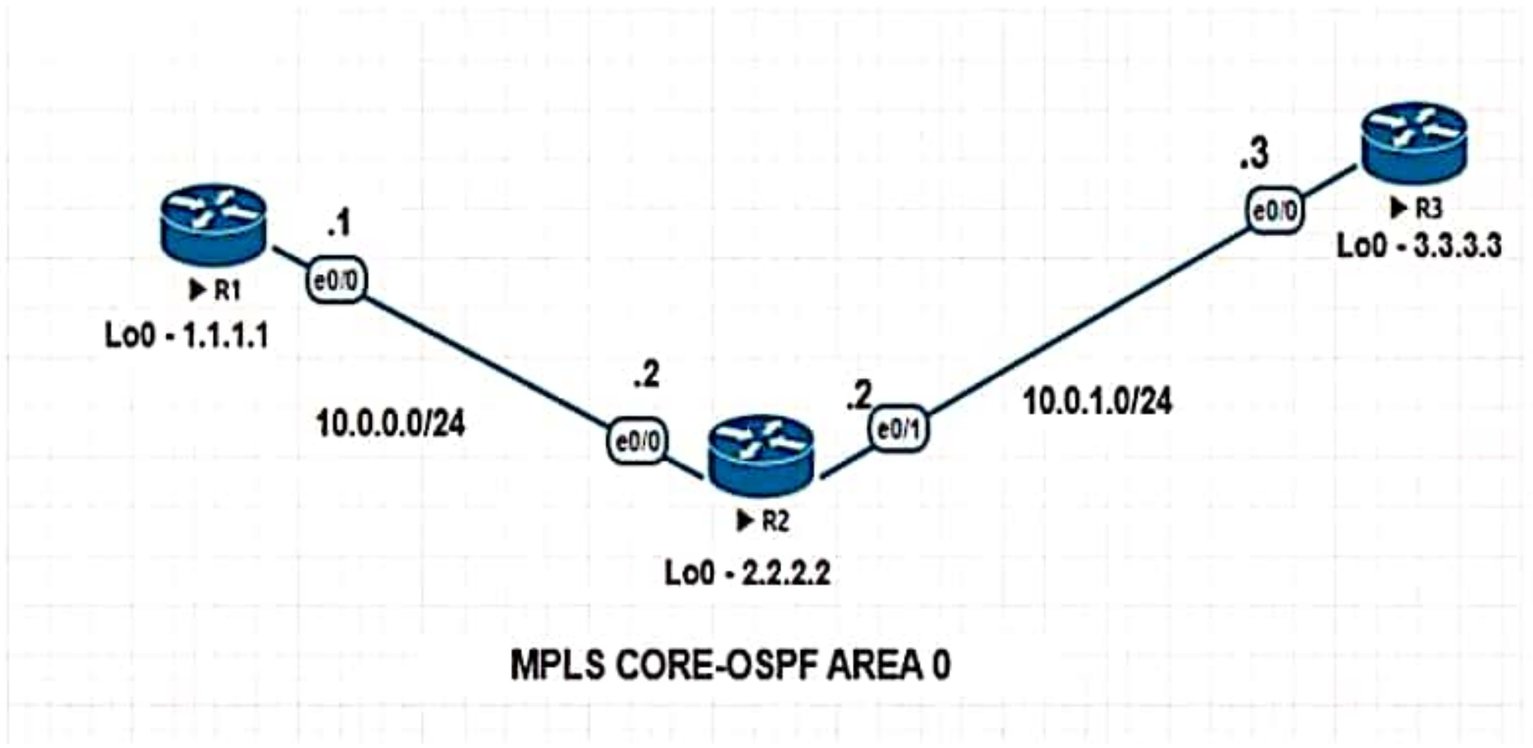
Practical 8

NETWORK TOPOLOGY



R1 Router>enable
Router#conf t
Router(config)#hostname R1
R1(config)# interface loopback 0
R1(config-if)#ip address 1.1.1.1 255.255.255.255
R1(config-if)#exit R1(config)#int e0/0
R1(config-if)#ip address 10.0.0.1 255.255.255.0
R1(config-if)#no shut
R1(config)#router ospf 1
R1(config-router)#network 1.1.1.0 0.0.0.255 area 0
R1(config-router)#network 10.0.0.0 0.0.0.255 area 0
R1(config-router)#exit R
1#show ip route ospf
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2 E1 - OSPF external type 1, E2 - OSPF external type 2 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2 ia - IS-IS inter area, * - candidate default, U - per-user static route o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP a - application route + - replicated route, % - next hop override
Gateway of last resort is not set
2.0.0.0/32 is subnetted, 1 subnets O 2.2.2.2 [110/11] via 10.0.0.2, 00:15:40, Ethernet0/0 3.0.0.0/32 is subnetted, 1 subnets
O 3.3.3.3 [110/21] via 10.0.0.2, 00:04:01, Ethernet0/0 10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
O 10.0.1.0/24 [110/20] via 10.0.0.2, 00:09:25, Ethernet0/0

R1#sh ip cef Prefix Next Hop Interface 0.0.0.0/0 no route 0.0.0.0/8 drop
0.0.0.0/32
receive 1.1.1.1/32 receive Loopback0 2.2.2.2/32 10.0.0.2
Ethernet0/0 3.3.3.3/32 10.0.0.2 Ethernet0/0 10.0.0.0/24 attached
Ethernet0/0 10.0.0.0/32 receive Ethernet0/0 10.0.0.1/32 receive Ethernet0/0
10.0.0.2/32 attached Ethernet0/0 10.0.0.255/32 receive Ethernet0/0
10.0.1.0/24 10.0.0.2
Ethernet0/0 127.0.0.0/8 drop 224.0.0.0/4 drop 224.0.0.0/24 receive
240.0.0.0/4 drop 255.255.255.255/32 receive
R1#sh ip route 2.2.2.2
Routing entry for 2.2.2.2/32 Known via "ospf 1", distance 110, metric 11,
type intra area Last update from 10.0.0.2 on Ethernet0/0, 00:30:34 ago
Routing Descriptor Blocks: * 10.0.0.2, from 2.2.2.2, 00:30:34 ago, via
Ethernet0/0 Route metric is 11, traffic share count is 1 R1#sh ip route 3.3.3.3
Routing entry for 3.3.3.3/32 Known via "ospf 1", distance 110, metric 21,
type intra area Last update from 10.0.0.2 on Ethernet0/0, 00:11:43 ago
Routing Descriptor Blocks: * 10.0.0.2, from 3.3.3.3, 00:11:43 ago, via
Ethernet0/0 Route metric is 21, traffic share count is 1 R1#sh ip cef 2.2.2.2
2.2.2.2/32 nexthop 10.0.0.2 Ethernet0/0
R1#sh ip cef 3.3.3.3 3.3.3.3/32 nexthop 10.0.0.2 Ethernet0/0
R1(config)#mpls label range 100 199
R1(config)#mpls label protocol ldp
R1(config)#mpls ldp router-id loopback 0
R1(config)#int e0/0
R1(config-if)#mpls ip
R1#sh mpls interfaces Interface IP Tunnel BGP Static Operational Ethernet0/0
Yes (ldp) No No No Yes
R1#sh mpls ldp neighbor Peer LDP Ident: 2.2.2.2:0; Local LDP Ident 1.1.1.1:0
TCP connection: 2.2.2.2.27963 - 1.1.1.1.646 State: Oper; Msgs sent/rcvd:
13/14; Downstream Up time: 00:05:21 LDP discovery sources: Ethernet0/0,
Src IP addr: 10.0.0.2 Addresses bound to peer LDP Ident: 10.0.0.2 10.0.1.2
2.2.2.2
R1#sh ip cef 3.3.3.3 3.3.3.3/32 nexthop 10.0.0.2 Ethernet0/0 label 201
R1#sh ip cef 2.2.2.2 2.2.2.2/32 nexthop 10.0.0.2 Ethernet0/0
R1#sh mpls forwarding-table
Local Outgoing Prefix Bytes Label Outgoing Next Hop Label Label or Tunnel Id
Switched interface 100 Pop Label 2.2.2.2/32 0 Et0/0 10.0.0.2 101 201
3.3.3.3/32 0 Et0/0 10.0.0.2 102 Pop Label 10.0.1.0/24 0 Et0/0 10.0.0.2
R1#sh mpls ldp bindings lib entry: 1.1.1.1/32, rev 2
local binding: label: imp-null

remote binding: lsr: 2.2.2.2:0, label: 200
lib entry: 2.2.2.2/32, rev 4 local binding: label: 100 remote binding: lsr: 2.2.2.2:0, label: imp-null
lib entry: 3.3.3.3/32, rev 6 local binding: label: 101 remote binding: lsr: 2.2.2.2:0, label: 201
lib entry: 10.0.0.0/24, rev 8 local binding: label: imp-null remote binding: lsr: 2.2.2.2:0, label: imp-null lib entry: 10.0.1.0/24, rev 10 local binding: label: 102 remote binding: lsr: 2.2.2.2:0, label: imp-null
R1#ping 3.3.3.3 source 10.0.0.1
Type escape sequence to abort. Sending 5, 100-byte
ICMP Echos to 3.3.3.3, timeout is 2 seconds:
Packet sent with a source address of 10.0.0.1 !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
R1#traceroute 3.3.3.3 source 10.0.0.1 Type escape sequence to abort.
Tracing the route to 3.3.3.3 VRF info: (vrf in name/id, vrf out name/id) 1 10.0.0.2 [MPLS: Label 201 Exp 0] 1 msec 1 msec 0 msec 2 10.0.1.3 1 msec 2 msec
* R1#ping 2.2.2.2 source 10.0.0.1 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
Packet sent with a source address of 10.0.0.1 !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 5/5/6 ms
R1#traceroute 2.2.2.2 source 10.0.0.1 Type escape sequence to abort.
Tracing the route to 2.2.2.2 VRF info: (vrf in name/id, vrf out name/id) 1 10.0.0.2 2 msec 1 msec
* R2
Router>enable
Router#conf t
Router(config)#hostname R2
R2(config)# interface loopback 0
R2(config-if)#ip address 2.2.2.2 255.255.255.255
R2(config-if)# exit
R2(config)#int e0/0
R2(config-if)#ip address 10.0.0.2 255.255.255.0 R2(config-if)#no shut
R2(config)#int e0/1
R2(config-if)#ip address 10.0.1.2 255.255.255.0
R2(config-if)#no shut
R2(config)#router ospf 1
R2(config-router)#network 2.2.2.0 0.0.0.255 area 0
R2(config-router)#network 10.0.0.0 0.0.0.255 area 0 R2(config-router)#network 10.0.1.0 0.0.0.255 area 0

R2(config-router)#exit
R2#show ip route
ospf Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2 E1 - OSPF external type 1, E2 - OSPF external type 2 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2 ia - IS-IS inter area, * - candidate default, U - per-user static route o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP a - application route + - replicated route, % - next hop override
Gateway of last resort is not set
1.0.0.0/32 is subnetted, 1 subnets O 1.1.1.1 [110/11] via 10.0.0.1, 00:15:32, Ethernet0/0 3.0.0.0/32 is subnetted, 1 subnets O 3.3.3.3 [110/11] via 10.0.1.3, 00:03:58, Ethernet0/1
R2#sh ip cef Prefix Next Hop Interface 0.0.0.0/0 no route 0.0.0.0/8 drop
0.0.0.0/32
receive 1.1.1.1/32 10.0.0.1 Ethernet0/0 2.2.2.2/32
receive Loopback0 3.3.3.3/32 10.0.1.3 Ethernet0/1 10.0.0.0/24 attached Ethernet0/0 10.0.0.0/32
receive Ethernet0/0 10.0.0.1/32 attached Ethernet0/0 10.0.0.2/32
receive Ethernet0/0 10.0.0.255/32
receive Ethernet0/0 10.0.1.0/24 attached Ethernet0/1 10.0.1.0/32
receive Ethernet0/1 10.0.1.2/32
receive Ethernet0/1 10.0.1.3/32 attached Ethernet0/1 10.0.1.255/32 r
eceive Ethernet0/1 127.0.0.0/8 drop 224.0.0.0/4 drop 224.0.0.0/24
receive 240.0.0.0/4 drop 255.255.255.255/32 receive
R2#sh ip route 1.1.1.1
Routing entry for 1.1.1.1/32 Known via "ospf 1", distance 110, metric 11, type intra area Last update from 10.0.0.1 on Ethernet0/0, 00:33:11 ago
Routing Descriptor Blocks: * 10.0.0.1, from 1.1.1.1, 00:33:11 ago, via Ethernet0/0 Route metric is 11, traffic share count is 1
R2#sh ip route 3.3.3.3
Routing entry for 3.3.3.3/32 Known via "ospf 1", distance 110, metric 11, type intra area Last update from 10.0.1.3 on Ethernet0/1, 00:21:49 ago R
outing Descriptor Blocks: * 10.0.1.3, from 3.3.3.3, 00:21:49 ago, via Ethernet0/1 Route metric is 11, traffic share count is 1
R2#sh ip cef 1.1.1.1 1.1.1.1/32 nexthop 10.0.0.1 Ethernet0/0 R2#sh ip cef 3.3.3.3 3.3.3.3/32 nexthop 10.0.1.3 Ethernet0/1
R2(config)#mpls label range 200 299
R2(config)#mpls label protocol ldp
R2(config)#mpls ldp router-id loopback 0

R2(config)#int e0/0
R2(config-if)#mpls ip
R2(config-if)#int e0/1
R2(config-if)#mpls ip
R2#sh mpls interfaces
Interface IP Tunnel BGP Static Operational Ethernet0/0 Yes (ldp) No No No Yes Ethernet0/1 Yes (ldp) No No No Yes
R2#sh mpls forwarding-table
Local Outgoing Prefix Bytes Label Outgoing Next Hop Label Label or Tunnel Id Switched interface 200 Pop Label 1.1.1.1/32 0 Et0/0 10.0.0.1 201 Pop Label 3.3.3.3/32 1266 Et0/1 10.0.1.3
R2#sh mpls ldp neighbor
Peer LDP Ident: 1.1.1.1:0; Local LDP Ident 2.2.2.2:0 TCP connection: 1.1.1.1.646 - 2.2.2.2.27963 State: Oper; Msgs sent/rcvd: 41/42; Downstream Up time: 00:29:24 LDP discovery sources: Ethernet0/0, Src IP addr: 10.0.0.1 Addresses bound to peer LDP Ident: 10.0.0.1 1.1.1.1 Peer LDP Ident: 3.3.3.3:0; Local LDP Ident 2.2.2.2:0 TCP connection: 3.3.3.3.44196 - 2.2.2.2.646 State: Oper; Msgs sent/rcvd: 38/38; Downstream Up time: 00:27:24 LDP discovery sources: Ethernet0/1, Src IP addr: 10.0.1.3 Addresses bound to peer LDP Ident: 10.0.1.3 3.3.3.3
R2#sh mpls ldp bindings
lib entry: 1.1.1.1/32, rev 2 local binding: label: 200 remote binding: lsr: 1.1.1.1:0, label: imp-null remote binding: lsr: 3.3.3.3:0, label: 300
lib entry: 2.2.2.2/32, rev 4 local binding: label: imp-null remote binding: lsr: 1.1.1.1:0, label: 100 remote binding: lsr: 3.3.3.3:0, label: 301
lib entry: 3.3.3.3/32, rev 6 local binding: label: 201 remote binding: lsr: 1.1.1.1:0, label: 101 remote binding: lsr: 3.3.3.3:0, label: imp-null
lib entry: 10.0.0.0/24, rev 8 local binding: label: imp-null remote binding: lsr: 1.1.1.1:0, label: imp-null remote binding: lsr: 3.3.3.3:0, label: 302
lib entry: 10.0.1.0/24, rev 10 local binding: label: imp-null remote binding: lsr: 1.1.1.1:0, label: 102 remote binding: lsr: 3.3.3.3:0, label: imp-null
R2#ping 1.1.1.1 source 10.0.0.2
Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 1.1.1.1, timeout is 2 seconds:
Packet sent with a source address of 10.0.0.2 !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
R2#traceroute 1.1.1.1 source 10.0.0.2 Type escape sequence to abort. Tracing the route to 1.1.1.1
VRF info: (vrf in name/id, vrf out name/id) 1 10.0.0.1 2 msec 1 msec *

R2#ping 3.3.3.3 source 10.0.1.2 Type escape sequence to abort. Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
Packet sent with a source address of 10.0.1.2 !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
R2#traceroute 3.3.3.3 source 10.0.1.2 Type escape sequence to abort. Tracing the route to 3.3.3.3 VRF info: (vrf in name/id, vrf out name/id) 1 10.0.1.3 0 msec 1 msec *
R3
Router>enable Router#conf t
Router(config)#hostname R
3 R3(config)#interface loopback 0
R3(config-if)#ip address 3.3.3.3 255.255.255.255
R3(config-if)#exit
R3(config)#int e0/0
R3(config-if)#ip address 10.0.1.3 255.255.255.0
R3(config-if)#no shu
t R3(config-if)#exit
R3(config)#router ospf 1
R3(config-router)#network 3.3.3.0 0.0.0.255 area 0
R3(config-router)#network 10.0.1.0 0.0.0.255 area 0
R3(config-router)#exit
R3#sh ip route osp
f Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2 E1 - OSPF external type 1, E2 - OSPF external type 2 i - IS-IS, su - IS-IS summary,
L1 - IS-IS level-1, L2 - IS-IS level-2 ia - IS-IS inter area, * - candidate default, U - per-user static route o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP a - application route + - replicated route, % - next hop override
Gateway of last resort is not set
1.0.0.0/32 is subnetted, 1 subnets O 1.1.1.1 [110/21] via 10.0.1.2, 00:03:45, Ethernet0/0 2.0.0.0/32 is subnetted, 1 subnets O 2.2.2.2 [110/11] via 10.0.1.2, 00:03:45, Ethernet0/0 10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks O 10.0.0.0/24 [110/20] via 10.0.1.2, 00:03:45, Ethernet0/0
R3#sh ip cef Prefix
Next Hop Interface 0.0.0.0/0 no route 0.0.0.0/8 drop 0.0.0.0/32 receive 1.1.1.1/32 10.0.1.2 Ethernet0/0 2.2.2.2/32 10.0.1.2 Ethernet0/0 3.3.3.3/32 receive Loopback0 10.0.0.0/24 10.0.1.2 Ethernet0/0 10.0.1.0/24 attached

Ethernet0/0 10.0.1.0/32 receive Ethernet0/0 10.0.1.2/32 attached
Ethernet0/0 10.0.1.3/32 receive Ethernet0/0 10.0.1.255/32 receive
Ethernet0/0 127.0.0.0/8 drop 224.0.0.0/4 drop 224.0.0.0/24 receive
240.0.0.0/4 drop 255.255.255.255/32 receive
R3#sh ip route 1.1.1.1
Routing entry for 1.1.1.1/32 Known via "ospf 1", distance 110, metric 21,
type intra area Last update from 10.0.1.2 on Ethernet0/0, 00:23:51 ago
Routing Descriptor Blocks: * 10.0.1.2, from 1.1.1.1, 00:23:51 ago, via
Ethernet0/0 Route metric is 21, traffic share count is 1
R3#sh ip route 2.2.2.2 Routing entry for 2.2.2.2/32 Known via "ospf 1",
distance 110, metric 11, type intra area Last update from 10.0.1.2 on
Ethernet0/0, 00:23:58 ago Routing Descriptor Blocks: * 10.0.1.2, from 2.2.2.2,
00:23:58 ago, via Ethernet0/0 Route metric is 11, traffic share count is 1
R3#sh ip cef 1.1.1.1 1.1.1.1/32 nexthop 10.0.1.2 Ethernet0/0
R3#sh ip cef 2.2.2.2 2.2.2.2/32 nexthop 10.0.1.2 Ethernet0/0
R3(config)#mpls label range 300 399
R3(config)#mpls lab
el protocol ldp
R3(config)#mpls ldp router-id loopback 0
R3(config)#int e0/0
R3(config-if)#mpls ip R3#sh mpls interfaces Interface IP Tunnel BGP Static
Operational Ethernet0/0 Yes (ldp) No No No Yes R3#sh mpls ldp binding
lib entry: 1.1.1.1/32, rev 2 local binding: label: 300 remote
binding: lsr: 2.2.2.2:0, label: 200 lib entry: 2.2.2.2/32, rev 4 local
binding: label: 301 remote binding: lsr: 2.2.2.2:0, label: imp-null lib entry:
3.3.3.3/32,
rev 6 local binding: label: imp-null remote binding: lsr: 2.2.2.2:0, label: 201 lib
entry: 10.0.0.0/24,
rev 8 local binding: label: 302 remote binding: lsr: 2.2.2.2:0, label: imp-null lib
entry: 10.0.1.0/24,
rev 10 local binding: label: imp-null remote binding: lsr: 2.2.2.2:0, label: imp-
null
R3#sh mpls ldp neighbor Peer LDP Ident: 2.2.2.2:0; Local LDP Ident 3.3.3.3:0
TCP connection: 2.2.2.2.646 - 3.3.3.3.44196 State: Oper; Msgs sent/rcvd:
51/51;
Downstream Up time: 00:38:15
LDP discovery sources:
Ethernet0/0, Src IP addr: 10.0.1.2 Addresses bound to peer LDP Ident:
10.0.0.2 10.0.1.2 2.2.2.2
R3#sh mpls forwarding-table

Local Outgoing Prefix Bytes
Label Outgoing Next Hop Label Label or Tunnel Id Switched interface 300 200
1.1.1.1/32 0 Et0/0 10.0.1.2 301 Pop Label 2.2.2.2/32 0 Et0/0 10.0.1.2 302 Pop
Label 10.0.0.0/24 0 Et0/0 10.0.1.2
R3#sh ip cef 1.1.1.1 1.1.1.1/32 nexthop 10.0.1.2 Ethernet0/0 label 200
R3#sh ip cef 2.2.2.2 2.2.2.2/32 nexthop 10.0.1.2 Ethernet0/0
R3#ping 1.1.1.1 source 10.0.1.3 Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.1.1.1, timeout is 2 seconds: Packet sent
with a source address of 10.0.1.3 !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/3 ms
R3#traceroute 1.1.1.1 source 10.0.1.3
Type escape sequence to abort.
Tracing the route to 1.1.1.1
VRF info:

(vrf in name/id, vrf out name/id) 1 10.0.1.2 [MPLS: Label 200 Exp 0] 1 msec 2
msec 1 msec 2 10.0.0.1 2 msec 2 msec *
R3#ping 2.2.2.2 source 10.0.1.3 Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
Packet sent with a source address of 10.0.1.3 !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
R3#traceroute 2.2.2.2
source 10.0.1.3
Type escape sequence to abort. Tracing the route to 2.2.2.2
VRF info:
(vrf in name/id, vrf out name/id) 1 10.0.1.2 2 msec 2 msec *