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INSTALLING LINUX OS OVER NETWORK IN AREA OF ITCGH (USING," KICKSTART")

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Abstract

Here in this monoscript installing operating system over the network, you will commonly find four solutions ways for these four problems Such as Cost savings, centralization, timekeeping, and security which has always challenged IT centers in Afghanistan as well as in Ghor province. This search goal is an possabel OS placement concept for IT centers. Using one of the OS spread methods over a network called "Kickstart". One of the most problematic obstacles against IT centers every day is IT centers' computers which are fundamental tools in many disciplines of study and work. In many cases, they are offered to users inside an open room to be used freely for their needs. ITCGh (Information Technology Center Ghor) is one example. During my year at the university, it was possible to observe the technological dependence of a tool used to deploy OS all along with the computers. Kickstart is a well defined program we can work with this in the form of Command-line (CLI) and Graphical User Interface (GUI). It response the queries while OS installation. Finally, DHCP, TFTP, FTP, xinetd, and syslinux are the protocols that we need to configure in our Server System.

Keywords: *DHCP, TFTP, SFTP, FTP, MBR, PXE, Kickstart*.

1. INTRODUCTION

Nowadays the IT departments need to facilitate their hardwares, softwares and drivers installations and configurations and it is a key activity for them to manage their recources in a easy way. To manage IT center resource IT department should provide centralized services. One of these services is OS placement over the network in enterprise environments; it can be a difficult and slow process as the IT professional can Remote new systems setup separatly. If the host device does not have an OS installed on its hard disk or booting from PXE. You're maybe aware with the popular branded commercial package WDS (windows Deployment

service), Clonezilla, and REBMO. The problem with these software packages is that it takes a lot of time to enormously clone systems and install them on many computers and require special management abilities to work with them and also most of them have Command-line(CLI) work environment. Well, now there is an Open Source system solution called **Kickstart**. Furthermore, The Kickstart file is used to automate Linux operating system installation. The fundamental concept behind the kickstart file is to make available all required installation information to the installer via the kickstart configuration file which would normally be submitted interactively. This can get faster an installation and provide a non-interactive capability for important placements. This article identifies one of the "Pre-boot Execution Environment (PXE) technologies" that will launch a common and stable set of pre-boot services. That make available a kickstart server. In summary, using the abilities defined above, a newly installed networked client machine should be able to enter a mixed network. In addition, many system administrators would like better to use an automatic installation method to install Linux OS on their equipment. To response this necessity, kickstart is the installation technique. Using kickstart, a system manager can create a single file containing the responses to all the queries that would usually be asked through a typical installation. And also, before we create the kickstart file we have to configure and install these protocols like DHCP, FTP, NFS and TFTP then install xinetd and syslinux services for booting, allocating IP addresses to our clients, transferring information, and keeping data that we have into our server computer to install OS over the network. Because it is very cost-effective, prevents time-consuming, and is useful for large companies.

2. METHOD

The data collected and analyzed from valid resources on the internet, different books and articles and have been used in different sections of the research paper. We have done and tested our practical work on Virtual Box, the practical parts brought briefly in this research.

2.1. Problem Statement

Afghanistan is backward than other countries, according to the economy and knowledge skills, the use of IT facilities is weak around the country. If we compare ourselves with our Neighbors, we should be up to date from IT outlook. As we all know according to the education system, Afghanistan is backward than developed countries, today schools don't have PC labs and also students who graduate from school don't have knowledge to use IT skills most of the Companies and Universities just have their local network, now all of the Companies and Universities around the world are agreed to centralized their network, it causes ease of use and great controlling of network systems, bandwidth management, time management and also brings security form physical attack or scavenging attacks, so we have to control and installing OS and necessary software through the server/remotely, not on every system individually. And also, IT centers must use the system to be simple and have more advantages that all can use this system and according to our country's economy, it is better to use free and open-source software for solving of the problems. Problems which most of the IT centers and especially in our ITCGh occur.

1- You have a large number of machines to install, and carrying a CD/USB drive to each of them is time-consuming and needs a big budget.

2- You have a machine where the hard drive is failing, and you need to run some problem-solving tools.

3- You have a machine in a remote location, but you need to reinstall the Operating system also control the client or users and install the necessary software, and limit their access to the files, resources, and the internet that they shared in the network. So, it is a big challenge that all IT officers are facing because it will be difficult to set behind each system and configure them individually.

3. GOALS

The goals is that we want to installing the OSs and necessary softwares through the Server and over the network remotely to computers, so PXE(Pre eXecution Environment) solution is recommended if you want to install OS over the network on all IT center's PCs at once, if the PCs don't have external CD drives or other USB storage media for installing OS. There are a lot of tools that you can use PXE notion one of the powerful tools that use the PXE notion is called Kickstart server which is free software Kickstart server helps you to install OS over the network locally and can solve all problems that I discussed in the previous discussion, the solutions are as follow. You can install OS over the network that is necessary for IT centers on your entire system. For example, if we have N number of Computers in a company and we want to install OS and necessary Software's it is expensive and time comsuming, we have to spend a lot of time for installing and configuring them individually. Contrariwise, if we have a Kickstart server and configure it as a server then we can install the OSs and necessary softwares to each computer in a short time.

3.1. Introduction to Network Services We will explain NFS, DHCP, TFTP, SFTP, FTP, MBR, PXE network services, and some terms which are related to the research and work on them.

a. Term of Network

Network is a collection of PCs, Servers, networking devices, and other devices connected to gather for sharing data and resources with eachothers. A great example of a network is the Internet, connecting millions of network devices all over the world, [1].

b. Term of Network booting

The procedure that permits a computer to boot or start-up and load software or operating system directly over LAN without any attached local storage like CD/DVD or USB flash drive to that computer is called network booting. In the other hand booting from a pre-boot execution environment (PXE), expand the specifications of the BIOS so that it can run the software directly from the network, most modern computers that already installed INC Ethernet jack (RJ45) can support PXE protocol booting form network and PXE encompasses two system server that preparers the bootable software and the client that use the server service, [2].

c. Network File System

The network file system is a protocol that allows a computer system to access a file through a network if the network device are in the same local network. This protocol was developed by the

sun microsystem. The network file system is a remote method technology that allows the software to make an execution file on another device through the network. This service is used by the OS deployment server to export an entire root file system this protocol must install on the client-side of the OS deployment server and the OS deployment must configure the kernel to support the NFS and the boot loader of the system also must configure to pass an NFS file to the kernel, [2].

d. BIOS

BIOS is the basic input/output system that is kept in the flash memory of the motherboard called (EPROM). The BIOS is the primary part of software loads when the PC power turns on. It also manages the data fallow between PC's operating systems attempts to identify the PC's hardware and begin it using the softwares inserted in each hardware devices like a hard disk, USB, keyboard video card and others. Once the hardware is prepared, BIOS loads the boot loader, which permits to boot of an OS, then the system memory is prepared, the BIOS typically copies/decompresses itself into that memory and keeps performing from here [3].

e. MBR

The Master Boot Record (MBR) is a special area on the hard drive that is automatically loaded by your computer's BIOS and is the primary point at which the boot loader can take control of the boot procedure if you install it in the MBR, when your device boots, GRUB (GRand Unified Bootloader) is a comprehensive program for loading and handling the boot procedure [4]. It is the most public bootloader for Linux distributions. You can then boot Red Hat Enterprise Linux or any other operating system that you have organized the boot loader to boot, [2].

f. DHCP

Dynamic Host Configuration Protocol (DHCP) is a network protocol in which we defined a range of IP addresses or a scope of IP addresses to it to automatically assign for client in the network. And also this protocol enables a server to keep the record of all assigned IPs to clients [5].

g. TFTP

TFTP (Trivial File Transfer Protocol) works differently than FTP (File Transfer Protocol) and HTTP (HyperText Transfer Protocol). Although TFTP is also based on FTP I think TFTP is a very different protocol because it uses UDP protocol for transporting data and it is not very secure while FTP uses TCP (Transmission Control Protocol) because it is more secure than TFTP. In addition, in the past, TFTP was designed to read and write files by using a remote server, and also TFTP has a multi-purpose which can be strength for an array of different tasks. Most of the IT professionals and System Admins typically use TFTP configuration for Transferring files, Remote-booting without hard drives, Saving IOS images, and also to boot PCs without any Disk [6].

h. FTP and SFTP

The File Transfer Protocol (FTP) standard network protocol is used for the transfer of computer files between a client and server on a computer network. FTP is built on a client-server model structural design and uses separate connection ports for control and data connections between the client and the server [6]. FTP users may authenticate themselves with a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it. For secure transmission that protects the username and

password, and encrypts the contents, FTP is regularly secured with SSL/TLS (FTPS) [6]. SSH File Transfer Protocol (SFTP) is sometimes also used instead if FTP and it is secure than FTP; it is technologically different [7].

i. PXE

"PXE (Pre eXecution Environment) is a method of having an end computer (client) boot using only its network card". This way of booting was created in the past in 1999 and as long as the computer was created. The PXE protocol is approximately a mixture of DHCP and TFTP, the DHCP is used to find the suitable boot server, while TFTP is essential to copy the primary bootstrap program and extra files.) the "PXE protocol" functions as follows. The client initiates the protocol by broadcasting a DHCP discovery having an extension that identifies the request as coming from a client that implements the PXE protocol. Assuming that a DHCP server implementing this extended protocol is available, after several intermediate steps, the server sends the client a list of appropriate Boot Servers. The client then discovers a Boot Server of the type selected and receives the name of an executable file on the chosen Boot Server. The client uses TFTP to download the executable from the Boot Server. Finally, the client initiates the execution of the downloaded image. At this point, the client's state must meet certain requirements that provide a predictable execution environment for the image, [8].

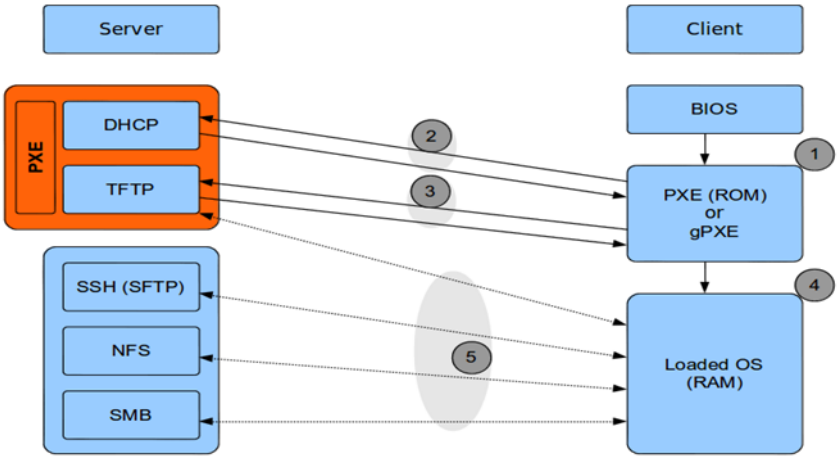

Figure 1: PXE procedures **[9]**

- **Hardware parts**

The hardware of your computer relates to all of the physical chunks that a computer have like "RAM (random access memory), CPU (Central processing units)", mother board, keyboard, mouse, etc… But Without an operating system, you would not be able to use your computer. Turning on a computer loads the operating system into computer hardware, which then loads and centrally controls all other application software in the background [10].

Despite that, we need Switch to connect all Computers to that Network and A router to connect this network to the internet.

Prerequisites

DHCP, TFTP-server, FTP, rinted, xinetd, and syslinux are protocols and services which need to install and configure in our server system to go ahead [11].

a. What is Kickstart

A "kickstart Is a tool that we can use in GUI (Graphical User Interface) and CLI (Command Line)" and also, it means automated. By Kickstart we can install OS automatically if we use the Kickstart GUI tool it is very simple. Furthermore, we can install N number of Servers at the same time because this method does not need user involvement while the installation process. So, installing Linux OSs depending on systems from physical or virtual media is easy enough when there are only one or two hosts to install. When an Administrator wants to set up or install several Linux systems, Kickstart can do that, and also Kickstart works automatically, [12].

- Creating the Kickstart File

Using CLI to create a new Kickstart file tailored to your requirements is to perform an primary Linux OS installation. During that we install the installer file will log all your installation collections and also we can create a "Kickstart file which can be found in the root's home directory (/root/anaconda-ks.cfg). Using GUI is another method we can configure our Kickstart very easily and use it graphically with GUI tools each person can configure it simply. But, we have to use this command to install that GUI tool (system-config-kickstart) [13].

a. Generating Auto Answer File

After installing the Kickstart configuration creator we have to open the tool and create an auto-answer file. [14].

b. Basic configuration

As shown the below screenshot select the required options, [14].

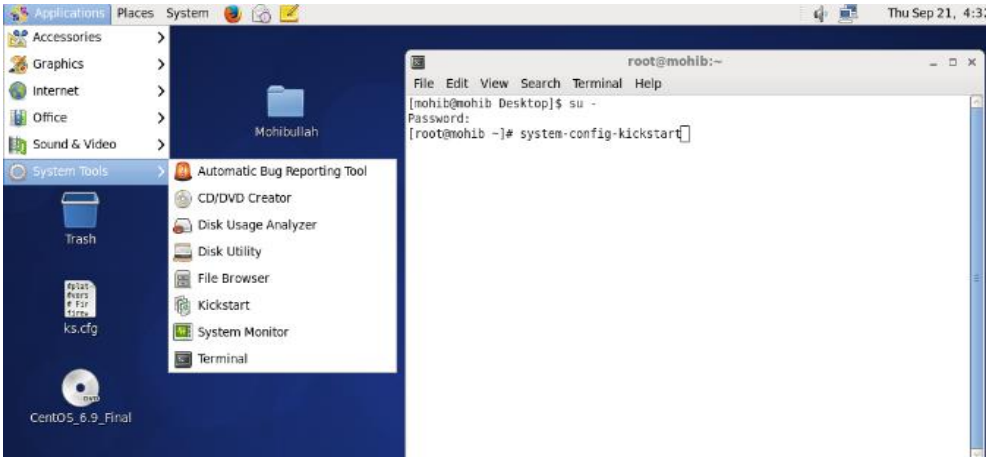

Figure.2: open GUI kickstart program [14]

- Default Language
- Keyboard
- Time Zone
- Root Password and Confirm Password
- Target Architecture
- Reboot system After Installation

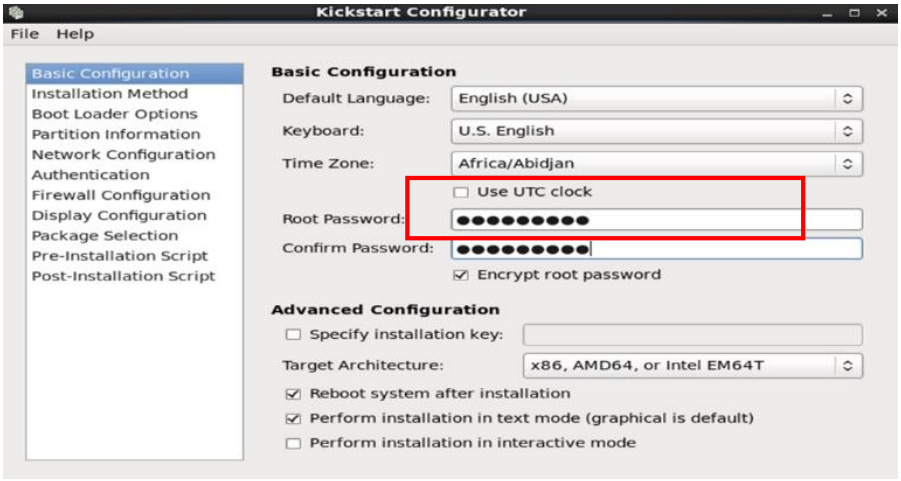

Figure.3. Basic configuration [14]

c. Installation Method

Select the Installation way and moreover perform a new installation or promotion an existing installation. Kickstart supports these methods now select your method and install accordingly, [14].

1: CD-ROM
2: NFS
3: FTP
4: HTTP
5: Hard Drive

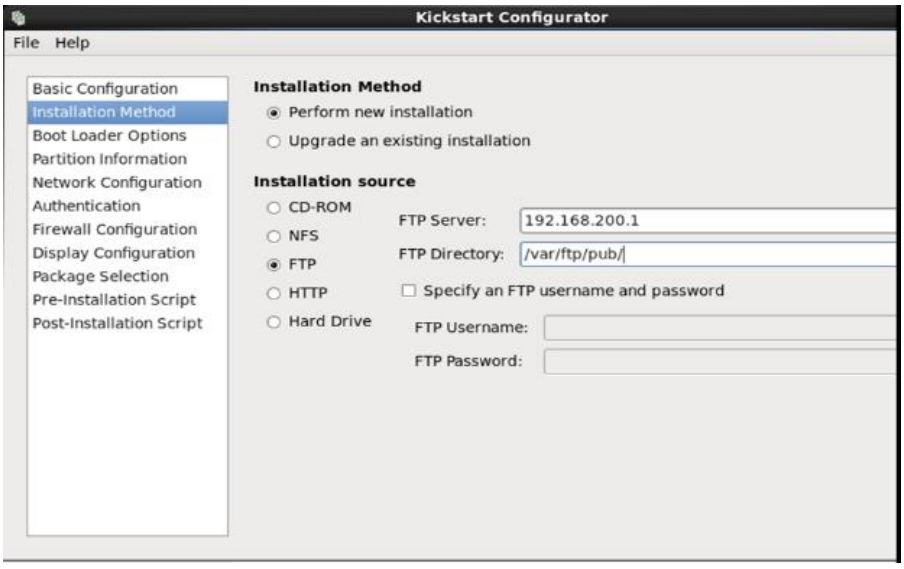

Figure.4: installation method [14]

d. Boot Loader Options

If you want to install the new boot loader, then select to install a new boot loader, or else select do not install the boot loader. If you're interested in setting up the GRUB password you can also do that by selecting the GRUB password option and providing the password,

[14]. Using the Partition Information tab state the partition details which are the partitions that you like to create, [14].

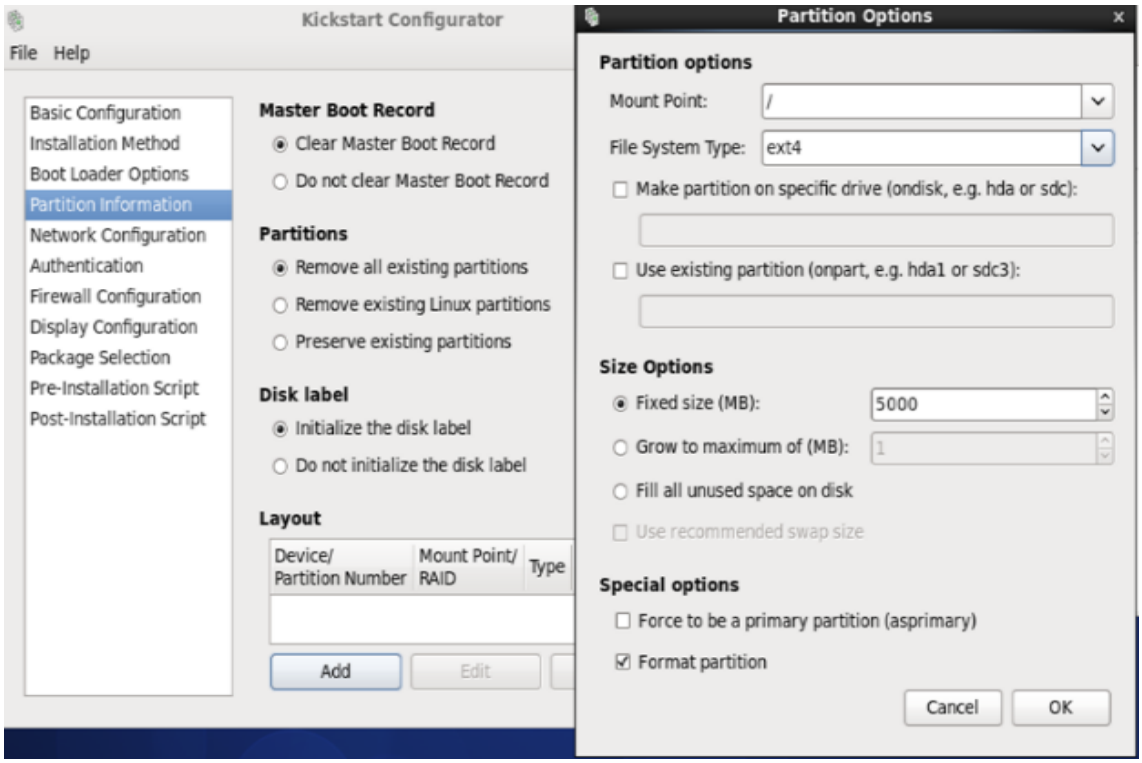

Figure.5: partition information [14]

e. Network Configuration

Working with configuration tab will help you to configure NIC, IP Address, and Network equeipments, [14].

f. Authentication / Firewall Configuration

Authentication Configuration is the option where you can select the choice to join to NIS, LDAP, Kerberos, and local encrypted authentication, [14].

The judgement to Enable / Disable firewall and its security level, [14].

g. Package Selection

A package option is an option in which we can select each package that we need or we want to install in our system, [14].

h. Pre&Post Installation Script

This is an option in which you can write a Script as you want and it will run before starting the installation, [14].

This is an option in which you can write a Script as you want and it will run after installation. And also, Post-installation scripts help in automating all the tasks, [14].

i. Saving the Right Path

And lastly save the file (ks.cfg) according to the protocol you configured or installed, [14].

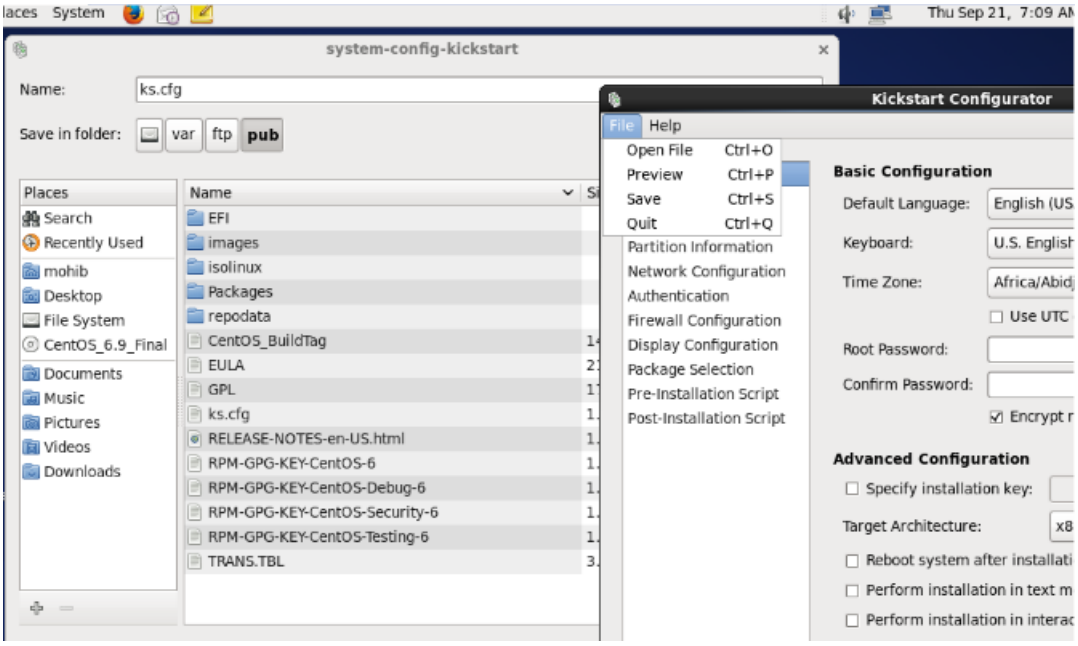

figure.6*: saving generated Kickstart file* [14]

These are paths you can save your Kickstart configuration file, [14].

- Web server Path: /var/www/html/
- FTP server Path: /var/ftp/pub/
- NFS Server Path: /nfsserver/

- **Technical Implementation**

Steps for preparing kickstart / PXE Boot Server

First choose the protocol which you're going to use for this Kickstart method Installation, above mentioned protocols will be supported HTTP, HTTPS, NFS, AND FTP.

For the NFS server location, you can make any directory under / (slash) and copy the media

If HTTP / HTTPS use default path as /var/www/html

FTP protocol use /var/ftp/pub/as default path

Mount ISO file or CD/DVD media into /mnt

Then copy the mounted files from /mnt to the protocol you would like.

Web server Path: cp -rfv /mnt/* /var/www/html/

FTP server Path: cp -rfv /mnt/* /var/ftp/pub/

NFS Server Path: cp -rfv /mnt/* /nfsserver/

a. Install the System and Services

Install one of the Linux distributions, [15]. We installed CenOS 6.9. And then install these protocols and services: DHCP, rinted, TFTP-server, syslinux, vsftpd.

Configure the static IP address on your server system, [15].

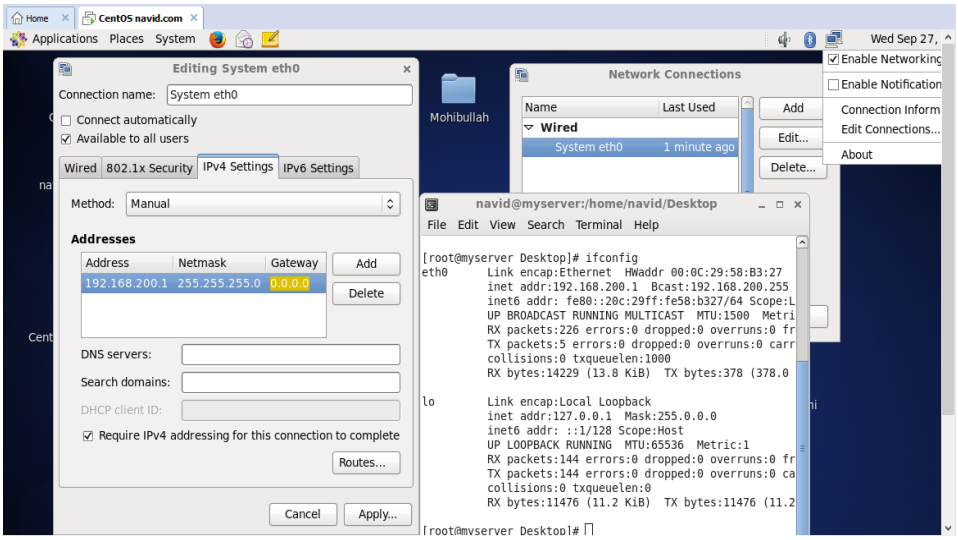

***Figure.7**: Adding*

b. Completed the Kichstart

Now our kickstart server is prepared to set up OS on remote Computers create a client machine to install its OS from the PXE boot server, [15]. No need for CD/DVD or Image.ISO file.

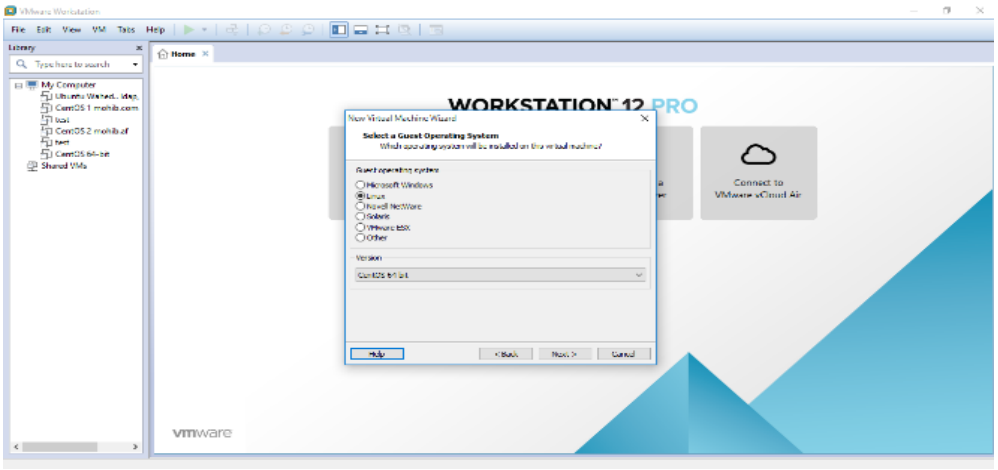

***Figure.8**:1 Creating a new virtual machine and choosing CentOS*

c. Installation Procedure

The Client Machine search for IP and then gets an IP address from the DHCP server and then contacts the boot (TFTP) server after that it starts installing the OS on the client and completes the installation as shown below figure.

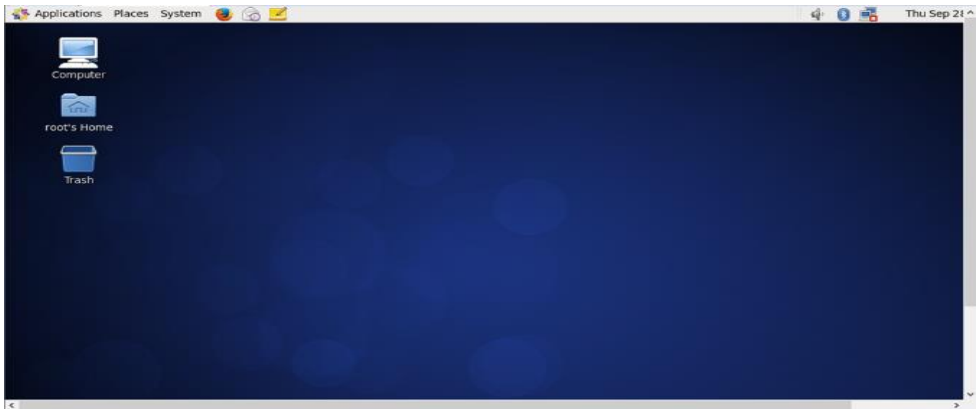

***Figure.9**: Installation is Completed*

4 CONCLUSION

Technologies are promoting and developing through new inventions and ideas even every Moment throughout the world and it is clear that the rapid growth of IT industries worldwide is slowly making pollution the environment. This dangerous threat requires immediate attention. Societies need to become more energy conscious to better manage IT resources. Ad networks rise out of these findings as a natural option for marketers, companies, and governmental offices whose mandate is to convert automotive services to clients so they always need cost-effective networks to gain the minimalist profit. And one of the automotive services for a client is Kickstart to deploy OS over the network which is very cost-effective in case of time and resources. Centralization of a network is one of the most important steps in creating a network in companies, organizations, and even government offices that can bring the ease of managing the entire clients or troubleshooting them, with centralization you can bring security that has been always challenged for IT industries. Kickstart installations can be performed using a local DVD, a local hard drive, or via NFS, FTP, HTTP, or HTTPS. First of all, we have to create a kickstart file. Then, we should create a boot media with the kickstart file or make the kickstart file available on the network. Moreover, we have to make the installation tree available. Finally, we can start the kickstart installation and create a new virtual machine or turn on the clients to be installed. Those with OS deployment over the network don't need to have CD/DVD ROM, by having a centralized network you can easily install one Software to your entire networked devices or your clients as well. So in Afghanistan, the two first factors are very important which are using open source software that is a useful way and setting up a network with minimal expense. Then I come across with Kickstart server which is free and open source. Further Work Probing deeper, the results in this research also provide a strong foundation for future work. In terms of cloning and restoring OS that one further work is combining the knowledge gained about online imaging/cloning and restoring OS. That is not implemented in this research and working with other tools like (WDS, LTSTP, Clonzilla).

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