# A Distributed System with

NETWORK AUTHENTICATION

and SHARED NFS

CIT 470-001

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Presented To

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**Introduction**

Distributed systems are a significant advancement in IT. It is an environment in which physically separated devices are linked together on a network. These devices collaborate with one another, divide up the work, and handle processes simultaneously to finish the job more quickly than if a single device had been in charge of it. We were successful in creating an example distributed system in this project. But here, we assembled four virtual machines on a distributed system with network authentication and shared network file systems. Because they are linked, users can log in to any VM with the same username and password and access the same home directory regardless of which client VM they log in to.

Our process for creating a distributed system has been fully automated with little to no user input, with the goals of increasing productivity, reducing human error, and saving money and time. For all four Client VMs a kickstart file named client-ks.cfg is used to automate the centOs 7 installation. To use less human input, the ldap and nfs configuration is also included in the %post section of the kickstart file. We set up an NFS server and an LDAP directory server with client authentication on a server VM that already had CentOS 7 installed. These scripts are named as install-nfs-server and install-ldap-server respectively.

**Procedure**

Below is a step-by-step guide for installing centOs 7 in all four Clients VMs and setting up the NFS server and the LDAP directory server with client authentication on the server VM:

1. The first step is to turn on the system where you want to install centOs 7. In this case, we are installing CentOs on the Client VMs. Let’s begin by turning on Client 1.
2. Within 10 seconds of turning on the Client 1, press Escape in the console. You will be then asked to select a boot device. Select CD/DVD drive, then, rather than using the graphical wizard, start the Kickstart installation with the boot command.

In this project we will be using the following boot command:

linux ks=http://studenthome.hh.nku.edu/~khatris1/Group5Kickstart.cfg

Here, we will be using the kickstart file named client-ks.cfg for all four clients to automate the installation.

1. After that we will wait for some time to let the device finish the installation on its own. The device then will reboot itself, then you can use the root login credentials to login to the machine.

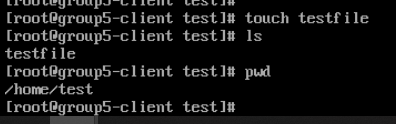
You will then repeat the process from 1-3 to automate the installation in Client 2, Client 3, and Client 4 using the same file named client-ks.cfg. All the client authentication for NFS and LDAP is already loaded in the Client kickstart file. Hence, after the OS installation is successful in all four VMs we will now set up the NFS server and the LDAP directory server with client authentication on the server VM.

First let’s use the following command to get all the files from GitHub into the server VM:

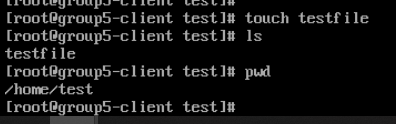
wget -L <https://raw.githubusercontent.com/KhatriSujata/Project2_LDAP_NFS/main/a2.tar.bz2>

1. Use tar xvf a2.tar.bz2 to unzip the file. Then change the current working directory to a2 using the command “cd a2”.
2. Then, use the command “./install-nfs-server” to begin the installation.

This process, like the previous one, is also completely automated and requires no user input. If you want to make sure that NFS server is working follow the commands shown in the screenshot below in either of your client or server VM. Here, we have used client VM to create a file named “testfile” under a test directory. After you create the file you can go to the other VM and see if the file exists there.



The following picture is taken from the server VM to make sure the testfile exists in the server.



Now, let’s follow the following steps to automate the install for LDAP server.

1. First, use the command “./install-ldap-server” to configure the LDAP server.

This process, like the previous ones, is also completely automated and requires no user input.

**Design**

Our primary goal in designing this project was to use as few users’ inputs as possible. Our second goal was to use as few scripts as possible in order to make the code appear simple and understandable. Bash was used to write all the scripts needed. Bash is native to Linux operating systems and the bash libraries that are available are capable of fulfilling every requirement of the project. Although other programming languages like Python and C were taken into consideration, their additional OOP features proved to be unnecessary, so bash was chosen instead for its comparatively low level of complexity.

Our Kickstart file is made to install CentOs7 without a graphical user interface and with as little as 20GB of disk space, in addition to automating the process with no user input. It increases the operating system's performance, makes it simpler to use, and conserves storage space and resources. Additionally, it comes with helpful packages like net-tools for networking tools, wget for web file downloads, bzip2 for decrypting encrypted files, and updates to automate all system updates and make sure installed modules are updated to the most recent version. All of the client ldap and nfs configuration can be found in the %post section of the client kickstart configuration, which is one of the useful features we have in our kickstart file. This simplifies the design as users will not have to further configure the clients to perform ldap and nfs configuration tasks.

As was already mentioned in the procedure, our design automates the installation of the nfs and ldap server using just three straightforward commands. These scripts are made to automatically install and configure LDAP and NFS servers in server virtual machines. The LDAP server script is also made to move our system's current user accounts and groups to the LDAP directory. Additionally, it makes it easier to install the "diradm utility," which can be used on the server VM to enable effective user management. The scripts used to install servers are also made to offer help using the -h help command line option. The project file also contains a README file for users that provides a summary of what this program is actually for.

**Achievements**

We were able to meet all the requirements needed to complete this project which are described briefly in the steps below:

1. The kickstart file named client-ks.cfg automates the Cent OS installation for all four Client VMs. It installs the OS without a graphical user interface. The IP addresses and other network configuration are provided via DHCP by the router. It also creates a log file to log all kickstart output.
2. As can be seen in the figure below, the kickstart also completes the client configuration scripts in %post section. This simplifies the design because users won't need to further set up the clients to carry out ldap and nfs configuration tasks.

***Picture***

1. The script file “install-nfs-server” successfully installs and configures the NFS server in the server VM. Similarly, the script file “install-ldap-server” successfully installs and configures ldap in the server VM. There is also a file name “migrate-ldap-server” which migrates the existing user accounts and groups on our system to the LDAP directory. As required by the project, the diradm utility is also installed and is functional on the server VM for enabling effective management of users.
2. As shown in the picture below, the server scripts are also functional to provide help using the “-h” help command line option.
3. Furthermore, A README file for users is also included in the project file, as required by the project, and it contains some basic information about the program.

Lastly, below includes the work each group member contributed to the project:

|  |  |  |  |
| --- | --- | --- | --- |
| Christopher McDowell | Nathaniel Rumping | Sujata Khatri | Tristan Fitzpatrick |
| Power point slides and Presentation | client-ks.cfg Kickstart file | Read Me file  Project Document File  Install-nfs-server  Install-ldap-server  Necessary client configuration scripts for the kickstart file. | **Some Lines for LDAP AND NFS script.** |

**Conclusion**

To summarize, manually installing and configuring servers takes time, is expensive, and is difficult to debug and maintain. After configuring once and running as many times as necessary, an automated server can speed up the installation and configuration process. We have completed the automated installation and configuration of an NFS server and an LDAP server in CentOS7 to be used in building a distributed system. The OS itself is also installed automatically using a Kickstart file. In addition, we successfully assembled four virtual machines on a distributed system using network authentication and shared network file systems. Because they are linked, users can log in to any Client VM with the same username and password and access the same home directory regardless of which client VM they log in to. Everything has been thoroughly tested and found to be error-free. These scripts, if used in the future, will save the company both time and money.