

Computer Networks Lab

UE19CS255

Week 8

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Semester: 4 Section: G

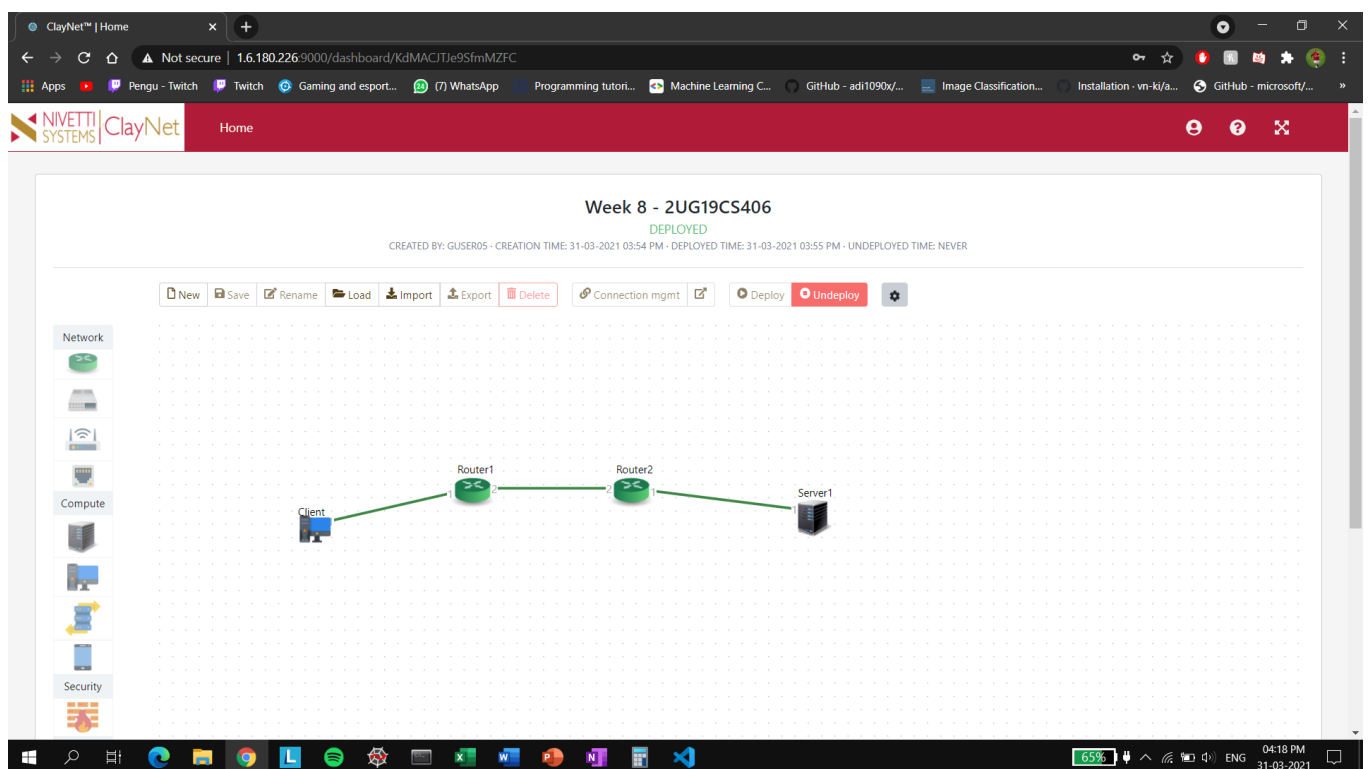
SRN: PES2UG19CS406

Date: 06/04/21

Objectives:

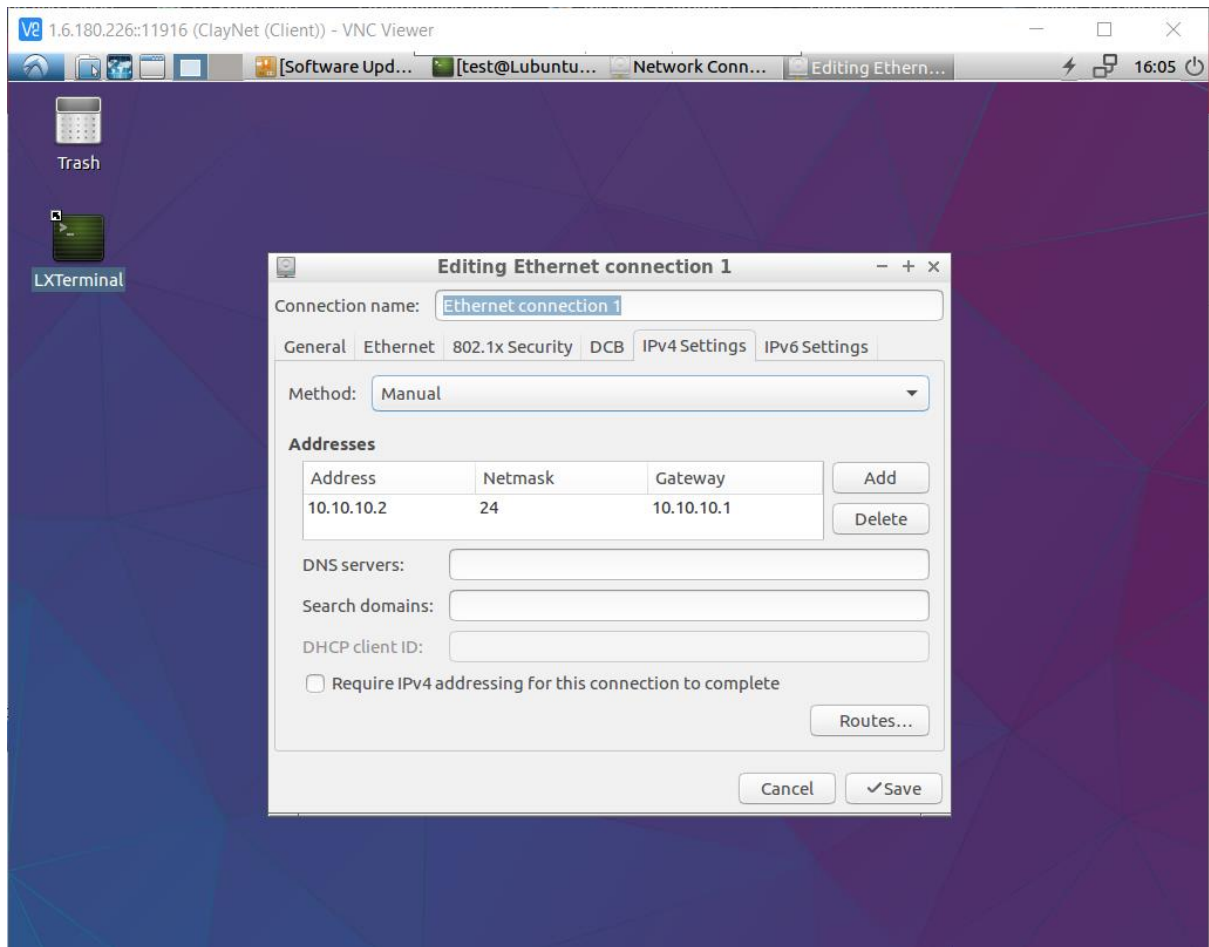
- Understand the building blocks of ClayNet.
- Build a simple client-server network using routers, switches and network hosts.
- To learn the static IP routing behaviour such as default and static routes and routing tables.
- Use common network utilities to verify LAN operation and analyze data traffic.

Topology -1:



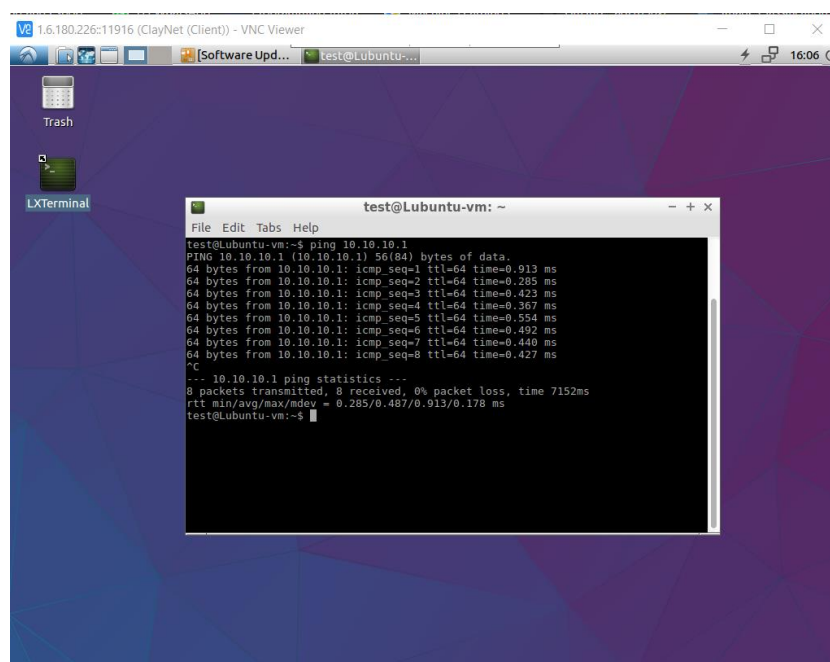
Topology diagram

Assigning IP address on the Client VM:

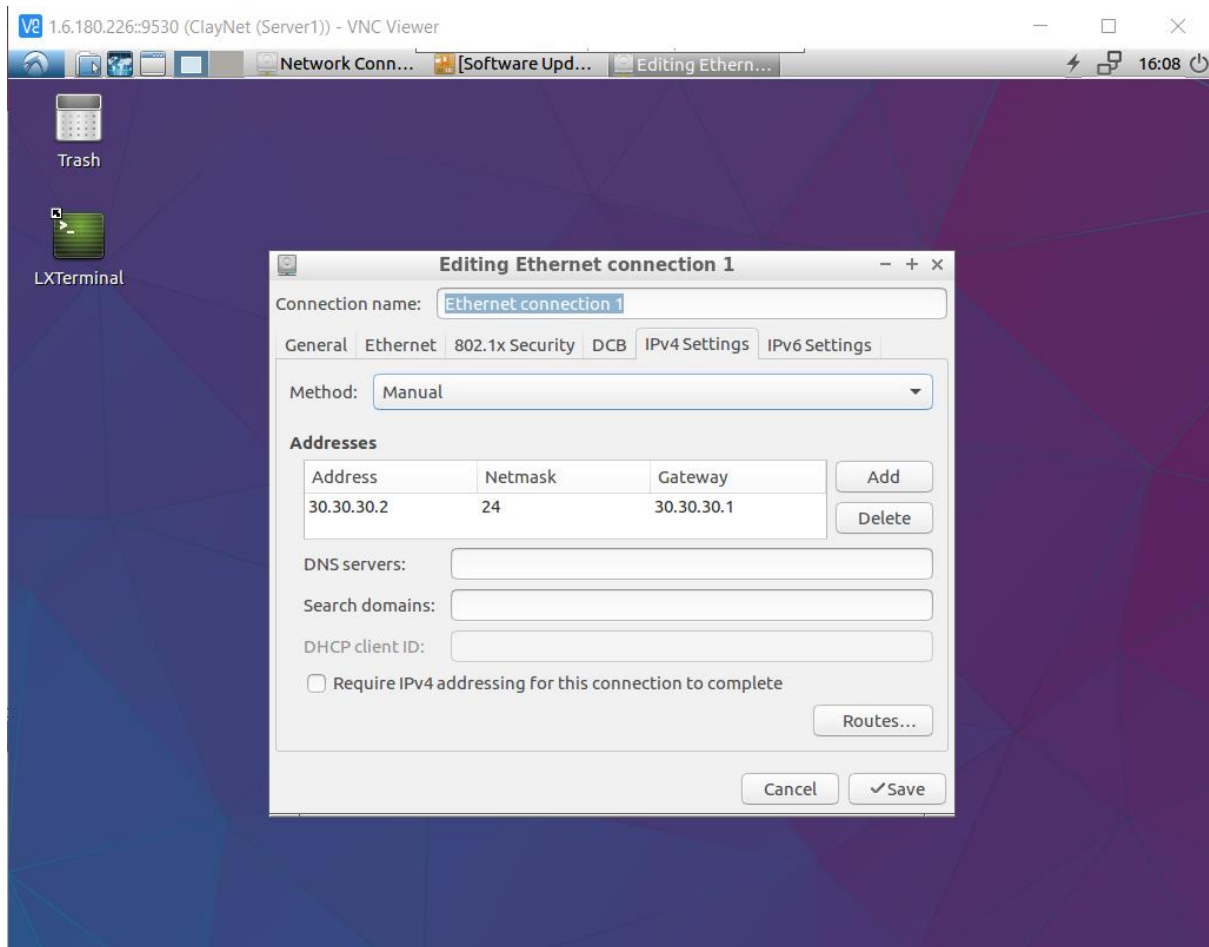


Client IP - 10.10.10.2

Pinging the 10.10.10.1 Router from Client:

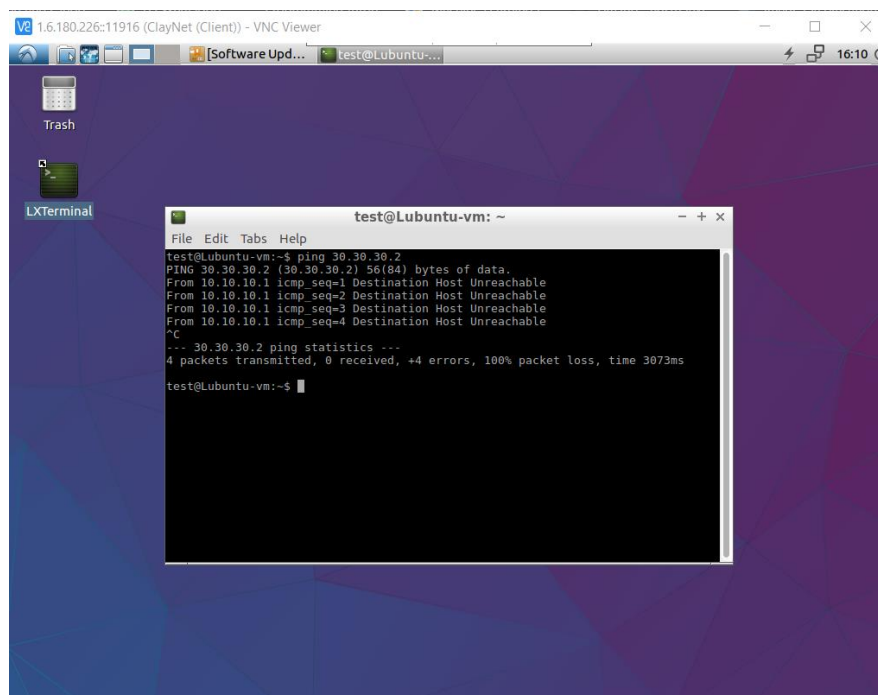


Assigning IP on Server VM:



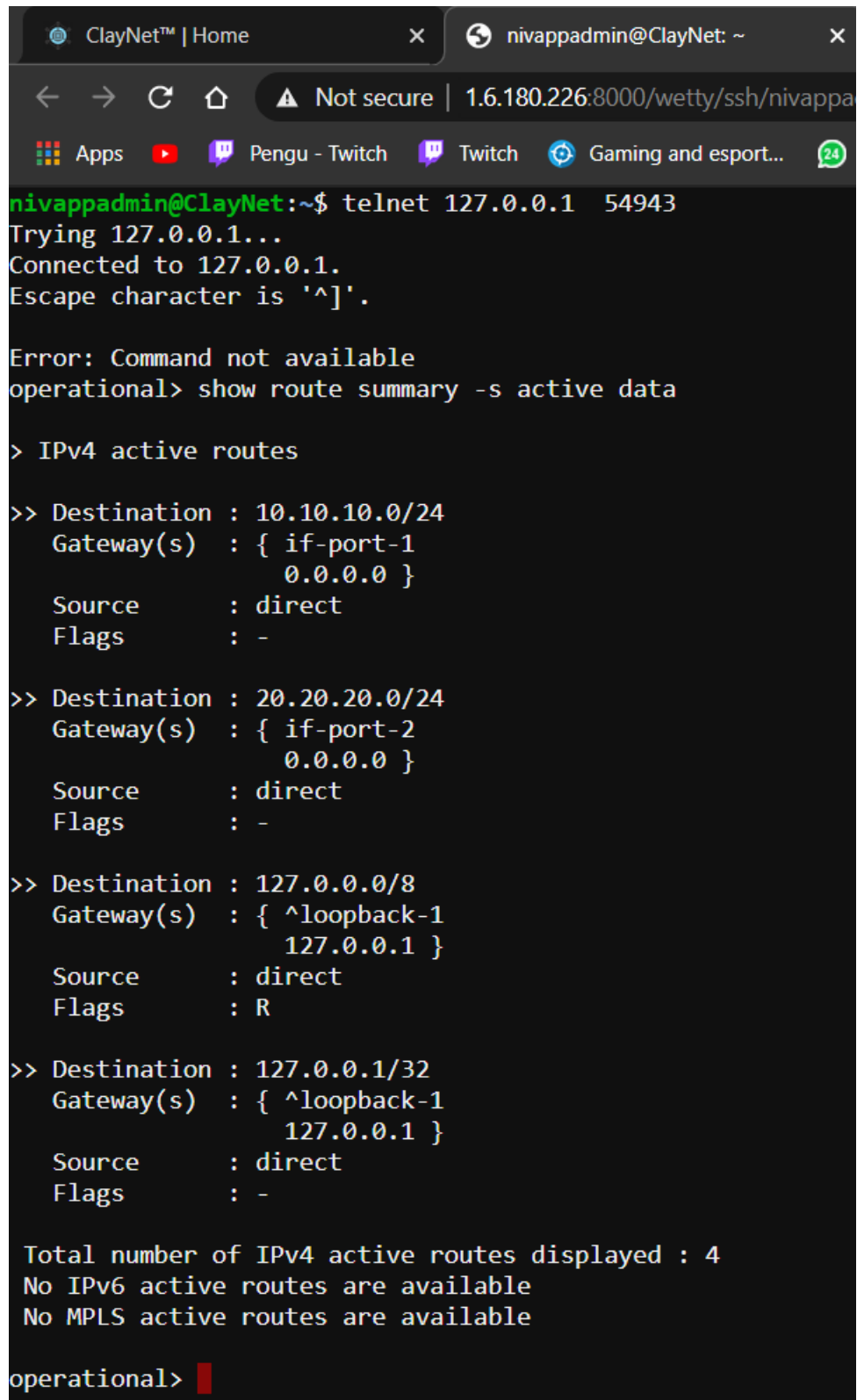
Server IP - 30.30.30.2

Pinging Server from Client before setting up routing tables:



Setting up the Routing Tables:

Router 1:



```
nivappadmin@ClayNet:~$ telnet 127.0.0.1 54943
Trying 127.0.0.1...
Connected to 127.0.0.1.
Escape character is '^]'.

Error: Command not available
operational> show route summary -s active data

> IPv4 active routes

>> Destination : 10.10.10.0/24
   Gateway(s)   : { if-port-1
                   0.0.0.0 }
   Source       : direct
   Flags        : -

>> Destination : 20.20.20.0/24
   Gateway(s)   : { if-port-2
                   0.0.0.0 }
   Source       : direct
   Flags        : -

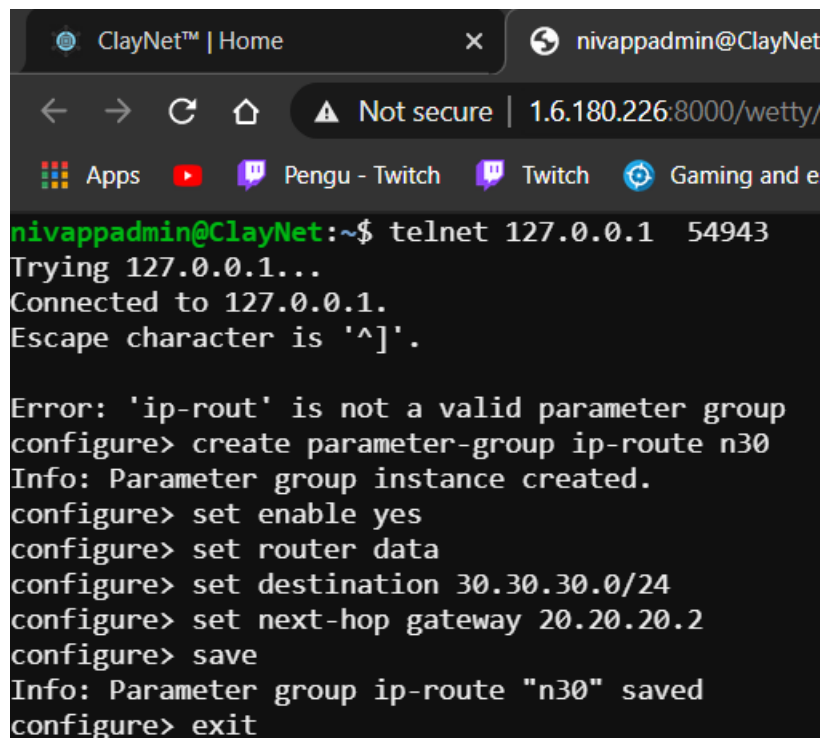
>> Destination : 127.0.0.0/8
   Gateway(s)   : { ^loopback-1
                   127.0.0.1 }
   Source       : direct
   Flags        : R

>> Destination : 127.0.0.1/32
   Gateway(s)   : { ^loopback-1
                   127.0.0.1 }
   Source       : direct
   Flags        : -

Total number of IPv4 active routes displayed : 4
No IPv6 active routes are available
No MPLS active routes are available

operational> █
```

Router 1 before routing config



```
nivappadmin@ClayNet:~$ telnet 127.0.0.1 54943
Trying 127.0.0.1...
Connected to 127.0.0.1.
Escape character is '^]'.

Error: 'ip-route' is not a valid parameter group
configure> create parameter-group ip-route n30
Info: Parameter group instance created.
configure> set enable yes
configure> set router data
configure> set destination 30.30.30.0/24
configure> set next-hop gateway 20.20.20.2
configure> save
Info: Parameter group ip-route "n30" saved
configure> exit
```

Setting up routing on Router 1

```
ClayNet™ | Home x nivappadmin@ClayNet: ~ x
Not secure | 1.6.180.226:8000/wetty/ssh/nivappadmin
Apps Pengu - Twitch Twitch Gaming and esport... (24) (7)

Info: Parameter group ip-route "n30" saved
configure> exit
operational> show route summary -s active data

> IPv4 active routes

>> Destination : 10.10.10.0/24
    Gateway(s)  : { if-port-1
                    0.0.0.0 }
    Source      : direct
    Flags       : -

>> Destination : 20.20.20.0/24
    Gateway(s)  : { if-port-2
                    0.0.0.0 }
    Source      : direct
    Flags       : -

>> Destination : 30.30.30.0/24
    Gateway(s)  : { if-port-2
                    20.20.20.2 }
    Source      : static
    Flags       : -

>> Destination : 127.0.0.0/8
    Gateway(s)  : { ^loopback-1
                    127.0.0.1 }
    Source      : direct
    Flags       : R

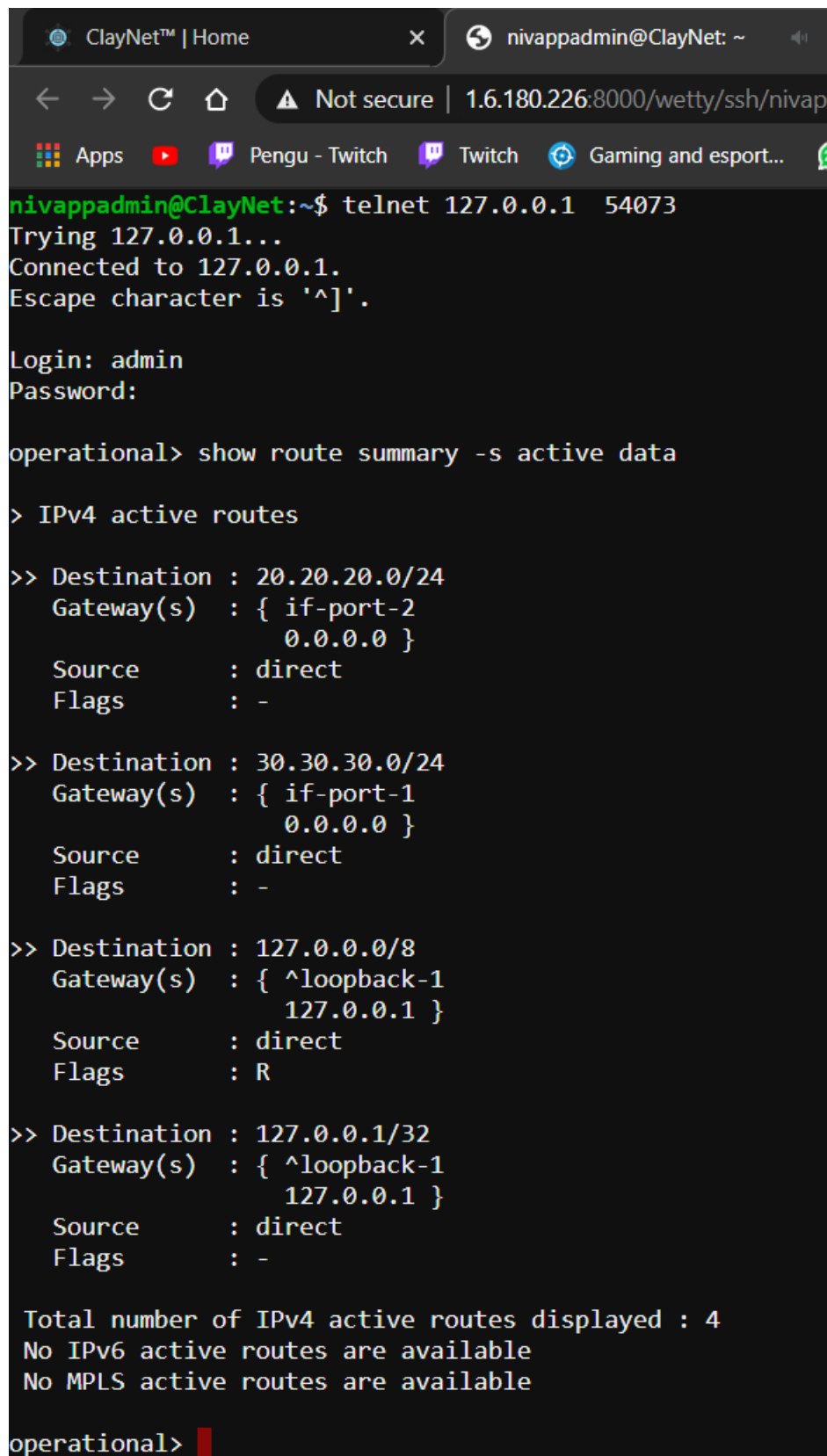
>> Destination : 127.0.0.1/32
    Gateway(s)  : { ^loopback-1
                    127.0.0.1 }
    Source      : direct
    Flags       : -

Total number of IPv4 active routes displayed : 5
No IPv6 active routes are available
No MPLS active routes are available

operational>
```

Router 1 with a static route set

Router 2:



```
nivappadmin@ClayNet:~$ telnet 127.0.0.1 54073
Trying 127.0.0.1...
Connected to 127.0.0.1.
Escape character is '^]'.

Login: admin
Password:

operational> show route summary -s active data

> IPv4 active routes

>> Destination : 20.20.20.0/24
   Gateway(s)   : { if-port-2
                   0.0.0.0 }
   Source       : direct
   Flags        : -

>> Destination : 30.30.30.0/24
   Gateway(s)   : { if-port-1
                   0.0.0.0 }
   Source       : direct
   Flags        : -

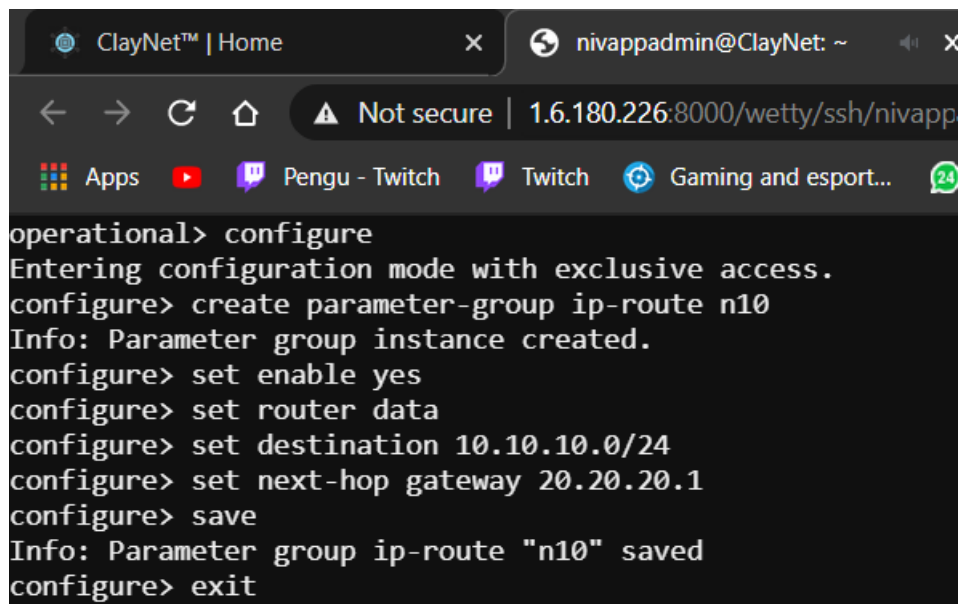
>> Destination : 127.0.0.0/8
   Gateway(s)   : { ^loopback-1
                   127.0.0.1 }
   Source       : direct
   Flags        : R

>> Destination : 127.0.0.1/32
   Gateway(s)   : { ^loopback-1
                   127.0.0.1 }
   Source       : direct
   Flags        : -

Total number of IPv4 active routes displayed : 4
No IPv6 active routes are available
No MPLS active routes are available

operational>
```

Router 2 before routing config



The screenshot shows a web browser window with two tabs. The first tab is 'ClayNet™ | Home'. The second tab is 'nivappadmin@ClayNet: ~'. The address bar shows '1.6.180.226:8000/wetty/ssh/nivapp'. Below the address bar, there are several icons for 'Apps', 'Pengu - Twitch', 'Twitch', and 'Gaming and esport...'. The main content area displays a terminal session with the following text:

```
operational> configure
Entering configuration mode with exclusive access.
configure> create parameter-group ip-route n10
Info: Parameter group instance created.
configure> set enable yes
configure> set router data
configure> set destination 10.10.10.0/24
configure> set next-hop gateway 20.20.20.1
configure> save
Info: Parameter group ip-route "n10" saved
configure> exit
```

Setting up routing on Router 2

```
ClayNet™ | Home x nivappadmin@ClayNet: ~
Not secure | 1.6.180.226:8000/wetty/ssh
Apps YouTube Pengu - Twitch Twitch Gaming and esp
Info: Parameter group ip-route "n10" saved
configure> exit
operational> show route summary -s active data

> IPv4 active routes

>> Destination : 10.10.10.0/24
    Gateway(s)  : { if-port-2
                    20.20.20.1 }
    Source      : static
    Flags       : -

>> Destination : 20.20.20.0/24
    Gateway(s)  : { if-port-2
                    0.0.0.0 }
    Source      : direct
    Flags       : -

>> Destination : 30.30.30.0/24
    Gateway(s)  : { if-port-1
                    0.0.0.0 }
    Source      : direct
    Flags       : -

>> Destination : 127.0.0.0/8
    Gateway(s)  : { ^loopback-1
                    127.0.0.1 }
    Source      : direct
    Flags       : R

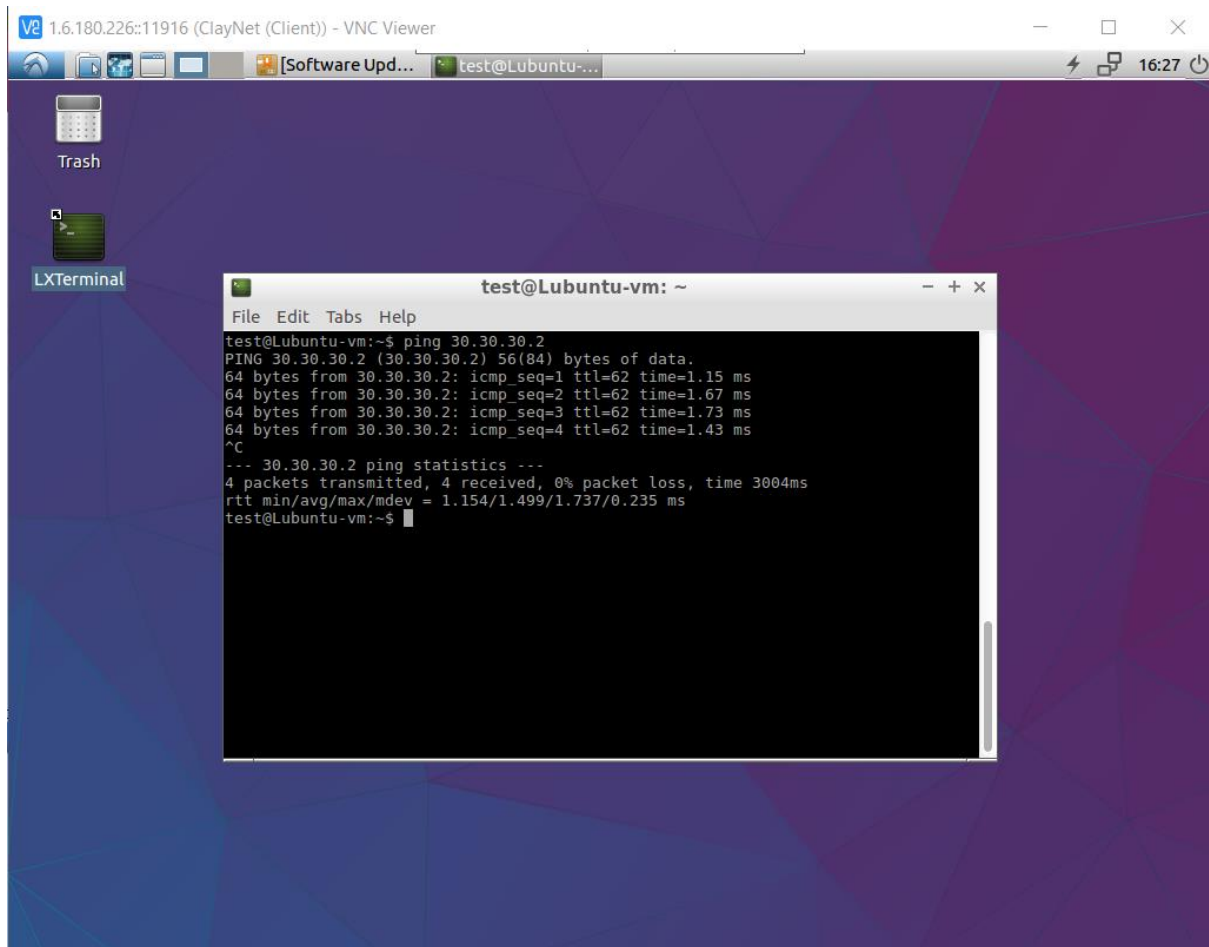
>> Destination : 127.0.0.1/32
    Gateway(s)  : { ^loopback-1
                    127.0.0.1 }
    Source      : direct
    Flags       : -

Total number of IPv4 active routes displayed : 5
No IPv6 active routes are available
No MPLS active routes are available

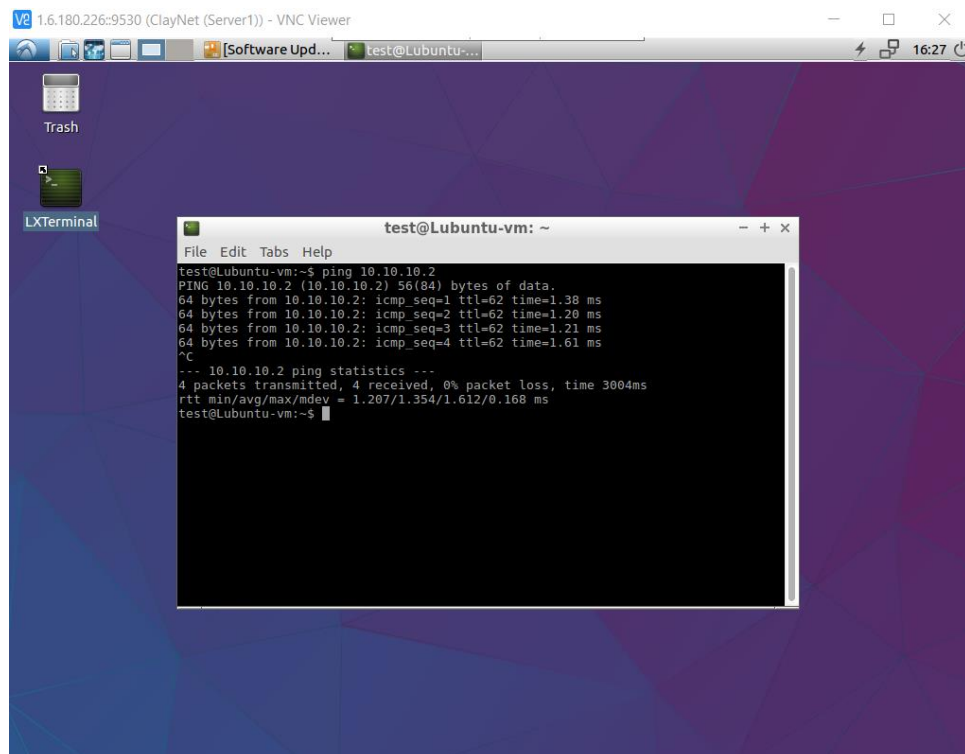
operational> █
```

Router 2 with a static route set

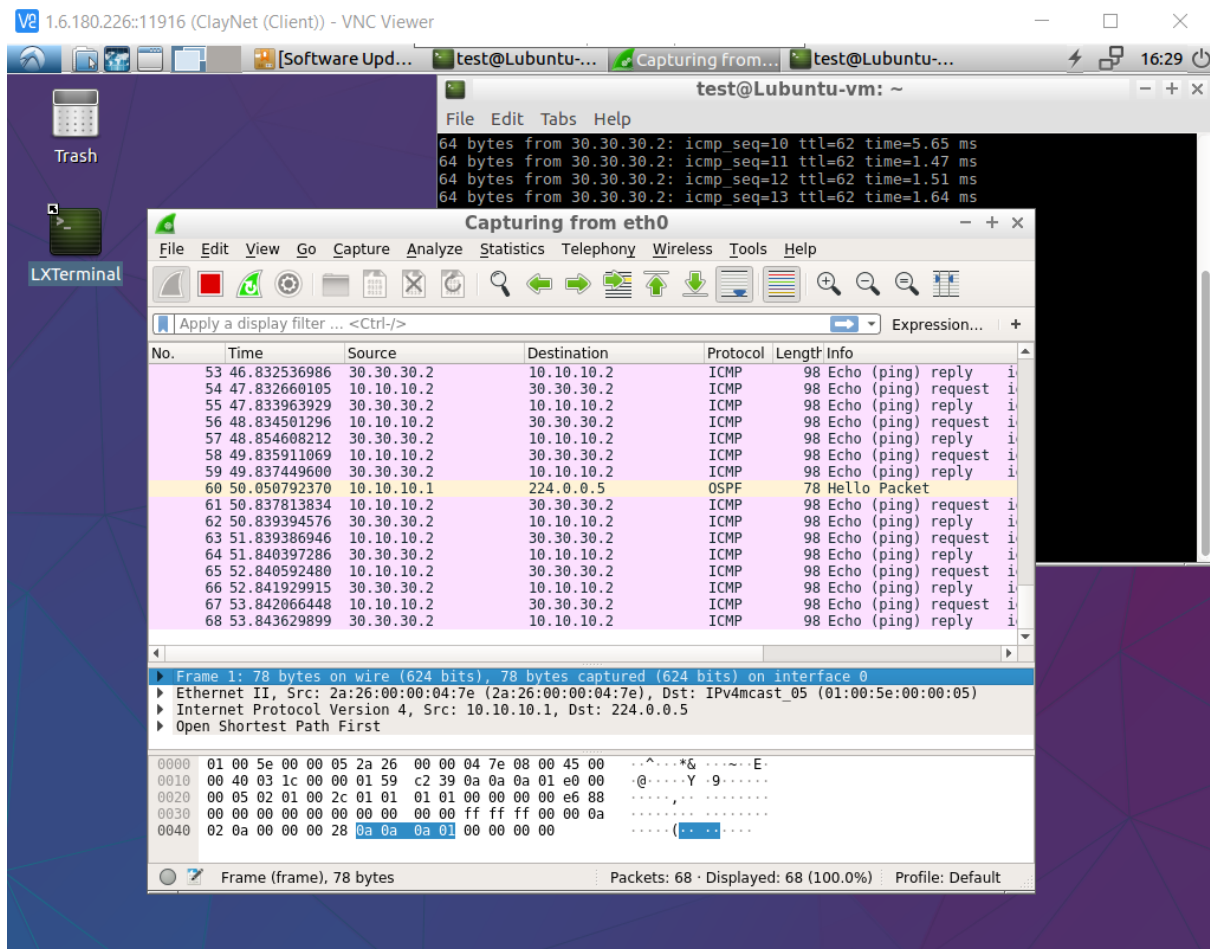
Pinging Server from Client:



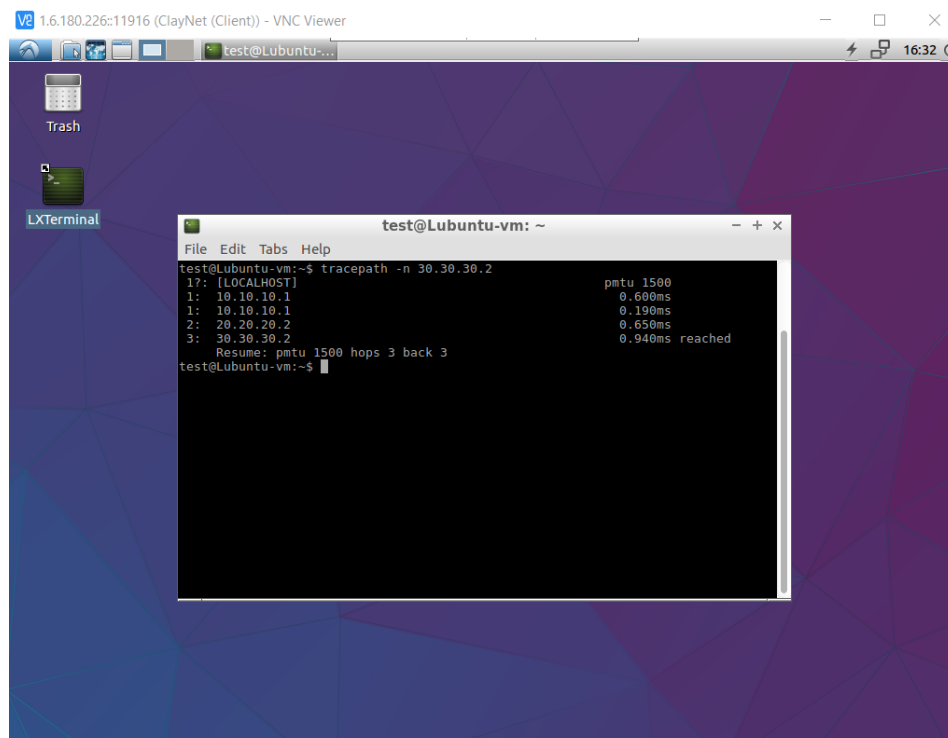
Pinging Client from Server:



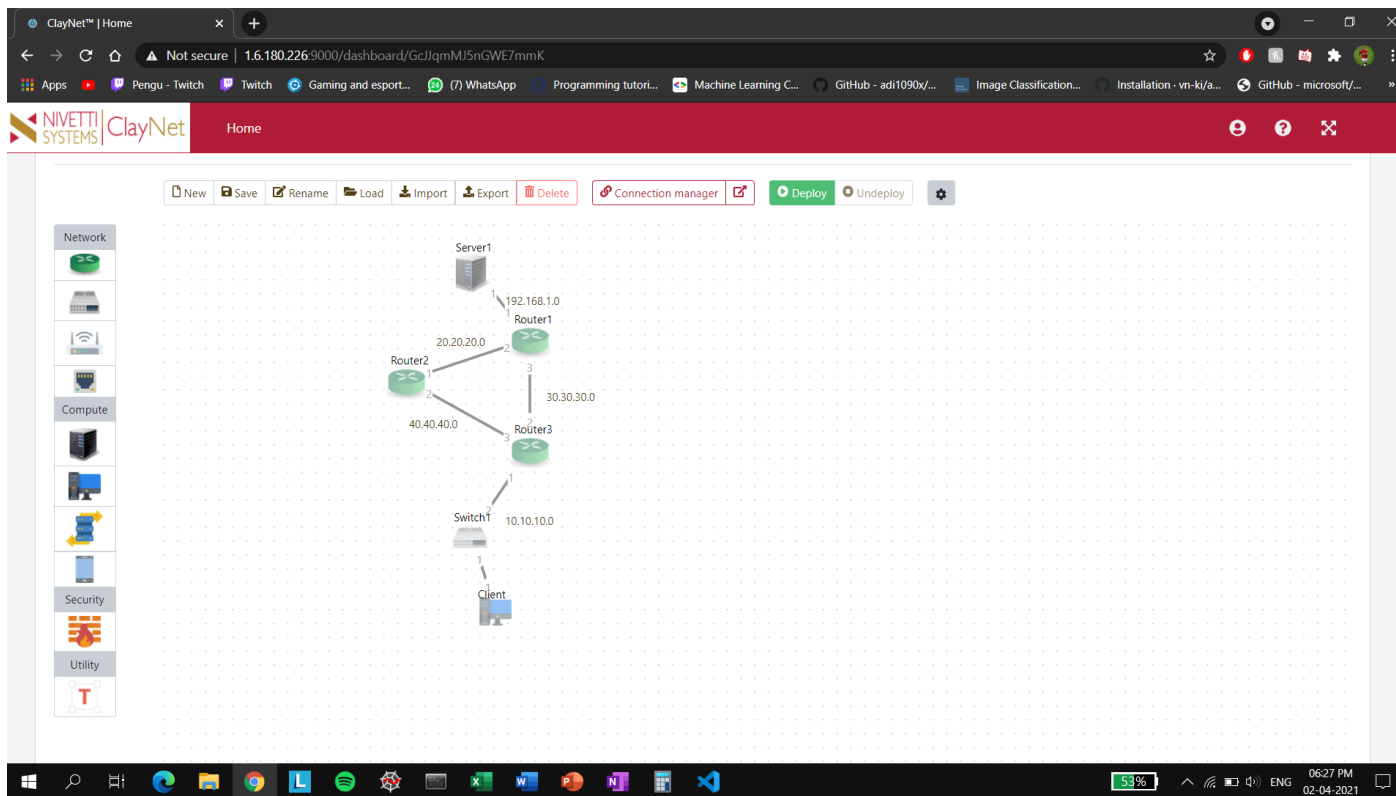
Wireshark capture on Client:



Running Tracert on Client:

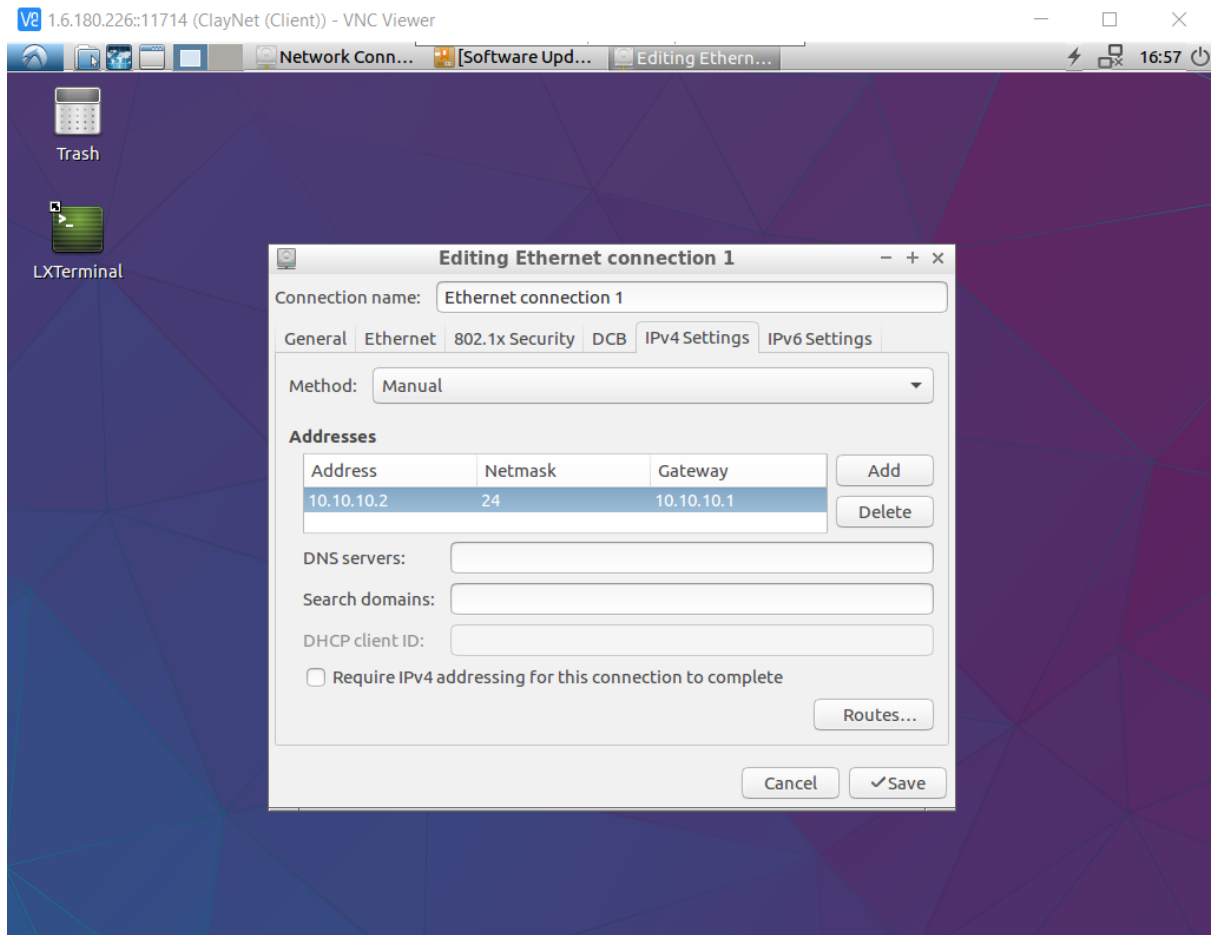


Topology -2:

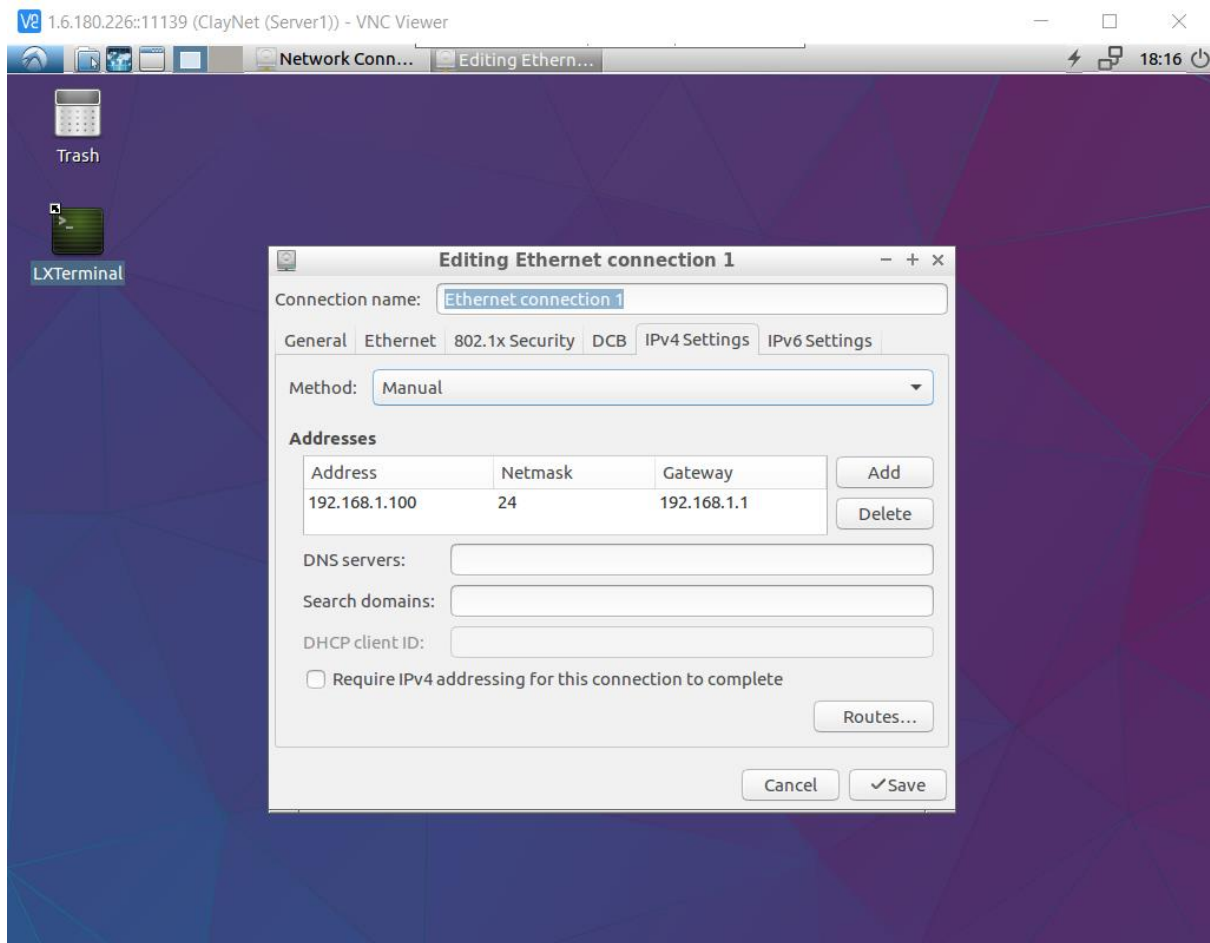


Topology Diagram

Setting Up Server and Client IP's:



Client IP - 10.10.10.2



Server IP - 192.168.1.100

Routing config for the Routers:

```
ClayNet™ | Home x nivappadmin@ClayNet: ~
← → ↻ 🏠 ⚠ Not secure | 1.6.180.226:8000/wetty/ssh/niv
📱 Apps 📺 Pengu - Twitch 📺 Twitch 🎮 Gaming and esport...

operational> show route summary -s active data

> IPv4 active routes

>> Destination : 10.10.10.0/24
  Gateway(s)   : { if-port-2
                  20.20.20.2 }
  Source       : static
  Flags        : -

>> Destination : 20.20.20.0/24
  Gateway(s)   : { if-port-2
                  0.0.0.0 }
  Source       : direct
  Flags        : -

>> Destination : 30.30.30.0/24
  Gateway(s)   : { if-port-3
                  0.0.0.0 }
  Source       : direct
  Flags        : -

>> Destination : 40.40.40.0/24
  Gateway(s)   : { if-port-2
                  20.20.20.2 }
  Source       : static
  Flags        : -

>> Destination : 127.0.0.0/8
  Gateway(s)   : { ^loopback-1
                  127.0.0.1 }
  Source       : direct
  Flags        : R

>> Destination : 127.0.0.1/32
  Gateway(s)   : { ^loopback-1
                  127.0.0.1 }
  Source       : direct
  Flags        : -

>> Destination : 192.168.1.0/24
  Gateway(s)   : { if-port-1
                  0.0.0.0 }
  Source       : direct
  Flags        : -

Total number of IPv4 active routes displayed : 7
No IPv6 active routes are available
No MPLS active routes are available
```

Router 1 after setup


```
ClayNet™ | Home x nivappadmin@ClayNet: ~  
← → ↻ ⌂ ⚠ Not secure | 1.6.180.226:8000/wetty/ssh/nivapp  
Apps YouTube Pengu - Twitch Twitch Gaming and esport... 24  
Escape character is '^['.  
operational> show route summary -s active data  
  
> IPv4 active routes  
  
>> Destination : 10.10.10.0/24  
Gateway(s) : { if-port-2  
40.40.40.2 }  
Source : static  
Flags : -  
  
>> Destination : 20.20.20.0/24  
Gateway(s) : { if-port-1  
0.0.0.0 }  
Source : direct  
Flags : -  
  
>> Destination : 40.40.40.0/24  
Gateway(s) : { if-port-2  
0.0.0.0 }  
Source : direct  
Flags : -  
  
>> Destination : 127.0.0.0/8  
Gateway(s) : { ^loopback-1  
127.0.0.1 }  
Source : direct  
Flags : R  
  
>> Destination : 127.0.0.1/32  
Gateway(s) : { ^loopback-1  
127.0.0.1 }  
Source : direct  
Flags : -  
  
>> Destination : 192.168.1.0/24  
Gateway(s) : { if-port-1  
20.20.20.1 }  
Source : static  
Flags : -  
  
Total number of IPv4 active routes displayed : 6  
No IPv6 active routes are available  
No MPLS active routes are available
```

Router 2 after setup

```
ClayNet™ | Home × nivappadmin@ClayNet: ~
Not secure | 1.6.180.226:8000/wetty/ssh/nivapp
Apps YouTube Pengu - Twitch Twitch Gaming and esport...
operational> show route summary -s active data

> IPv4 active routes

>> Destination : 10.10.10.0/24
Gateway(s) : { if-port-1
               0.0.0.0 }
Source      : direct
Flags       : -

>> Destination : 20.20.20.0/24
Gateway(s) : { if-port-3
               40.40.40.1 }
Source      : static
Flags       : -

>> Destination : 30.30.30.0/24
Gateway(s) : { if-port-2
               0.0.0.0 }
Source      : direct
Flags       : -

>> Destination : 40.40.40.0/24
Gateway(s) : { if-port-3
               0.0.0.0 }
Source      : direct
Flags       : -

>> Destination : 127.0.0.0/8
Gateway(s) : { ^loopback-1
               127.0.0.1 }
Source      : direct
Flags       : R

>> Destination : 127.0.0.1/32
Gateway(s) : { ^loopback-1
               127.0.0.1 }
Source      : direct
Flags       : -

>> Destination : 192.168.1.0/24
Gateway(s) : { if-port-3
               40.40.40.1 }
Source      : static
Flags       : -

Total number of IPv4 active routes displayed : 7
No IPv6 active routes are available
No MPLS active routes are available
```

Router 3 after setup

Pinging Server from Client:

The image shows a VNC window titled "1.6.180.226:11714 (ClayNet (Client)) - VNC Viewer" displaying a Linux desktop. A terminal window shows the command `test@Lubuntu-vm: ~`. In the background, a Wireshark window titled "Capturing from eth0" is open, showing a packet capture of ping traffic. The packet list shows 49 packets, including ICMP Echo (ping) requests and replies. The packet details pane shows the structure of the first packet: Frame 1: 53 bytes on wire (424 bits), 53 bytes captured (424 bits) on interface 0. The packet structure is: IEEE 802.3 Ethernet, Logical-Link Control, Spanning Tree Protocol. The packet bytes pane shows the raw data: 0000 01 80 c2 00 00 00 2a 26 00 00 04 ca 00 27 42 42*&.....'BB, 0010 03 00 00 02 02 7e 80 00 2a 26 00 00 04 ca 00 00*&....., 0020 00 00 80 00 2a 26 00 00 04 ca 80 0c 00 00 14 00*&....., 0030 02 00 0f 00 00

No.	Time	Source	Destination	Protocol	Length	Info
36	19.101466539	192.168.1.100	10.10.10.2	ICMP	98	Echo (ping) reply
37	19.971685076	2a:26:00:00:04:ca	Spanning-tree-(for-...	STP	53	RST. Root = 32768/0/2a
38	20.100872013	10.10.10.2	192.168.1.100	ICMP	98	Echo (ping) request
39	20.103484685	192.168.1.100	10.10.10.2	ICMP	98	Echo (ping) reply
40	21.101863550	10.10.10.2	192.168.1.100	ICMP	98	Echo (ping) request
41	21.103969626	192.168.1.100	10.10.10.2	ICMP	98	Echo (ping) reply
42	21.972138279	2a:26:00:00:04:ca	Spanning-tree-(for-...	STP	53	RST. Root = 32768/0/2a
43	22.103304813	10.10.10.2	192.168.1.100	ICMP	98	Echo (ping) request
44	22.105853955	192.168.1.100	10.10.10.2	ICMP	98	Echo (ping) reply
45	23.105035700	10.10.10.2	192.168.1.100	ICMP	98	Echo (ping) request
46	23.107836603	192.168.1.100	10.10.10.2	ICMP	98	Echo (ping) reply
47	23.971997610	2a:26:00:00:04:ca	Spanning-tree-(for-...	STP	53	RST. Root = 32768/0/2a
48	24.106962156	10.10.10.2	192.168.1.100	ICMP	98	Echo (ping) request
49	24.109402973	192.168.1.100	10.10.10.2	ICMP	98	Echo (ping) reply

Wireshark Capture of Ping

Tracepath from Client to Server:

The image shows a VNC window titled "1.6.180.226:11714 (ClayNet (Client)) - VNC Viewer" displaying a Linux desktop. A terminal window titled "test@Lubuntu-vm: ~" shows the output of the `test@Lubuntu-vm:~$ traceroute -n 192.168.1.100` command. The output shows the path from the client to the server, with 30 hops max and 60 byte packets. The path consists of 4 hops: 1. 10.10.10.1 (1.621 ms, 1.574 ms, 1.597 ms), 2. 40.40.40.1 (1.642 ms, 1.675 ms, 1.720 ms), 3. 20.20.20.1 (2.255 ms, 2.307 ms, 2.356 ms), 4. 192.168.1.100 (2.510 ms, 2.658 ms, 2.802 ms).

```
test@Lubuntu-vm:~$ traceroute -n 192.168.1.100
traceroute to 192.168.1.100 (192.168.1.100), 30 hops max, 60 byte packets
 1 10.10.10.1 1.621 ms 1.574 ms 1.597 ms
 2 40.40.40.1 1.642 ms 1.675 ms 1.720 ms
 3 20.20.20.1 2.255 ms 2.307 ms 2.356 ms
 4 192.168.1.100 2.510 ms 2.658 ms 2.802 ms
test@Lubuntu-vm:~$
```