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Winter 2018

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Nicholas Maurer

maurern2@student.lasalle.edu

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Recommended Citation

Maurer, Nicholas, "Active Directory and Group Policy from the Ground Up" (2018). *Undergraduate Research*. 36.

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Nicholas Maurer

1/5/19

Active Directory and Group Policy from the Ground Up

When it comes to the world of computer science and IT there is no way to cover every single aspect of this industry in just in four short years. There is simply too much to cover, and one could spend a lifetime learning about any one topic. One such topic is the suite of tools that Microsoft provides to IT administrators. These tools are used for everything from network creation, to user management, to even website hosting. As someone who's job field is built on the back of these tools, I felt that it was important for me to get some exposure to these tools before I graduated. This is where my project began.

Taking just one look at the entire toolset that Microsoft provides, I quickly realized that there was no way that I would be able to conquer them all within a semester, so I decided to focus on the two that were the most relevant to me, Active Directory (AD) and Group Policy. These two tools provide network administrators with the ability to manage users and computers along with the ability to set rules for the entire network.

With the goal of learning the ins and outs of these two tools in mind, the next step was to build a network that would be capable of utilizing these tools to their full potential. In order to build a network of this scale I needed to virtualize everything, but before I could do so, I had to buy myself a server. While my laptop can run a virtual machine (VM) or two just fine, it would not be able to handle an entire network. After some research and shopping, I ended up with a Dell PowerEdge r510. This server was a perfect fit for me as it was within my price range, had

all the features I wanted, and had more than enough raw resources to handle my network and had plenty of room to expand if need be.

Happy as a clam with my purchase I set out to build the network. Since the Dell PowerEdge r510 is a bare metal server I needed a hypervisor to divide up the hardware resources and to manage the virtual machines. I ended up using VMware's ESXI hypervisor. I chose this hypervisor for a lot of reasons but mainly because it is free, has excellent documentation, and is from one of the largest networking companies in the world. With ESXI installed on the Dell PowerEdge r510 I was able to start crafting the network. I ended up creating four VMs, three for my users and one to act as the core of the network.

With all the VMs created and connected to one domain, it was time to dive into Active Directory (AD) and start creating users. In short, AD acts as a phone book and keeps a record of all the users, computers, and groups on the network. This gives network administrators the ability to easily create/delete users, reset passwords, create groups, and grant permissions all from one central location among other things. For my project, I wanted to create a lot of users that way I could better reflect an enterprise environment. In order to make this a reality, I ended up writing a PowerShell script that automatically created users based off an excel spreadsheet that I found online. After everything was said and done, I ended up with about five thousand user accounts, with every account containing the user's first and last name, email, username, and password.

With the user accounts set up and ready to go, I was able to dive into the core of my project and start customizing my network via Group Policy. Group Policy is a tool provided by Microsoft that allows network administrators to create different rule sets and apply them to specific areas of the network. These rule sets can contain almost any rule imaginable, from basic

tasks such as setting a specific background to complex tasks such as silently installing software without user input. Due to the complexity of Group policy, I spent most of the semester learning how Group Policy works from both a conceptual perspective and from an implementation perspective. By the end of the semester, I ended up with about ten different rules which covered a wide range of topics. Some of these rules dealt with customizing what the user sees (such as setting a wallpaper, creating a custom shortcut on the desktop, etc.) while other rules worked below the surface, (such as stopping users from accessing the registry, automatically connecting the user to a network drive, etc.).

While I did accomplish my goal of creating an enterprise-grade network, it did not come without its fair share of challenges. One of the biggest issues, and lessons, that I faced was losing data. As with any computer system, it is considered best practice to create regular backups and this is something that I did not put much thought into at first since it is so simple to create VMs in ESXI. However, what I did not account for is the time that it takes to get a new VM back on the network and get it caught up to the rest of the VMs. This oversight would become very apparent as during week ten I managed to knock all three of my user VMs off the domain and managed to lock the local administrator accounts of all three of those VMs and with no backups, I had to scrap all three VMs and start over. While this wasn't quite the worst-case scenario, it was a good learning lesson for me. Besides this incident, the other major challenge I faced was getting Group policy to install software for my users. This is one thing that I wanted to do from the start but ultimately unable to accomplish. The process of getting group policy to install software is very simple and straightforward but every time I tried, I kept getting different errors with no commonality between them. The closest I was able to come to accomplishing this goal was to have Google Chrome automatically installed for the network administrators. While this

did prove that I was following the correct process and that my network is capable of installing software through this method, I was unable to install software for all of my users like I originally intended. This is something that I still want to investigate when I get the time.

In the end, this project turned out very well. It gave me the opportunity to experiment and learn about some of the tools that I will end up using on a daily basis after I graduate. It also provided me with a unique set of challenges and taught me some valuable lessons that I otherwise might not have been able to experience while still in school. It also gave me the opportunity to do something different and unique. Going forward I plan on continuing and expanding my project in my spare time so that I can continue to expand my horizons and continue trying out new methods and tools.