we can create snapshots in case we mess up and want to go back to a point in time where our things weren't broken, we need to choose a hypervisor like VirtualBox, or VMware. Yousef and Sereen will use VirutaBox as they are most used to it. I, on the other hand, will use UTM since it is better compatible with my computer at home and I have been using it this entire semester. At school, we can all use VirtualBox, but the choice shouldn't matter too much since they are all capable of running Debian.
7. Repository Configuration: We must determine whether to use the default Debian repositories, add third-party repositories, or create your own for distributing updates and new packages.

   Solution: Utilizing the default Debian repositories while adding a custom repository for your own packages allows for ease of updates and package management, while still providing a personalized touch to our distribution. Compared to third-party repositories which require trust for the creators since

they are not necessarily official debian developers, the default Debian repositories (with a mix of a potential personal touch of our own packages) makes more sense as we can trust it more and make it fit our specific needs.

Timeline:

Week	Task
Week 1	**Finalize project idea, set up points that would make our OS personalized. Divide the work for the development of the OS**
Week 2	**Develop the OS by adding our own features/content to it. Run tests to ensure full functionality**
Week 3	**Finalize OS, prepare presentation, execute demonstration**

Team compositions:

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