

IT Solutions

Setting Up a Network



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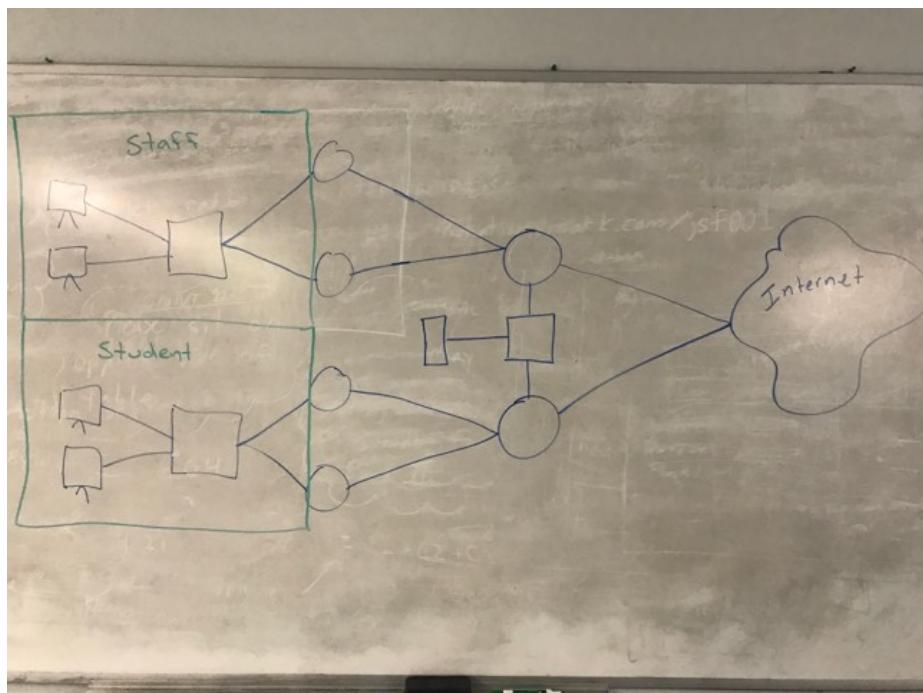
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1 Introduction

Our company was approached by SIIT to come up with a network solution that would efficiently suit their business requirements. They require implementation of multiple VLANs on the network to provide redundant reliable service to all their employees and clients. The network we will be implementing should consist of the following equipment: 6 routers, 4 switches, one primary domain controller, one backup domain controller, several windows client machines spread across the two subnets, at least three windows client machines set up in their own VLAN (for audio and video streaming), a Linux server running Clonezilla software, and two printers set up in the printer pool.

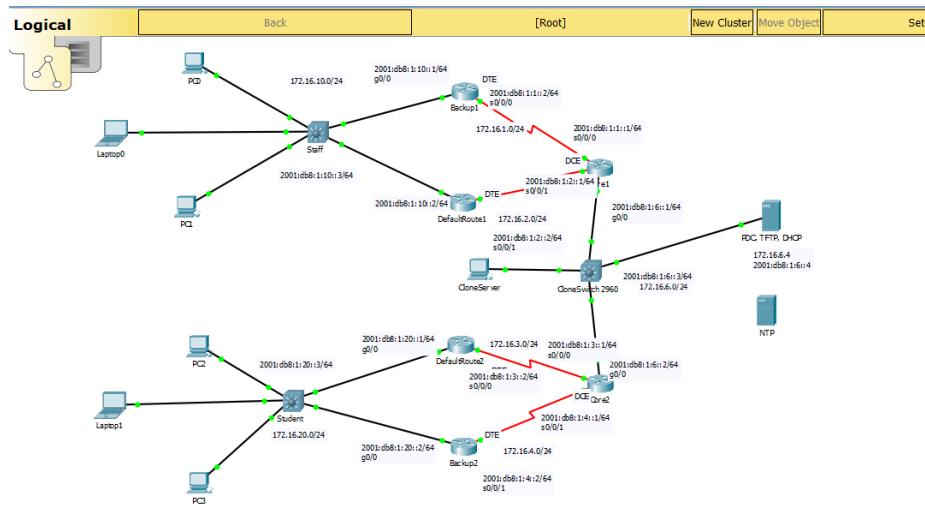
The purpose of multiple subnets is to make the network run a lot smoother, as well as split up the two VLANs: staff and student. The purpose of setting up the VLANs is so that remote end devices can still access all of the network resources they are required to access.

2 Network Sketch



The network sketch will give you a rough idea of how you want the network to work and function. The sketch will show you how the topology would look before implementing it in a virtual environment. During the process, you should consider how much equipment will be needed and how much equipment you have access to.

3 Network Map



The network map is the implementation of the network sketch in a virtual environment such as Cisco Packet Tracer. In this environment you are able to assign IP addresses, routing protocols (OSPF, RIP, EIGRP, ISIS) and connect devices. This program also allows you to see the flow of packets throughout the network.

4 IP Addressing Scheme

DEVICE	INTERFACE	IPv4	SUBNET MASK	IPv6	DEFAULT GATEWAY
Core1	G0/0	172.16.6.1	255.255.255.0	2001:db8:1:6::1/64	N/A
	S0/0/0	172.16.1.1	255.255.255.0	2001:db8:1:1::1/64	N/A
	S0/0/1	172.16.2.1	255.255.255.0	2001:db8:1:2::1/64	N/A
Core2	G0/0	172.16.6.2	255.255.255.0	2001:db8:1:6::2/64	N/A
	S0/0/0	172.16.3.2	255.255.255.0	2001:db8:1:3::1/64	N/A
	S0/0/1	172.16.4.1	255.255.255.0	2001:db8:1:4::1/64	N/A
Default1	G0/0	172.16.10.1	255.255.255.0	2001:db8:1:10::1/64	N/A
	S0/0/0	172.16.1.2	255.255.255.0	2001:db8:1:1::2/64	N/A
Backup1	G0/0	172.16.10.2	255.255.255.0	2001:db8:1:10::2/64	N/A
	S0/0/0	172.16.2.2	255.255.255.0	2001:db8:1:2::1/64	N/A
	G0/0	172.16.20.1	255.255.255.0	2001:db8:1:20::1/64	N/A
Default2	S0/0/0	172.16.3.2	255.255.255.0	2001:db8:1:3::2/64	N/A
	G0/0	172.16.20.2	255.255.255.0	2001:db8:1:20::2/64	N/A
Backup2	S0/0/0	172.16.4.2	255.255.255.0	2001:db8:1:4::2/64	N/A
	VLAN 5	172.16.6.3	255.255.255.0	2001:db8:1:6::3/64	N/A
Clone Switch	VLAN 25	NULL	NULL	NULL	NULL
Staff Switch	VLAN 10	172.16.10.3	255.255.255.0	2001:db8:1:10::3/64	N/A
Student Switch	VLAN 20	NULL	NULL	NULL	NULL
PDC/DNS /DHCP/T FTP	Fa0/0	172.16.6.4	255.255.255.0	2001:db8:1:6::4/64	172.16.6.3
Active Directory Server	NULL	NULL	NULL	NULL	NULL
Clone Server	Fa0/0	172.16.6.5	255.255.255.0	2001:db8:1:6::5/64	N/A
PC0					
PC1					
LAPTOPO					
PC2					
PC3					
LAPTOP1					

The IP addressing scheme is used to keep track of the addresses in your network. Without IP addresses devices would not have connectivity. There are two types of IP addresses: IPv4 (eg. 192.168.1.0/24) and IPv6 (eg. 2001:db8:acad::1/64).

5 Preparing The Equipment



Before working on your equipment be sure to erase the startup configuration (erase startup-config) followed by the reload command (reload). This is done to restore the devices to default factory settings.

6 Initializing the Devices

```
Staff#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Staff(config)#line console 0
Staff(config-line)#password cisco
Staff(config-line)#login
Staff(config-line)#line vty 0 15
Staff(config-line)#password cisco
Staff(config-line)#login
Staff(config-line)#exit
```

6.1 Hostnames

Before you begin setting up and configuring a router or switch you want to set the hostnames. You set these hostnames so you can identify which device your connected to.

```
Router(config)#hostname Core1
Core1(config)#[
```

6.2 Password Encryption

When you first begin setting up a router or switch you want to make sure that the switch is password protected. By doing this you will not allow anyone access without a password. Using the "service password-encryption" command will take that password and encrypt it so that it will not be shown in plain text.

```
Staff(config)#service password-encryption
Staff(config)#[
```

6.3 Telnet

Telnet is a simple, text-based network protocol that is used for accessing remote networks over TCP/IP networks. Telnet was created in 1969 and has been replaced by SSH because Telnet poses security issues.

```
|CloneSwitch(config)#line vty 0 15  
|CloneSwitch(config-line)#password cisco  
|CloneSwitch(config-line)#login  
|CloneSwitch(config-line)#[
```

6.4 Message Of The Day

The banner Message of The Day(MOTD) is a message that is presented to someone who is access the router or the switch. Most network administrators use it to display legal notices regarding access to the device.

```
|Core1(config)#banner motd #Unauthorized Access Is Prohibited#  
|Core1(config)#[
```

6.5 Default Route

The default route is a setting on a device that defines the packet forwarding rule to use when no specific route can be determined for a given Internet Protocol(IP) destination address.

```
|Core1(config)#ip route 172.16.3.0 255.255.255.0 g0/0  
|Core1(config)#[
```

7 Configure Device Ports

An Internet Protocol (IP) address is a unique identifier that is assigned to specific ports to allow communication between devices on a network. An IP address provides an identity to a networked device. There are 2 types of IP addresses IPv4 and IPv6, IPv6 is the successor to IPv4 and is less likely to run out of IP addresses. In order to use IPv6 addresses you have to enable unicast routing.

```
Core1(config-if)#int s0/0/1
Core1(config-if)#ip ad
Core1(config-if)#ip address 172.16.2.1 255.255.255.0
Core1(config-if)#ipv6 ad
Core1(config-if)#ipv6 address 2001:db8:1:2::1/64
Core1(config-if)#no shut
```

```
Core1(config)#ipv6 unicast-routing
Core1(config)#
```

7.1 Labelling Ports

When a network administrator configures a description on a port it gives that interface a label of what the interface's purpose is and what it is connected to.

```
Core1(config)#int g0/0
Core1(config-if)#description ?
    LINE Description that will be truncated to 200 characters.

Core1(config-if)#description Link to Core2 Router
Core1(config-if)#
```

7.2 Clock Rate

The clock rate is important for routers because it defines which side of the WAN link is the DCE and what side is DTE. The clock rate sets the speed at which data is transferred over the network. If your clock rate is low then your bandwidth will be low.

```
Core1(config)#int s0/0/0
Core1(config-if)#clock rate 2000000
Core1(config-if)#[
```

7.3 Interfaces

To activate an interface you can specify which interface or ranges of interfaces that you want to activate. If an interface is not activated then it will not be able to transfer data through it until the **no shutdown** command has been issued.

```
Core1(config)#int g0/0
Core1(config-if)#no shutdown
Core1(config-if)#int s0/0/0
Core1(config-if)#no shutdown
Core1(config-if)#int s0/0/1
Core1(config-if)#no shutdown
Core1(config-if)#[
```

8 Test and Troubleshoot Network Connectivity

Troubleshooting commands:

- 1: show running-config (Displays the entire routers configuration)
- 2: show ip interface brief (Displays information about the interface)
- 3: show ip(v6) route (Displays all available routes on your router)
- 4: show interfaces (Displays all interfaces with detailed information(interface speed,bandwidth, clock rate etc.)
- 5: copy running-config startup-config (copies the current running configuration to the startup configuration)
- 6: ping 'ip-address' (Will verify connectivity between devices)
- 7: traceroute (Traces the routes packets take within the network to its destination)
- 8: show ip(v6) ospf (Shows the number of interfaces in each area and the areas)
- 9: show ip(v6) protocols (Shows which routing protocol, router-id, and attached networks)

9 Setting up DHCP

Dynamic Host Configuration Protocol(DHCP) is a network management protocol used on TCP/IP networks where a DHCP server dynamically assigns an IP address and other network configuration parameters to each device on a network so they can communicate with other IP networks.

9.1 Installing DHCP

To install DHCP run the following command.

```
student@dhcp:~$ su  
Password:  
root@dhcp:/home/student# apt-get install isc-dhcp-server
```

9.2 Configuring DHCP

```
root@dhcp:/home/student# cd /etc/dhcp/  
root@dhcp:/etc/dhcp# ls  
debug          dhclient-enter-hooks.d  dhcpd6.conf  dhcpd.conf.backup  
dhclient.conf  dhclient-exit-hooks.d  dhcpd.conf  
root@dhcp:/etc/dhcp#
```

Change the directory to /etc/dhcp

Using a text editor such as vi, vim, or nano you will need to edit the file: dhcpcd.conf. Here you want to set up the subnets so that the hosts connected to those specific networks get an ip address in those ranges. For each zones in your network you'll need to specify the range of IP addresses, the subnet mask, default gateway and DNS servers.

```
File Edit View Search Terminal Help
GNU nano 2.7.4                               File: dhcpcd.conf

ddns-update-style none;
default-lease-time 600;
max-lease-time 7200;
#ping true;
option domain-name-servers 172.16.6.6, 172.16.6.6;
option domain-name "clone";
authoritative;
log-facility local7;
;

subnet 172.16.6.0 netmask 255.255.255.0 {
range 172.16.6.15 172.16.6.250;
option subnet-mask 255.255.255.0;
option domain-name-servers 172.16.6.6, 172.16.6.6;
option domain-name "clone";
option routers 172.16.6.1;
get-lease-hostnames true;
use-host-decl-names true;
default-lease-time 600;
max-lease-time 7200;
}

subnet 172.16.10.0 netmask 255.255.255.0 {
range 172.16.10.5 172.16.10.250;
option subnet-mask 255.255.255.0;
option domain-name-servers 172.16.6.6, 172.16.6.6;
option domain-name "staff";
option routers 172.16.10.1;
get-lease-hostnames true;
use-host-decl-names true;
```

```
File Edit View Search Terminal Help
GNU nano 2.7.4                               File: dhcpcd.conf

option routers 172.16.6.1;
get-lease-hostnames true;
use-host-decl-names true;
default-lease-time 600;
max-lease-time 7200;
}

subnet 172.16.10.0 netmask 255.255.255.0 {
range 172.16.10.5 172.16.10.250;
option subnet-mask 255.255.255.0;
option domain-name-servers 172.16.6.6, 172.16.6.6;
option domain-name "staff";
option routers 172.16.10.1;
get-lease-hostnames true;
use-host-decl-names true;
default-lease-time 600;
max-lease-time 7200;
}

subnet 172.16.20.0 netmask 255.255.255.0 {
range 172.16.20.5 172.16.20.250;
option subnet-mask 255.255.255.0;
option domain-name-servers 172.16.6.6, 172.16.6.6;
option domain-name "student";
option routers 172.16.20.1;
get-lease-hostnames true;
use-host-decl-names true;
default-lease-time 600;
max-lease-time 7200;
}
```

Running the following command restarts the DHCP server with the new settings in the configuration file.

```
root@dhcp:/etc/dhcp# systemctl restart isc-dhcp-server  
root@dhcp:/etc/dhcp#
```

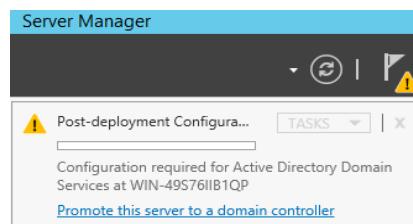
10 Setting up the PDC and DNS

The Primary Domain Controller (PDC) is the main service which controls all aspects of the domain including users, groups, and different services that the network may need. The Domain Name System (DNS) is a central part of the Internet, it provides a way to match the name of a website to its IP address.

10.1 Primary Domain Controller

First step you need to do is install **Windows Server 2012** or equivalent. Then follow these steps:

1. Click **Add Roles and Features** in the Server Manager.
2. Check the Active Directory Domain Services box.
3. Check the DNS Server box.
4. Click on Add Features for both of the services.
5. Click Next until you reach the confirmation window.
6. Click install to begin your installation if all prerequisites have been met.
7. Restart your server after installation is complete.



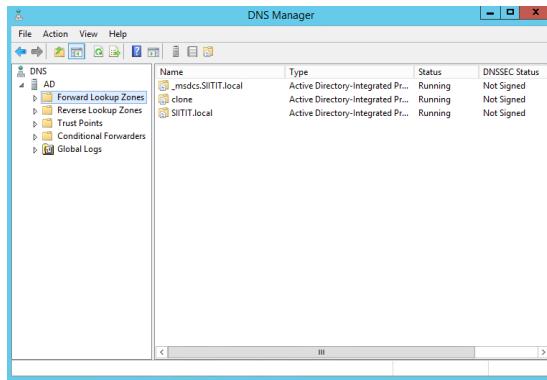
8. After your restart is complete you will see the above picture. Click on **Promote this server to Domain Controller**
9. The Deployment Configuration window will pop up.
10. Click the **Add a new forest**. Inside the root domain name text box, enter the domain name you wish to use followed by a period and the top level domain.(eg. .com, .ca, .local etc.)

11. In the Domain Controller Options window leave all values at the default except the password field.
12. Click next until you reach **Prerequisites Check**.
13. Verify all prerequisites have been met and click Install.

10.2 Domain Name System

To set up DNS follow these steps:

1. In Server Manager Click **Tools** and then click **DNS**.
2. In the DNS Manager

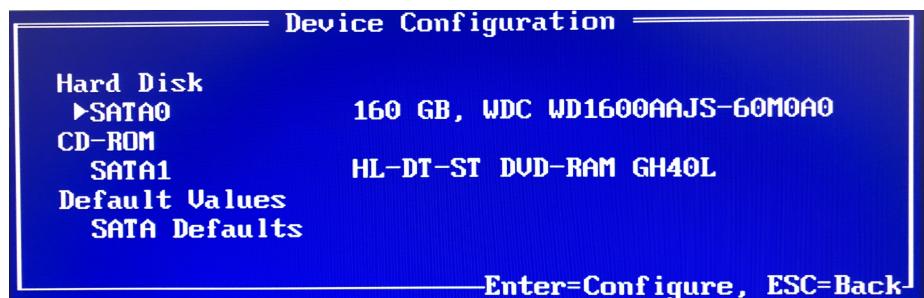
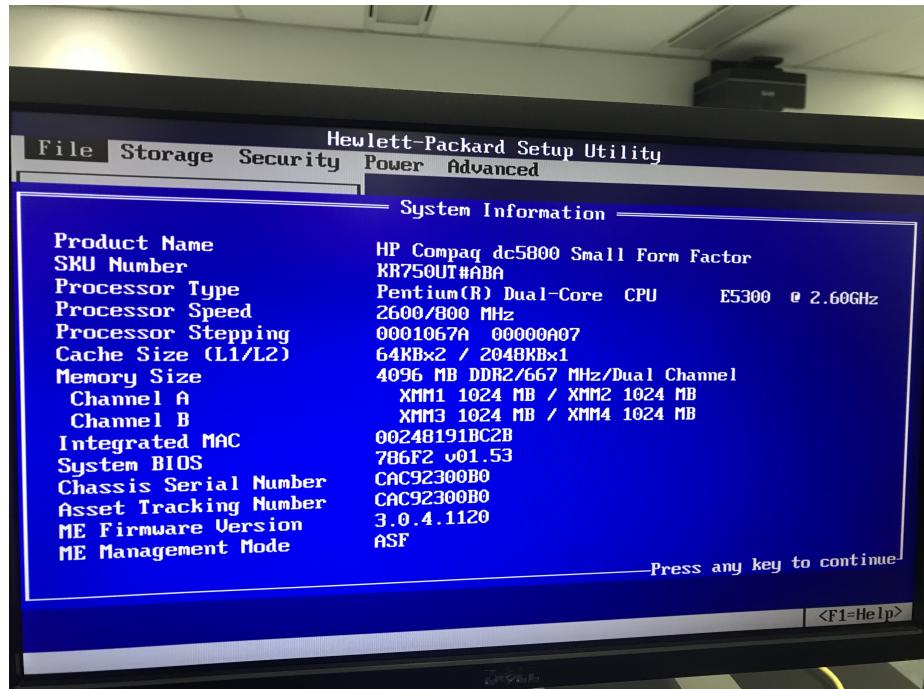


3. Here you can set up multiple domain zones. However if this is your initial domain controller setup you will see one domain available. You will see the domain you have previously created during the Active Directory setup.
4. When you click a zone you will be able to see all the hosts in that particular zone.
5. To add a host make sure you are inside the domain folder and right click the blank area. Click the **New A or AAAA host**
6. Make sure you have the **Create associated pointer** checked off to create the reverse lookup for that particular host.

11 End Device Specifications

Recording the specifications of host machines gives an idea of compatibility for the companies software and resources it requires.

Shown below is one of the machines we have documented.



12 Creating the Clone Server

The clone server is used to copy an existing machine and push it out to other machines. The purpose of cloning is to make it easier to produce copies of existing infrastructure.

12.1 Installing Disk-less Remote Boot For Linux

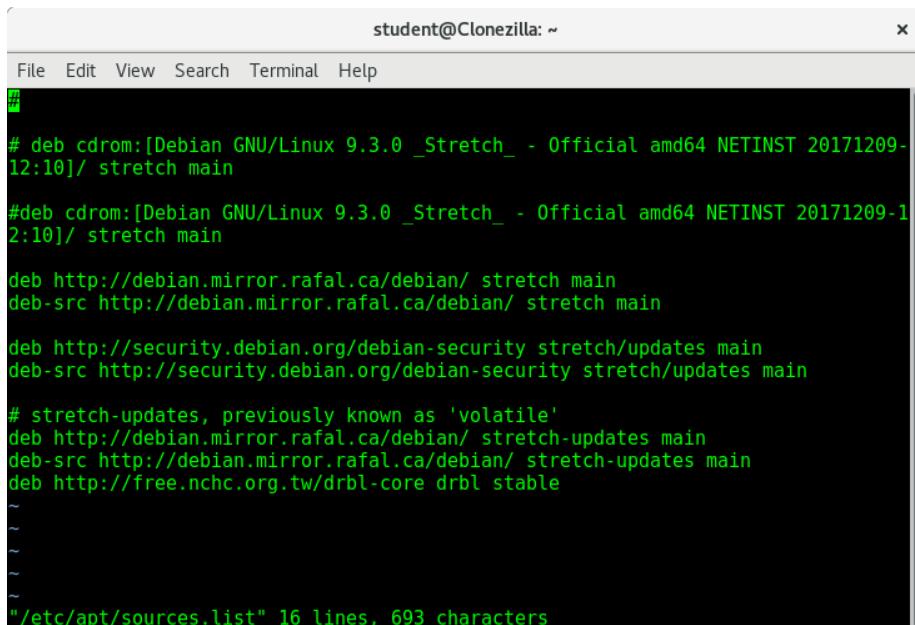
Make a directory called images with the command **sudo mkdir /images** or another meaningful name to store your clone images. Next you want to give the directory root permissions using the **chown root:root /images** and **chmod 770 /images** to set permissions of read/write/execute to the user, group but not anyone else.

To add the key so that the clone server can obtain all of the required packages use:

```
wget -q http://drbl.org/GPG-KEY-DRBL -O- | sudo apt-key-add -  
Go into superuser mode with su and use vi to get into the /etc/apt/sources.list  
file.
```

You will need to add **deb http://free.nchc.org.tw/drbl-core drbl stable** to the end of the text file

Note: You need to add the key and this line in order to download the full DRBL software when you run the **sudo apt-get update** command

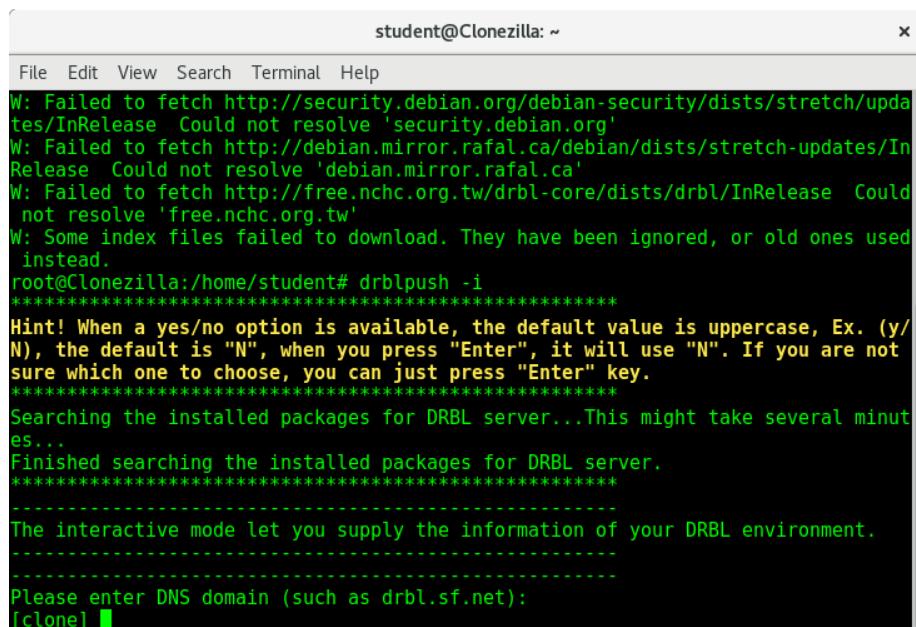


A screenshot of a terminal window titled "student@Clonezilla: ~". The window shows the contents of the "/etc/apt/sources.list" file. The text is as follows:

```
# deb cdrom:[Debian GNU/Linux 9.3.0 _Stretch_ - Official amd64 NETINST 20171209-12:10]/ stretch main  
  
#deb cdrom:[Debian GNU/Linux 9.3.0 _Stretch_ - Official amd64 NETINST 20171209-12:10]/ stretch main  
  
deb http://debian.mirror.rafael.ca/debian/ stretch main  
deb-src http://debian.mirror.rafael.ca/debian/ stretch main  
  
deb http://security.debian.org/debian-security stretch/updates main  
deb-src http://security.debian.org/debian-security stretch/updates main  
  
# stretch-updates, previously known as 'volatile'  
deb http://debian.mirror.rafael.ca/debian/ stretch-updates main  
deb-src http://debian.mirror.rafael.ca/debian/ stretch-updates main  
deb http://free.nchc.org.tw/drbl-core drbl stable  
~  
~  
~  
~  
~/etc/apt/sources.list" 16 lines, 693 characters
```

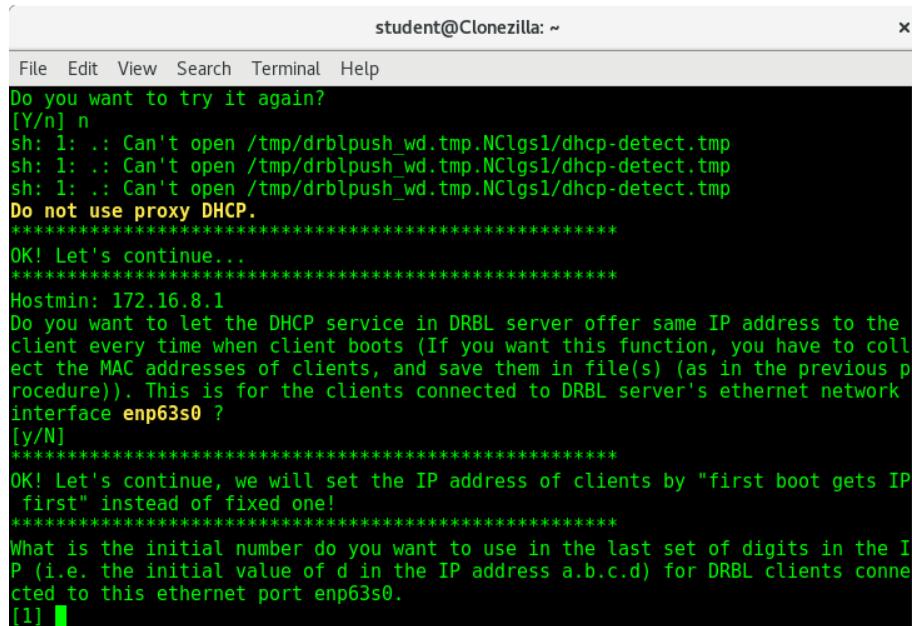
12.2 Configuring DRBL

Update your system with **apt-get update**. To install the clone server type **apt-get install drbl** after it is installed type in the command **apt-get install nmap** this ensures that DHCP can be run on the server. Once this is installed type in **drblpush -i**, the -i means it will run the program in interactive mode. Any entry in this setup process in between [] is a default value. Pressing enter will use the value between these brackets, or enter your own to customize it to your network.



```
student@Clonezilla: ~
File Edit View Search Terminal Help
W: Failed to fetch http://security.debian.org/debian-security/dists/stretch/updates/InRelease Could not resolve 'security.debian.org'
W: Failed to fetch http://debian.mirror.rafal.ca/debian/dists/stretch-updates/InRelease Could not resolve 'debian.mirror.rafal.ca'
W: Failed to fetch http://free.nchc.org.tw/drbl-core/dists/drbl/InRelease Could not resolve 'free.nchc.org.tw'
W: Some index files failed to download. They have been ignored, or old ones used instead.
root@Clonezilla:/home/student# drblpush -i
*****
Hint! When a yes/no option is available, the default value is uppercase, Ex. (y/N), the default is "N", when you press "Enter", it will use "N". If you are not sure which one to choose, you can just press "Enter" key.
*****
Searching the installed packages for DRBL server...This might take several minutes...
Finished searching the installed packages for DRBL server.
*****
The interactive mode let you supply the information of your DRBL environment.
-----
Please enter DNS domain (such as drbl.sf.net):
[clone] 
```

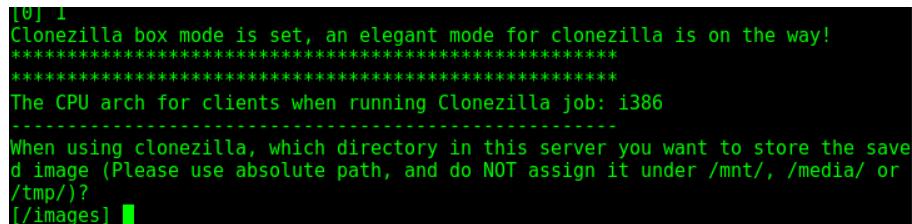
When you are on the step to set an initial value for the DRBL clients, pick a number that wont overlap with your existing static devices. For example if your network has host with an IP address of 172.16.6.8 it is best to set the initial client number to 15 in order to make sure no overlap exists.



```
student@Clonezilla: ~
File Edit View Search Terminal Help
Do you want to try it again?
[Y/n] n
sh: 1: .. Can't open /tmp/drblpush_wd.tmp.NClgs1/dhcp-detect.tmp
sh: 1: .. Can't open /tmp/drblpush_wd.tmp.NClgs1/dhcp-detect.tmp
sh: 1: .. Can't open /tmp/drblpush_wd.tmp.NClgs1/dhcp-detect.tmp
Do not use proxy DHCP.
*****
OK! Let's continue...
*****
Hostmin: 172.16.8.1
Do you want to let the DHCP service in DRBL server offer same IP address to the
client every time when client boots (If you want this function, you have to coll
ect the MAC addresses of clients, and save them in file(s) (as in the previous p
rocedure)). This is for the clients connected to DRBL server's ethernet network
interface enp63s0 ?
[y/N]
*****
OK! Let's continue, we will set the IP address of clients by "first boot gets IP
first" instead of fixed one!
*****
What is the initial number do you want to use in the last set of digits in the I
P (i.e. the initial value of d in the IP address a.b.c.d) for DRBL clients conne
cted to this ethernet port enp63s0.
[1] ■
```

The next step will prompt you on the maximum amount of potential clients that will be assigned IP addresses.

When you are asked which directory to store the cloned images on, use the folder created at **12.1**.

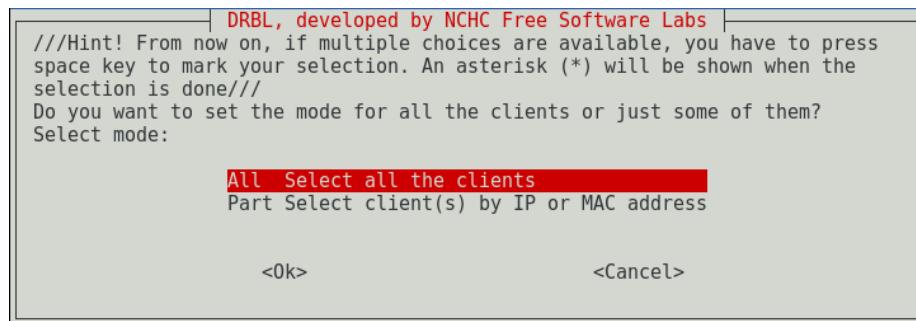


```
[0] i
Clonezilla box mode is set, an elegant mode for clonezilla is on the way!
*****
The CPU arch for clients when running Clonezilla job: i386
-----
When using clonezilla, which directory in this server you want to store the save
d image (Please use absolute path, and do NOT assign it under /mnt/, /media/ or
/tmp/)?
[/images] ■
```

For a basic network setup you can leave the following settings as default, or else enter specific requirements tailored to your network.

The next step you'll need to connect the server to the Internet then run **drblsrv -i**. Once it begins it will ask for values, leave them as their default values and select the kernel from this server. Once this is done you are ready for the next step. After running the drblsrv we are ready to start the clone server. To start the clone server type in **dcs**. You should see the screen shown below.

Choose: **All Select all the clients**



Follow these steps for basic setup:

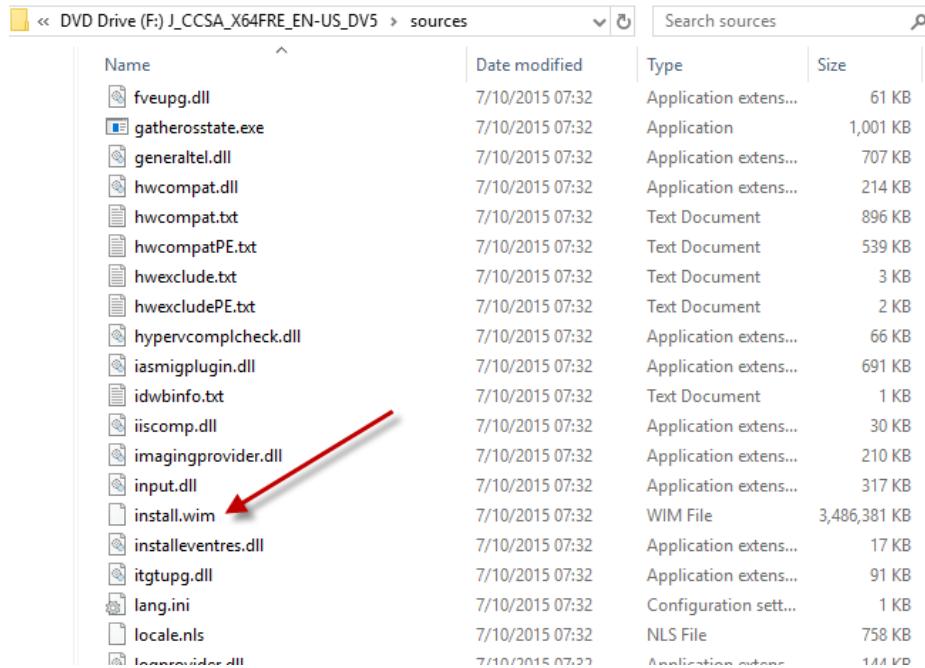
1. Clonezilla-start
2. Beginner mode
3. Save-disk
4. Now in server
5. Now choose a image name
6. sda
7. Skip checking (optional)
8. -scs
9. -p choose
10. 1000000

Once you have completed the previous steps start your client machine with Network Boot (F12 in most cases).

13 Preparing a system for Sysprep

Before you can begin preparing sysprep you need to install Windows ADK.
[Download Here](#)

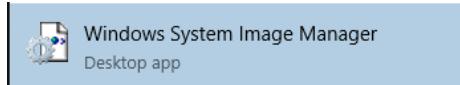
Mount a Windows 10 installation disc and copy the install.wim file in the sources folder to your desktop.



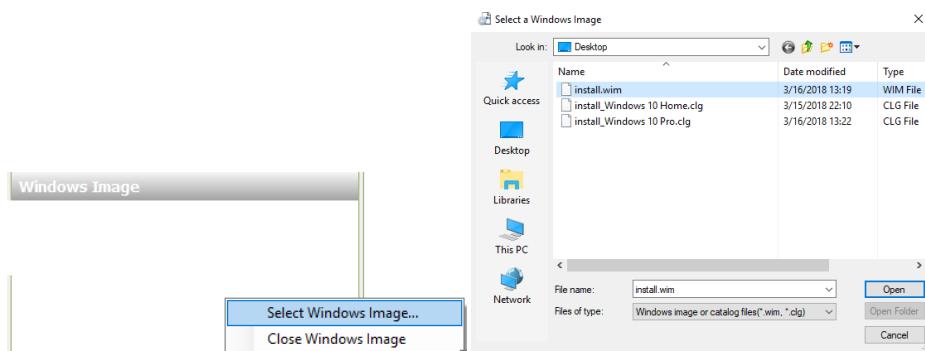
Name	Date modified	Type	Size
fveupg.dll	7/10/2015 07:32	Application extens...	61 KB
gatherosstate.exe	7/10/2015 07:32	Application	1,001 KB
generaltel.dll	7/10/2015 07:32	Application extens...	707 KB
hwcompat.dll	7/10/2015 07:32	Application extens...	214 KB
hwcompat.txt	7/10/2015 07:32	Text Document	896 KB
hwcompatPE.txt	7/10/2015 07:32	Text Document	539 KB
hwexclude.txt	7/10/2015 07:32	Text Document	3 KB
hwexcludePE.txt	7/10/2015 07:32	Text Document	2 KB
hypervcomplcheck.dll	7/10/2015 07:32	Application extens...	66 KB
iasmigplugin.dll	7/10/2015 07:32	Application extens...	691 KB
idwbinfo.txt	7/10/2015 07:32	Text Document	1 KB
iiscomp.dll	7/10/2015 07:32	Application extens...	30 KB
imagingprovider.dll	7/10/2015 07:32	Application extens...	210 KB
input.dll	7/10/2015 07:32	Application extens...	317 KB
install.wim	7/10/2015 07:32	WIM File	3,486,381 KB
installeventres.dll	7/10/2015 07:32	Application extens...	17 KB
itgtupg.dll	7/10/2015 07:32	Application extens...	91 KB
lang.ini	7/10/2015 07:32	Configuration sett...	1 KB
locale.nls	7/10/2015 07:32	NLS File	758 KB
languageprovider.dll	7/10/2015 07:29	Application extens...	144 KB

13.1 Configuring The Answer File

Once installed open 'Windows System Image Manager' Right click inside the

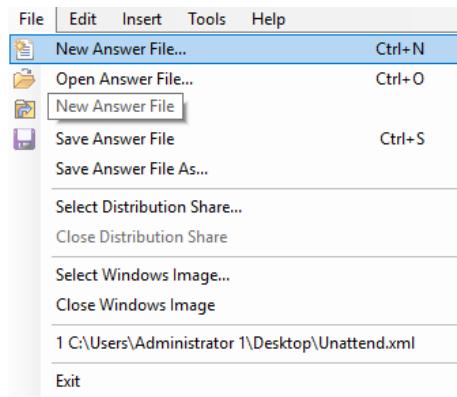


Windows Image tab and click **Select Windows Image**

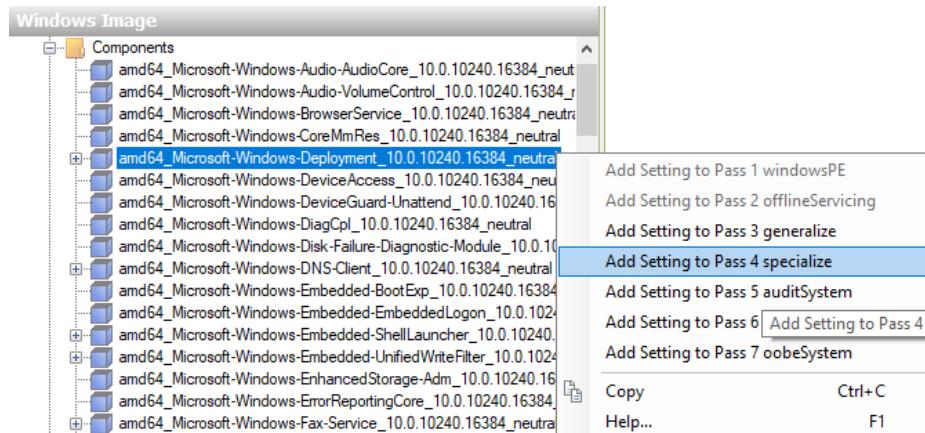


Select the **install.wim** file we copied earlier.

Next you will create a new answer file by clicking **New Answer File** in the file menu.

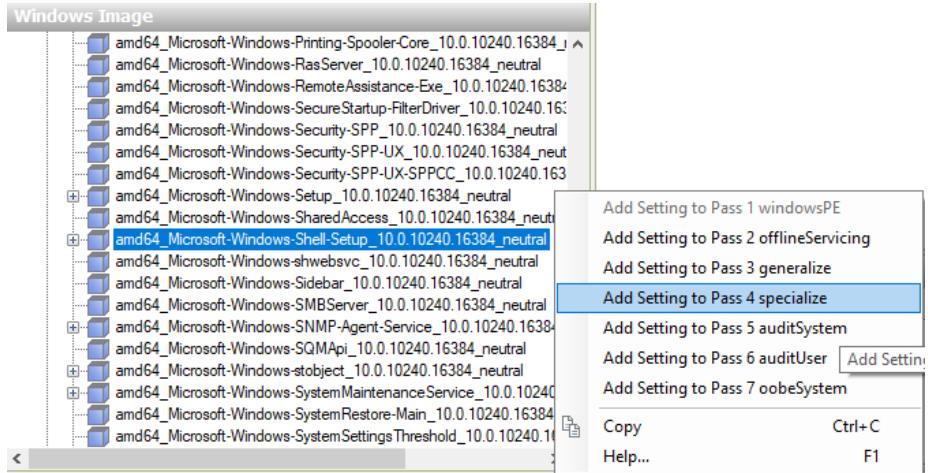


Under the **Components** tab right click **amd64_Microsoft-Windows-Deployment** and add the setting to pass 4 specialize.



Note: Setting the Extend setting to **true** will automatically extend the partition to use up the entire hard-drive of the system you are cloning to.

This screenshot shows the 'Answer File' editor. On the left, the 'Unattend' section is expanded, showing the 'Components' node and its sub-nodes: 1 windowsPE, 2 offlineServicing, 3 generalize, 4 specialize, 5 auditSystem, 6 auditUser, and 7 oobeSystem. The '4 specialize' node is currently selected. On the right, a 'ExtendOSPartition Properties' dialog is open. It has two sections: 'Properties' and 'Settings'. In the 'Properties' section, 'AppliedConfigurationPass' is set to '4 specialize', 'Component' is 'Microsoft-Windows-Deployment', and 'Path' is 'ExtendOSPartition'. In the 'Settings' section, 'Extend' is set to 'true'. Below the dialog, the 'UserAccounts' node under '7 oobeSystem' is expanded, showing 'LocalAccounts' and 'LocalAccount[Name="Admin"]'.

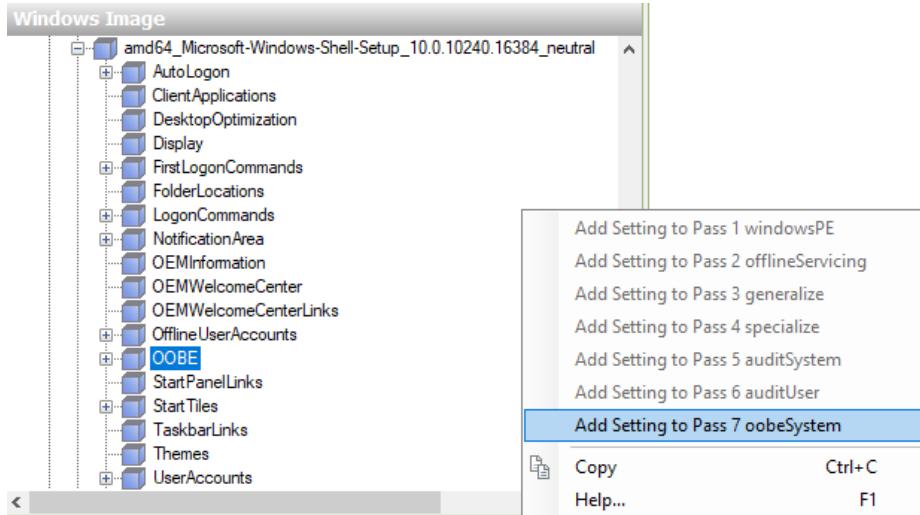


Note: Setting the **ComputerName** to * will automatically assign a unique identifier to each system when you run sysprep later on.

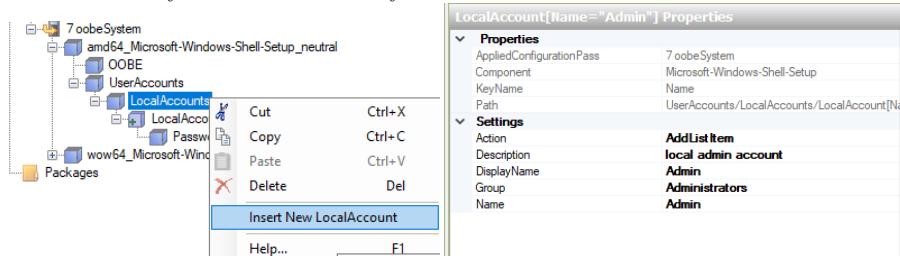
Properties	
AppliedConfigurationPass	4 specialize
Enabled	True
> Id	amd64_Microsoft-Windows-Shell-Setup_neutral

Settings	
BluetoothTaskbarIconEnabled	
ComputerName	.
ConvertibleStateModePromptPreference	
CopyProfile	
DisableAutoDaylightTimeSet	
DoNotCleanTaskBar	
EnableStartMenu	
OEMName	
ProductKey	
RegisteredOrganization	
RegisteredOwner	Student
ShowPowerButtonOnStartScreen	
ShowWindowsLive	
SignInMode	
TimeZone	Canada Central Standard Time

The **RegisteredOwner** will be a part of the computer name, we chose Student, however you can assign it with whichever identifier you want to use. To set the **TimeZone** run the command **tzutil /g** in a CLI on Windows



After adding in the OOBE into the Pass 7 oobesystem you will have to insert a new Local Account, doing so will allow you to set up a default Administrator account to the system automatically.



The screenshot shows the Windows Deployment Toolkit's Answer File Editor. On the left, the 'Answer File' tree view displays the Unattend.xml structure. It includes sections for Components (1 windowsPE, 2 offlineServicing, 3 generalize, 4 specialize, 5 auditSystem, 6 auditUser, 7 oobeSystem), Packages, and a specific component entry for 'wow64_Microsoft-Windows-International-Core_neutral'. On the right, the 'Microsoft-Windows-International-Core Properties' pane shows the configuration for this component. Under 'Properties', it lists 'AppliedConfigurationPass' (7 oobeSystem), 'Enabled' (True), and 'Id' (wow64_Microsoft-Windows-International-Core). Under 'Settings', it lists 'InputLocale' (en-US), 'SystemLocale' (en-US), 'UILanguage' (en-US), 'UILanguageFallback' (en-US), and 'UserLocale' (en-US).

After adding the **wow64_Microsoft-Windows-International-Core neutral** set all the Locale to **en-US** or your preferred language.

Once you have setup the answer file save it to a portable thumb drive and copy it to the **C:\Windows\System32\Sysprep** folder on the client machine you wish to clone

Next on the client machine run the CLI as an Administrator, doing so will put you into the **C:\Windows\System32** folder. The first command you will have to enter is **cd Sysprep** to enter into the Sysprep folder. Before this next step make sure you have everything setup on the computer you wish to copy over to all the other client machines. Once you are ready type in the command in the CLI:

```
sysprep.exe /generalize /oobe /unattend:Unattend.xml /shutdown
```

Once the computer has shutdown repeat the steps in [12.2](#) using a different image name in step 5 as to not overwrite your previous image.

14 Multicast Cloning

Multicast cloning gives you the ability to deploy an image from the server machine to all connected clients on the network. Using multicast cloning will cut down bandwidth usage on the network by sending out one packet that will replicate itself to clients on the specified list of MAC addresses.

Run the **dcs** command on the clone server and follow these steps:

1. Clonezilla-start
2. Beginner mode
3. Restore-disk
4. Skip checking (optional)
5. -p choose
6. Choose the image
7. Select the disks you want to clone
8. Multicast Multicast Restore
9. Clients+time-to-wait
10. Enter in how many clients you want to clone to

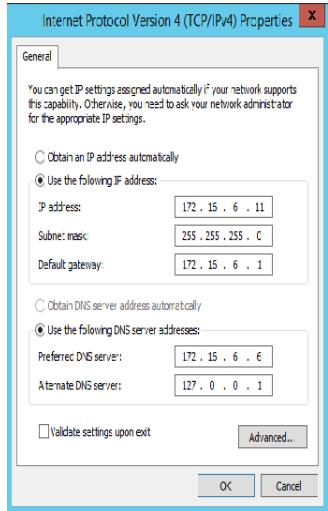
After you have completed these steps now Network boot all the clients you want to clone.

Note: To network boot press the F12 key, this could be different depending on the machine hardware.

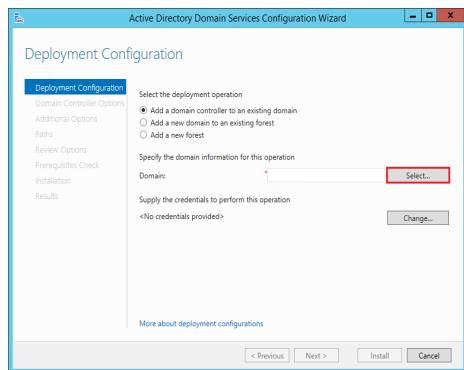
15 Backup Domain Controller

Once you have installed Windows Server 2012 on a backup machine, set a static IP address and DNS of the Primary Domain controller.

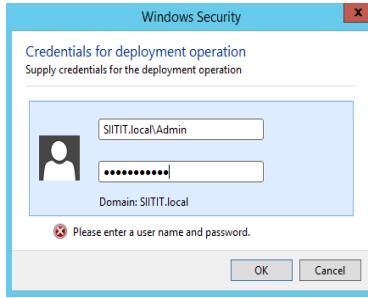
Note: 127.0.0.1 is the localhost IP address of the local computer, set that as the alternate DNS server. You do this so that if the primary DNS goes down the backup DNS can take over.



Following the steps in [10.1](#), install the **Active Directory Domain Services** and the **DNS Server**. Once the installation is finished click **Promote this server to a domain controller**.



You have to set it to **Add to existing domain**. Then you enter the domain that you set up in the PDC.



Enter the Administrators credentials from the PDC in order for you to add the machine to the domain.

1. In **Domain Controller Options** leave settings at their default except the **DSRM** password for recovery.
2. Click next on the **DNS Options** unless you want to change any options for DNS.
3. **Additional Options** make sure you replicate from the appropriate domain controller in your network.
4. Click next until you are at the **Prerequisites Check** page, once all prerequisites have been met click on install.

16 Setting up Syslog

Syslog receives logs from remotely connected devices in a network. With these logs you are able to troubleshoot and observe security information. These logs allow administrators to maintain the network properly by pinpointing flaws within the network.

16.1 Installing A Syslog Server

First you will have to install the Syslog server, we used Kiwi found at [This website](#). After downloading and installing Kiwi server **as a service**, on one of your machines run the command **logging host (IP address of the server machine)** eg. **logging host 172.16.6.10** onto each of your routers. **Note:** Kiwi Free version only allows up to 5 connected devices.

17 Network Time Protocol

Network Time protocol (NTP) is used to sync your internal network time to a single time server from the internet. The Canadian time servers are:

1. server 0.ca.pool.ntp.org
2. server 1.ca.pool.ntp.org
3. server 2.ca.pool.ntp.org
4. server 3.ca.pool.ntp.org

To setup the NTP connections enter in the following command on your backbone routers **ntp server (IP address/domain name)** eg. **ntp server 0.ca.pool.ntp.org**

18 Access Control Lists

Access control lists (ACLs) allow an administrator to control the flow of traffic within the network. With ACLs you can control the direction the traffic flows and restrict access by protocol, IP address, network. There are two types of ACLs; standard and extended. Standard ACLs are located near the destination while Extended ACLs are located near the source. ACLs are made up of one or more access control entries (ACEs). **All ACL have an explicit deny all applied to the end**

Standard ACL syntax:

1. ip access-list standard (1-99 or a NAME)
2. permit (IP address)
3. permit (network address)
4. int g0/0
5. ip access-group (1-100 or a NAME) (IN or OUT)

Extended ACL syntax:

1. ip access-list extended (100-199,2000-2699 or a NAME)
2. permit (protocol) (source) (destination) eq (port or name)
3. int g0/0
4. ip access-group (100-199, 2000-2699) (IN or OUT)

19 Virtual Local Area Network

VLAN is a Virtual LAN that lets administrator restrict access to different areas of a network. Using VLANs administrator are able to enforce security policies, reduce the broadcast domains and traffic. VLANs are based on logical connection instead of physical connections.

20 Conclusion

This manual is just one way to implement a network, there are many possible ways of going about setting up a network. This is the set up that worked for us based on our business requirements. Throughout working on the project as a team we built up many skills: time management, TeXstudio, team building, conflict resolution. The biggest challenge during this project was allocating the time to work on it outside of class, another challenge we faced was having enough resources to work with: routers, switches, end devices.