**Section 8: Networking, Services, and System Updates**

**Topic: DNS - Download, Install and Configure (Domain Name Systems) – Lecture # 156**

* DNS, which is called Domain Name System.
* I'm sure you have heard of DNS from many different people.
* What exactly is it? What's the purpose of DNS? Well DNS is a system that is used to translate a hostname to an IP address.
* So what that means is when the whole internet started the websites that were built, or when the systems were built, computer systems were built, every computer system has an IP address.
* And to remember those IP addresses was so cumbersome, people wouldn't remember the IP addresses, they would forget it, they would have to write it, it's a security issue.
* So then they came up with a resolution and the resolution was to come up with names, the hostnames.
* Okay, we do have the hostname but computers don't understand letters or hostnames, computers only understand digits.
* So how do we translate it? We do need a system in place that does the translation for us.
* And that system, or that service, is called DNS.
* Again, Domain Name System.
* It translates hostname to IP address, IP address to hostname, which is called a PTR record.
* And hostname to IP address, the record name is called A record.
* And the last function of DNS is to translate hostname to hostname, and this is for some of the hostname to translate to an easier, like an alias type of hostname.
* For example, Google had probably like 50 servers running background that serves their website google.com.
* But do you think that Google itself is the name on every server, is the same name? No, it's not possible.
* They probably have different names on those 50 servers, but they do have one alias, Google, which is pointing to other server hostnames.
* And when it points to other servers that is when it's called hostname to hostname.
* And in order to create that, you need to create a record.
* And that record is called CNAME record.
* Please do remember these A record, PTR record and CNAME record.
* If you are going to be preparing yourself to go for a Linux interview, you will be asked these questions and I know that for sure, many people have been asked these questions, so remember these records.
* Then there are files that are involved in the configuration of DNS, and the primary configuration file is in etc, as you already know.
* Everyone should know that by now, that etc is the configuration directory where all the configuration of every service is located.
* And the file name for DNS is called named.conf.
* named.conf is because named is the name of the process of the DNS.
* And the package that you install for DNS, it's called bind.
* Next file we have is /var/named.
* This is not a file; this is a directory.
* In this directory you have all the zone files where you define all the hostname to IP, IP to hostname, and all the other stuff that you want it to do.
* The service that you need to run in your system, or when you start it, you have to run the command systemctl restart named.
* named is, again, name and D stands for daemon.
* So this daemon, it's gonna run, keep running it.
* Every time a request comes in, it's gonna serve the request.
* (From here voice issue in original Video Lecture)
* From this point on, we will go through the download, install and configuration of the DNS server.
* So the first thing I will always recommend is that you create a snapshot of your virtual machine.
* Whenever we touch the configuration file of a Linux machine it is always a good idea to create a snapshot, just in case if you make a mistake in the configurations, you don't have to troubleshoot or spend endless number of hours or even rebuild the entire Linux machine.
* So please go ahead and create the snapshot.
* Then the setup usually looks like, as in the DNS there's a master server, and then there's a secondary or slave server which is a replication to the master server.
* And then the client, the client is any machine that will resolve its hostname or other server's hostname to IP addresses.
* In our setup, since we are using one lab machine, we only have one Linux machine, we will use that one Linux machine as a master server and as a client as well.
* We will not be setting up as a secondary or slave server.
* But if you have two machines, then I will recommend that you set up the DNS on one machine and the other machine use it as a client to look up for DNS entries.
* Anyway, moving on, our domain name that we will set up for, our lab DNS configuration is lab.local and the IP address that we will give to that DNS server is the local IP address that is right now assigned to enp0s3.
* So of course, I'm sure everyone is using a Wi-Fi network adapter.
* So in a Wi-Fi network adapter, the IP address that is assigned to your network, or to your interface, is always a DHCP, meaning it changes every time you reboot.
* So when you assign this IP address to your DNS, remember it could change.
* So it's better we will do the install, configure DNS, but then we could actually undo all the changes or revert or restore to the original virtual machine snapshot.
* Anyway, the steps that will be involved would be just to install the DNS package, and the package is bind bind-utils and -y option meaning say yes to every question that will be asked.
* Then we'll do the configured DNS. In summary, we will modify the /etc/named.conf file. We will create two zone files, forward.lab and reverse.lab. Forward.lab is to do hostname to IP address lookup and reverse is to do a reverse lookup, which is IP to hostname lookup.
* Then we'll modify the DNS file permissions and start the service.
* And of course, after that, once you verify everything, DNS is working the way we wanted it to configure, then I would definitely recommend that you revert, or restore back, to your original snapshot.
* So this way, if your IP changes you don't have to go into the DNS configuration file and update that IP over and over again.
* This configuration of DNS works best if you have a static IP, but since we are working on a Wi-Fi, DHCP IP, and this is a lab and my intention here is to teach you how you can download, install, configure, and manage DNS, and that's why we are going through this lab process.
* So I will go into my Linux machine and first of all I am here and I am logged in as root.
* And then I can use “ip a” command to see the IP address of this machine. It shows that 192.168.1.29 is assigned to enp0s3. Now I will use this.
* Perfect.
* I could do the installation or configuration right here on the console, but I would prefer to use a PuTTY session.
* So I already have a PuTTY session open, right here, and I will minimize this window, the console, and I will use the PuTTY machine.
* Again with PuTTY, I will see whoami, I am myself, which directory I am in, and which host I'm in. Okay, now I will become root.
* Okay, I'm logged in as root. Let's do whoami, root.
* Let's clear the screen.
* And now I will follow my detailed procedure that I have documented everything in a Word document.
* So I will open that up on the side.
* So this way we'll follow the document step-by-step.
* All the steps are highlighted in step one, step two, all the way I think until step 13.
* So first thing first, let's go ahead and do the install of the DNS package.
* Before we do install, let's check if we have that package. So to check it, it's rpm -qa and grep for bind.
* It will pull up all the list of RPMs that we have installed and specifically grep for bind.
* Now look at the list and you will see there aren't any bind packages installed just by itself.
* Bind, there's bind, license, libs and utils. If you do have utils that's good, but I will still go ahead and do an install on utils just in case there's a newer version.
* If there is, it will upgrade this old version which is right here.
* All right, so first step, install DNS, DNF install bind space bind, this is second package, utils, -y, meaning just say yes to the questions that will be asked during this install.
* So when you do the DNF, the DNF will download as well as install your package, or the package that you're looking for. All right, let's go ahead and hit Enter.
* Of course this will go out under CentOS repositories, it will look for these packages.
* So before it goes out to the CentOS repository, and make sure you could actually get online, meaning get on the internet, you could just simply do ping google.com.
* And if you're getting a response, it means you are, you're able to get online.
* So that's when you actually go in and install the package. (Stop for few seconds here)
* And completed.
* Good.
* Now you could go ahead and do rpm -qa and grep for bind again. And you will see and you will verify that the bind package, just by itself, bind, has been installed. Beautiful.
* And the utils package is there, it is still 9.16, which means it is already updated.
* Perfect.
* Download, installation is done. Next part is actually configuring the DNS.
* So when you install the bind, or DNS, by the way DNS is the name, bind is the package name, and the service that DNS runs, it's called named. D stands for daemon.
* So remember the difference: DNS refers to the overall system and application.
* Bind is the name of the package, and the service name is named.
* All right, let's edit the /etc/named.conf file, before you edit it, you could make a copy as well if you're doing it in production, but I'm sure you have taken the snapshot.
* So let's go ahead and do vi /etc/named.conf, come down to the point where it says options. And here you have to do listen-on port 53.
* So by default, DNS listens on port 53.
* So right here, I want you to type in the IP address of enp0s3, which is 192.168.100.153, followed by a semicolon.
* Please make sure there is a space, then a curly brace, and finally, close the curly brace and another semicolon here.
* Now I want you to go down all the way down to the bottom of the file, right above where you see these two lines, include, you're gonna see this section, these three, four lines of parameters, it starts with a zone.
* Now you have to add in the value dot, take that out and add lab.local. So this is the domain that I have picked to be the DNS domain.
* Type, replace hint with master. File, the file name that we will create will be forward.lab.
* And one last parameter would be allow-update, space, curly braces, none, semicolon, space, curly braces, close and then semicolon.
* All right, then next one is for our reverse.
* So for this what I will do is I'll simply copy it from here, insert it. All right, so now this is the reverse zone lookup configuration parameters.
* So in reverse we have to specify in the reverse order, 192.168.1, type is master, file is reverse.lab, allow-update and let's close, curly braces.
* Okay, include, the last two lines stay the same, you don't have to change it.
* Okay, just make sure this part is added to your named.conf file exactly as I'm showing.
* All right, so once it's added, by the way, the document that I have on my left-hand side is also attached as part of this lecture.
* You could download it and you could go through this exact same document.
* All right, let's go ahead and save this file. File is saved.
* Now create two zone files.
* So one zone file will be forward.lab, but you have to go into the /var/named directory, make sure you are in the /var/named directory, good.
* touch forward.lab.
* touch reverse.lab.
* We have both forward and reverse.
* Now these are the zone files where we will actually be going to keep the entries, the forward lookup entries and reverse lookup entries.
* So if you want it to resolve hostname to IP it will go into forward.lab file.
* And if you want it to resolve IP to hostname, then it will go into reverse.lab file.
* All right, anyway, let's keep moving.
* So now modify the first file which is vi forward.lab, this is the empty file.
* Copy this, everything that I have in here, and paste it in your file.
* So now let me just quickly tell you what this is.
* it's better that you format it the right way, not because it will be a bad configuration or it won't work, but it will be easier for you to read.
* Okay, so basically it's time to live 86400.
* Every line that you see here has a meaning.
* And of course if I go into every meaning it will take a long time, but just quickly, I'll tell you, every time you make a change to this file, the serial number has to be updated.
* So if you are adding an entry here, please make sure, change one to two or if you're adding the third entry make two to three.
* All right, so these are the predefined parameters that we have, that we need to follow.
* So let's come to DNS.
* Masterdns, so first of all at in nameserver, our masterdns is lab.local, and then at IN A 192.160.100.153, this is our IP address. And our masterdns server has the entry IN A 192.160.100.153.
* These are the last two lines that I have added as a test.
* By the way, these two machines, clienta and clientb do not exist.
* But I have just for testing purposes, whether I could resolve that when I am completely done configuring the DNS.
* All right, so let's go ahead and save this file.
* Now, let's go ahead and modify the reverse.lab.
* And I'm gonna do the same thing, I'm going to copy and paste exactly what I have here.
* Okay, everything is copied.
* Again, this one is reversed.
* The first three entries will be the same. It has this client one. It should have these first two as it was in the forward as well. Then the third one, masterdns IN A 192.168.100.153. If you notice, these last three entries are the same as in the forward, but they are now reversed.
* All right, good. Now go ahead and save it.
* Now we need to restart, or start the service that is associated with DNS.
* With that we'll do systemctl start named.
* Perfect.
* It’s now started.
* Now let's enable it, so it could start at boot time.
* It's now enabled.
* Okay, the next part is to disable the firewall.
* If you have a firewall running, go ahead and disable it. And to disable the firewall is systemctl stop firewalld.
* If you do not want to disable the firewall, then make sure you configure your firewall to allow port 53 to come in and listen on port 53.
* All right, let's disable it, so it won't start back on at boot time.
* Now it's disabled.
* Now let's go ahead and configure the permissions on /var/named.
* For ownership and SELinux, if you're running SELinux then you have to run these commands. If you're not running SELinux then you don't have to run the last two commands.
* But anyway, still run it.
* This will set the permission of your /var/named directory.
* Make sure you run them in sequence.
* So let's keep running.
* Ownership of this retains as root, that's fine. It didn't change, it's still root. If it wasn't root, then it would've changed it.
* Okay, and the last one is named.conf.
* So everything is done now to test the configuration and zone files for any syntax error.
* Okay, so we have to make sure those configuration files, the changes we made to have no mistake.
* So for that, the first configuration file changes we made was in /etc/named.conf.
* So to verify, if there isn't any mistake in that configuration file we'll run the command named-checkconf etc/named.conf.
* If you don't get any output, that means it has no issues or there isn't any mistakes in that configuration file.
* Now I will do the same thing but run a different command which is check named.checkzone, and that is for my lab and the lab forward zone file that we created, and it says, "zone lab.local loaded serial number" is this, and it says, "OK," meaning it works.
* There are no mistakes.
* Perfect.
* Now to run on the second command for our reverse zone. And it says, "OK." Beautiful.
* Now we'll go into our network config files to add that DNS server information into that network config file. And as you know my NIC is enp0s3.
* So if I do ip addr show enp0s3, you're gonna see that it has the IP address, the same IP address I have given to that DNS server.
* So I will go into this configuration file, /etc/NetworkManager/system-connections/. In there, there is a configuration file enp0s3.nmconnection, vi, this file.
* I'll come all the way down and add the DNS entry which should be DNS=192.168.100.153.
* Save it.
* Before we modify the /etc/resolv.conf, let's restart the network by running the command systemctl restart NetworkManager.
* Why?
* Because whenever you restart the network, it changes your DNS information back.
* Now we will have to modify the /etc/resolv.conf.
* Now remember, if you are using two Linux machines and you are trying, or configuring, this DNS on one server and have the other server as a client, now it's time for you to go to the client.
* So the client can look it up to DNS. If you only have one machine, that is fine. We will keep, or consider, this one machine as a client as well as a server.
* So for this, modify the /etc/resolv.conf file, vi /etc/resolv.conf. And here you'll see the name server is set to your default gateway, which is 192.168.100.1, which is your modem as well as in your home.
* So replace 1 with 153 because this is now your new DNS server. It's saved.
* Now it's time to verify whether our configuration, or our DNS works.
* So we'll do, dig masterdns.lab.local.
* Okay, so we will see right here, you're gonna see masterdns.lab.local is actually resolving to 192.168.100.153.
* Beautiful.
* Okay, now I'll try the nslookup command. By the way, nslookup and dig commands actually perform the same function.
* But dig gives you more information than nslookup.
* Okay, so now I'm gonna do nslookup with masterdns.lab.local. Hit Enter.
* And now you'll see, it is going to the DNS server which we created, 192.168.100.153, and it is resolving itself and it is 192.168.100.153.
* Awesome.
* Now remember we created two more entries in the forward lookup zone and that was clienta and clientb.
* We're gonna try to resolve that as well. And let's nslookup clienta.lab.local and it's showing 192.168.1.240.
* Nice.
* And let's do clientb. 192.168.1.241.
* Nice, so the forward lookup works. Now let's try the reverse lookup. So instead of putting the hostname, let's put in the IP, 192.168.1.240.
* And look at that it is resolving it to the hostname now.
* Same way we'll do for 241, and it is resolving for clientb.
* Now if you build a new system and you want to add a new entry to the DNS server all you would have to do is to cd into /var/named directory.
* Then you will go into the forward.lab, you've modified that, you'll come all the way down and for example, you'll type clientc, IN A, and then the new IP address of that client, 242.
* And make sure to update the serial number from one to two, in this case.
* Save it and then you could try to look it up.
* clientc, right now it's not showing because we have to restart the named service.
* So that would be a systemctl restart named.
* Now let's try clientc and you're gonna see that it is resolving to 242 now.
* See that's how you keep adding the hostnames and it will keep resolving it for you.
* By the way, there is also a command to instead of restart named, you could reload the configuration file.
* But anyway, you could look that up.
* So this is how you do the download, installation and configuration of your DNS.
* At this point you should know how it works.
* If you want, you could revert back to your original snapshot or you could simply do systemctl restart NetworkManager.
* And what it will do is it will reset your /etc/resolv.conf file back to the original DNS, 192.168.100.1.
* So you're not gonna have a problem going to the internet and when you do, ping google.com you're gonna see it is able to ping.
* Anyway, I hope this lecture serves its purpose, you learned a lot from this lecture.
* And if you have any questions regarding DNS, please let me know. It's just simple.
* Just go through my documentation, the Word document that I've attached, and good luck.