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NET-45

420-635-AB-Network Installation and Administration I

Assignment 2

Handed to

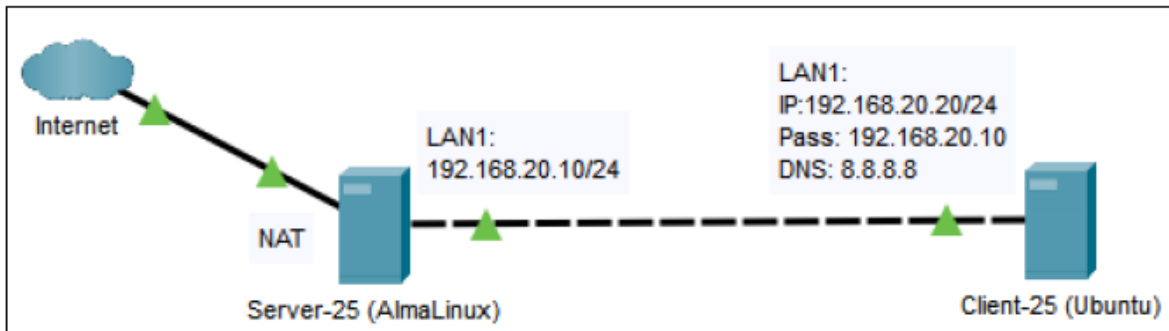
MR. Antoine Thome

Date

2025-04-10

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Introduction – Deploying Real-World Network Services with Linux

In this assignment, we go beyond basic configuration and step into the world of real-world network service deployment. Building on the foundation set in Assignment 1, we now install and configure three essential services on a Linux server: DNS, DHCP, and FTP. These services are critical for any functioning network—handling everything from hostname resolution and IP address assignment to file sharing between systems.

Finally, we deploy an FTP server with anonymous upload capabilities, simulating a public-facing file-sharing service. While many modern networks now rely on SFTP or cloud-based storage, FTP remains widely used in legacy systems and embedded environments. Configuring it helps us understand how to manage file permissions, control user access, and enable secure data transfer—skills that remain highly relevant in many IT environments.

This lab mirrors the kind of hands-on work done by professionals in roles such as IT Support Specialists, System Administrators, and Network Administrators. Learning to deploy and manage services like BIND, DHCPd, and vsFTPd doesn't just deepen our understanding—it prepares us for the demands of real IT environments.

The skills we develop here directly contribute to industry certifications like **CompTIA Linux+** and **Red Hat Certified System Administrator (RHCSA)**, both of which are recognized stepping stones into IT careers. By completing this lab, we're not only practicing commands—we're laying the groundwork for professional readiness and future job opportunities in Linux-based system administration.

Assignment 2

Part 1:

DNS Configuration with BIND (AlmaLinux Server)

On AlmaLinux Server:

1. Install BIND on AlmaLinux

```
dnf install -y bind
```

```
[root@server-3 ~]# dnf install -y bind
AlmaLinux 9 - AppStream 7.2 kB/s | 4.2 kB 00:00
AlmaLinux 9 - AppStream 13 MB/s | 15 MB 00:01
AlmaLinux 9 - BaseOS 8.9 kB/s | 3.8 kB 00:00
AlmaLinux 9 - BaseOS 19 MB/s | 18 MB 00:00
AlmaLinux 9 - Extras 11 kB/s | 3.3 kB 00:00
AlmaLinux 9 - Extras 34 kB/s | 13 kB 00:00
Dependencies resolved.
=====
Package Architecture Version Repository Size
=====
Installing:
bind x86_64 32:9.16.23-24.el9_5.3 appstream 490 k
Upgrading:

Upgraded:
audit-3.1.5-1.el9.x86_64 audit-libs-3.1.5-1.el9.x86_64 libselinux-3.6-1.el9.x86_64
libselinux-utils-3.6-1.el9.x86_64 libsemanage-3.6-2.1.el9_5.x86_64 libsepol-3.6-1.el9.x86_64
policycoreutils-3.6-2.1.el9.x86_64 python3-libselinux-3.6-1.el9.x86_64
Installed:
bind-32:9.16.23-24.el9_5.3.x86_64 bind-dnssec-doc-32:9.16.23-24.el9_5.3.noarch
bind-dnssec-utils-32:9.16.23-24.el9_5.3.x86_64 bind-libs-32:9.16.23-24.el9_5.3.x86_64
bind-license-32:9.16.23-24.el9_5.3.noarch bind-utils-32:9.16.23-24.el9_5.3.x86_64
checkpolicy-3.6-1.el9.x86_64 fstrm-0.6.1-3.el9.x86_64
libmaxminddb-1.5.2-4.el9.x86_64 libuv-1:1.42.0-2.el9_4.x86_64
policycoreutils-python-utils-3.6-2.1.el9.noarch protobuf-c-1.3.3-13.el9.x86_64
python3-audit-3.1.5-1.el9.x86_64 python3-bind-32:9.16.23-24.el9_5.3.noarch
python3-distro-1.5.0-7.el9.noarch python3-libsemanage-3.6-2.1.el9_5.x86_64
python3-ply-3.11-14.el9.noarch python3-policycoreutils-3.6-2.1.el9.noarch
python3-setools-4.4.4-1.el9.x86_64 python3-setuptools-53.0.0-13.el9.noarch

Complete!
[root@server-3 ~]#
```

```
[root@server-3 ~]# vim /etc/hosts
[root@server-3 ~]#
```

[illegible]

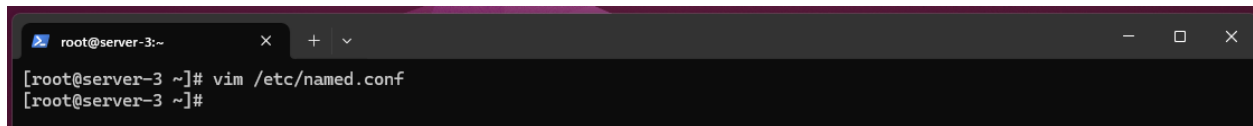
3. Configure BIND to Listen on Specific IP and Allow Queries

Edit the configuration file:

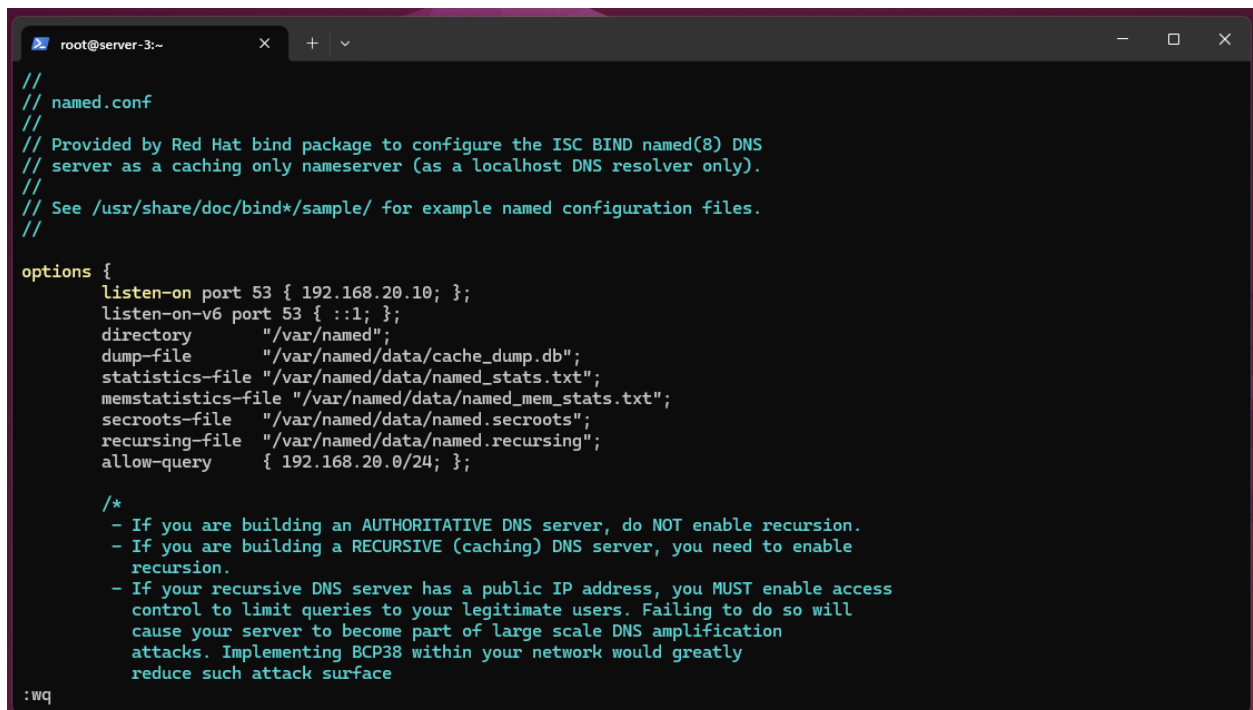
```
vim /etc/named.conf
```

Under the options section, add or modify:

```
listen-on port 53 { 192.168.20.10; };  
allow-query { 192.168.20.0/24; };
```



```
root@server-3:~  
[root@server-3 ~]# vim /etc/named.conf  
[root@server-3 ~]#
```

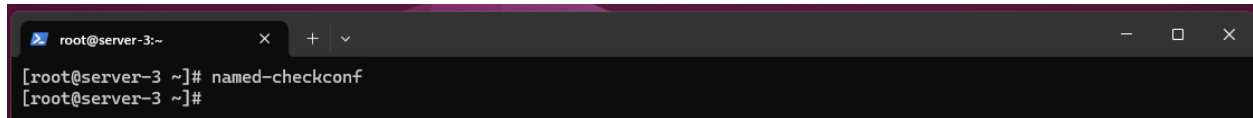


```
//  
// named.conf  
//  
// Provided by Red Hat bind package to configure the ISC BIND named(8) DNS  
// server as a caching only nameserver (as a localhost DNS resolver only).  
//  
// See /usr/share/doc/bind*/sample/ for example named configuration files.  
//  
options {  
    listen-on port 53 { 192.168.20.10; };  
    listen-on-v6 port 53 { ::1; };  
    directory      "/var/named";  
    dump-file       "/var/named/data/cache_dump.db";  
    statistics-file "/var/named/data/named_stats.txt";  
    memstatistics-file "/var/named/data/named_mem_stats.txt";  
    secroots-file   "/var/named/data/named.secroots";  
    recursing-file  "/var/named/data/named.recursing";  
    allow-query     { 192.168.20.0/24; };  
  
    /*  
    - If you are building an AUTHORITATIVE DNS server, do NOT enable recursion.  
    - If you are building a RECURSIVE (caching) DNS server, you need to enable  
      recursion.  
    - If your recursive DNS server has a public IP address, you MUST enable access  
      control to limit queries to your legitimate users. Failing to do so will  
      cause your server to become part of large scale DNS amplification  
      attacks. Implementing BCP38 within your network would greatly  
      reduce such attack surface  
    */  
};  
:  
:wq
```

4. Check BIND Configuration Syntax

named-checkconf

(No output means the syntax is correct)




```
root@server-3:~  
[root@server-3 ~]# named-checkconf  
[root@server-3 ~]#
```

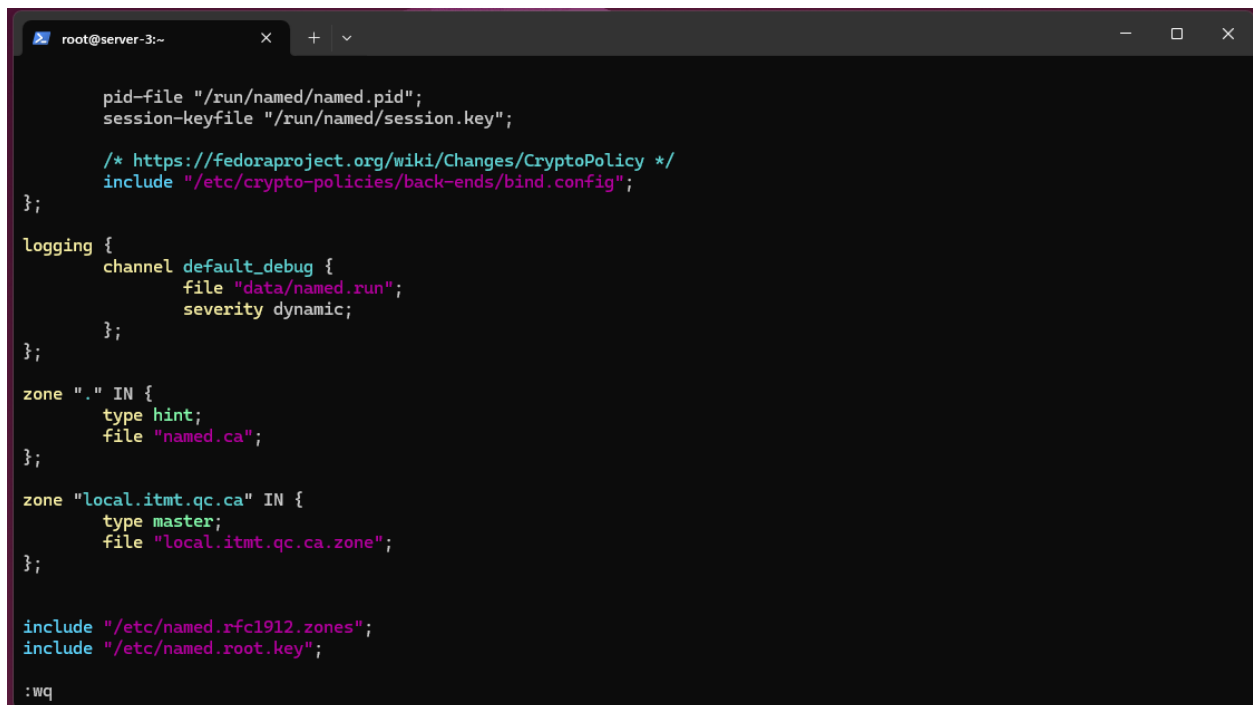
5. Configure the Forward Master DNS Zone

In /etc/named.conf, add the following below the existing zones:

```
zone "local.itmt.qc.ca" IN {  
    type master;  
    file "local.itmt.qc.ca.zone";  
};
```



```
root@server-3:~  
[root@server-3 ~]# vim /etc/named.conf  
[root@server-3 ~]#
```



```
root@server-3:~  
  
pid-file "/run/named/named.pid";  
session-keyfile "/run/named/session.key";  
  
/* https://fedoraproject.org/wiki/Changes/CryptoPolicy */  
include "/etc/crypto-policies/back-ends/bind.config";  
};  
  
logging {  
    channel default_debug {  
        file "data/named.run";  
        severity dynamic;  
    };  
};  
  
zone "." IN {  
    type hint;  
    file "named.ca";  
};  
  
zone "local.itmt.qc.ca" IN {  
    type master;  
    file "local.itmt.qc.ca.zone";  
};  
  
include "/etc/named.rfc1912.zones";  
include "/etc/named.root.key";  
  
:wq
```


6. Create the Forward Zone File

```
vim /var/named/local.itmt.qc.ca.zone
```

```
root@server-3:~# vim /var/named/local.itmt.qc.ca.zone
root@server-3 ~#
```

Add the following content:

\$TTL 86400

```
@ IN SOA server-3.local.itmt.qc.ca. root.local.itmt.qc.ca. (
```

```
40 ; serial
```

1D ; refresh

1H ; retry

1W ; expire

3H) ; minimum

IN NS server-3.local.itmt.qc.ca.

```
server-3  IN A 192.168.20.10
```

```
client-3  IN A 192.168.20.20
```

web-server IN A 192.168.20.2

email-server IN A 192.168.20.3

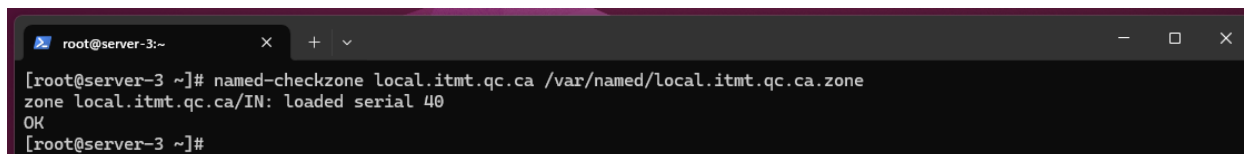
www IN CNAME web-server

@ IN MX 20 email-server

[illegible]

7. Check Forward Zone File Syntax

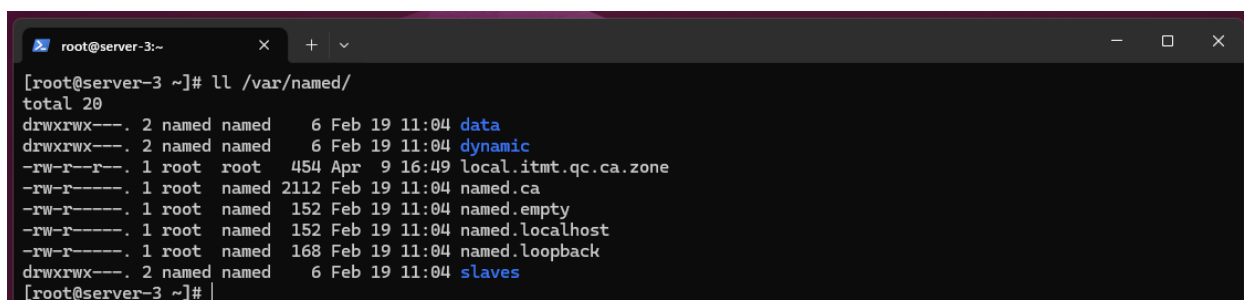
`named-checkzone local.itmt.qc.ca /var/named/local.itmt.qc.ca.zone`



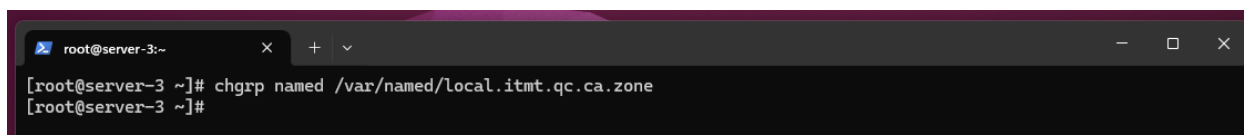
```
root@server-3:~  
[root@server-3 ~]# named-checkzone local.itmt.qc.ca /var/named/local.itmt.qc.ca.zone  
zone local.itmt.qc.ca/IN: loaded serial 40  
OK  
[root@server-3 ~]#
```

8. Set Correct Ownership on Zone File

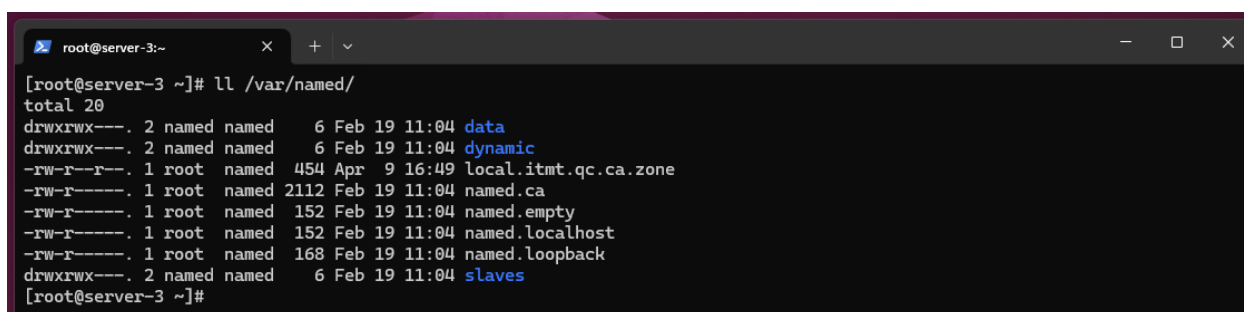
`chgrp named /var/named/local.itmt.qc.ca.zone`



```
root@server-3:~  
[root@server-3 ~]# ll /var/named/  
total 20  
drwxrwx---. 2 named named 6 Feb 19 11:04 data  
drwxrwx---. 2 named named 6 Feb 19 11:04 dynamic  
-rw-r--r--. 1 root root 454 Apr 9 16:49 local.itmt.qc.ca.zone  
-rw-r-----. 1 root named 2112 Feb 19 11:04 named.ca  
-rw-r-----. 1 root named 152 Feb 19 11:04 named.empty  
-rw-r-----. 1 root named 152 Feb 19 11:04 named.localhost  
-rw-r-----. 1 root named 168 Feb 19 11:04 named.loopback  
drwxrwx---. 2 named named 6 Feb 19 11:04 slaves  
[root@server-3 ~]#
```



```
root@server-3:~  
[root@server-3 ~]# chgrp named /var/named/local.itmt.qc.ca.zone  
[root@server-3 ~]#
```



```
root@server-3:~  
[root@server-3 ~]# ll /var/named/  
total 20  
drwxrwx---. 2 named named 6 Feb 19 11:04 data  
drwxrwx---. 2 named named 6 Feb 19 11:04 dynamic  
-rw-r--r--. 1 root named 454 Apr 9 16:49 local.itmt.qc.ca.zone  
-rw-r-----. 1 root named 2112 Feb 19 11:04 named.ca  
-rw-r-----. 1 root named 152 Feb 19 11:04 named.empty  
-rw-r-----. 1 root named 152 Feb 19 11:04 named.localhost  
-rw-r-----. 1 root named 168 Feb 19 11:04 named.loopback  
drwxrwx---. 2 named named 6 Feb 19 11:04 slaves  
[root@server-3 ~]#
```

9. Start and Enable the DNS Server

`systemctl enable --now named`

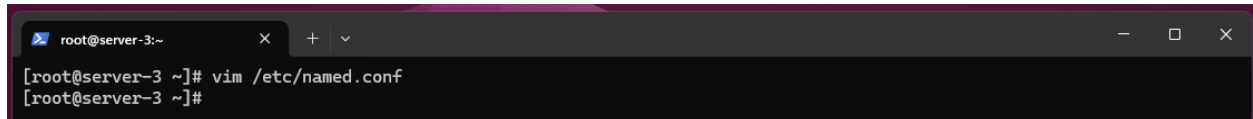
`systemctl status named`

```
root@server-3:~  
[root@server-3 ~]# systemctl enable --now named  
Created symlink /etc/systemd/system/multi-user.target.wants/named.service → /usr/lib/systemd/system/named.service.  
[root@server-3 ~]#
```

```
root@server-3:~  
[root@server-3 ~]# systemctl status named  
● named.service - Berkeley Internet Name Domain (DNS)  
   Loaded: loaded (/usr/lib/systemd/system/named.service; enabled; preset: disabled)  
   Active: active (running) since Wed 2025-04-09 16:55:10 EDT; 34s ago  
     Process: 2782 ExecStartPre=/bin/bash -c if [ ! "$DISABLE_ZONE_CHECKING" == "yes" ]; then /usr/sbin/named-checkconf  
     Process: 2785 ExecStart=/usr/sbin/named -u named -c ${NAMEDCONF} $OPTIONS (code=exited, status=0/SUCCESS)  
    Main PID: 2786 (named)  
      Tasks: 10 (limit: 10852)  
     Memory: 21.5M  
        CPU: 252ms  
    CGroup: /system.slice/named.service  
            └─2786 /usr/sbin/named -u named -c /etc/named.conf  
  
Apr 09 16:55:10 server-3 named[2786]: running  
Apr 09 16:55:10 server-3 named[2786]: network unreachable resolving './DNSKEY/IN': 2001:500:9f::42#53  
Apr 09 16:55:10 server-3 named[2786]: network unreachable resolving './NS/IN': 2001:500:9f::42#53  
Apr 09 16:55:10 server-3 named[2786]: network unreachable resolving './DNSKEY/IN': 2001:500:a8::e#53  
Apr 09 16:55:10 server-3 named[2786]: network unreachable resolving './NS/IN': 2001:500:a8::e#53  
Apr 09 16:55:10 server-3 named[2786]: network unreachable resolving './DNSKEY/IN': 2001:500:1::53#53  
Apr 09 16:55:10 server-3 named[2786]: network unreachable resolving './NS/IN': 2001:500:1::53#53  
Apr 09 16:55:10 server-3 named[2786]: managed-keys-zone: Initializing automatic trust anchor management for zone '.'; D  
Apr 09 16:55:10 server-3 named[2786]: managed-keys-zone: Initializing automatic trust anchor management for zone '.'; D  
Apr 09 16:55:10 server-3 named[2786]: resolver priming query complete  
lines 1-22/22 (END)
```

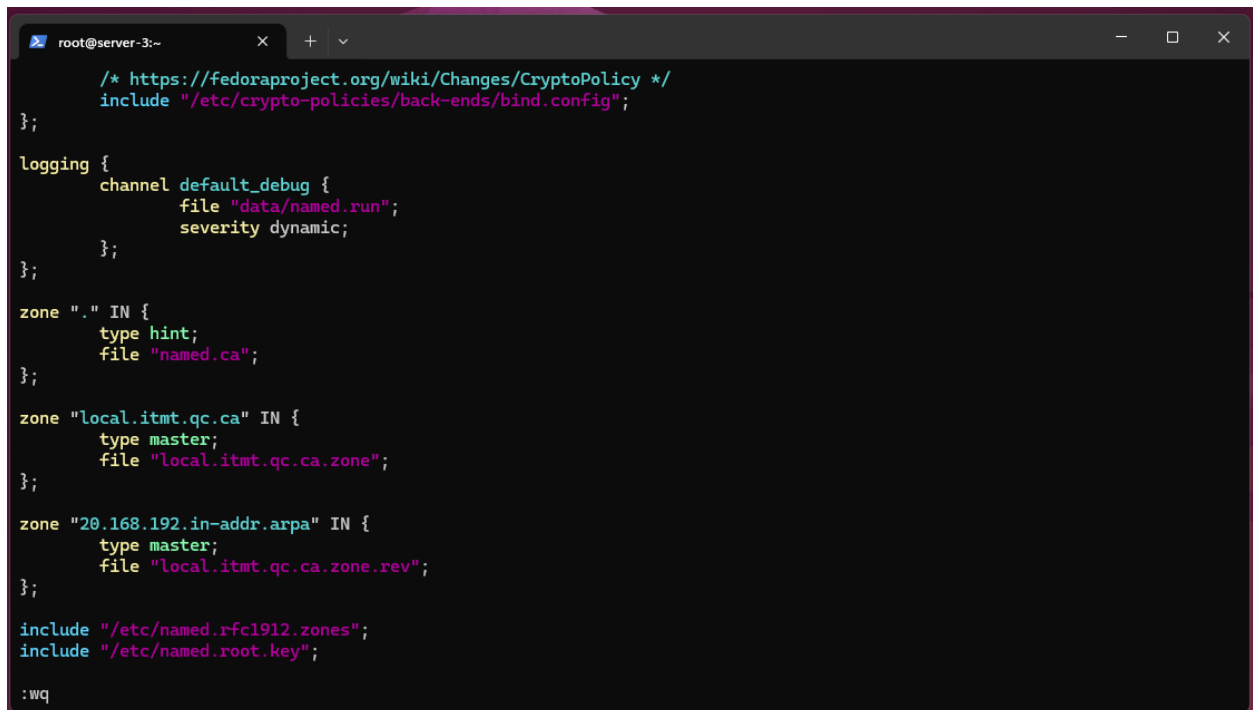
10. Configure the Reverse Master DNS Zone

Edit /etc/named.conf and add below the forward zone:



```
root@server-3:~  
[root@server-3 ~]# vim /etc/named.conf  
[root@server-3 ~]#
```

```
zone "20.168.192.in-addr.arpa" IN {  
    type master;  
    file "local.itmt.qc.ca.zone.rev";  
};
```



```
root@server-3:~  
/* https://fedoraproject.org/wiki/Changes/CryptoPolicy */  
include "/etc/crypto-policies/back-ends/bind.config";  
};  
  
logging {  
    channel default_debug {  
        file "data/named.run";  
        severity dynamic;  
    };  
};  
  
zone "." IN {  
    type hint;  
    file "named.ca";  
};  
  
zone "local.itmt.qc.ca" IN {  
    type master;  
    file "local.itmt.qc.ca.zone";  
};  
  
zone "20.168.192.in-addr.arpa" IN {  
    type master;  
    file "local.itmt.qc.ca.zone.rev";  
};  
  
include "/etc/named.rfc1912.zones";  
include "/etc/named.root.key";  
  
:wq
```

11. Create the Reverse Zone File

```
vim /var/named/local.itmt.qc.ca.zone.rev
```

Add the following content:

\$TTL 86400

```
@ IN SOA server-3.local.itmt.qc.ca. root.local.itmt.qc.ca. (
```

```
40 ; serial
```

1D ; refresh

1H ; retry

1W ; expire

3H) ; minimum

@ IN NS server-3.local.itmt.qc.ca.

10 IN PTR server-3

20 IN PTR client-3

4 IN PTR web-server

5 IN PTR email-server

[illegible]

12. Check Reverse Zone File Syntax

`named-checkzone 20.168.192.in-addr.arpa /var/named/local.itmt.qc.ca.zone.rev`

```
root@server-3:~  
[root@server-3 ~]# named-checkzone 20.168.192.in-addr.arpa /var/named/local.itmt.qc.ca.zone.rev  
zone 20.168.192.in-addr.arpa/IN: loaded serial 40  
OK  
[root@server-3 ~]#
```

13. Set Correct Ownership on Reverse Zone File

`chgrp named /var/named/local.itmt.qc.ca.zone.rev`

```
root@server-3:~  
[root@server-3 ~]# ll /var/named/  
total 24  
drwxrwx---. 2 named named 23 Apr 9 16:55 data  
drwxrwx---. 2 named named 60 Apr 9 16:55 dynamic  
-rw-r--r--. 1 root named 454 Apr 9 16:49 local.itmt.qc.ca.zone  
-rw-r--r--. 1 root root 401 Apr 9 17:02 local.itmt.qc.ca.zone.rev  
-rw-r-----. 1 root named 2112 Feb 19 11:04 named.ca  
-rw-r-----. 1 root named 152 Feb 19 11:04 named.empty  
-rw-r-----. 1 root named 152 Feb 19 11:04 named.localhost  
-rw-r-----. 1 root named 168 Feb 19 11:04 named.loopback  
drwxrwx---. 2 named named 6 Feb 19 11:04 slaves  
[root@server-3 ~]#
```

```
root@server-3:~  
[root@server-3 ~]# chgrp named /var/named/local.itmt.qc.ca.zone.rev  
[root@server-3 ~]#
```

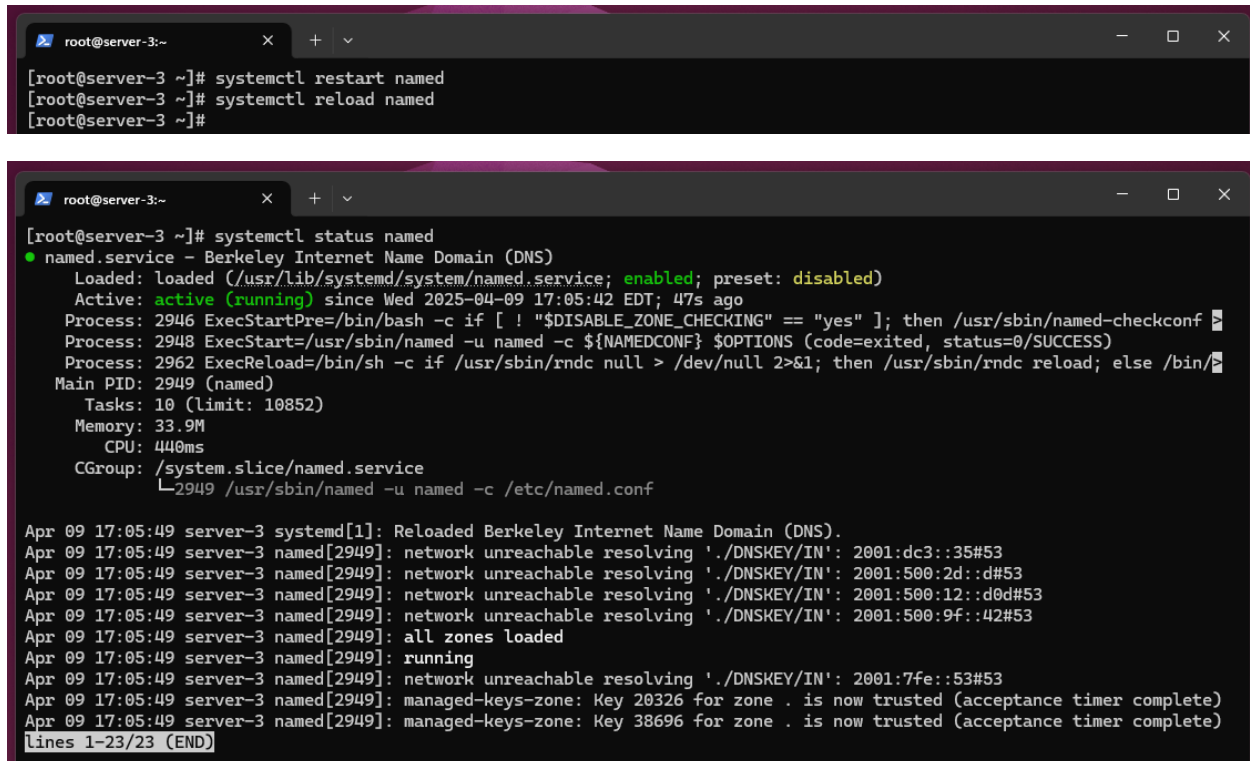
```
root@server-3:~  
[root@server-3 ~]# ll /var/named/  
total 24  
drwxrwx---. 2 named named 23 Apr 9 16:55 data  
drwxrwx---. 2 named named 60 Apr 9 16:55 dynamic  
-rw-r--r--. 1 root named 454 Apr 9 16:49 local.itmt.qc.ca.zone  
-rw-r--r--. 1 root named 401 Apr 9 17:02 local.itmt.qc.ca.zone.rev  
-rw-r-----. 1 root named 2112 Feb 19 11:04 named.ca  
-rw-r-----. 1 root named 152 Feb 19 11:04 named.empty  
-rw-r-----. 1 root named 152 Feb 19 11:04 named.localhost  
-rw-r-----. 1 root named 168 Feb 19 11:04 named.loopback  
drwxrwx---. 2 named named 6 Feb 19 11:04 slaves  
[root@server-3 ~]#
```

14. Restart and Reload BIND

systemctl restart named

systemctl reload named

systemctl status named



```
root@server-3:~# systemctl restart named
root@server-3:~# systemctl reload named
root@server-3:~#

root@server-3:~# systemctl status named
● named.service - Berkeley Internet Name Domain (DNS)
   Loaded: loaded (/usr/lib/systemd/system/named.service; enabled; preset: disabled)
   Active: active (running) since Wed 2025-04-09 17:05:42 EDT; 47s ago
     Process: 2946 ExecStartPre=/bin/bash -c if [ ! "$DISABLE_ZONE_CHECKING" == "yes" ]; then /usr/sbin/named-checkconf
     Process: 2948 ExecStart=/usr/sbin/named -u named -c ${NAMEDCONF} $OPTIONS (code=exited, status=0/SUCCESS)
     Process: 2962 ExecReload=/bin/sh -c if /usr/sbin/rndc null > /dev/null 2>&1; then /usr/sbin/rndc reload; else /bin/
   Main PID: 2949 (named)
      Tasks: 10 (limit: 10852)
     Memory: 33.9M
        CPU: 440ms
    CGroup: /system.slice/named.service
            └─2949 /usr/sbin/named -u named -c /etc/named.conf

Apr 09 17:05:49 server-3 systemd[1]: Reloaded Berkeley Internet Name Domain (DNS).
Apr 09 17:05:49 server-3 named[2949]: network unreachable resolving './DNSKEY/IN': 2001:dc3::35#53
Apr 09 17:05:49 server-3 named[2949]: network unreachable resolving './DNSKEY/IN': 2001:500:2d::d#53
Apr 09 17:05:49 server-3 named[2949]: network unreachable resolving './DNSKEY/IN': 2001:500:12::d0d#53
Apr 09 17:05:49 server-3 named[2949]: network unreachable resolving './DNSKEY/IN': 2001:500:9f::42#53
Apr 09 17:05:49 server-3 named[2949]: all zones loaded
Apr 09 17:05:49 server-3 named[2949]: running
Apr 09 17:05:49 server-3 named[2949]: network unreachable resolving './DNSKEY/IN': 2001:7fe::53#53
Apr 09 17:05:49 server-3 named[2949]: managed-keys-zone: Key 20326 for zone . is now trusted (acceptance timer complete)
Apr 09 17:05:49 server-3 named[2949]: managed-keys-zone: Key 38696 for zone . is now trusted (acceptance timer complete)
lines 1-23/23 (END)
```

DNS Client Configuration

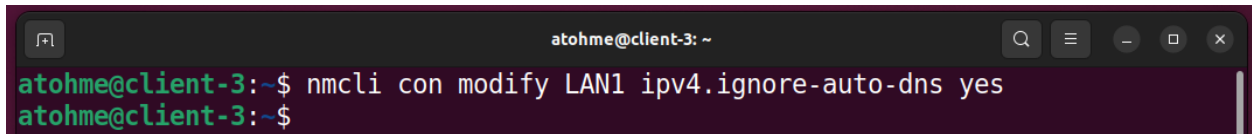
On Ubuntu Client:

1. Disable Automatic DNS from NetworkManager

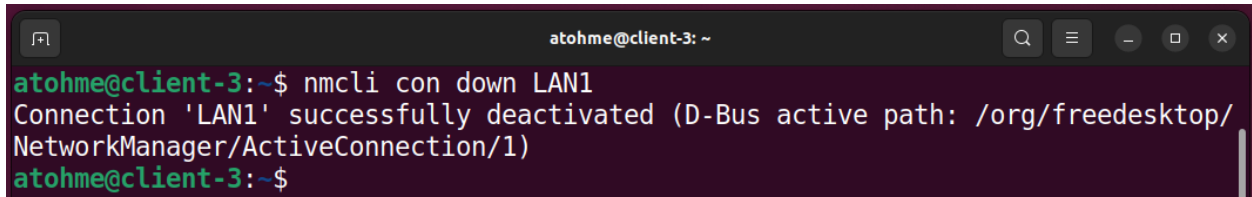
```
nmcli con mod LAN1 ipv4.ignore-auto-dns yes
```

```
nmcli con down LAN1
```

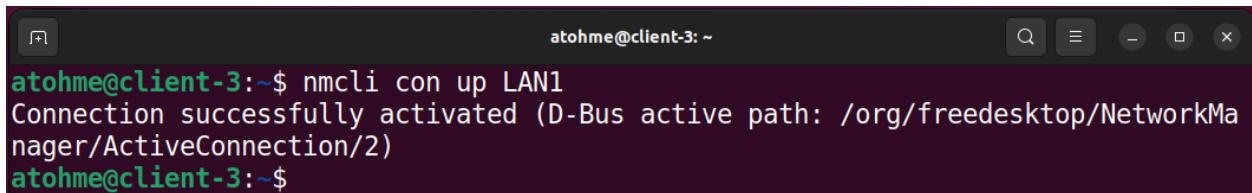
```
nmcli con up LAN1
```



```
atohme@client-3: ~  
atohme@client-3:~$ nmcli con modify LAN1 ipv4.ignore-auto-dns yes  
atohme@client-3:~$
```



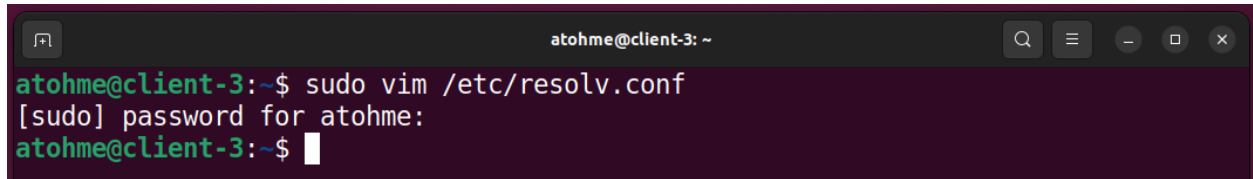
```
atohme@client-3: ~  
atohme@client-3:~$ nmcli con down LAN1  
Connection 'LAN1' successfully deactivated (D-Bus active path: /org/freedesktop/  
NetworkManager/ActiveConnection/1)  
atohme@client-3:~$
```



```
atohme@client-3: ~  
atohme@client-3:~$ nmcli con up LAN1  
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkMa  
nager/ActiveConnection/2)  
atohme@client-3:~$
```

2. Manually Set DNS Servers

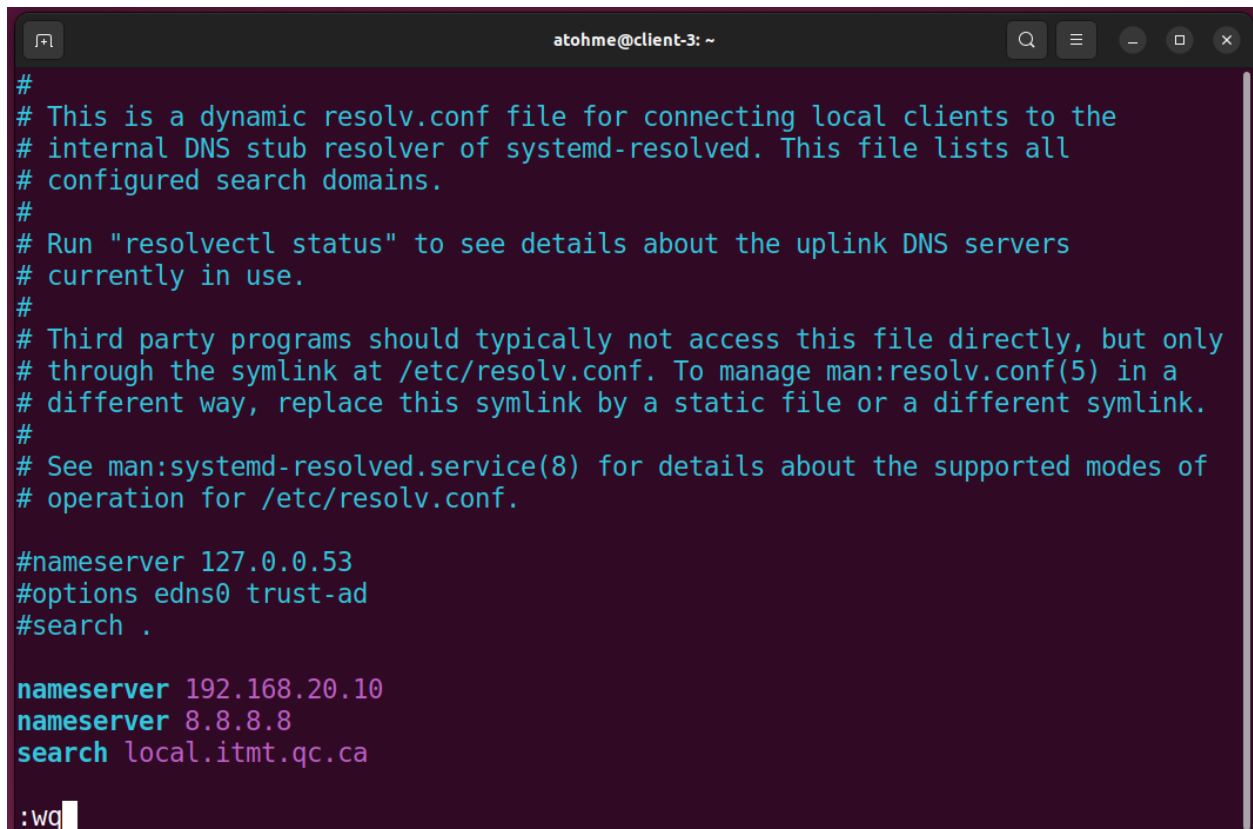
`sudo vim /etc/resolv.conf`

A terminal window titled 'atohme@client-3: ~' with search, menu, and window control icons. The prompt is 'atohme@client-3:~\$'. The user enters 'sudo vim /etc/resolv.conf'. The prompt changes to '[sudo] password for atohme:' and then back to 'atohme@client-3:~\$' after the password is entered.

```
atohme@client-3:~$ sudo vim /etc/resolv.conf
[sudo] password for atohme:
atohme@client-3:~$
```

Add the following:

```
nameserver 192.168.20.10
nameserver 8.8.8.8
search local.itmt.qc.ca
```

A terminal window titled 'atohme@client-3: ~' with search, menu, and window control icons. It displays the contents of the /etc/resolv.conf file. The file contains several comment lines starting with '#', followed by configuration lines for nameservers and search domains. The user has just finished editing the file, as indicated by the ':wq' prompt.

```
#
# This is a dynamic resolv.conf file for connecting local clients to the
# internal DNS stub resolver of systemd-resolved. This file lists all
# configured search domains.
#
# Run "resolvectl status" to see details about the uplink DNS servers
# currently in use.
#
# Third party programs should typically not access this file directly, but only
# through the symlink at /etc/resolv.conf. To manage man:resolv.conf(5) in a
# different way, replace this symlink by a static file or a different symlink.
#
# See man:systemd-resolved.service(8) for details about the supported modes of
# operation for /etc/resolv.conf.

#nameserver 127.0.0.53
#options edns0 trust-ad
#search .

nameserver 192.168.20.10
nameserver 8.8.8.8
search local.itmt.qc.ca

:wq
```

3. Test the DNS Server

Using nslookup:

```
nslookup server-3.local.itmt.qc.ca
```

```
nslookup client-3.local.itmt.qc.ca
```

```
nslookup email-server.local.itmt.qc.ca
```

```
atohme@client-3: ~  
atohme@client-3:~$ nslookup server-3.local.itmt.qc.ca  
Server:      192.168.20.10  
Address:     192.168.20.10#53  
  
Name:   server-3.local.itmt.qc.ca  
Address: 192.168.20.10  
  
atohme@client-3:~$
```

```
atohme@client-3: ~  
atohme@client-3:~$ nslookup client-3.local.itmt.qc.ca  
Server:      192.168.20.10  
Address:     192.168.20.10#53  
  
Name:   client-3.local.itmt.qc.ca  
Address: 192.168.20.20  
  
atohme@client-3:~$
```

```
atohme@client-3: ~  
atohme@client-3:~$ nslookup email-server.local.itmt.qc.ca  
Server:      192.168.20.10  
Address:     192.168.20.10#53  
  
Name:   email-server.local.itmt.qc.ca  
Address: 192.168.20.3  
  
atohme@client-3:~$
```

Using dig:

```
dig server-3.local.itmt.qc.ca
```

```
dig -x 192.168.20.10
```

```
dig local.itmt.qc.ca MX
```

```
atohme@client-3: ~  
atohme@client-3:~$ dig server-3.local.itmt.qc.ca  
  
; <<>> DiG 9.18.30-0ubuntu0.22.04.2-Ubuntu <<>> server-3.local.itmt.qc.ca  
;; global options: +cmd  
;; Got answer:  
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 51282  
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1  
  
;; OPT PSEUDOSECTION:  
; EDNS: version: 0, flags;; udp: 1232  
; COOKIE: 0dd1leeda702c5a90100000067f6e34b6ba5d8e11a6e397a (good)  
;; QUESTION SECTION:  
;server-3.local.itmt.qc.ca.      IN      A  
  
;; ANSWER SECTION:  
server-3.local.itmt.qc.ca. 86400 IN      A      192.168.20.10  
  
;; Query time: 3 msec  
;; SERVER: 192.168.20.10#53(192.168.20.10) (UDP)  
;; WHEN: Wed Apr 09 17:14:51 EDT 2025  
;; MSG SIZE rcvd: 98  
  
atohme@client-3:~$
```

```
atohme@client-3: ~  
atohme@client-3:~$ dig -x 192.168.20.10  
  
; <<>> DiG 9.18.30-0ubuntu0.22.04.2-Ubuntu <<>> -x 192.168.20.10  
;; global options: +cmd  
;; Got answer:  
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 33046  
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1  
  
;; OPT PSEUDOSECTION:  
; EDNS: version: 0, flags;; udp: 1232  
; COOKIE: acb0b05de75fef90100000067f6e377feccc2876effa46f (good)  
;; QUESTION SECTION:  
;10.20.168.192.in-addr.arpa.    IN      PTR  
  
;; ANSWER SECTION:  
10.20.168.192.in-addr.arpa. 86400 IN      PTR      server-3.20.168.192.in-addr.arpa  
.  
  
;; Query time: 4 msec  
;; SERVER: 192.168.20.10#53(192.168.20.10) (UDP)  
;; WHEN: Wed Apr 09 17:15:35 EDT 2025  
;; MSG SIZE rcvd: 106  
  
atohme@client-3:~$
```

```

atohme@client-3: ~
atohme@client-3:~$ dig local.itmt.qc.ca MX

; <<> DiG 9.18.30-0ubuntu0.22.04.2-Ubuntu <<> local.itmt.qc.ca MX
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 29091
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 2

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: c7fbda41ce93c9210100000067f6e39f6a54aeb9c380748a (good)
;; QUESTION SECTION:
;local.itmt.qc.ca.                IN      MX

;; ANSWER SECTION:
local.itmt.qc.ca.                86400   IN      MX      20 email-server.local.itmt.qc.ca.

;; ADDITIONAL SECTION:
email-server.local.itmt.qc.ca. 86400   IN      A        192.168.20.3

;; Query time: 2 msec
;; SERVER: 192.168.20.10#53(192.168.20.10) (UDP)
;; WHEN: Wed Apr 09 17:16:15 EDT 2025
;; MSG SIZE rcvd: 118

atohme@client-3:~$

```

Using host:

host -l local.itmt.qc.ca

```

atohme@client-3: ~
atohme@client-3:~$ host -l local.itmt.qc.ca
local.itmt.qc.ca name server server-3.local.itmt.qc.ca.
client-3.local.itmt.qc.ca has address 192.168.20.20
email-server.local.itmt.qc.ca has address 192.168.20.3
server-3.local.itmt.qc.ca has address 192.168.20.10
web-server.local.itmt.qc.ca has address 192.168.20.2
atohme@client-3:~$

```

Using ping:

ping server-3.local.itmt.qc.ca and client-3.local.itmt.qc.ca

```
atohme@client-3: ~  
atohme@client-3:~$ ping server-3.local.itmt.qc.ca  
PING server-3.local.itmt.qc.ca (192.168.20.10) 56(84) bytes of data.  
64 bytes from server-3.20.168.192.in-addr.arpa (192.168.20.10): icmp_seq=1 ttl=6  
4 time=1.43 ms  
64 bytes from server-3.20.168.192.in-addr.arpa (192.168.20.10): icmp_seq=2 ttl=6  
4 time=1.40 ms  
64 bytes from server-3.20.168.192.in-addr.arpa (192.168.20.10): icmp_seq=3 ttl=6  
4 time=1.38 ms  
^C  
--- server-3.local.itmt.qc.ca ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2004ms  
rtt min/avg/max/mdev = 1.379/1.403/1.429/0.020 ms  
atohme@client-3:~$
```

```
atohme@client-3: ~  
atohme@client-3:~$ ping client-3.local.itmt.qc.ca  
PING client-3.local.itmt.qc.ca (192.168.20.20) 56(84) bytes of data.  
64 bytes from client-3.20.168.192.in-addr.arpa (192.168.20.20): icmp_seq=1 ttl=6  
4 time=0.025 ms  
64 bytes from client-3.20.168.192.in-addr.arpa (192.168.20.20): icmp_seq=2 ttl=6  
4 time=0.048 ms  
64 bytes from client-3.20.168.192.in-addr.arpa (192.168.20.20): icmp_seq=3 ttl=6  
4 time=0.048 ms  
^C  
--- client-3.local.itmt.qc.ca ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2005ms  
rtt min/avg/max/mdev = 0.025/0.040/0.048/0.010 ms  
atohme@client-3:~$
```

Part 2:

DHCP Server Configuration (AlmaLinux & Ubuntu)

On AlmaLinux Server:

1. Install the DHCP Server

```
dnf -y install dhcp-server
```

```
[root@server-3 ~]# dnf -y install dhcp-server
Last metadata expiration check: 21:23:00 ago on Wed Apr  9 16:55:11 2025.
Dependencies resolved.
=====
Package                                Architecture      Version           Repository        Size
=====
Installing:
dhcp-server                            x86_64            12:4.4.2-19.b1.el9    baseos            1.2 M
Installing dependencies:
dhcp-common                            noarch            12:4.4.2-19.b1.el9    baseos            128 k
=====
Transaction Summary
=====
Install 2 Packages

Total download size: 1.3 M
Installed size: 4.2 M

Installed:
  dhcp-common-12:4.4.2-19.b1.el9.noarch      dhcp-server-12:4.4.2-19.b1.el9.x86_64

Complete!
[root@server-3 ~]#
```

2. Configure the DHCP Server

Edit the DHCP configuration file:

```
vim /etc/dhcp/dhcpd.conf
```

```
root@server-3:/
[root@server-3 /]# vim /etc/dhcp/dhcpd.conf
[root@server-3 /]#
```

Add the following configuration to define the IP address range and options:

```
subnet 192.168.20.0 netmask 255.255.255.0 {
    range dynamic-bootp 192.168.20.200 192.168.20.220;
    option routers 192.168.20.10;
    option domain-name-servers 192.168.20.10;
    option domain-name-servers 8.8.8.8;
    option domain-name "local.itmt.qc.ca";
    option broadcast-address 192.168.20.255;
    default-lease-time 86400;
```

```
max-lease-time 86400;
}
```

```
root@server-3:/ # DHCP Server Configuration file.
# see /usr/share/doc/dhcp-server/dhcpd.conf.example
# see dhcpd.conf(5) man page
#
subnet 192.168.20.0 netmask 255.255.255.0 {
    range dynamic-bootp 192.168.20.200 192.168.20.220;
    option routers 192.168.20.10;
    option domain-name-servers 192.168.20.10;
    option domain-name-servers 8.8.8.8;
    option domain-name "local.itmt.qc.ca";
    option broadcast-address 192.168.20.255;
    default-lease-time 86400;
    max-lease-time 86400;
}

~
~
~
~
~
~
~
~
~
~
~
~
~

"/etc/dhcp/dhcpd.conf" 16L, 473B
```

3. Check Configuration Syntax

```
dhcpcd -cf /etc/dhcp/dhpcd.conf
```

```
root@server-3:/  
[root@server-3 /]# dhcpd -cf /etc/dhcp/dhcpd.conf  
Internet Systems Consortium DHCP Server 4.4.2b1  
Copyright 2004-2019 Internet Systems Consortium.  
All rights reserved.  
For info, please visit https://www.isc.org/software/dhcp/  
ldap_gssapi_principal is not set,GSSAPI Authentication for LDAP will not be used  
Not searching LDAP since ldap-server, ldap-port and ldap-base-dn were not specified in the config file  
Config file: /etc/dhcp/dhcpd.conf  
Database file: /var/lib/dhcpd/dhcpd.leases  
PID file: /var/run/dhcpd.pid  
Source compiled to use binary-leases  
Wrote 0 leases to leases file.  
Listening on LPF/ens192/00:0c:29:40:97:d2/192.168.20.0/24  
Sending on   LPF/ens192/00:0c:29:40:97:d2/192.168.20.0/24  
  
No subnet declaration for ens160 (192.168.19.136).  
** Ignoring requests on ens160.  If this is not what  
you want, please write a subnet declaration  
in your dhcpd.conf file for the network segment  
to which interface ens160 is attached. **  
  
Sending on   Socket/fallback/fallback-net  
[root@server-3 /]#
```

4. Enable and Start the DHCP Service

```
systemctl enable --now dhcpd
```

```
systemctl status dhcpd
```

```
root@server-3: /  
[root@server-3 /]# systemctl enable --now dhcpd  
Created symlink /etc/systemd/system/multi-user.target.wants/dhcpd.service → /usr/lib/systemd/system/dhcpd.service.  
[root@server-3 /]#
```

```
root@server-3: /  
[root@server-3 /]# systemctl status dhcpd  
● dhcpd.service - DHCPv4 Server Daemon  
   Loaded: loaded (/usr/lib/systemd/system/dhcpd.service; enabled; preset: disabled)  
   Active: active (running) since Thu 2025-04-10 14:25:52 EDT; 2min 31s ago  
     Docs: man:dhcpd(8)  
           man:dhcpd.conf(5)  
   Main PID: 1764 (dhcpd)  
    Status: "Dispatching packets..."  
     Tasks: 1 (limit: 10852)  
    Memory: 4.5M  
       CPU: 29ms  
   CGroup: /system.slice/dhcpd.service  
           └─1764 /usr/sbin/dhcpd -f -cf /etc/dhcp/dhcpd.conf -user dhcpd -group dhcpd --no-pid  
  
Apr 10 14:25:52 server-3 dhcpd[1764]:  
Apr 10 14:25:52 server-3 dhcpd[1764]: No subnet declaration for ens160 (192.168.19.136).  
Apr 10 14:25:52 server-3 dhcpd[1764]: ** Ignoring requests on ens160. If this is not what  
Apr 10 14:25:52 server-3 dhcpd[1764]: you want, please write a subnet declaration  
Apr 10 14:25:52 server-3 dhcpd[1764]: in your dhcpd.conf file for the network segment  
Apr 10 14:25:52 server-3 dhcpd[1764]: to which interface ens160 is attached. **  
Apr 10 14:25:52 server-3 dhcpd[1764]:  
Apr 10 14:25:52 server-3 dhcpd[1764]: Sending on Socket/fallback/fallback-net  
Apr 10 14:25:52 server-3 dhcpd[1764]: Server starting service.  
Apr 10 14:25:52 server-3 systemd[1]: Started DHCPv4 Server Daemon.  
[root@server-3 /]#
```

On Ubuntu Client:

5. Configure the Network to Use DHCP

```
nmcli con mod LAN1 ipv4.method auto
```

```
nmcli con down LAN1
```

```
nmcli con up LAN1
```

```
atohme@client-3: ~  
atohme@client-3:~$ nmcli con mod LAN1 ipv4.method auto  
atohme@client-3:~$
```

```
atohme@client-3:~$ nmcli con down LAN1  
Connection 'LAN1' successfully deactivated (D-Bus active path: /org/freedesktop/  
NetworkManager/ActiveConnection/1)  
atohme@client-3:~$
```

```
atohme@client-3: ~  
atohme@client-3:~$ nmcli con up LAN1  
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkMa  
nager/ActiveConnection/2)  
atohme@client-3:~$
```


After changing the network connection from static to automatic you need to redo steps 1 and 2 of “DNS Client Configuration on Ubuntu” from Part 1

6. Verify DHCP Lease

Run the following to confirm the client received an IP address:

nmcli

```
atohme@client-3:~$ nmcli
ens33: connected to LAN1
    "Intel 82545EM"
    ethernet (e1000), 00:0C:29:64:E9:AB, hw, mtu 1500
    ip4 default
    inet4 192.168.20.200/24
    inet4 192.168.20.20/24
    route4 192.168.20.0/24 metric 100
    route4 192.168.20.0/24 metric 100
    route4 169.254.0.0/16 metric 1000
    route4 default via 192.168.20.10 metric 100
    inet6 fe80::cb2:7f19:6bb3:276d/64
    route6 fe80::/64 metric 1024

lo: unmanaged
    "lo"
    loopback (unknown), 00:00:00:00:00:00, sw, mtu 65536

DNS configuration:
    servers: 8.8.8.8
    interface: ens33

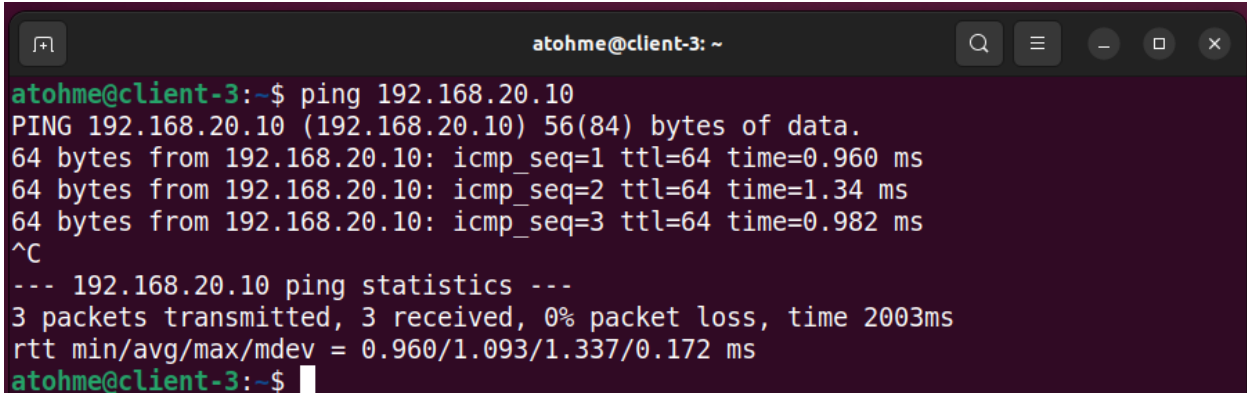
Use "nmcli device show" to get complete information about known devices and
"nmcli connection show" to get an overview on active connection profiles.
lines 1-23...skipping...
```

7. Test Connectivity

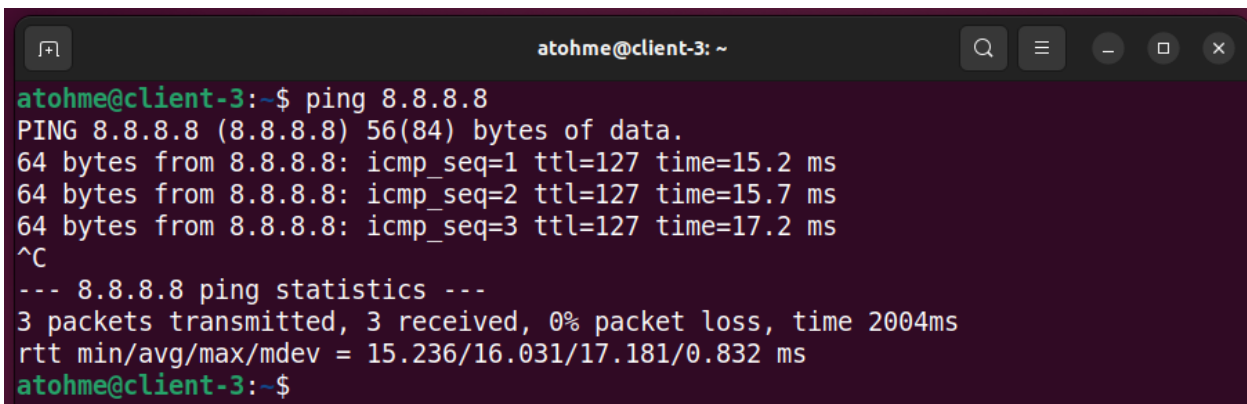
ping 192.168.20.10

ping 8.8.8.8

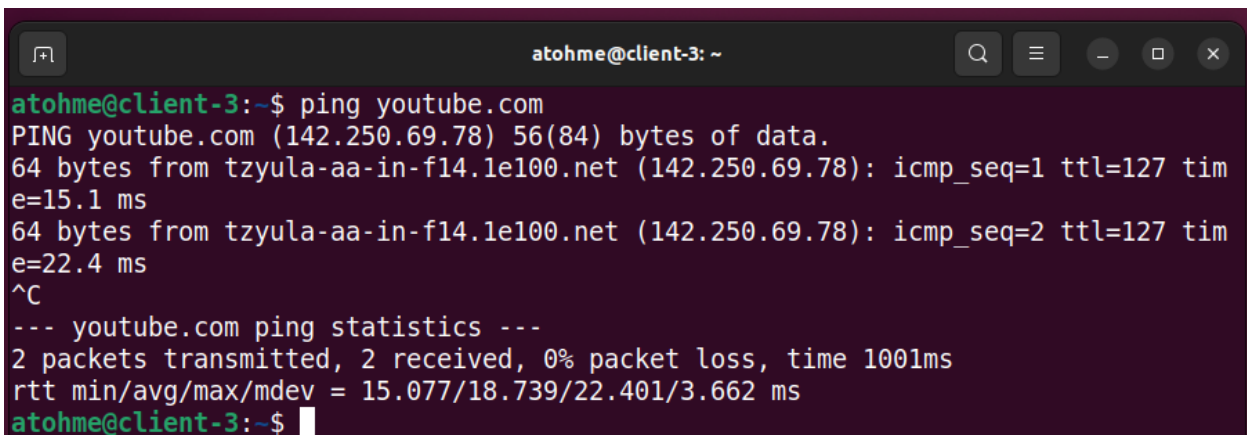
ping youtube.com

A terminal window titled 'atohme@client-3: ~' with standard window controls. The user has entered 'ping 192.168.20.10'. The output shows three successful pings with times around 1ms. After pressing Ctrl-C, it displays ping statistics: 3 packets transmitted, 3 received, 0% packet loss, and an average round-trip time of approximately 1ms.

```
atohme@client-3:~$ ping 192.168.20.10
PING 192.168.20.10 (192.168.20.10) 56(84) bytes of data.
64 bytes from 192.168.20.10: icmp_seq=1 ttl=64 time=0.960 ms
64 bytes from 192.168.20.10: icmp_seq=2 ttl=64 time=1.34 ms
64 bytes from 192.168.20.10: icmp_seq=3 ttl=64 time=0.982 ms
^C
--- 192.168.20.10 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 0.960/1.093/1.337/0.172 ms
atohme@client-3:~$
```

A terminal window titled 'atohme@client-3: ~' with standard window controls. The user has entered 'ping 8.8.8.8'. The output shows three successful pings with times around 15-17ms. After pressing Ctrl-C, it displays ping statistics: 3 packets transmitted, 3 received, 0% packet loss, and an average round-trip time of approximately 16ms.

```
atohme@client-3:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=127 time=15.2 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=127 time=15.7 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=127 time=17.2 ms
^C
--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 15.236/16.031/17.181/0.832 ms
atohme@client-3:~$
```

A terminal window titled 'atohme@client-3: ~' with standard window controls. The user has entered 'ping youtube.com'. The output shows two successful pings with times around 15-22ms. After pressing Ctrl-C, it displays ping statistics: 2 packets transmitted, 2 received, 0% packet loss, and an average round-trip time of approximately 18ms.

```
atohme@client-3:~$ ping youtube.com
PING youtube.com (142.250.69.78) 56(84) bytes of data.
64 bytes from tzyula-aa-in-f14.1e100.net (142.250.69.78): icmp_seq=1 ttl=127 time=15.1 ms
64 bytes from tzyula-aa-in-f14.1e100.net (142.250.69.78): icmp_seq=2 ttl=127 time=22.4 ms
^C
--- youtube.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 15.077/18.739/22.401/3.662 ms
atohme@client-3:~$
```

On AlmaLinux Server:

8. Check Active DHCP Leases

```
cat /var/lib/dhcpd/dhcpd.leases
```

```
root@server-3:/
[root@server-3 /]# cat /var/lib/dhcpd/dhcpd.leases
# The format of this file is documented in the dhcpd.leases(5) manual page.
# This lease file was written by isc-dhcp-4.4.2b1

# authoring-byte-order entry is generated, DO NOT DELETE
authoring-byte-order little-endian;

server-uid "\000\001\000\001\212\311?\000\014)\227\322";

lease 192.168.20.200 {
  starts 4 2025/04/10 18:30:28;
  ends 5 2025/04/11 18:30:28;
  cltt 4 2025/04/10 18:30:28;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 00:0c:29:64:e9:ab;
  uid "\001\000\014)d\351\253";
  client-hostname "client-3";
}
[root@server-3 /]#
```

Part 3:

FTP Server Configuration with vsftpd (AlmaLinux & Ubuntu)

On AlmaLinux Server:

1. Install the FTP Server

```
dnf install -y vsftpd
```

```
[root@server-3 /]# dnf install -y vsftpd
Last metadata expiration check: 1:37:54 ago on Thu Apr 10 15:00:43 2025.
Dependencies resolved.
=====
Package                Architecture      Version           Repository        Size
=====
Installing:
vsftpd                  x86_64            3.0.5-6.el9      appstream         157 k
Transaction Summary
=====
Install 1 Package

Total download size: 157 k
Installed size: 347 k
Downloading Packages:
vsftpd-3.0.5-6.el9.x86_64.rpm                                966 kB/s | 157 kB  00:00
-----
Total                                                    337 kB/s | 157 kB  00:00
Running transaction check
```

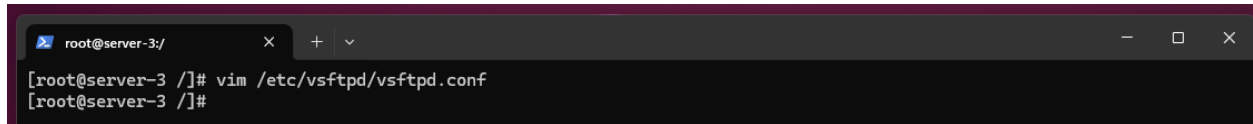
```
Installed:
vsftpd-3.0.5-6.el9.x86_64

Complete!
[root@server-3 /]#
```

2. Configure vsftpd for Anonymous Access

Edit the configuration file:

```
vim /etc/vsftpd/vsftpd.conf
```

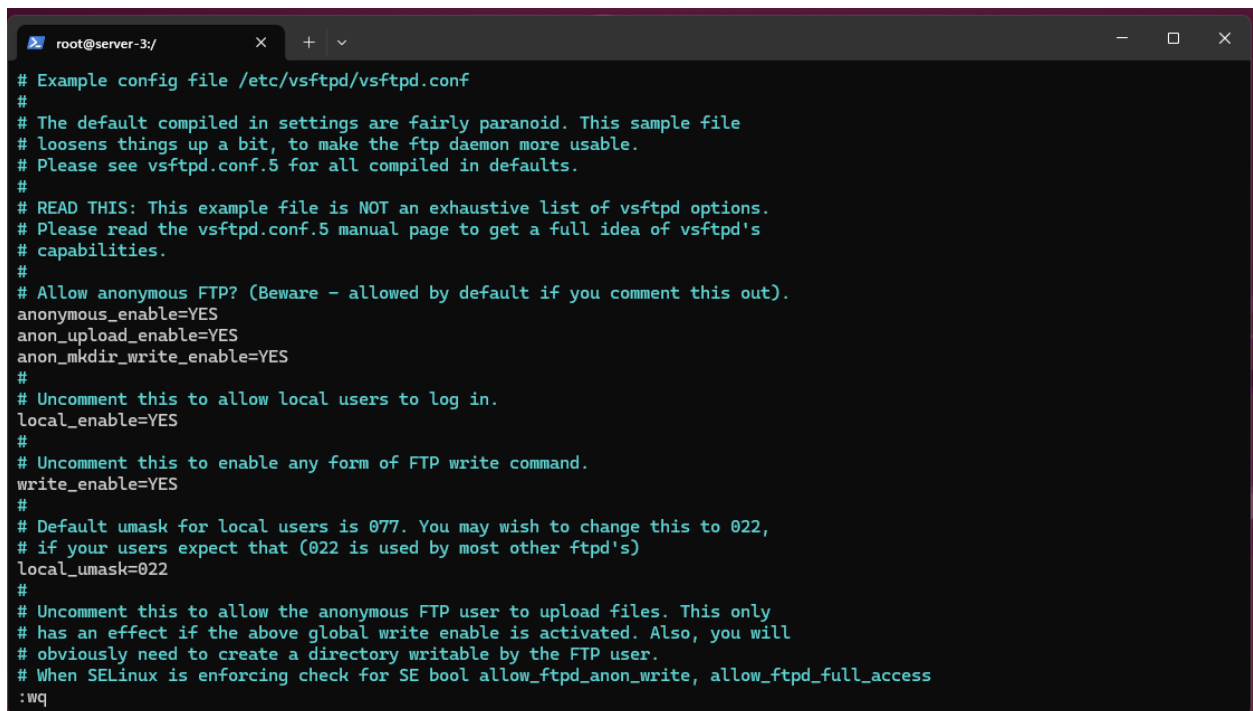


```
root@server-3/ x + v
[root@server-3 /]# vim /etc/vsftpd/vsftpd.conf
[root@server-3 /]#
```

Make the following changes:

```
anonymous_enable=YES
anon_upload_enable=YES
anon_mkdir_write_enable=YES
local_enable=YES
write_enable=YES
local_umask=022
```

Save the file and exit vim.



```
root@server-3/ x + v
# Example config file /etc/vsftpd/vsftpd.conf
#
# The default compiled in settings are fairly paranoid. This sample file
# loosens things up a bit, to make the ftp daemon more usable.
# Please see vsftpd.conf.5 for all compiled in defaults.
#
# READ THIS: This example file is NOT an exhaustive list of vsftpd options.
# Please read the vsftpd.conf.5 manual page to get a full idea of vsftpd's
# capabilities.
#
# Allow anonymous FTP? (Beware - allowed by default if you comment this out).
anonymous_enable=YES
anon_upload_enable=YES
anon_mkdir_write_enable=YES
#
# Uncomment this to allow local users to log in.
local_enable=YES
#
# Uncomment this to enable any form of FTP write command.
write_enable=YES
#
# Default umask for local users is 077. You may wish to change this to 022,
# if your users expect that (022 is used by most other ftpd's)
local_umask=022
#
# Uncomment this to allow the anonymous FTP user to upload files. This only
# has an effect if the above global write enable is activated. Also, you will
# obviously need to create a directory writable by the FTP user.
# When SELinux is enforcing check for SE bool allow_ftp_anon_write, allow_ftp_full_access
:wq
```

3. Configure the Firewall for FTP Access

```
root@server-3:/  
[root@server-3 /]# firewall-cmd --list-services --zone=nm-shared  
dhcp dns mountd nfs rpc-bind samba ssh  
[root@server-3 /]#
```

```
firewall-cmd --permanent --add-service=ftp --zone=nm-shared
```

```
firewall-cmd --reload
```

```
firewall-cmd --list-services --zone=nm-shared
```

```
root@server-3:/  
[root@server-3 /]# firewall-cmd --permanent --add-service=ftp --zone=nm-shared  
success  
[root@server-3 /]#
```

```
root@server-3:/  
[root@server-3 /]# firewall-cmd --reload  
success  
[root@server-3 /]#
```

```
root@server-3:/  
[root@server-3 /]# firewall-cmd --list-services --zone=nm-shared  
dhcp dns ftp mountd nfs rpc-bind samba ssh  
[root@server-3 /]#
```

4. Set Correct Ownership for the FTP Public Directory

```
chown -R ftp /var/ftp/pub
```

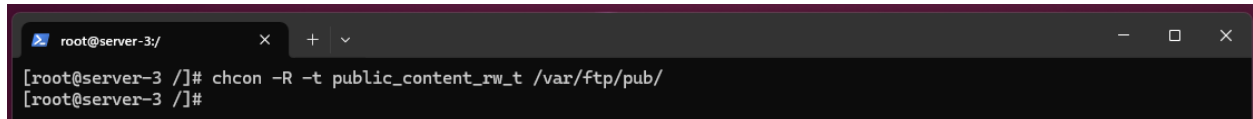
```
root@server-3:/  
[root@server-3 /]# ll /var/ftp  
total 0  
drwxr-xr-x. 2 root root 6 Oct 2 2024 pub  
[root@server-3 /]#
```

```
root@server-3:/  
[root@server-3 /]# chown -R ftp /var/ftp/pub  
[root@server-3 /]#
```

```
root@server-3:/  
[root@server-3 /]# ll /var/ftp  
total 0  
drwxr-xr-x. 2 ftp root 6 Oct 2 2024 pub  
[root@server-3 /]#
```

5. Set SELinux Permissions to Allow Uploads

```
chcon -R -t public_content_rw_t /var/ftp/pub
```

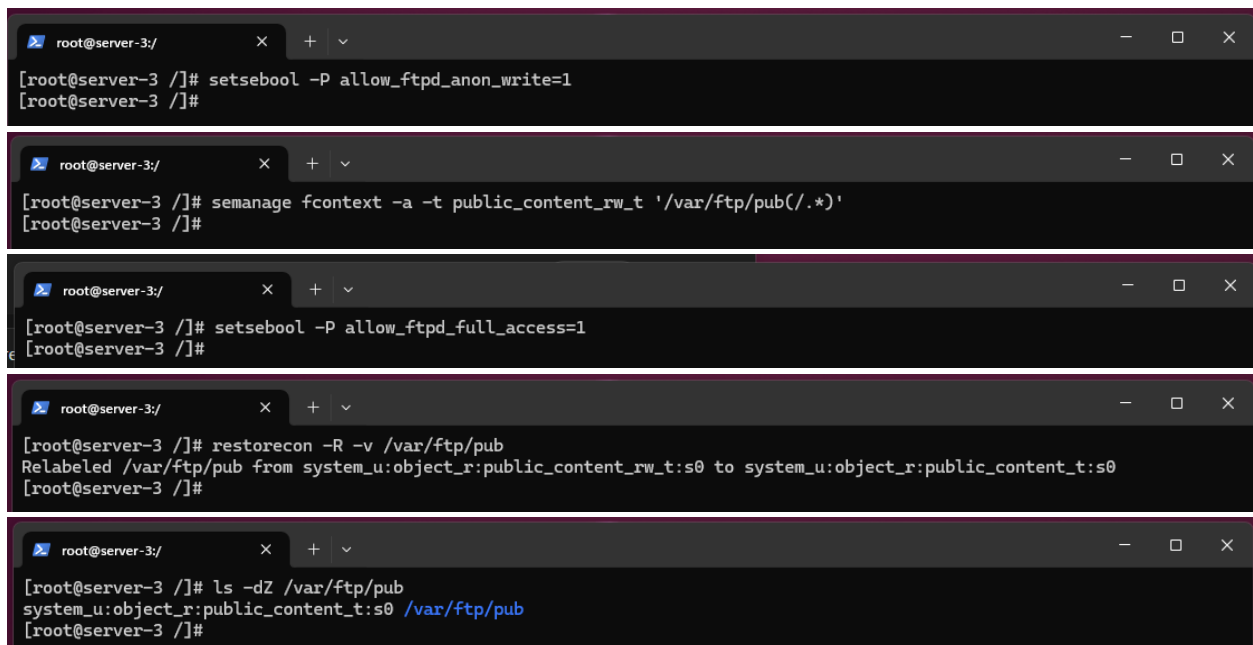


```
root@server-3:/  
[root@server-3 /]# chcon -R -t public_content_rw_t /var/ftp/pub/  
[root@server-3 /]#
```

6. Allow Anonymous Uploads

##setenforce 0 ## Note: This disables SELinux enforcement temporarily. Use cautiously.

```
setsebool -P allow_ftpd_anon_write=1  
setsebool -P allow_ftpd_full_access=1  
semanage fcontext -a -t public_content_rw_t '/var/ftp/pub(/.*)'  
restorecon -R -v /var/ftp/pub  
ls -dZ /var/ftp/pub
```



```
root@server-3:/  
[root@server-3 /]# setsebool -P allow_ftpd_anon_write=1  
[root@server-3 /]#  
  
root@server-3:/  
[root@server-3 /]# semanage fcontext -a -t public_content_rw_t '/var/ftp/pub(/.*)'  
[root@server-3 /]#  
  
root@server-3:/  
[root@server-3 /]# setsebool -P allow_ftpd_full_access=1  
[root@server-3 /]#  
  
root@server-3:/  
[root@server-3 /]# restorecon -R -v /var/ftp/pub  
Relabeled /var/ftp/pub from system_u:object_r:public_content_rw_t:s0 to system_u:object_r:public_content_t:s0  
[root@server-3 /]#  
  
root@server-3:/  
[root@server-3 /]# ls -dZ /var/ftp/pub  
system_u:object_r:public_content_t:s0 /var/ftp/pub  
[root@server-3 /]#
```

7. Enable and Start the FTP Service

`systemctl enable --now vsftpd`

`systemctl status vsftpd`

```
root@server-3:/  
[root@server-3 /]# systemctl enable --now vsftpd  
Created symlink /etc/systemd/system/multi-user.target.wants/vsftpd.service → /usr/lib/systemd/system/vsftpd.service.  
[root@server-3 /]#
```

```
root@server-3:/  
[root@server-3 /]# systemctl status vsftpd  
● vsftpd.service - Vsftpd ftp daemon  
   Loaded: loaded (/usr/lib/systemd/system/vsftpd.service; enabled; preset: disabled)  
   Active: active (running) since Thu 2025-04-10 16:58:12 EDT; 25s ago  
 Process: 2432 ExecStart=/usr/sbin/vsftpd /etc/vsftpd/vsftpd.conf (code=exited, status=0/SUCCESS)  
 Main PID: 2433 (vsftpd)  
    Tasks: 1 (limit: 10852)  
  Memory: 712.0K  
     CPU: 12ms  
   CGroup: /system.slice/vsftpd.service  
           └─2433 /usr/sbin/vsftpd /etc/vsftpd/vsftpd.conf  
  
Apr 10 16:58:12 server-3 systemd[1]: Starting Vsftpd ftp daemon...  
Apr 10 16:58:12 server-3 systemd[1]: Started Vsftpd ftp daemon.  
[root@server-3 /]#
```

On Ubuntu Client:

8. Create a Test File for Upload

`touch test_ftp_1.txt`

```
atohme@client-3: ~  
atohme@client-3:~$ touch test_ftp_1.txt  
atohme@client-3:~$
```

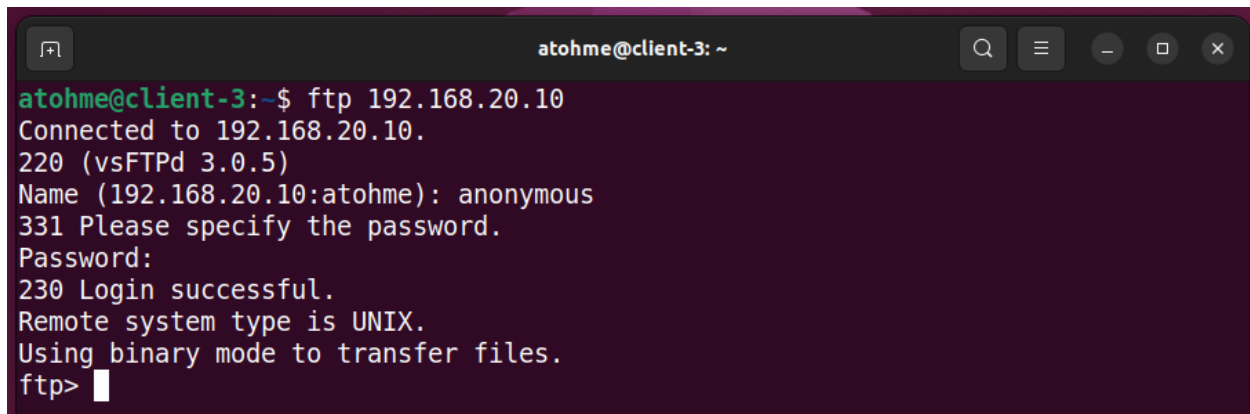
```
atohme@client-3:~$ pwd  
/home/atohme  
atohme@client-3:~$ ls -l test_ft*  
-rw-rw-r-- 1 atohme atohme 0 Apr 10 17:00 test_ftp_1.txt  
atohme@client-3:~$
```

9. Connect to the FTP Server Anonymously

ftp 192.168.20.10

At the Name: prompt, enter:

anonymous

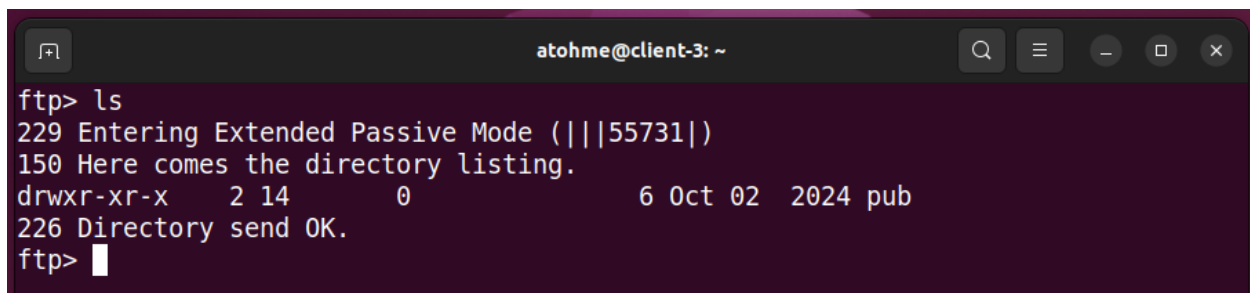
A terminal window titled 'atohme@client-3: ~' with standard window controls. The text inside shows the execution of the 'ftp 192.168.20.10' command. The output includes connection status, version (220 vsFTPd 3.0.5), a name prompt (Name (192.168.20.10:atohme): anonymous), a password prompt (331 Please specify the password.), a successful login (230 Login successful.), remote system type (Remote system type is UNIX.), and transfer mode (Using binary mode to transfer files.). The prompt 'ftp>' is shown at the end.

```
atohme@client-3:~$ ftp 192.168.20.10
Connected to 192.168.20.10.
220 (vsFTPd 3.0.5)
Name (192.168.20.10:atohme): anonymous
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp>
```

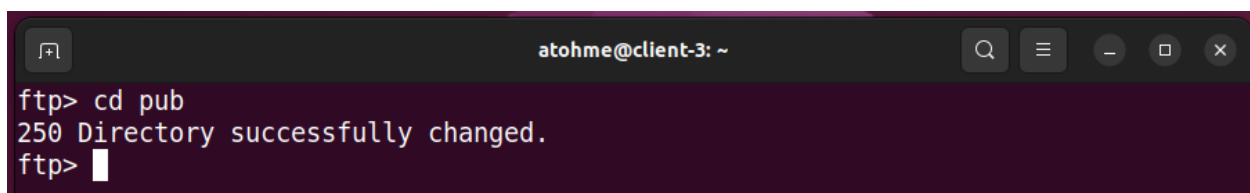
10. Upload the Test File

Use these FTP commands after connecting:

```
ls
cd pub
put test_ftp_1.txt
ls
```

A terminal window titled 'atohme@client-3: ~' showing the output of the 'ls' command in an FTP session. The output includes '229 Entering Extended Passive Mode (|||55731|)', '150 Here comes the directory listing.', and a directory listing for 'pub' with permissions 'drwxr-xr-x', size '214', owner '0', date '6 Oct 02 2024', and name 'pub'. The prompt 'ftp>' is shown at the end.

```
ftp> ls
229 Entering Extended Passive Mode (|||55731|)
150 Here comes the directory listing.
drwxr-xr-x  214      0          6 Oct 02  2024 pub
226 Directory send OK.
ftp>
```

A terminal window titled 'atohme@client-3: ~' showing the output of the 'cd pub' command in an FTP session. The output is '250 Directory successfully changed.' and the prompt 'ftp>' is shown at the end.

```
ftp> cd pub
250 Directory successfully changed.
ftp>
```



```
atohme@client-3: ~  
ftp> put test_ftp_1.txt  
local: test_ftp_1.txt remote: test_ftp_1.txt  
229 Entering Extended Passive Mode (|||47684|)  
150 Ok to send data.  
0 0.00 KiB/s  
226 Transfer complete.  
ftp>
```

```
atohme@client-3: ~  
ftp> ls  
229 Entering Extended Passive Mode (|||42274|)  
150 Here comes the directory listing.  
-rw----- 1 14 50 0 Apr 10 21:23 test_ftp_1.txt  
-rw----- 1 14 50 0 Apr 10 21:08 test_ftp_2.txt  
226 Directory send OK.  
ftp> █
```

On AlmaLinux Server:

11. Verify the File Was Uploaded

```
cd /var/ftp/pub  
ll
```

```
root@server-3: /var/ftp/pub  
[root@server-3 /]# cd /var/ftp/pub/  
[root@server-3 pub]# ll  
total 0  
-rw-----. 1 ftp ftp 0 Apr 10 17:23 test_ftp_1.txt  
-rw-----. 1 ftp ftp 0 Apr 10 17:08 test_ftp_2.txt  
[root@server-3 pub]#
```

You should see test_ftp_1.txt (and other files you added) listed.

12. Verify FTP Server Is Listening

Install net-tools if required

```
[root@server-3 pub]# dnf install net-tools -y
Last metadata expiration check: 2:28:59 ago on Thu Apr 10 15:00:43 2025.
Dependencies resolved.
=====
Package                        Architecture      Version           Repository        Size
=====
Installing:
net-tools                      x86_64            2.0-0.64.20160912git.el9    baseos            294 k
Transaction Summary
=====
Install 1 Package

Total download size: 294 k

Installing:
net-tools                      x86_64            2.0-0.64.20160912git.el9    baseos            294 k
Transaction Summary
=====
Install 1 Package

Total download size: 294 k
Installed size: 906 k
Downloading Packages:
net-tools-2.0-0.64.20160912git.el9.x86_64.rpm                1.4 MB/s | 294 kB    00:00
-----
Total                                                    504 kB/s | 294 kB    00:00
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing      :                                1/1
  Installing     : net-tools-2.0-0.64.20160912git.el9.x86_64 1/1
  Running scriptlet: net-tools-2.0-0.64.20160912git.el9.x86_64 1/1
  Verifying      : net-tools-2.0-0.64.20160912git.el9.x86_64 1/1

Installed:
net-tools-2.0-0.64.20160912git.el9.x86_64

Complete!
[root@server-3 pub]#
```

netstat -tunap | grep ftp

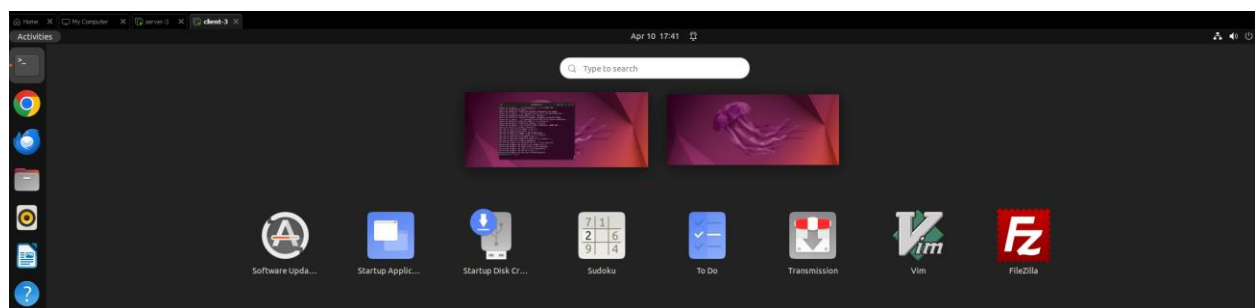
```
root@server-3:/var/ftp/pub  X  +  v  -  □  X
[root@server-3 pub]# netstat -tunap | grep ftp
tcp6      0      0 :::21                :::*                  LISTEN      2533/vsftpd
[root@server-3 pub]#
```

On Ubuntu Client:

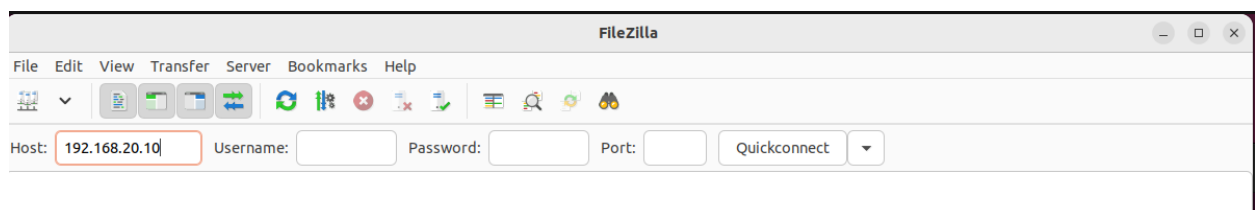
13. Test with FileZilla

1. Open FileZilla on the Ubuntu client (install via 'sudo apt install filezilla -y' if needed).

```
atohme@client-3:~$ sudo apt install filezilla -y
[sudo] password for atohme:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  atohme@client-3:~$
Preparing to unpack .../6-filezilla_3.58.0-1ubuntu0.1_amd64.deb ...
Unpacking filezilla (3.58.0-1ubuntu0.1) ...
Setting up libfilezilla-common (0.36.0-2) ...
Setting up libpugixmlv5:amd64 (1.12.1-1) ...
Setting up filezilla-common (3.58.0-1ubuntu0.1) ...
Setting up libwxbase3.0-0v5:amd64 (3.0.5.1+dfsg-4) ...
Setting up libfilezilla24:amd64 (0.36.0-2) ...
Setting up libwxgtk3.0-gtk3-0v5:amd64 (3.0.5.1+dfsg-4) ...
Setting up filezilla (3.58.0-1ubuntu0.1) ...
Processing triggers for desktop-file-utils (0.26-1ubuntu3) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for gnome-menus (3.36.0-1ubuntu3) ...
Processing triggers for libc-bin (2.35-0ubuntu3.9) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for mailcap (3.70+nmu1ubuntu1) ...
atohme@client-3:~$
```

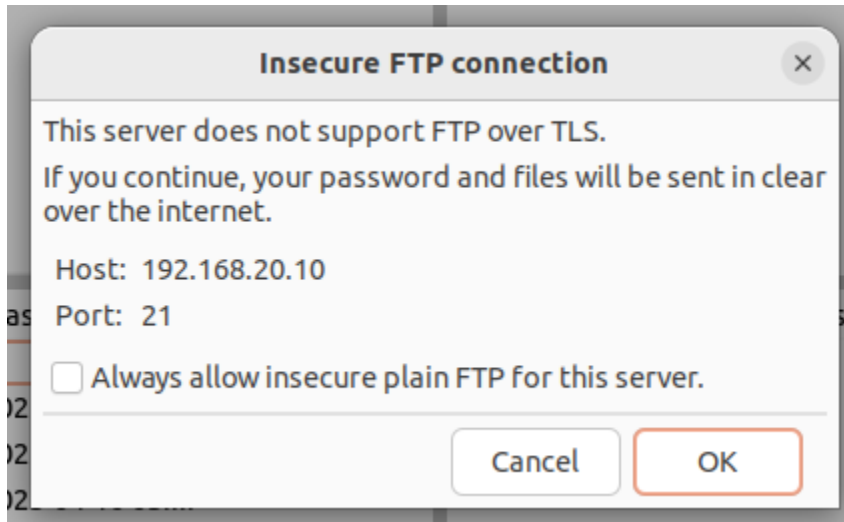


2. In the **Host** field, enter: 192.168.20.10

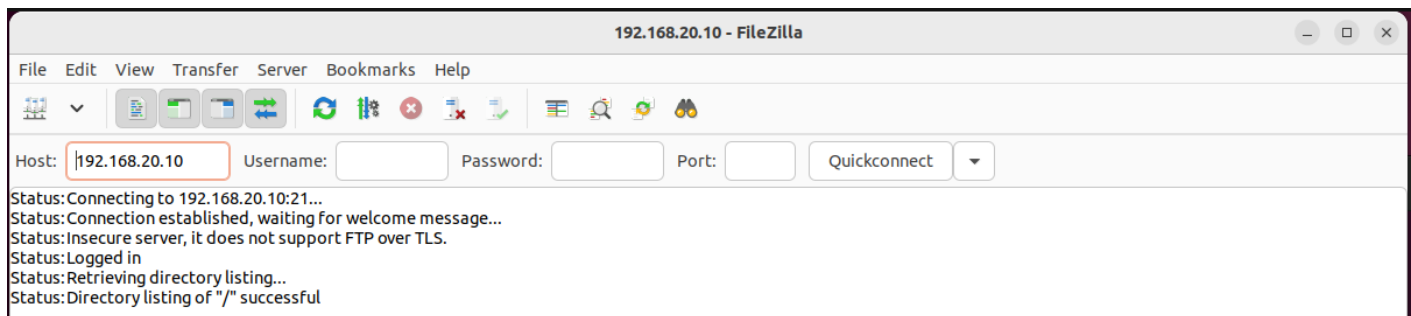


3. Click **Quickconnect** → then press enter

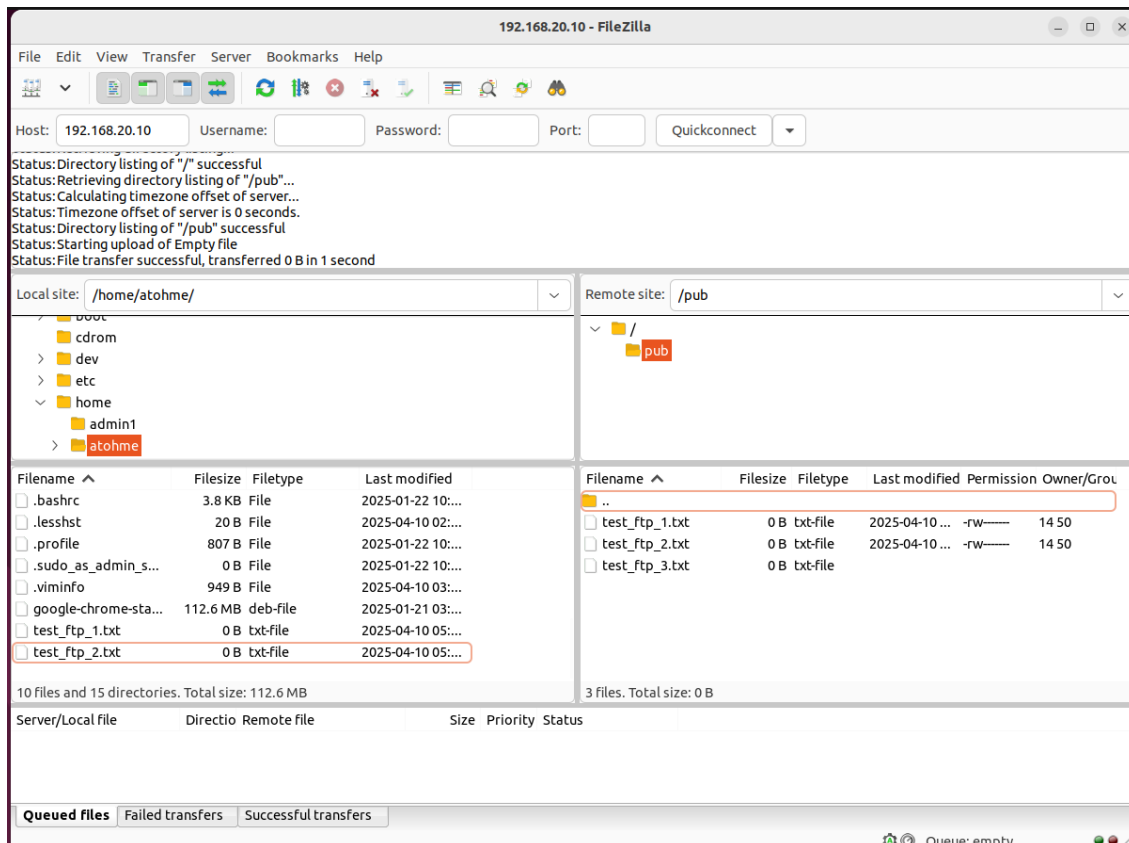
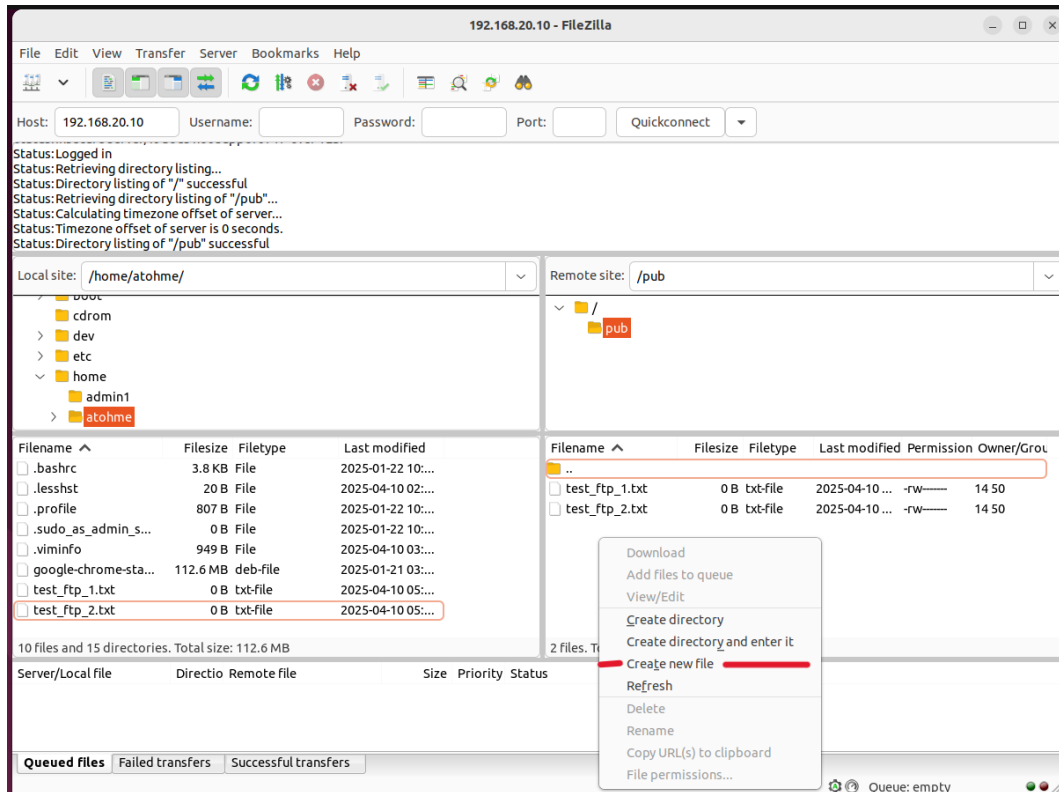
When prompted answer **yes**



4. You should see a successful connection in the status window.

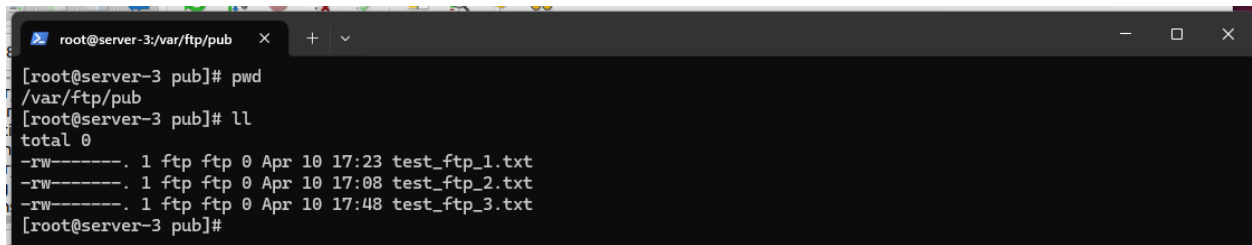


5. Create a new file on the server using FileZilla from the client



On AlmaLinux Server:

14. Verify the changes on the Server

A terminal window titled 'root@server-3:/var/ftp/pub' with standard window controls. The terminal shows the following commands and output:

```
[root@server-3 pub]# pwd
/var/ftp/pub
[root@server-3 pub]# ll
total 0
-rw-----. 1 ftp ftp 0 Apr 10 17:23 test_ftp_1.txt
-rw-----. 1 ftp ftp 0 Apr 10 17:08 test_ftp_2.txt
-rw-----. 1 ftp ftp 0 Apr 10 17:48 test_ftp_3.txt
[root@server-3 pub]#
```

Conclusion

This lab gave us valuable, hands-on experience with deploying and validating core network services in a Linux environment. By setting up DNS with BIND, configuring DHCP for dynamic IP management, and enabling FTP for anonymous file sharing, we've reinforced key administrative tasks that are critical in real-world IT infrastructures.

More than just completing a checklist of tasks, this assignment helped build practical skills that are directly relevant to roles in system and network administration. These exercises also align closely with the requirements of certifications like **CompTIA Linux+** and **RHCSA**, making this lab an important step toward becoming a confident, job-ready IT professional. As we continue developing our technical abilities, these foundational experiences will serve as the building blocks for more advanced projects and real-world challenges in the industry.