

COMPUTER NETWORKS LAB

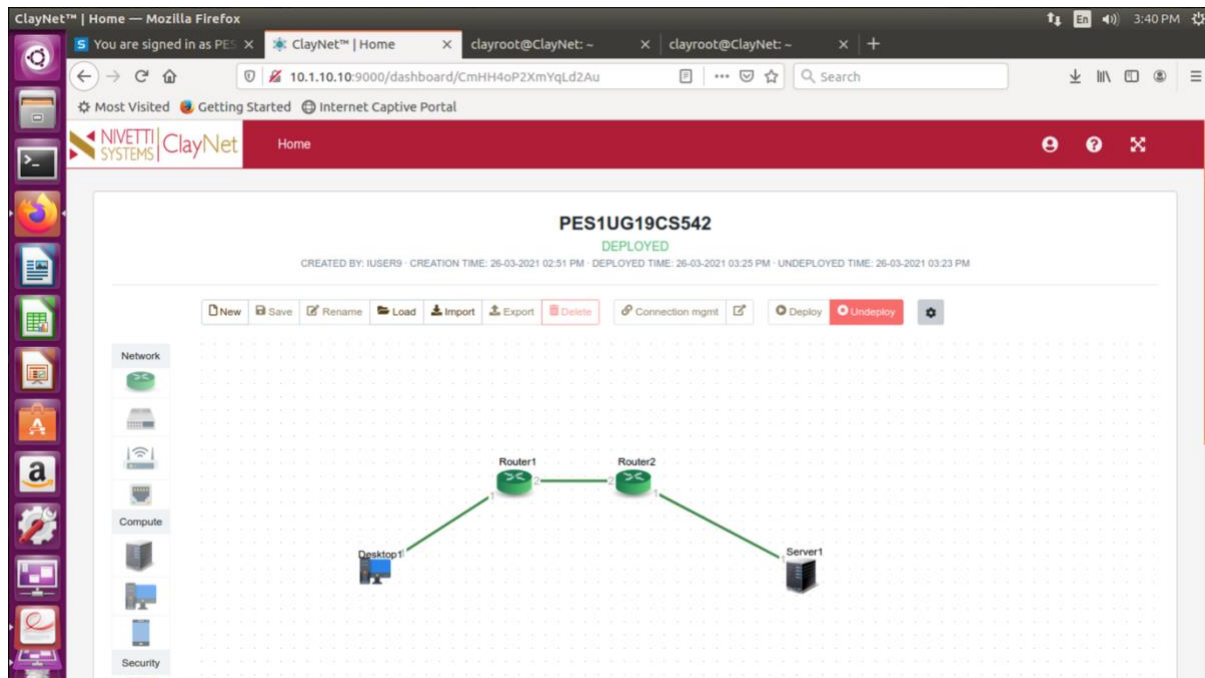
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SECTION : I

Objective :- Understand the building blocks and usage of ClayNet Network Virtualization platform with reference to OSI Layer.

TOPOLOGY



Configuring the End Systems :-

<u>END SYSTEM</u>	<u>IP ADDRESS</u>	<u>GATEWAY</u>
Desktop1	10.10.10.2/24	10.10.10.1
Server1	30.30.30.2/24	30.30.30.1

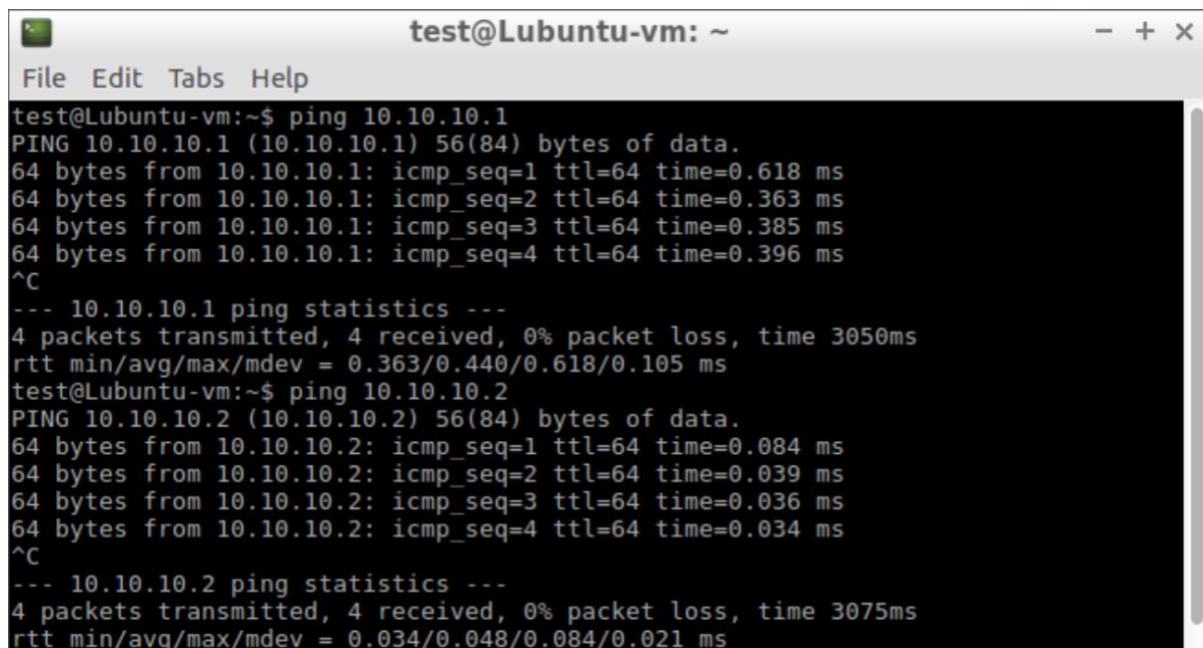
Configuring the Routers :-

<u>ROUTER</u>	<u>INTERFACE NUMBER (port)</u>	<u>IP ADDRESS</u>
Router1	1	10.10.10.1/24
Router1	2	20.20.20.1/24
Router2	1	30.30.30.1/24
Router2	2	20.20.20.2/24

PINGING

Pinging from the client:-

1) ping 10.10.10.1 & ping 10.10.10.2



```
test@Lubuntu-vm: ~  
File Edit Tabs Help  
test@Lubuntu-vm:~$ ping 10.10.10.1  
PING 10.10.10.1 (10.10.10.1) 56(84) bytes of data.  
64 bytes from 10.10.10.1: icmp_seq=1 ttl=64 time=0.618 ms  
64 bytes from 10.10.10.1: icmp_seq=2 ttl=64 time=0.363 ms  
64 bytes from 10.10.10.1: icmp_seq=3 ttl=64 time=0.385 ms  
64 bytes from 10.10.10.1: icmp_seq=4 ttl=64 time=0.396 ms  
^C  
--- 10.10.10.1 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3050ms  
rtt min/avg/max/mdev = 0.363/0.440/0.618/0.105 ms  
test@Lubuntu-vm:~$ ping 10.10.10.2  
PING 10.10.10.2 (10.10.10.2) 56(84) bytes of data.  
64 bytes from 10.10.10.2: icmp_seq=1 ttl=64 time=0.084 ms  
64 bytes from 10.10.10.2: icmp_seq=2 ttl=64 time=0.039 ms  
64 bytes from 10.10.10.2: icmp_seq=3 ttl=64 time=0.036 ms  
64 bytes from 10.10.10.2: icmp_seq=4 ttl=64 time=0.034 ms  
^C  
--- 10.10.10.2 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3075ms  
rtt min/avg/max/mdev = 0.034/0.048/0.084/0.021 ms
```

2) ping 30.30.30.2

```
test@Lubuntu-vm:~$ ping 30.30.30.2  
PING 30.30.30.2 (30.30.30.2) 56(84) bytes of data.  
From 10.10.10.1 icmp_seq=1 Destination Host Unreachable  
From 10.10.10.1 icmp_seq=2 Destination Host Unreachable
```

Ping is not successful, and “Destination Host Unreachable” status is displayed. This happens because the routing table entries have not been made yet.

The following routing table entries need to be made :-

ROUTERS	DESTINATION	NXT HOP GATEWAY	VIA
Router1	30.30.30.0	20.20.20.2	Direct
Router2	10.10.10.0	20.20.20.1	Direct

Adding Routing Table entries for Router1 :-

```
operational> configure
Entering configuration mode with exclusive access.
configure> create parameter-group ip-route to-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 "to-n30" saved
configure> exit
```

```
> 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
```

```
Line : 12-34, Press 'q' to quit.
```

Adding Routing Table entries for Router2 :-

```
operational> configure
Entering configuration mode with exclusive access.
configure> create parameter-group ip-route to-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 "to-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        : -

Line : 10-32, Press 'q' to quit.
```

FINAL PINGING

Now the pinging from the client to the 30.30.30.2 is performed again and this time it is successful, because the routing table entries have been made.


```
test@Lubuntu-vm: ~  
File Edit Tabs Help  
test@Lubuntu-vm:~$ ping 30.30.30.2  
PING 30.30.30.2 (30.30.30.2) 56(84) bytes of data.  
64 bytes from 30.30.30.2: icmp_seq=1 ttl=62 time=1.44 ms  
64 bytes from 30.30.30.2: icmp_seq=2 ttl=62 time=0.652 ms  
64 bytes from 30.30.30.2: icmp_seq=3 ttl=62 time=1.30 ms  
64 bytes from 30.30.30.2: icmp_seq=4 ttl=62 time=0.766 ms  
64 bytes from 30.30.30.2: icmp_seq=5 ttl=62 time=0.815 ms  
64 bytes from 30.30.30.2: icmp_seq=6 ttl=62 time=0.784 ms  
64 bytes from 30.30.30.2: icmp_seq=7 ttl=62 time=0.683 ms  
^C  
--- 30.30.30.2 ping statistics ---  
7 packets transmitted, 7 received, 0% packet loss, time 6095ms  
rtt min/avg/max/mdev = 0.652/0.921/1.449/0.295 ms  
test@Lubuntu-vm:~$
```

Observation :- Now the Client is able to ping the server. And the ttl value is reduced to 62 because of two hops.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	10.10.10.1	224.0.0.5	OSPF	78	Hello Packet
2	2.086845151	a2:26:00:00:15:a9	Broadcast	ARP	42	Who has 10.10.10.1? Tell
3	2.087253717	a2:26:00:00:03:f9	a2:26:00:00:15:a9	ARP	42	10.10.10.1 is at a2:26:0
4	2.087264622	10.10.10.2	30.30.30.2	ICMP	98	Echo (ping) request id=
5	2.088270778	30.30.30.2	10.10.10.2	ICMP	98	Echo (ping) reply id=
6	3.088369607	10.10.10.2	30.30.30.2	ICMP	98	Echo (ping) request id=
7	3.089001777	30.30.30.2	10.10.10.2	ICMP	98	Echo (ping) reply id=
8	4.118324437	10.10.10.2	30.30.30.2	ICMP	98	Echo (ping) request id=
9	4.119603142	30.30.30.2	10.10.10.2	ICMP	98	Echo (ping) reply id=
10	5.119745475	10.10.10.2	30.30.30.2	ICMP	98	Echo (ping) request id=
11	5.120491523	30.30.30.2	10.10.10.2	ICMP	98	Echo (ping) reply id=
12	6.134301807	10.10.10.2	30.30.30.2	ICMP	98	Echo (ping) request id=
13	6.135097511	30.30.30.2	10.10.10.2	ICMP	98	Echo (ping) reply id=
14	7.158321447	10.10.10.2	30.30.30.2	ICMP	98	Echo (ping) request id=
15	7.159081665	30.30.30.2	10.10.10.2	ICMP	98	Echo (ping) reply id=
16	8.182297909	10.10.10.2	30.30.30.2	ICMP	98	Echo (ping) request id=
17	8.182960493	30.30.30.2	10.10.10.2	ICMP	98	Echo (ping) reply id=
18	10.030175489	10.10.10.1	224.0.0.5	OSPF	78	Hello Packet

Frame 1: 78 bytes on wire (624 bits), 78 bytes captured (624 bits) on interface 0
Ethernet II, Src: a2:26:00:00:03:f9 (a2:26:00:00:03:f9), Dst: IPv4mcast_05 (01:00:5e:00:00:05)
Internet Protocol Version 4, Src: 10.10.10.1, Dst: 224.0.0.5
Open Shortest Path First

Wireshark packet capture

Observation :- ICMP request packets are sent from client to the server.