Wentworth Institute of Technology

School of Computing and Data Science

COMP 3100-05 - System Administration

COMP 3100-05 Project Report: Creating A Virtual Enterprise

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1 Introduction

Our idea for the project is to create the computing and networking infrastructure for a virtual enterprise. Our project will model how a Systems Administrator would set up and manage these infrastructures for a business in the real world. In our *virtual* enterprise, we are going to establish three departments: management, sales, and accounting. Of course, there will be employees in each department. The goal of our project is to make a model IT infrastructure, for a company with three departments, allow the employees communicate with each other, in their given department, access the specified files that they need to, while simultaneously prohibiting them from accessing files that do not belong to their departments and general scope of work. For our project, we will be working on VMware, using three Kali Linux operating systems.

2 Project Step-up and Commands

The first step for creating our project was to create, and configure, the settings of the three virtual machines to represent the three different departments represented in this virtual company. We also needed to create a new virtual network for these VMs, our virtual LAN, and we did this through the “Virtual Network Editor”, inside the VMWare settings. Then, we added all three of these virtual machines to this newly created LAN segment.

The main commands that we used are:

1. adduser
2. addgroup
3. mkdir

4. chmod
5. chown
6. gpasswd

Furthermore, we needed to add users and groups to the system. We utilized the “adduser” command to create the different user accounts for each of our model employees, as well as the “addgroup” command, to create the groups for each of the given departments. This makes our virtual enterprise easier to manage. We also used the “gpasswrd” command to assign the workers to their department’s corresponding group. Futhermore, we created, and assigned files for multiple different departments, across all of the virtual machines. We also assigned it, so that only the group belonging to the proper department authority could be able to access it. Here, we use “chmod” to change the permission of a file to their user (head of the department) and the group (all workers in the department). We also can use “chown” to change the owner of the file to the head of the department.

3 Architecture of the Project

The architecture of our project revolves around the structure of a typical company, in the real world. We created various user groups, resembling different departments and authority levels, and we created three different users for each department, resembling employees and their corresponding accounts in a company. Furthermore, we created one virtual machine per department, one VM for the “management” department, one VM for the “sales” department, and one VM for the “accounting” department. Each of these virtual machines we put on the same Local Area Network of 192.168.5.0/26. This was intentional, so that the higher levels of

authority in the company could overview the files, and work, performed by the lower-level departments. The groups that we created consisted of “management”, “head-of-departments", “sales”, and “accounting”. These user groups all resemble the different departments in a typical real-world company. The permissions associated with each group matched the organization of the corporate hierarchy, as seen in the real world. The “management” group had the highest access, which consisted of access to all the different files across the different departments in the virtual enterprise. The “heads-of-departments” had the second highest access, with them having access to each other's files, as well as the files correlating with their direct departments that they belonged to. Lastly, the “sales” and “accounting” groups had the least access, with them only having access to the files that belonged to their associated groups, except for the “head-of-departments” files, respectively.

Moreover, we created three different user accounts for each department: two sales employees, one head of sales employee, two accounting employees, one head of accounting employee, CFO, COO, and CEO user accounts. All the sales employees were given the primary group assignment of “sales”, while the head of sales was given the primary group of “head-of-departments”, with the secondary group of “sales”. All the accounting employees were given the primary group assignment of “accounting”, while the head of accounting was given the primary group of “head-of-departments”, with the secondary group of “accounting”. Additionally, all the management employees were given access to every department’s user groups, as their secondary groups, and they were all given the primary group of “management” as well.

4 Limitations of the Project

The biggest hardware limitation of our project is we cannot create more than 3 access VMs (without stability issues). These components need to be split between the 3 VMs. Each VM currently has 4 Cores, 4GB of RAM, and 20GB of Storage. The maximum number of virtual CPU sockets that a virtual machine can have is 128, if we want to configure a virtual machine with more than 128 virtual CPUs, we must use multicore virtual CPUs. A virtual machine cannot have more virtual CPUs than the number of logical cores on the host. The number of logical cores is equal to the number of physical cores if hyperthreading is deactivated or two times that number if hyperthreading is activated. Since we work on VMware station, we can only work on the VMs when we meet and only one of us can configure the VMs outside of our group meetings. And we did not have a lot of time to expand the project. Our virtual business implementation needs to match our allotted project time. If we had more time, we could include more users, groups, networks, and files with access control.

5 Final Testing Conducted

We performed a variety of different tests throughout all these virtual machines, so that we could ensure the structure and integrity of our project. We performed a variety of different tests on each of the virtual machines. One of the main tests that we did was a “ping” test, to test the connectivity, and communication between the different virtual machines. Another test we did was checking the “/etc/passwd” file and searching for the corresponding group that the individuals belonged to. We did this and performed the “groups” command on every user on the virtual machine, to verify that the primary groups, and secondary groups, of the different users were implemented as intended. Furthermore, we checked to see the various directories that we

stored on the virtual machines, using the "ls" command. We did this to verify that each virtual machine contained the files, and directories that they were intended to have. Additionally, we went into these directories, and performed the "ls -al" command on the files inside of them, throughout all the virtual machines. We did this with the intention of checking the permissions associated with the file, as well as the user and group which corresponded with the given file, to ensure file access confidentiality and integrity was maintained. All these various methods of project implication verification can be seen in our video project.

6 Legal Impacts of the Project

Whether online or brick-and-mortar, every business must have the proper licenses to do business in each state. The legal requirements for business licenses vary from state to state. In our case, if we want to establish a virtual enterprise in Massachusetts. According to Massachusetts court law, to start a home office or business we will need to check local ordinances and bylaws for zoning restrictions, health regulations, employees, signage, parking, and other issues. We need to research our local city and town ordinances and bylaws or contact our town hall. Another legal concern is copyright, it can easily copy and paste pictures, commercials, products, and ideas on the internet, and it may be against the copyright law.

7 Ethical Impacts of the Project

The ethical concern is the operating system Kali, which is a tool that is used by white and black hackers a lot. It is because Kali is a free, convenient, high secure, open-source operating system. Kali is one of the very few Linux distributions which have a working accessibility system for blind or visually impaired users through both voice feedback and braille hardware support. Also,

Kali has extensive support for USB live installs, allowing for features such as file persistence or full (USB) disk encryption. It also supports multiple persistence USB stores on a single USB drive. Another ethical concern is technology makes it easy to track what your employees do; email, browser history, and keystrokes, it is intrusive to others' privacy.

8 Environmental Impacts of the Project

We are a virtual company working from home, with employees who do not spend time on company premises or ditching office-based work altogether, we are finding it contributes to environmental protection. The main thing that almost all regular companies do is to have a dining service to serve food to their employees. Yet, we do not need to have the dining hall or cafeteria, because we are staying in our own place. So, it will provide us with less plastic usage, reduce power consumption since we do not need to have electricity and all the machines running all the time. On the other hand, regular companies may leave their company illuminated after business hours to let passers-by know that they exist or to spotlight certain products and safety reasons. Our virtual entrepreneur will cause less air pollution due to all of us not having to drive vehicles or take public transportation to a physical company. Additionally, we do not need cleaning service for a big building, without cleaning service, we are trying to keep the amount of chemicals emitted during cleanings to a minimum, and ensure that the vacuum cleaners, carpets, and adhesives meet indoor air quality standards. Since our company works online, it greatly eliminates many negative environmental impacts. Additionally, when remote work began, data from Breathe London showed that GHG emission fell 25% during morning commutes and 34% during evening commutes. This goes to show how remote work can
make a positive environmental impact.

9 Conclusion and Reflections

Our project aims to resemble the computing and networking infrastructure that a Systems Administrator would implement into a business. And we successfully configure these three departments to communicate with each other and give them different permissions to access files. From this project, we obtain separate groups and networks for each department. Creating user accounts and permissions, depending on the employee's position in the company. We followed the concepts and commands previously learned through the System Administration course and will be utilized throughout our project implementation, creating virtual networks, file, and directory access control. We used commands like; adduser, addgroup, gpasswd, id, groups, usermod, mkdir, chmod, hostname, chmod, and chown. This project will provide our group with further insight into the structure and policies that should be upheld in a business. Furthermore, the way of organizing departments, which employees should have access to what data, corporate hierarchy. We also summarized the legal and ethical concerns surrounding our virtual enterprise, and we see great results environmentally with a virtual company. In the knowledge economy nowadays, physical working space is less valuable than virtual networks. Basically, an online enterprise can be inexpensive, work location and hours are flexible, and it makes a decent amount of income if you are running it successfully.