

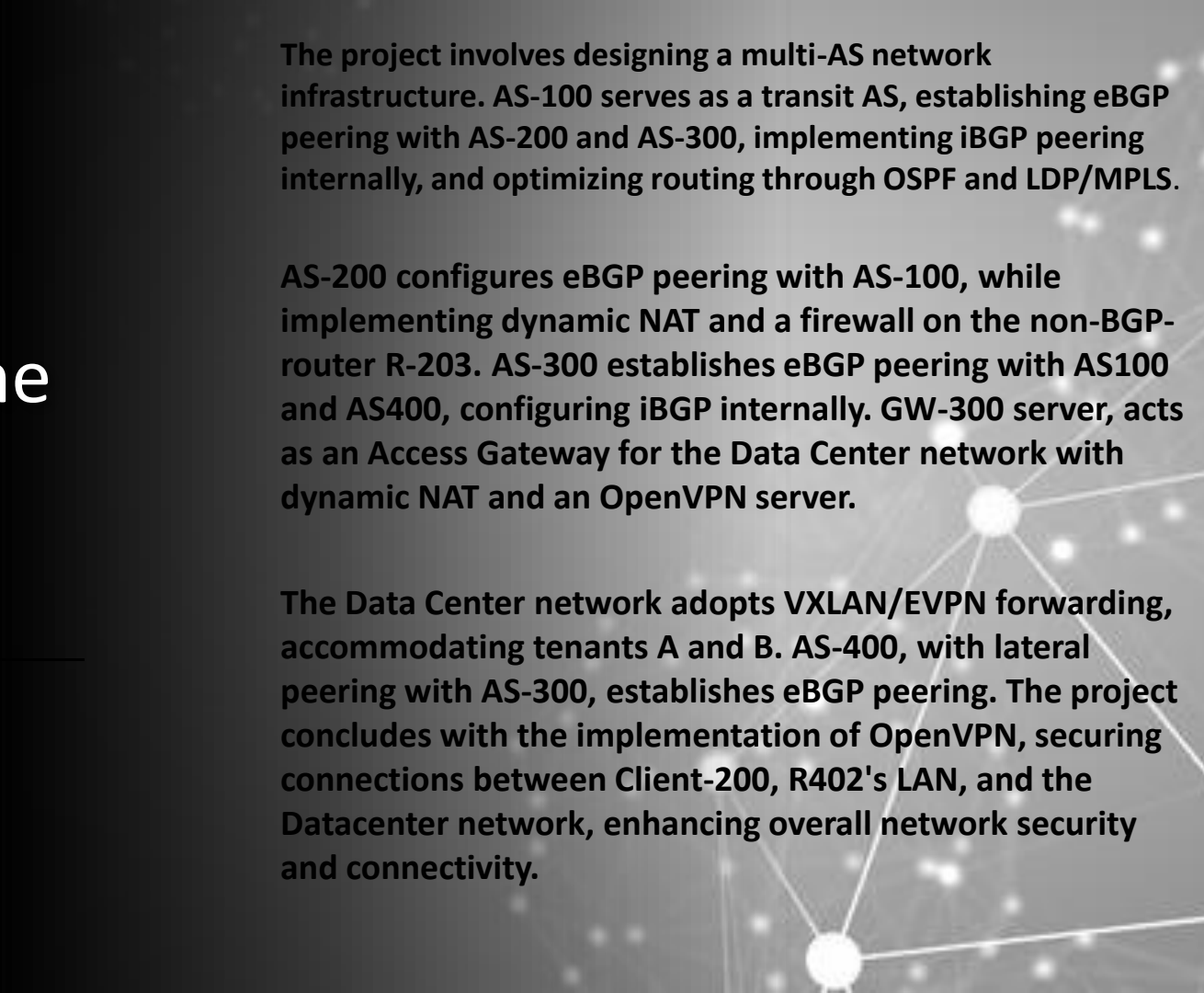


# Objective of the project

The project involves designing a multi-AS network infrastructure. AS-100 serves as a transit AS, establishing eBGP peering with AS-200 and AS-300, implementing iBGP peering internally, and optimizing routing through OSPF and LDP/MPLS.

AS-200 configures eBGP peering with AS-100, while implementing dynamic NAT and a firewall on the non-BGP-router R-203. AS-300 establishes eBGP peering with AS100 and AS400, configuring iBGP internally. GW-300 server, acts as an Access Gateway for the Data Center network with dynamic NAT and an OpenVPN server.

The Data Center network adopts VXLAN/EVPN forwarding, accommodating tenants A and B. AS-400, with lateral peering with AS-300, establishes eBGP peering. The project concludes with the implementation of OpenVPN, securing connections between Client-200, R402's LAN, and the Datacenter network, enhancing overall network security and connectivity.

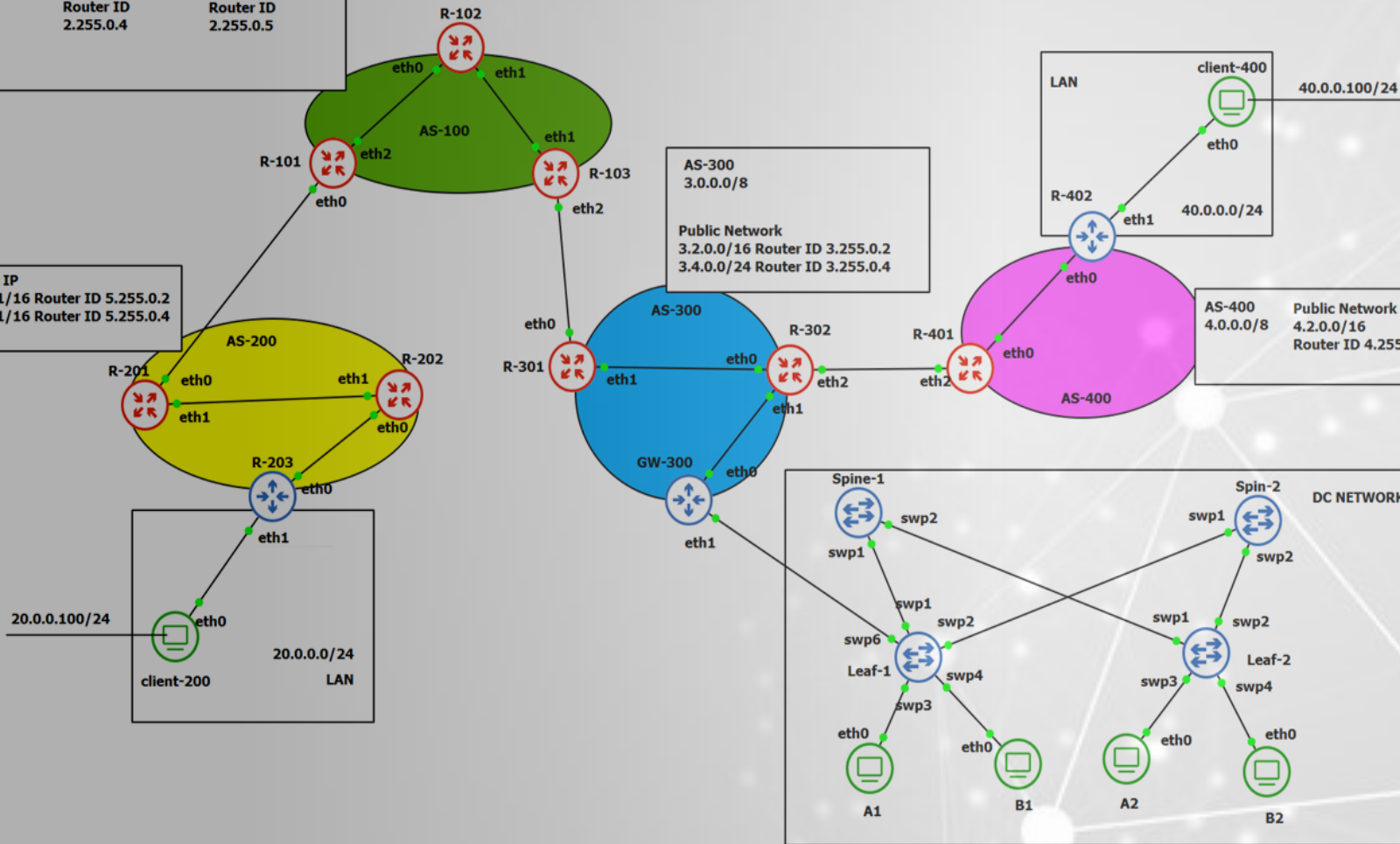
A faint, stylized network diagram is visible in the background on the right side of the slide. It features several white circular nodes connected by thin white lines, representing a network topology. The nodes are of varying sizes, and the connections form a complex web-like structure.


AS-100 2.0.0.0/8	Public Network R-101 2.2.0.1/16	Public Network R-102 2.4.0.1/16	Public Network R-103 2.5.0.1/16
	Router ID 2.255.0.2	Router ID 2.255.0.4	Router ID 2.255.0.5

AS-200 5.0.0.0/8	Public IP 5.2.0.1/16 Router ID 5.255.0.2 5.4.0.1/16 Router ID 5.255.0.4
---------------------	-------------------------------------------------------------------------------

AS-300 3.0.0.0/8	Public Network 3.2.0.0/16 Router ID 3.255.0.2 3.4.0.0/24 Router ID 3.255.0.4
---------------------	------------------------------------------------------------------------------------

AS-400 4.0.0.0/8	Public Network 4.2.0.0/16 Router ID 4.255.0.4
---------------------	-----------------------------------------------------





# AS-100

## 2.0.0.0/8

- The Autonomous system 100 has 3 routers R-101 R-102 and R-103.
  - R-101 has eBGP peering with AS-200 R-202.
  - R-102 has iBGP peering with internal routers.
  - R-103 has eBGP peering with AS-300 R-301
  - All router has Multi-Protocol Packet Switching MPLS and configure Open Shortest Path First OSPF
  - Public Network of R-101 2.2.0.1/16 and Router ID 2.255.0.2
  - Public Network of R-102 2.4.0.1/16 and Router ID 2.255.0.4
  - Public Network of R-103 2.5.0.1/16 and Router ID 2.255.0.5
- 

Capturing from [R-102 eth1 to R-103 eth1]

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No.	Time	Source	Destination	Protocol	Length	Info
51	10.004617	10.0.45.2	224.0.0.2	LDP	84	Hello Message
52	10.143667	5.2.0.1	3.2.0.1	ICMP	98	Echo (ping) request id=0x009e, seq=20/5120, ttl=62 (reply in 53)
53	10.148606	5.2.0.1	5.2.0.1	ICMP	102	Echo (ping) reply id=0x009e, seq=20/5120, ttl=63 (request in 52)
54	10.974311	2.255.0.4	2.255.0.5	BGP	85	KEEPALIVE Message
55	10.974494	2.255.0.5	2.255.0.4	TCP	66	179 → 42417 [ACK] Seq=58 Ack=77 Win=509 Len=0 TSval=2127938093 TSecr=3026691885
56	11.141288	5.2.0.1	3.2.0.1	ICMP	98	Echo (ping) request id=0x009e, seq=21/5376, ttl=62 (reply in 57)
57	11.141414	3.2.0.1	5.2.0.1	ICMP	102	Echo (ping) reply id=0x009e, seq=21/5376, ttl=63 (request in 56)
58	11.162941	2.255.0.5	2.255.0.4	BGP	85	KEEPALIVE Message
59	11.163048	2.255.0.4	2.255.0.5	TCP	66	42417 → 179 [ACK] Seq=77 Ack=77 Win=502 Len=0 TSval=3026692074 TSecr=2127938281
60	12.064035	2.255.0.2	2.255.0.5	BGP	85	KEEPALIVE Message
61	12.092898	2.255.0.5	2.255.0.2	BGP	89	KEEPALIVE Message
62	12.095594	2.255.0.2	2.255.0.5	TCP	66	36203 → 179 [ACK] Seq=96 Ack=96 Win=510 Len=0 TSval=2243903019 TSecr=1666566484
63	12.146642	5.2.0.1	3.2.0.1	ICMP	98	Echo (ping) request id=0x009e, seq=22/5632, ttl=62 (reply in 64)
64	12.147990	3.2.0.1	5.2.0.1	ICMP	102	Echo (ping) reply id=0x009e, seq=22/5632, ttl=63 (request in 63)
65	12.587315	10.0.45.1	224.0.0.2	LDP	84	Hello Message
66	13.147194	5.2.0.1	3.2.0.1	ICMP	98	Echo (ping) request id=0x009e, seq=23/5888, ttl=62 (reply in 67)
67	13.147435	3.2.0.1	5.2.0.1	ICMP	102	Echo (ping) reply id=0x009e, seq=23/5888, ttl=63 (request in 66)
68	13.745810	10.0.45.1	224.0.0.5	OSPF	82	Hello Packet
69	13.974456	2.255.0.4	2.255.0.5	BGP	85	KEEPALIVE Message

> Frame 57: 102 bytes on wire (816 bits), 102 bytes captured (816 bits) on interface -, id 0

> Ethernet II, Src: 4a:1e:8e:1a:61:09 (4a:1e:8e:1a:61:09), Dst: 16:c8:79:34:4d:90 (16:c8:79:34:4d:90)

> MultiProtocol Label Switching Header, Label: 17, Exp: 0, S: 1, TTL: 63

> Internet Protocol Version 4, Src: 3.2.0.1, Dst: 5.2.0.1

> Internet Control Message Protocol

0000 16 c8 79 34 4d 90 4a 1e 8e 1a 61 09 88 47 00 01

0010 11 3f 45 00 04 5a dd f6 00 00 3f 01 95 ad 03 02

0020 00 01 05 02 00 01 00 00 ec bf 00 9e 00 15 c5 b2

0030 4c da 00 00 00 00 00 00 00 00 00 00 00 00 00 00

0040 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

0050 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

0060 00 00 00 00 00 00 00

# AS-100 Working

```
R-201:~# ping 3.2.0.1 -I 5.2.0.1
PING 3.2.0.1 (3.2.0.1) from 5.2.0.1: 56 data bytes
64 bytes from 3.2.0.1: seq=0 ttl=61 time=0.851 ms
64 bytes from 3.2.0.1: seq=1 ttl=61 time=4.737 ms
64 bytes from 3.2.0.1: seq=2 ttl=61 time=0.938 ms
64 bytes from 3.2.0.1: seq=3 ttl=61 time=0.896 ms
64 bytes from 3.2.0.1: seq=4 ttl=61 time=1.820 ms
64 bytes from 3.2.0.1: seq=5 ttl=61 time=0.820 ms
64 bytes from 3.2.0.1: seq=6 ttl=61 time=1.071 ms
64 bytes from 3.2.0.1: seq=7 ttl=61 time=0.860 ms
64 bytes from 3.2.0.1: seq=8 ttl=61 time=0.653 ms
64 bytes from 3.2.0.1: seq=9 ttl=61 time=0.552 ms
64 bytes from 3.2.0.1: seq=10 ttl=61 time=0.797 ms
64 bytes from 3.2.0.1: seq=11 ttl=61 time=0.905 ms

R-102# show ip bgp
BGP table version is 17, local router ID is 2.255.0.4, vrf id 0
Default local pref 100, local AS 100
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
               i internal, r RIB-failure, S Stale, R Removed
NextHop codes: @NNN nexthop's vrf id, < announce-nh-self
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
```

Capturing from [R-102 eth1 to R-103 eth1]

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No.	Time	Source	Destination	Protocol	Length	Info
57	11.141414	3.2.0.1	5.2.0.1	ICMP	102	Echo (ping) reply id=0x009e, seq=21/5376, ttl=63 (request in 56)
58	11.162941	2.255.0.5	2.255.0.4	BGP	85	KEEPALIVE Message
59	11.163048	2.255.0.4	2.255.0.5	TCP	66	42417 → 179 [ACK] Seq=77 Ack=77 Win=502 Len=0 TSval=3026692074 TSecr=2127938281
60	12.064035	2.255.0.2	2.255.0.5	BGP	85	KEEPALIVE Message
61	12.092898	2.255.0.5	2.255.0.2	BGP	89	KEEPALIVE Message
62	12.095594	2.255.0.2	2.255.0.5	TCP	66	36203 → 179 [ACK] Seq=96 Ack=96 Win=510 Len=0 TSval=2243903019 TSecr=1666566484
63	12.146642	5.2.0.1	3.2.0.1	ICMP	98	Echo (ping) request id=0x009e, seq=22/5632, ttl=62 (reply in 64)
64	12.147990	3.2.0.1	5.2.0.1	ICMP	102	Echo (ping) reply id=0x009e, seq=22/5632, ttl=63 (request in 63)
65	12.587315	10.0.45.1	224.0.0.2	LDP	84	Hello Message
66	13.147194	5.2.0.1	3.2.0.1	ICMP	98	Echo (ping) request id=0x009e, seq=23/5888, ttl=62 (reply in 67)
67	13.147435	3.2.0.1	5.2.0.1	ICMP	102	Echo (ping) reply id=0x009e, seq=23/5888, ttl=63 (request in 66)
68	13.745810	10.0.45.1	224.0.0.5	OSPF	82	Hello Packet
69	13.974456	2.255.0.4	2.255.0.5	BGP	85	KEEPALIVE Message
70	13.974724	2.255.0.5	2.255.0.4	TCP	66	179 → 42417 [ACK] Seq=77 Ack=96 Win=509 Len=0 TSval=2127941093 TSecr=3026694885
71	14.147861	5.2.0.1	3.2.0.1	ICMP	98	Echo (ping) request id=0x009e, seq=24/6144, ttl=62 (reply in 72)
72	14.148035	3.2.0.1	5.2.0.1	ICMP	102	Echo (ping) reply id=0x009e, seq=24/6144, ttl=63 (request in 71)
73	14.163647	2.255.0.5	2.255.0.4	BGP	85	KEEPALIVE Message
74	14.163826	2.255.0.4	2.255.0.5	TCP	66	42417 → 179 [ACK] Seq=96 Ack=96 Win=502 Len=0 TSval=3026695074 TSecr=2127941282
75	15.007188	10.0.45.2	224.0.0.2	LDP	84	Hello Message

> Frame 69: 85 bytes on wire (680 bits), 85 bytes captured (680 bits) on interface -, id 0

> Ethernet II, Src: 16:c8:79:34:4d:90 (16:c8:79:34:4d:90), Dst: 4a:1e:8e:1a:61:09 (4a:1e:8e:1a:61:09)

> Internet Protocol Version 4, Src: 2.255.0.4, Dst: 2.255.0.5

> Transmission Control Protocol, Src Port: 42417, Dst Port: 179, Seq: 77, Ack: 77, Len: 19

> Border Gateway Protocol - KEEPALIVE Message

0000 4a 1e 8e 1a 61 09 16 c8 79 34 4d 90 08 00 45 c0

0010 00 47 83 75 40 00 ff 06 f1 74 02 ff 00 04 02 ff

0020 00 05 a5 b1 00 b3 0a e2 fa 5c ed 91 4b b5 80 18

0030 01 f6 dc 9b 00 00 01 01 08 0a b4 67 b2 e5 7e d5


0040 c2 e9 ff ff ff ff ff ff ff ff ff ff ff ff ff

0050 ff ff 00 13 04

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i2.2.0.0/16	2.255.0.2(R-101)		0	100	0 i
*>2.4.0.0/16	0.0.0.0(R-102)		0	32768	i
*>i2.5.0.0/16	2.255.0.5(R-103)		0	100	0 i
*>i3.2.0.0/16	2.255.0.5(R-103)		0	100	0 300 i
*>i3.4.0.0/16	2.255.0.5(R-103)		100	0 300	i
*>i4.2.0.0/16	2.255.0.5(R-103)		100	0 300 400	i
*>i5.2.0.0/16	2.255.0.2(R-101)		0	100	0 200 i
*>i5.4.0.0/16	2.255.0.2(R-101)		100	0 200	i
*>i10.0.37.0/30	2.255.0.5(R-103)		100	0 300	i


Displayed 9 routes and 9 total paths

R-102#



# AS-200

## 5.0.0.0/8

- The Autonomous system 200 has 3 routers R-201 R-202 and R-203.
  - R-201 has eBGP peering with AS-100 R-101.
  - R-202 has iBGP peering with internal router R-201.
  - R-203 is absent from the BGP
  - R-201 and R-202 configure with Open Shortest Path First OSPF
  - R-203 has default route with R-202, and Access gateway of LAN attached to it, configuration of Dynamic NAT and a Simple firewall.
  - Public Network of R-201 5.2.0.1/16 and Router ID 5.255.0.2
  - Public Network of R-202 5.4.0.1/16 and Router ID 5.255.0.4
  - Public Network of R-203 of AS-200 pool 5.4.0.8/30
- 
- A faint, stylized network diagram is visible in the background on the right side of the slide. It consists of several white circular nodes connected by thin white lines, forming a complex web-like structure. The nodes vary in size, and the lines are thin and light gray, creating a subtle pattern against the dark background.

Capturing from - [R-201 eth1 to R-202 eth1]

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No.	Time	Source	Destination	Protocol	Length	Info
655	159.789455	5.4.0.9	3.4.0.1	ICMP	98	Echo (ping) request id=0x006f, seq=91/23296, ttl=63 (reply in 656)
656	159.790031	3.4.0.1	5.4.0.9	ICMP	98	Echo (ping) reply id=0x006f, seq=91/23296, ttl=59 (request in 655)
657	162.028498	10.0.15.2	10.0.15.1	BGP	85	KEEPALIVE Message
658	162.028575	5.255.0.4	5.255.0.2	BGP	85	KEEPALIVE Message
659	162.028603	10.0.15.1	10.0.15.2	TCP	66	179 → 58028 [ACK] Seq=1027 Ack=1046 Win=509 Len=0 TSval=4023805323 TSecr=311583...
660	162.028631	5.255.0.2	5.255.0.4	TCP	66	179 → 42459 [ACK] Seq=1027 Ack=1046 Win=509 Len=0 TSval=160606173 TSecr=1725493...
661	162.204444	10.0.15.1	10.0.15.2	BGP	85	KEEPALIVE Message
662	162.204631	5.255.0.2	5.255.0.4	BGP	85	KEEPALIVE Message
663	162.205214	10.0.15.2	10.0.15.1	TCP	66	58028 → 179 [ACK] Seq=1046 Ack=1046 Win=510 Len=0 TSval=3115834178 TSecr=402380...
664	162.205301	5.255.0.4	5.255.0.2	TCP	66	42459 → 179 [ACK] Seq=1046 Ack=1046 Win=510 Len=0 TSval=1725493916 TSecr=160606...
665	165.028571	10.0.15.2	10.0.15.1	BGP	85	KEEPALIVE Message
666	165.028685	10.0.15.1	10.0.15.2	TCP	66	179 → 58028 [ACK] Seq=1046 Ack=1065 Win=509 Len=0 TSval=4023808323 TSecr=311583...
667	165.028722	5.255.0.4	5.255.0.2	BGP	85	KEEPALIVE Message
668	165.028940	5.255.0.2	5.255.0.4	TCP	66	179 → 42459 [ACK] Seq=1046 Ack=1065 Win=509 Len=0 TSval=160609173 TSecr=1725496...
669	165.205741	10.0.15.1	10.0.15.2	BGP	85	KEEPALIVE Message
670	165.207149	5.255.0.2	5.255.0.4	BGP	85	KEEPALIVE Message
671	165.207931	10.0.15.2	10.0.15.1	TCP	66	58028 → 179 [ACK] Seq=1065 Ack=1065 Win=510 Len=0 TSval=3115837180 TSecr=402380...
672	165.208970	5.255.0.4	5.255.0.2	TCP	66	42459 → 179 [ACK] Seq=1065 Ack=1065 Win=510 Len=0 TSval=1725496920 TSecr=160609...

> Frame 537: 85 bytes on wire (680 bits), 85 bytes captured (680 bits) on interface -, id 0

> Ethernet II, Src: 2a:3c:6b:58:46:8b (2a:3c:6b:58:46:8b), Dst: aa:da:1b:81:62:19 (aa:da:1b:81:62:19)

> Internet Protocol Version 4, Src: 10.0.15.2, Dst: 10.0.15.1

> Transmission Control Protocol, Src Port: 58028, Dst Port: 179, Seq: 875, Ack: 875, Len: 19

> Border Gateway Protocol - KEEPALIVE Message

0000 aa da 1b 81 62 19 2a 3c 6b 58 46 8b 08 00 45 c0  
0010 00 47 5f a1 40 00 ff 06 e9 4c 0a 00 0f 02 0a 00  
0020 0f 01 e2 ac 00 b3 89 5a 77 f5 c5 75 d5 ff 80 18  
0030 01 fe 9b 53 00 00 01 01 08 0a b9 b7 7c ca ef d5  
0040 fc bd ff ff ff ff ff ff ff ff ff ff ff ff ff  
0050 ff ff 00 13 04

Packets: 672 - Displayed: 672 (100.0%) Profile: Default

# AS-200 Working

## R-203 Dynamic NAT conf

```
sysctl -w net.ipv4.ip_forward=1
```

```
ip addr add 20.0.0.1/24 dev eth1
```

```
ip addr add 5.4.0.9/30 dev eth0
```

```
ip route add default via 5.4.0.10
```

```
iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE
```

```
echo 1 > /proc/sys/net/ipv4/ip_forward
```

```
root@R-203:/# sudo iptables -L
```

Chain INPUT (policy DROP)

target	prot	opt	source	destination	state
ACCEPT	all	--	anywhere	anywhere	ESTABLISHED
ACCEPT	icmp	--	anywhere	anywhere	


Chain FORWARD (policy DROP)

target	prot	opt	source	destination	state
ACCEPT	all	--	anywhere	anywhere	ESTABLISHED
ACCEPT	icmp	--	anywhere	anywhere	
ACCEPT	all	--	anywhere	anywhere	
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:http
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:https
ACCEPT	tcp	--	anywhere	anywhere	tcp dpt:ssh
ACCEPT	udp	--	anywhere	anywhere	udp dpt:domain

Chain OUTPUT (policy ACCEPT)

target	prot	opt	source	destination
--------	------	-----	--------	-------------

```
root@R-203:/#
```



# AS-300

## 3.0.0.0/8

- The Autonomous system 300 has 3 routers R-301 R-302 and GW-300.
- R-301 has eBGP peering with AS-100 R-103.
- R-302 has iBGP peering with internal router R-301.
- GW-300 is absent from the BGP
- GW-300 is the OpenVPN Server, It has default route via with R-302, and Access gateway of Data Center and a configuration of Dynamic NAT,
- GW-300 has client1(client-200), client(R-203) and Server(GW-300) certificates + dh parameters + OpenVPN conf
- Public Network of R-301 3.2.0.1/16 and Router ID 3.255.0.2
- Public Network of R-302 3.4.0.1/24 and Router ID 3.255.0.4
- Public Network of GW-300 of AS-300 pool 3.4.0.9/24



Capturing from - [R-301 eth1 to R-302 eth0]

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No.	Time	Source	Destination	Protocol	Length	Info
107	21.004273	10.0.37.1	10.0.37.2	TCP	66	55724 → 179 [ACK] Seq=134 Ack=153 Win=501 Len=0 TSval=4283049480 TSecr=1235192160
108	21.004313	3.255.0.2	3.255.0.4	TCP	66	33153 → 179 [ACK] Seq=134 Ack=153 Win=501 Len=0 TSval=1772397399 TSecr=2887973858
109	21.087242	3.4.0.9	5.4.0.9	ICMP	98	Echo (ping) request id=0x00e8, seq=39/9984, ttl=63 (reply in 110)
110	21.088003	5.4.0.9	3.4.0.9	ICMP	98	Echo (ping) reply id=0x00e8, seq=39/9984, ttl=58 (request in 109)
111	21.619260	10.0.37.1	224.0.0.5	OSPF	82	Hello Packet
112	22.088492	3.4.0.9	5.4.0.9	ICMP	98	Echo (ping) request id=0x00e8, seq=40/10240, ttl=63 (reply in 113)
113	22.089601	5.4.0.9	3.4.0.9	ICMP	98	Echo (ping) reply id=0x00e8, seq=40/10240, ttl=58 (request in 112)
114	23.089087	3.4.0.9	5.4.0.9	ICMP	98	Echo (ping) request id=0x00e8, seq=41/10496, ttl=63 (reply in 115)
115	23.089914	5.4.0.9	3.4.0.9	ICMP	98	Echo (ping) reply id=0x00e8, seq=41/10496, ttl=58 (request in 114)
116	23.639688	10.0.37.1	10.0.37.2	BGP	85	KEEPALIVE Message
117	23.639778	3.255.0.2	3.255.0.4	BGP	85	KEEPALIVE Message
118	23.640312	10.0.37.2	10.0.37.1	TCP	66	179 → 55724 [ACK] Seq=153 Ack=153 Win=507 Len=0 TSval=1235194797 TSecr=4283052116
119	23.640348	3.255.0.4	3.255.0.2	TCP	66	179 → 33153 [ACK] Seq=153 Ack=153 Win=507 Len=0 TSval=2887976495 TSecr=1772400035
120	24.003536	10.0.37.2	10.0.37.1	BGP	85	KEEPALIVE Message
121	24.003736	10.0.37.1	10.0.37.2	TCP	66	55724 → 179 [ACK] Seq=153 Ack=172 Win=501 Len=0 TSval=4283052480 TSecr=1235195160
122	24.003810	3.255.0.4	3.255.0.2	BGP	85	KEEPALIVE Message
123	24.004015	3.255.0.2	3.255.0.4	TCP	66	33153 → 179 [ACK] Seq=153 Ack=172 Win=501 Len=0 TSval=1772400399 TSecr=2887976858
124	24.090326	3.4.0.9	5.4.0.9	ICMP	98	Echo (ping) request id=0x00e8, seq=42/10752, ttl=63 (reply in 125)
125	24.091729	5.4.0.9	3.4.0.9	ICMP	98	Echo (ping) reply id=0x00e8, seq=42/10752, ttl=58 (request in 124)

> Frame 111: 82 bytes on wire (656 bits), 82 bytes captured (656 bits) on interface -, id 0

> Ethernet II, Src: 2e:d6:c8:55:b7:c3 (2e:d6:c8:55:b7:c3), Dst: IPv4mcast\_05 (01:00:5e:00:00:05)

> Internet Protocol Version 4, Src: 10.0.37.1, Dst: 224.0.0.5

> Open Shortest Path First

0000 01 00 5e 00 00 05 2e d6 c8 55 b7 c3 08 00 45 c0

0010 00 44 a2 3d 00 00 01 59 07 5e 0a 00 25 01 e0 00

0020 00 05 02 01 00 30 03 ff 00 02 00 00 00 03 95 94

0030 00 00 00 00 00 00 00 00 00 ff ff ff fc 00 0a

0040 02 01 00 00 00 28 0a 00 25 01 0a 00 25 02 03 ff

0050 00 04

Ready to load or capture

Packets: 160 · Displayed: 160 (100.0%)

Profile: Default

# AS-300 Working

```
root@GW-300:~/CA/server# ls
ca.crt ccd dh.pem server.crt server.key server.ovpn
root@GW-300:~/CA/server# cat server.crt
Certificate:
    Data:
        Version: 3 (0x2)
        Serial Number:
            9b:9e:05:2d:06:63:89:49:d3:70:e0:2e:1c:ad:ba:4c
        Signature Algorithm: sha256WithRSAEncryption
        Issuer: CN=OVPN_PRO_CA
        Validity
            Not Before: Jan 27 22:02:24 2024 GMT
            Not After : May  1 22:02:24 2026 GMT
        Subject: CN=server
        Subject Public Key Info:
            Public Key Algorithm: rsaEncryption
            Public-Key: (2048 bit)
            Modulus:
root@GW-300:~/CA/server# cat server.ovpn
port 1194
proto udp
dev tun
ca ca.crt
cert server.crt
key server.key
dh dh.pem
server 192.168.100.0 255.255.255.0
push "route 40.0.0.0 255.255.255.0"
push "route 10.0.31.0 255.255.255.252"
route 40.0.0.0 255.255.255.0
client-config-dir ccd
client-to-client
keepalive 10 120
cipher AES-256-GCM
root@GW-300:~/CA/server#
```



# AS-400

## 4.0.0.0/8

- The Autonomous system 400 has 2 routers R-401 R-402
- R-401 has eBGP peering with AS-300 R-302.
- R-402 is absent from the BGP
- R-402 is the OpenVPN Client2, It has default route via with R-401, R-402 is an OpenVPN client, providing VPN access to and from the LAN attached to it. and Access gateway of LAN with a configuration of Dynamic NAT,

```
root@R-402:~/ovpn# ls
ca.crt client2.crt client2.key client2.ovpn
root@R-402:~/ovpn# cat client2.ovpn
client
dev tun
proto udp
remote 3.4.0.9 1194
resolv-retry infinite
ca ca.crt
cert client2.crt
key client2.key
remote-cert-tls server
cipher AES-256-GCM

root@R-402:~/ovpn#
```

- Public Network of R-401 4.2.0.1/16 and Router ID 4.255.0.2
- Public Network of R-402 of AS-400 pool 4.4.0.9/24

```
R-401#
R-401# show running config
% Unknown command: show running config
R-401# show running-config
Building configuration...
```

```
Current configuration:
!
frr version 9.0.1_git
frr defaults datacenter
hostname R-401
no ipv6 forwarding
!
interface eth0
 ip address 4.2.0.10/24
exit
!
interface eth2
 ip address 10.0.41.1/30
exit
!
interface lo
 ip address 4.2.0.1/16
 ip address 4.255.0.2/32
exit
!
router bgp 400
 neighbor 10.0.41.2 remote-as 300
!
 address-family ipv4 unicast
  network 4.2.0.0/16
  neighbor 10.0.41.2 next-hop-self
exit-address-family
exit
!
router ospf
 ospf router-id 4.255.0.2
 network 4.2.0.0/16 area 4
 network 4.2.0.0/24 area 4
 network 4.255.0.2/32 area 4
 network 10.0.41.0/30 area 4
exit
!
end
R-401#
```

```
IPv4 Unicast Summary (VRF default):
BGP router identifier 4.255.0.2, local AS number 400 vrf-id 0
BGP table version 33
RIB entries 17, using 3264 bytes of memory
Peers 1, using 13 KiB of memory
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd	PfxSnt	Desc
R-302(10.0.41.2)	4	300	29717	29724	33	0	0	19:52:24	8	9	N/A

```
Total number of neighbors 1
R-401# show ip bgp
BGP table version is 33, local router ID is 4.255.0.2, vrf id 0
Default local pref 100, local AS 400
Status codes:  s suppressed, d damped, h history, * valid, > best, = multipath,
                i internal, r RIB-failure, S Stale, R Removed
Nexthop codes: @NNN nexthop's vrf id, < announce-nh-self
Origin codes:  i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 2.2.0.0/16	10.0.41.2(R-302)			0 300 100	i
*> 2.4.0.0/16	10.0.41.2(R-302)			0 300 100	i
*> 2.5.0.0/16	10.0.41.2(R-302)			0 300 100	i
*> 3.2.0.0/16	10.0.41.2(R-302)			0 300	i
*> 3.4.0.0/16	10.0.41.2(R-302)			0 300	i
*> 4.2.0.0/16	0.0.0.0(R-401)	0	32768		i
*> 5.2.0.0/16	10.0.41.2(R-302)			0 300 100 200	i
*> 5.4.0.0/16	10.0.41.2(R-302)			0 300 100 200	i
*> 10.0.37.0/30	10.0.41.2(R-302)			0 300	i

```
Displayed 9 routes and 9 total paths
R-401# exit
R-401:~# ping 5.4.0.9 -I 4.2.0.1
PING 5.4.0.9 (5.4.0.9) from 4.2.0.1: 56 data bytes
64 bytes from 5.4.0.9: seq=0 ttl=57 time=1.438 ms
64 bytes from 5.4.0.9: seq=1 ttl=57 time=1.369 ms
^C
--- 5.4.0.9 ping statistics ---
```

# DC Network

- The Data Center contain a Leaf-Spine Network. two/two-tier topologies
- Configuration of VXLAN static tunnels
- Configuration of EVPN with MP-eBGP peering
- The two tenant connected to leaf-1 and leaf-2
- L3VNI → Layer 3 VXLAN Network Identifier for each tenant, and both are different broadcast domain
- A1 and B2 are same broadcast domain and A2 and B2 same broadcast domain
- L3VNI **1020**, common to both broadcast domain L2VNI **100** and L2VNI **200**
- Leaf-1 has connectivity of GW-300 server, with default route.

Leaf – 1 to GW-300

```
cumulus@cumulus:mgmt:~$ ip r
default via 10.0.31.1 dev swp6
2.2.2.2 proto ospf metric 20
    nexthop via 10.1.1.2 dev swp1 weight 1
    nexthop via 10.1.2.2 dev swp2 weight 1
3.4.0.0/24 via 10.0.31.1 dev swp6
4.4.4.4 via 10.1.1.2 dev swp1 proto ospf metric 20
5.5.5.5 via 10.1.2.2 dev swp2 proto ospf metric 20
10.0.31.0/30 dev swp6 proto kernel scope link src 10.0.31.2
10.1.1.0/30 dev swp1 proto kernel scope link src 10.1.1.1
10.1.2.0/30 dev swp2 proto kernel scope link src 10.1.2.1
10.2.1.0/30 via 10.1.1.2 dev swp1 proto ospf metric 20
10.2.2.0/30 via 10.1.2.2 dev swp2 proto ospf metric 20
cumulus@cumulus:mgmt:~$
cumulus@cumulus:mgmt:~$ ping 3.4.0.9
vrf-wrapper.sh: switching to vrf "default"; use '--no-vrf-switch' to disable
PING 3.4.0.9 (3.4.0.9) 56(84) bytes of data.
64 bytes from 3.4.0.9: icmp_seq=1 ttl=64 time=0.969 ms
64 bytes from 3.4.0.9: icmp_seq=2 ttl=64 time=0.899 ms
64 bytes from 3.4.0.9: icmp_seq=3 ttl=64 time=0.952 ms
64 bytes from 3.4.0.9: icmp_seq=4 ttl=64 time=0.981 ms
64 bytes from 3.4.0.9: icmp_seq=5 ttl=64 time=1.02 ms
64 bytes from 3.4.0.9: icmp_seq=6 ttl=64 time=1.07 ms
64 bytes from 3.4.0.9: icmp_seq=7 ttl=64 time=2.05 ms
64 bytes from 3.4.0.9: icmp_seq=8 ttl=64 time=0.949 ms
^C
cumulus@cumulus:mgmt:~$ net show evpn vni
VNI      Type VxLAN IF      # MACs  # ARPs  # Remote VTEPs  Tenant VRF
100      L2    vni100          3        6        1                TEN1
200      L2    vni200          3        6        1                TEN1
1020     L3    vni-1020        1        1        n/a              TEN1
cumulus@cumulus:mgmt:~$
```

A1 to A2 and A1 to B2

```
root@A1:/# ip r
default via 10.0.0.254 dev eth0
10.0.0.0/24 dev eth0 proto kernel scope link src 10.0.0.1
root@A1:/# ping 10.0.0.2
PING 10.0.0.2 (10.0.0.2): 56 data bytes
64 bytes from 10.0.0.2: icmp_seq=0 ttl=64 time=3.966 ms
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=7.860 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=7.253 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=3.966 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=3.961 ms
^C--- 10.0.0.2 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 3.961/5.401/7.860/1.770 ms
root@A1:/#
```

Capturing from - [Spine-1 swp1 to Leaf-1 swp1]

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-F>

No.	Time	Source	Destination	Protocol	Length	Info
147	73.467374	fe80::a00:27ff:fec5::ff02::1	10.0.0.1	ICMPv6	78	Router Advertisement from 08:00:27:c5:9b:fa
148	73.679940	10.0.0.1	10.1.1.2	ICMP	148	Echo (ping) request id=0x00c0, seq=11/2816, ttl=63 (no response found!)
149	74.680899	10.0.0.1	10.1.1.2	ICMP	148	Echo (ping) request id=0x00c0, seq=12/3072, ttl=63 (no response found!)
150	74.971550	10.1.1.2	224.0.0.5	OSPF	82	Hello Packet
151	75.011417	10.1.1.2	10.1.1.2	BGP	85	KEEPALIVE Message
152	75.011771	10.1.1.2	10.1.1.1	TCP	66	57180 → 179 [ACK] Seq=476 Ack=495 Win=249 Len=0 TSval=3746238259 TSecr=2612883412
153	75.211592	10.1.1.2	10.1.1.1	BGP	85	KEEPALIVE Message
154	75.212113	10.1.1.2	10.1.1.2	TCP	66	179 → 57180 [ACK] Seq=495 Ack=495 Win=251 Len=0 TSval=2612883613 TSecr=3746238458
155	75.682213	10.0.0.1	10.1.1.2	ICMP	148	Echo (ping) request id=0x00c0, seq=13/3328, ttl=63 (no response found!)
156	76.682927	10.0.0.1	10.1.1.2	ICMP	148	Echo (ping) request id=0x00c0, seq=14/3584, ttl=63 (no response found!)
157	77.684138	10.0.0.1	10.1.1.2	ICMP	148	Echo (ping) request id=0x00c0, seq=15/3840, ttl=63 (no response found!)
158	78.012405	10.1.1.1	10.1.1.2	BGP	85	KEEPALIVE Message
159	78.012832	10.1.1.2	10.1.1.1	TCP	66	57180 → 179 [ACK] Seq=495 Ack=514 Win=249 Len=0 TSval=3746241260 TSecr=2612886413
160	78.212483	10.1.1.2	10.1.1.1	BGP	85	KEEPALIVE Message
161	78.213083	10.1.1.1	10.1.1.2	TCP	66	179 → 57180 [ACK] Seq=514 Ack=514 Win=251 Len=0 TSval=2612886614 TSecr=3746241459
162	78.478421	fe80::a00:27ff:fe1d::ff02::1	10.0.0.1	ICMPv6	78	Router Advertisement from 08:00:27:1d:8e:f7
163	78.685041	10.0.0.1	10.1.1.2	ICMP	148	Echo (ping) request id=0x00c0, seq=16/4096, ttl=63 (no response found!)
164	79.685750	10.0.0.1	10.1.1.2	ICMP	148	Echo (ping) request id=0x00c0, seq=17/4352, ttl=63 (no response found!)

> Frame 130: 148 bytes on wire (1184 bits), 148 bytes captured (1184 bits) on interface -, id 0

> Ethernet II, Src: PcsCompu\_c5:9b:fa (08:00:27:c5:9b:fa), Dst: PcsCompu\_1d:8e:f7 (08:00:27:1d:8e:f7)

> Internet Protocol Version 4, Src: 1.1.1.1, Dst: 2.2.2.2

> User Datagram Protocol, Src Port: 47134, Dst Port: 4789

> Virtual eXtensible Local Area Network

> Ethernet II, Src: PcsCompu\_5b:8d:49 (08:00:27:5b:8d:49), Dst: PcsCompu\_e7:27:14 (08:00:27:e7:27:14)

> Internet Protocol Version 4, Src: 10.0.0.1, Dst: 10.1.1.2

> Internet Control Message Protocol

Ready to load or capture

Packets: 164 · Displayed: 164 (100.0%) Profile: Default

# OPENVPN Client-200 GW-300 R-402

```
root@R-402:~/ovpn# openvpn client2.ovpn &
[1] 210
root@R-402:~/ovpn# 2024-01-28 22:23:52 WARNING: file 'client2.key' is group or o
2024-01-28 22:23:52 OpenVPN 2.5.5 x86_64-pc-linux-gnu [SSL (OpenSSL)] [LZO] [LZ4]
2024-01-28 22:23:52 library versions: OpenSSL 3.0.2 15 Mar 2022, LZO 2.10
2024-01-28 22:23:52 TCP/UDP: Preserving recently used remote address: [AF_INET]3
2024-01-28 22:23:52 UDP link local (bound): [AF_INET][undef]:1194
2024-01-28 22:23:52 UDP link remote: [AF_INET]3.4.0.9:1194
2024-01-28 22:23:52 [server] Peer Connection Initiated with [AF_INET]3.4.0.9:119
2024-01-28 22:23:52 TUN/TAP device tun0 opened
2024-01-28 22:23:52 net_iface_mtu_set: mtu 1500 for tun0
2024-01-28 22:23:52 net_iface_up: set tun0 up
2024-01-28 22:23:52 net_addr_ptp_v4_add: 192.168.100.6 peer 192.168.100.5 dev tun
2024-01-28 22:23:52 WARNING: this configuration may cache passwords in memory --
2024-01-28 22:23:52 Initialization Sequence Completed
root@client-200:~/ovpn# ls
ca.crt client1.crt client1.key client1.ovpn
root@client-200:~/ovpn# openvpn client1.ovpn &
[1] 147
root@client-200:~/ovpn# 2024-01-28 22:24:58 WARNING: file 'client1.key' is group or others accessible
2024-01-28 22:24:58 OpenVPN 2.5.5 x86_64-pc-linux-gnu [SSL (OpenSSL)] [LZO] [LZ4] [EPOLL] [PKCS11] [MH/PM]
2024-01-28 22:24:58 library versions: OpenSSL 3.0.2 15 Mar 2022, LZO 2.10
2024-01-28 22:24:58 TCP/UDP: Preserving recently used remote address: [AF_INET]3.4.0.9:1194
2024-01-28 22:24:58 UDP link local (bound): [AF_INET][undef]:1194
2024-01-28 22:24:58 UDP link remote: [AF_INET]3.4.0.9:1194
2024-01-28 22:24:58 [server] Peer Connection Initiated with [AF_INET]3.4.0.9:1194
2024-01-28 22:24:58 TUN/TAP device tun0 opened
2024-01-28 22:24:58 net_iface_mtu_set: mtu 1500 for tun0
2024-01-28 22:24:58 net_iface_up: set tun0 up
2024-01-28 22:24:58 net_addr_ptp_v4_add: 192.168.100.10 peer 192.168.100.9 dev tun0
2024-01-28 22:24:58 WARNING: this configuration may cache passwords in memory -- use the auth-nocache opt
2024-01-28 22:24:58 Initialization Sequence Completed
```

```
root@GW-300:~/CA/server# 2024-01-28 22:23:40 --topology net30 support for server configs with
2024-01-28 22:23:40 OpenVPN 2.5.5 x86_64-pc-linux-gnu [SSL (OpenSSL)] [LZO] [LZ4] [EPOLL] [PKCS11] [MH/PM]
2024-01-28 22:23:40 library versions: OpenSSL 3.0.2 15 Mar 2022, LZO 2.10
2024-01-28 22:23:40 TUN/TAP device tun0 opened
2024-01-28 22:23:40 net_iface_mtu_set: mtu 1500 for tun0
2024-01-28 22:23:40 net_iface_up: set tun0 up
2024-01-28 22:23:40 net_addr_ptp_v4_add: 192.168.100.1 peer 192.168.100.2 dev tun0
2024-01-28 22:23:40 Could not determine IPv4/IPv6 protocol. Using AF_INET
2024-01-28 22:23:40 UDPv4 link local (bound): [AF_INET][undef]:1194
2024-01-28 22:23:40 UDPv4 link remote: [AF_UNSPEC]
2024-01-28 22:23:40 Initialization Sequence Completed
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_VER=2.5.5
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_PLAT=linux
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_PROTO=6
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_NCP=2
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_CIPHERS=AES-256-GCM:AES-128-GCM
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_LZ4=1
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_LZ4v2=1
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_LZO=1
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_COMP_STUB=1
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_COMP_STUBv2=1
2024-01-28 22:23:52 4.2.0.9:1194 peer info: IV_TCPNL=1
2024-01-28 22:23:52 4.2.0.9:1194 [client2] Peer Connection Initiated with [AF_INET]4.2.0.9:1194
2024-01-28 22:23:52 client2/4.2.0.9:1194 MULTI_sva: pool returned IPv4=192.168.100.6, IPv6=(Not enabled)
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_VER=2.5.5
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_PLAT=linux
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_PROTO=6
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_NCP=2
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_CIPHERS=AES-256-GCM:AES-128-GCM
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_LZ4=1
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_LZ4v2=1
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_LZO=1
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_COMP_STUB=1
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_COMP_STUBv2=1
2024-01-28 22:24:58 5.4.0.9:1194 peer info: IV_TCPNL=1
2024-01-28 22:24:58 5.4.0.9:1194 [client1] Peer Connection Initiated with [AF_INET]5.4.0.9:1194
2024-01-28 22:24:58 client1/5.4.0.9:1194 MULTI_sva: pool returned IPv4=192.168.100.10, IPv6=(Not enabled)
```

Client-200 to Client-400

```
xroot@client-200:~# ip r
xdefault via 20.0.0.1 dev eth0
x10.0.31.0/30 via 192.168.100.9 dev tun0
x20.0.0.0/24 dev eth0 proto kernel scope link src 20.0.0.100
x40.0.0.0/24 via 192.168.100.9 dev tun0
x192.168.100.0/24 via 192.168.100.9 dev tun0
x192.168.100.9 dev tun0 proto kernel scope link src 192.168.100.10
xroot@client-200:~# ping 40.0.0.100
xPING 40.0.0.100 (40.0.0.100): 56 data bytes
x64 bytes from 40.0.0.100: icmp_seq=0 ttl=63 time=3.051 ms
x64 bytes from 40.0.0.100: icmp_seq=1 ttl=63 time=2.445 ms
x64 bytes from 40.0.0.100: icmp_seq=2 ttl=63 time=2.610 ms
x64 bytes from 40.0.0.100: icmp_seq=3 ttl=63 time=2.683 ms
x64 bytes from 40.0.0.100: icmp_seq=4 ttl=63 time=2.862 ms
x64 bytes from 40.0.0.100: icmp_seq=5 ttl=63 time=3.617 ms
x64 bytes from 40.0.0.100: icmp_seq=6 ttl=63 time=3.588 ms
x64 bytes from 40.0.0.100: icmp_seq=7 ttl=63 time=2.602 ms
x64 bytes from 40.0.0.100: icmp_seq=8 ttl=63 time=3.251 ms
x64 bytes from 40.0.0.100: icmp_seq=9 ttl=63 time=2.745 ms
x64 bytes from 40.0.0.100: icmp_seq=10 ttl=63 time=3.317 ms
x64 bytes from 40.0.0.100: icmp_seq=11 ttl=63 time=3.126 ms
x64 bytes from 40.0.0.100: icmp_seq=12 ttl=63 time=2.752 ms
```

Capturing from - [R-302 eth1 to GW-300 eth0]

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
71	16.056471	a2:2b:e9:7b:2f:21	7a:b2:8d:e1:3c:0f	ARP	42	Who has 3.4.0.9? Tell 3.
72	16.056660	a2:2b:e9:7b:2f:21	7a:b2:8d:e1:3c:0f	ARP	42	3.4.0.9 is at 7a:b2:8d:
73	17.028218	5.4.0.9	3.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
74	17.028576	3.4.0.9	4.2.0.9	OpenVPN	150	MessageType: P_DATA_V2
75	17.029389	4.2.0.9	3.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
76	17.029640	3.4.0.9	5.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
77	18.030797	5.4.0.9	3.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
78	18.031203	3.4.0.9	4.2.0.9	OpenVPN	150	MessageType: P_DATA_V2
79	18.032038	4.2.0.9	3.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
80	18.032462	3.4.0.9	5.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
81	19.032353	5.4.0.9	3.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
82	19.032778	3.4.0.9	4.2.0.9	OpenVPN	150	MessageType: P_DATA_V2
83	19.033311	4.2.0.9	3.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
84	19.033522	3.4.0.9	5.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
85	20.034296	5.4.0.9	3.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
86	20.034579	3.4.0.9	4.2.0.9	OpenVPN	150	MessageType: P_DATA_V2
87	20.035199	4.2.0.9	3.4.0.9	OpenVPN	150	MessageType: P_DATA_V2
88	20.035409	3.4.0.9	5.4.0.9	OpenVPN	150	MessageType: P_DATA_V2

Frame 1: 150 bytes on wire (1200 bits), 150 bytes captured (1200 bits) on interface -, id 0  
Ethernet II, Src: a2:2b:e9:7b:2f:21 (a2:2b:e9:7b:2f:21), Dst: 7a:b2:8d:e1:3c:0f (7a:b2:8d:e1:3c:0f)  
Internet Protocol Version 4, Src: 5.4.0.9, Dst: 3.4.0.9  
User Datagram Protocol, Src Port: 1194, Dst Port: 1194  
OpenVPN Protocol

Client-200 to Leaf-1

```
xroot@client-200:~# ping 10.0.31.2
xPING 10.0.31.2 (10.0.31.2): 56 data bytes
x64 bytes from 10.0.31.2: icmp_seq=0 ttl=63 time=3.878 ms
x64 bytes from 10.0.31.2: icmp_seq=1 ttl=63 time=2.929 ms
x64 bytes from 10.0.31.2: icmp_seq=2 ttl=63 time=3.115 ms
x64 bytes from 10.0.31.2: icmp_seq=3 ttl=63 time=2.619 ms
x64 bytes from 10.0.31.2: icmp_seq=4 ttl=63 time=3.372 ms
x64 bytes from 10.0.31.2: icmp_seq=5 ttl=63 time=3.297 ms
x64 bytes from 10.0.31.2: icmp_seq=6 ttl=63 time=5.488 ms
x^C--- 10.0.31.2 ping statistics ---
x7 packets transmitted, 7 packets received, 0% packet loss
xround-trip min/avg/max/stddev = 2.619/3.528/5.488/0.878 ms
```

Capturing from - [GW-300 eth1 to Leaf-1 swp6]

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
21	7.817029	fe80::a00:27ff:fee1...	ff02::1	ICMPv6	78	Router Advertisement
22	8.013923	192.168.100.10	10.0.31.2	ICMP	98	Echo (ping) request
23	8.014449	10.0.31.2	192.168.100.10	ICMP	98	Echo (ping) reply
24	9.014745	192.168.100.10	10.0.31.2	ICMP	98	Echo (ping) request
25	9.015281	10.0.31.2	192.168.100.10	ICMP	98	Echo (ping) reply
26	10.016502	192.168.100.10	10.0.31.2	ICMP	98	Echo (ping) request
27	10.016928	10.0.31.2	192.168.100.10	ICMP	98	Echo (ping) reply
28	11.017236	192.168.100.10	10.0.31.2	ICMP	98	Echo (ping) request
29	11.017611	10.0.31.2	192.168.100.10	ICMP	98	Echo (ping) reply
30	11.848148	10.0.31.2	224.0.0.5	OSPF	78	Hello Packet
31	12.018784	192.168.100.10	10.0.31.2	ICMP	98	Echo (ping) request
32	12.019234	10.0.31.2	192.168.100.10	ICMP	98	Echo (ping) reply
33	13.020199	192.168.100.10	10.0.31.2	ICMP	98	Echo (ping) request
34	13.020547	10.0.31.2	192.168.100.10	ICMP	98	Echo (ping) reply
35	14.021604	192.168.100.10	10.0.31.2	ICMP	98	Echo (ping) request
36	14.022097	10.0.31.2	192.168.100.10	ICMP	98	Echo (ping) reply
37	15.022569	192.168.100.10	10.0.31.2	ICMP	98	Echo (ping) request
38	15.023063	10.0.31.2	192.168.100.10	ICMP	98	Echo (ping) reply