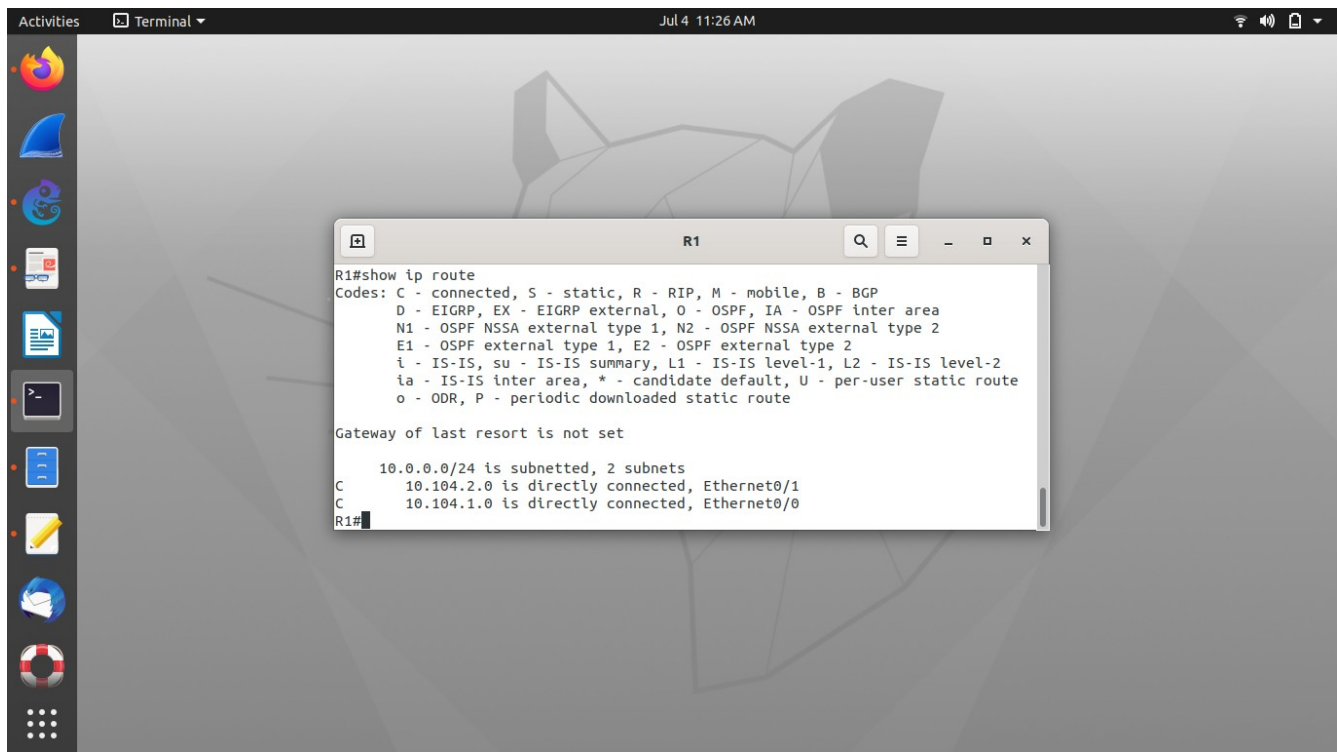


Note: Wireshark file with comments is Final_file.pcapng. In this, note that I restarted the full network from the start, as 2a, 2b, 2c steps were required only for this pdf. So, DR and BDR there will be different than those found here.

R1's show ip route :-

1) 2-a (with only link of R1-switch active) :



```
R1#show ip route
Codes: 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

Gateway of last resort is not set

  10.0.0.0/24 is subnetted, 2 subnets
C      10.104.2.0 is directly connected, Ethernet0/1
C      10.104.1.0 is directly connected, Ethernet0/0
R1#
```

The only networks known to R1 are the ones directly connected to it, which are, 10.104.2.0 and 10.104.1.0, which connects it to switch and PC1 respectively. This is because the links switch-R2, switch-R3 are down.

2) 2-b (with links of R1-switch and R2-switch active) :

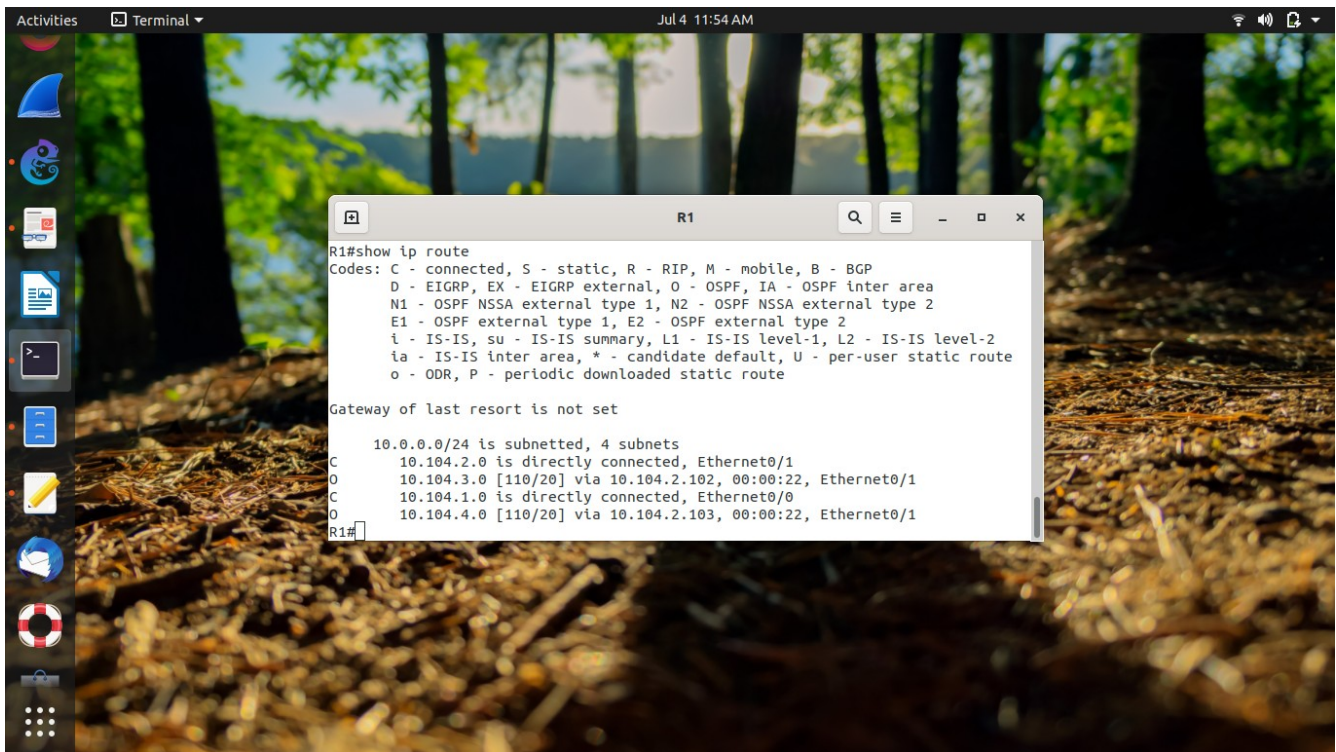
```
Activities Terminal Jul 4 11:42 AM
R1
R1#show ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - 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

Gateway of last resort is not set

 10.0.0.0/24 is subnetted, 3 subnets
C    10.104.2.0 is directly connected, Ethernet0/1
O    10.104.3.0 [110/20] via 10.104.2.102, 00:04:22, Ethernet0/1
C    10.104.1.0 is directly connected, Ethernet0/0
R1#
```

10.104.2.101 and 10.104.1.101 are directly connected to R1 as switch-R1 and PC1-R1 networks respectively.
10.104.3.0 network is known to R1 by OSPF packets, which reaches to it via network 10.104.2.0.

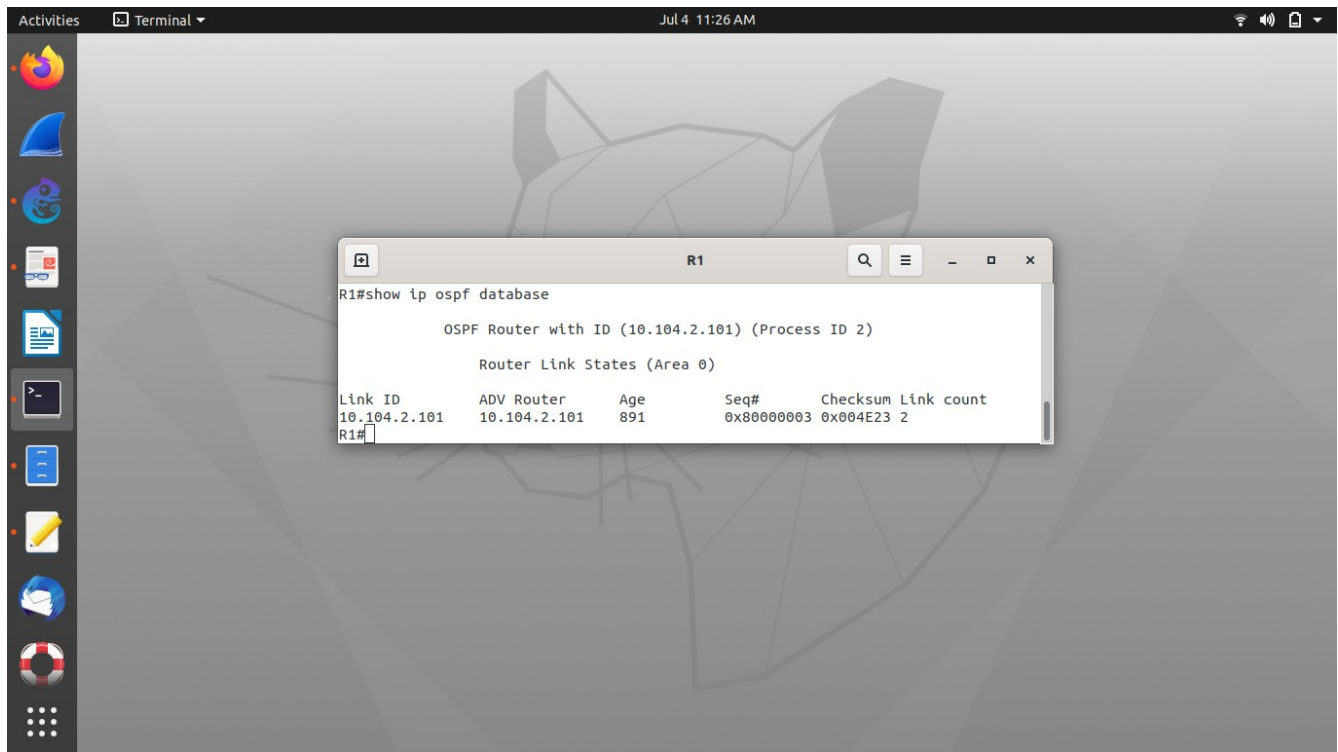
3) 2-c (with all links active) :



10.104.2.101 and 10.104.1.101 are directly connected to R1 as switch-R1 and PC1-R1 networks respectively.
10.104.3.0 and 10.104.4.0 networks are known to R1 by OSPF packets, which both reach to it via network 10.104.2.0.

R1's LSDB :-

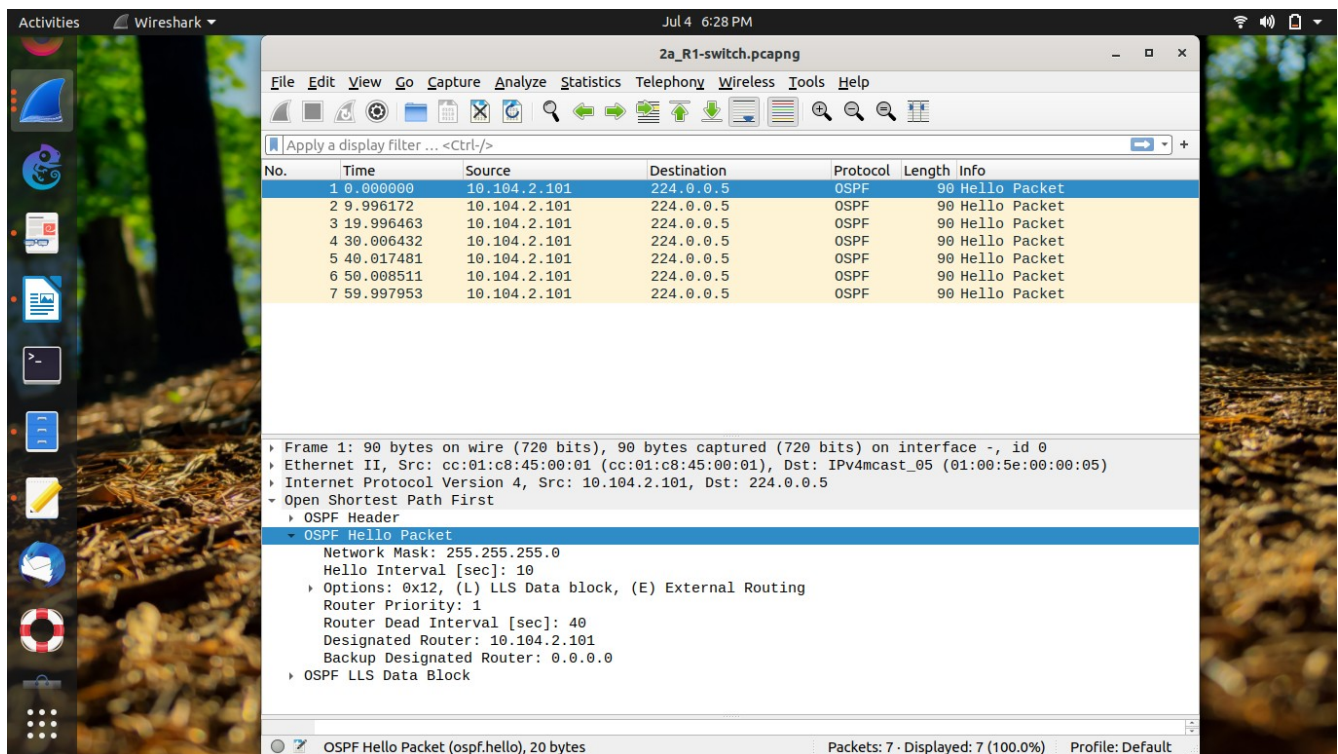
1) 2-a (with only link of R1-switch active) :



Router ID given to R1 is 10.104.2.101, which is an IPv4 address on its interface. Since other routers are not active, so there is only R1, giving out type-1 Router LSA, and as Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.2.101. Link count is 2, with links as- 10.104.1.0 and 10.104.2.0; both as stub networks.

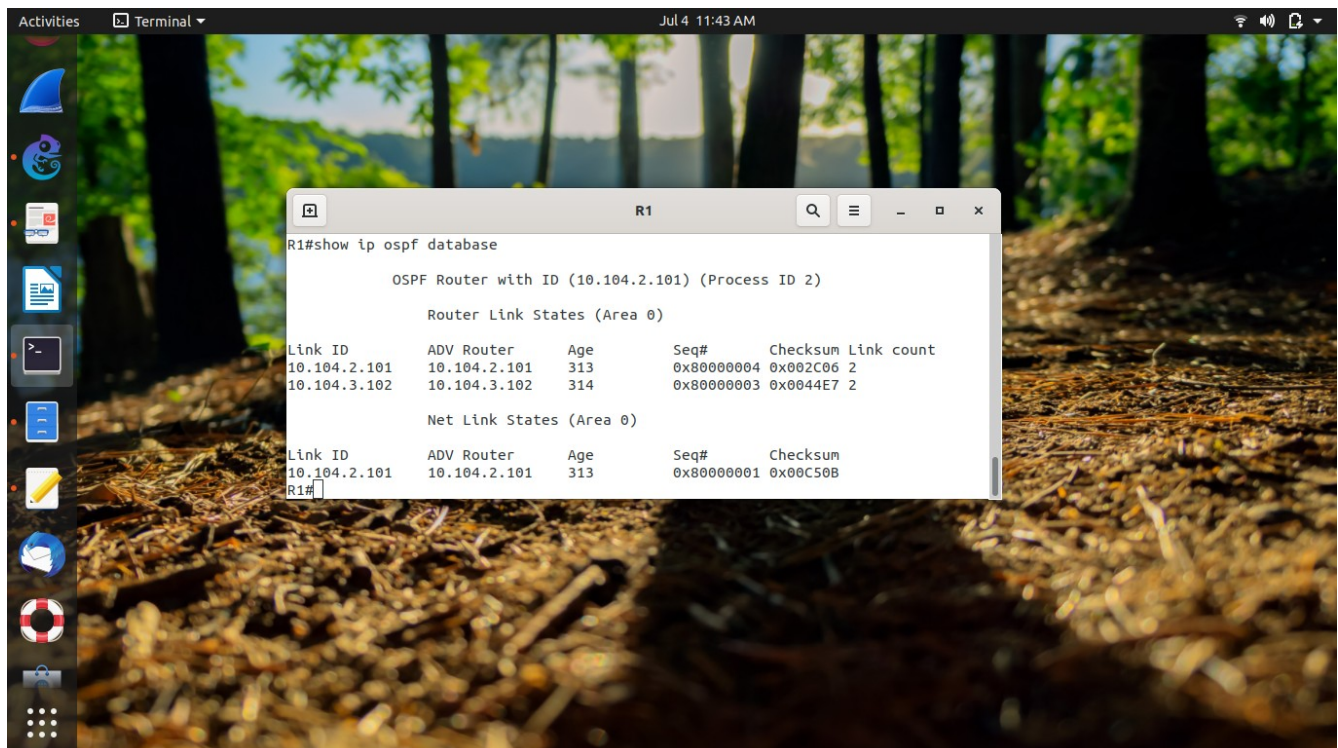
DR is 10.104.2.101

Proof of this is by seeing wireshark capture in R1-switch-



Note that only 10.104.2.101 is active here, and other routers are dead. As can be seen, 10.104.2.101 is DR, and 0.0.0.0 is BDR.

2) 2-b (with links of R1-switch and R2-switch active) :



Router ID given to R1 is 10.104.2.101, which is an IPv4 address on its interface.

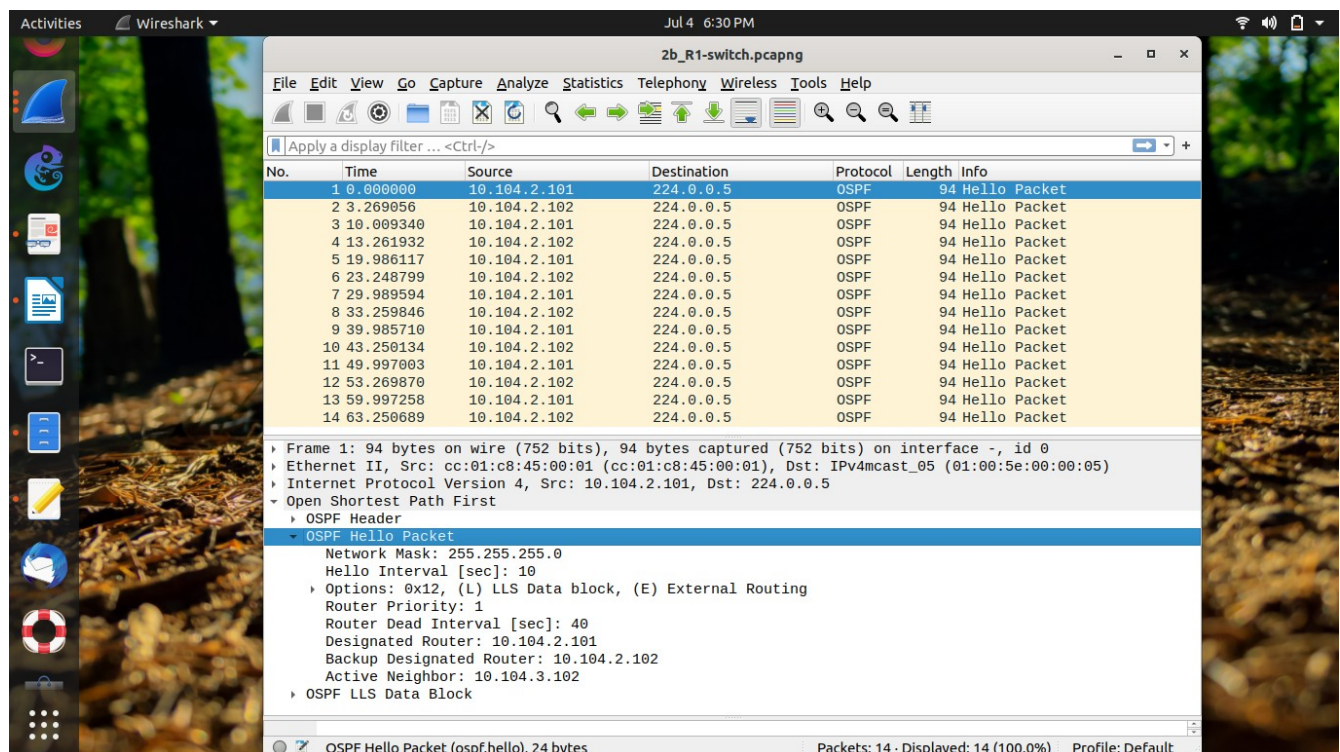
As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.2.101. Link count is 2 for 10.104.2.101, with links as- 10.104.1.0 and 10.104.2.0; both as stub networks.

Router ID given to R2 is 10.104.3.102, which is an IPv4 address on its interface.

As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.3.102. Link count is 2 for 10.104.3.102, with links as- 10.104.2.0 and 10.104.3.0; both as stub networks.

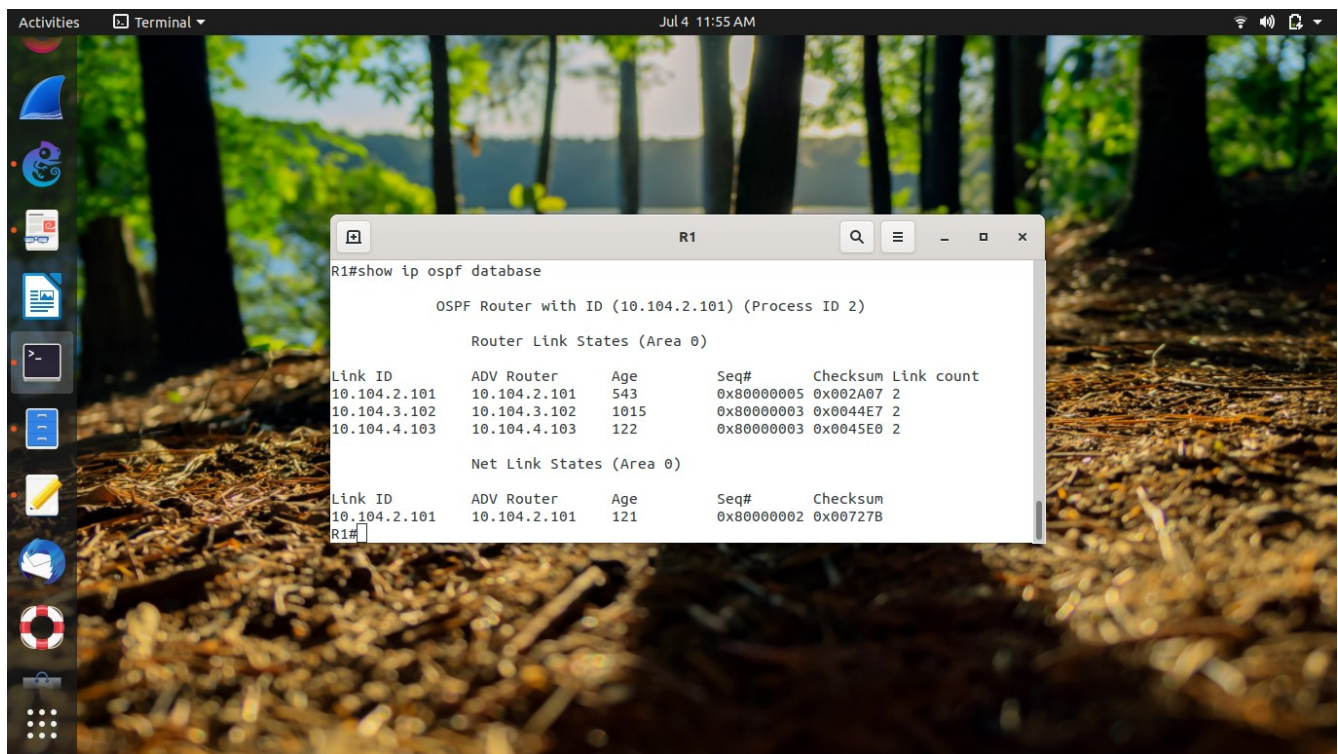
Type-2 or Network LSA is present here. As its link id is 10.104.2.101, the address of DR is also 10.104.2.101, as this is the link id of Network LSA.

Proof of this is by seeing wireshark capture in R1-switch -



Only R1 and R2 are sending OSPF Hello packets. In each of them, DR elected is 10.104.2.101 and BDR is 10.104.2.102, which is the only other OSPF interface. R2's Router ID is 10.104.3.102, and it is an active neighbor of R1.

3) 2-c (with all links active) :



Router ID given to R1 is 10.104.2.101, which is an IPv4 address on its interface.

As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.2.101. Link count is 2 for 10.104.2.101, with links as- 10.104.1.0 and 10.104.2.0; both as stub networks.

Router ID given to R2 is 10.104.3.102, which is an IPv4 address on its interface.

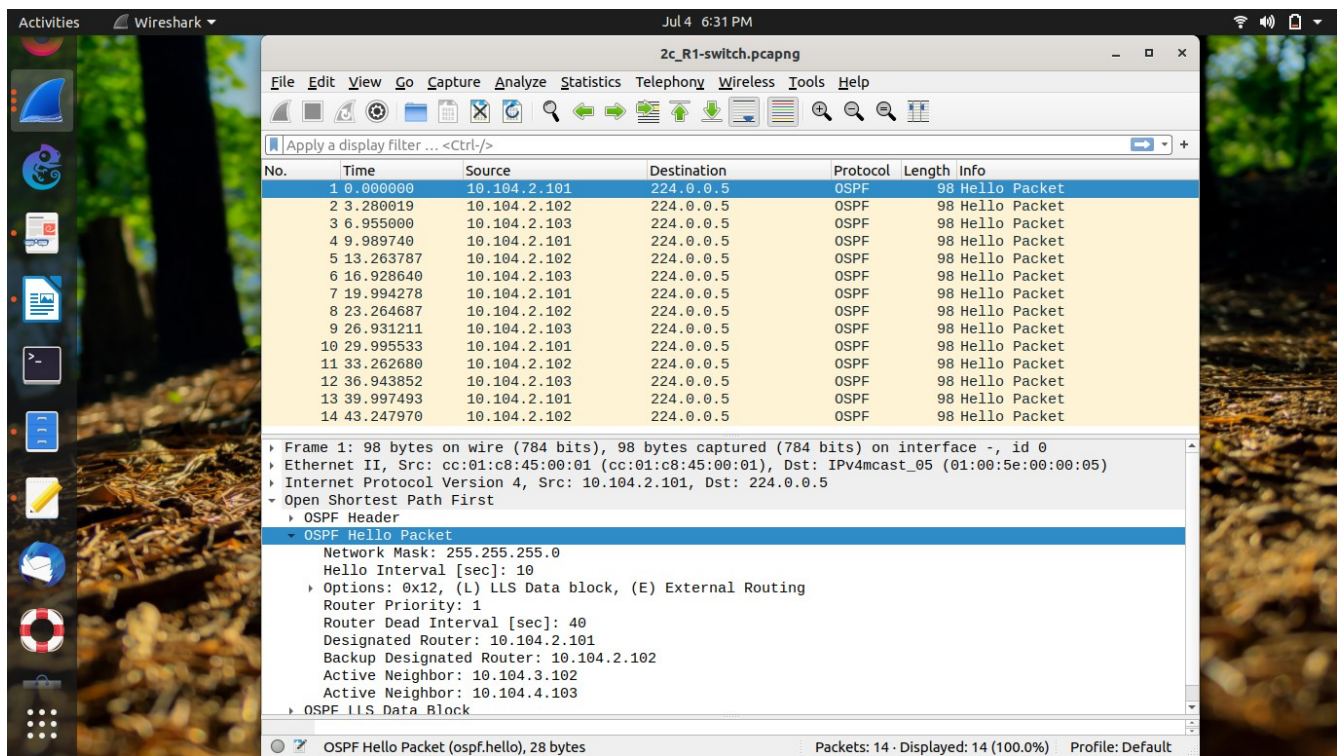
As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.3.102. Link count is 2 for 10.104.3.102, with links as- 10.104.2.0 and 10.104.3.0; both as stub networks.

Router ID given to R3 is 10.104.4.103, which is an IPv4 address on its interface.

As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.3.102. Link count is 2 for 10.104.4.103, with links as- 10.104.2.0 and 10.104.4.0; both as stub networks.

Type-2 or Network LSA is present here. As its link id is 10.104.2.101, the address of DR is also 10.104.2.101, as this is the link id of Network LSA. BDR is 10.104.2.102.

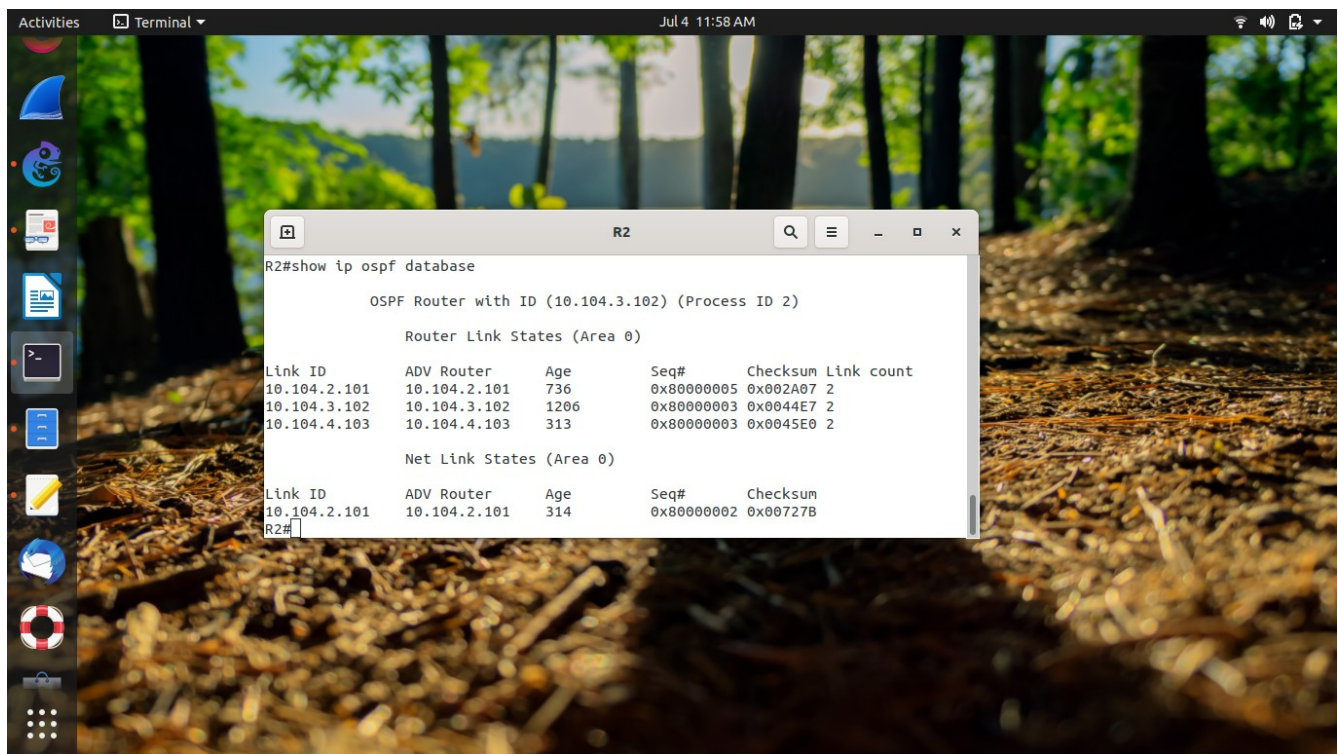
Proof of this is by seeing wireshark capture in R1-switch -



R1, R2 and R3 are sending OSPF Hello packets. In each of them, DR elected is 10.104.2.101 and BDR is 10.104.2.102. R2's Router ID is 10.104.3.102, R3's router ID is 10.104.4.103, and both are active neighbors of R1.

R2 and R3's LSDB at 2c :-

1) R2:



Note that the entries of R1 and R2 are same; just the age of LSA of R2 is more than that of R1.

Router ID given to R1 is 10.104.2.101, which is an IPv4 address on its interface.

As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.2.101. Link count is 2 for 10.104.2.101, with links as- 10.104.1.0 and 10.104.2.0; both as stub networks.

Router ID given to R2 is 10.104.3.102, which is an IPv4 address on its interface.

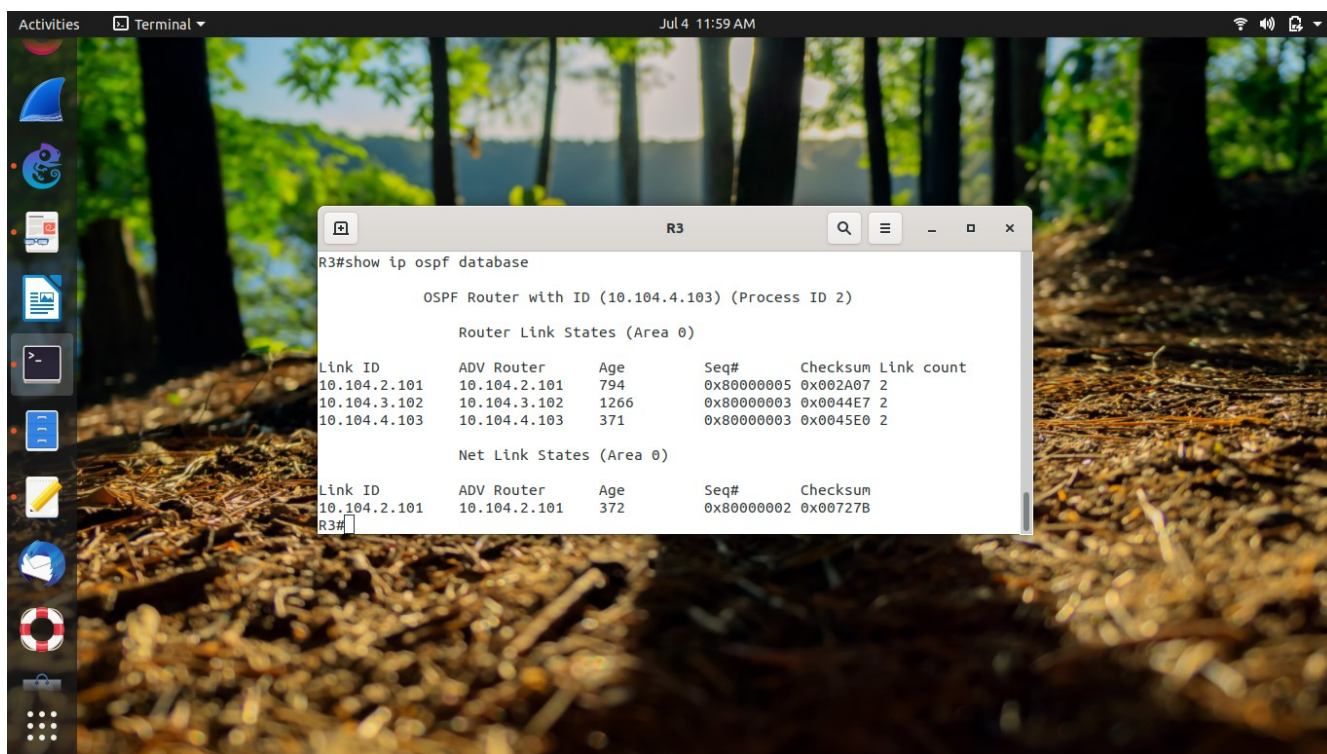
As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.3.102. Link count is 2 for 10.104.3.102, with links as- 10.104.2.0 and 10.104.3.0; both as stub networks.

Router ID given to R3 is 10.104.4.103, which is an IPv4 address on its interface.

As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.3.102. Link count is 2 for 10.104.4.103, with links as- 10.104.2.0 and 10.104.4.0; both as stub networks.

Type-2 or Network LSA is present here. As its link id is 10.104.2.101, the address of DR is also 10.104.2.101, as this is the link id of Network LSA. BDR is 10.104.2.102.

2) R3:



Note that the entries of R1, R2, R3 are same; just the age of LSA of R3 is more than that of R2, and R2's age is more than R1's.

Router ID given to R1 is 10.104.2.101, which is an IPv4 address on its interface.

As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.2.101. Link count is 2 for 10.104.2.101, with links as- 10.104.1.0 and 10.104.2.0; both as stub networks.

Router ID given to R2 is 10.104.3.102, which is an IPv4 address on its interface.

As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.3.102. Link count is 2 for 10.104.3.102, with links as- 10.104.2.0 and 10.104.3.0; both as stub networks.

Router ID given to R3 is 10.104.4.103, which is an IPv4 address on its interface.

As Link id and Advertisement Router is same for type-1 LSA, so, Advertisement Router is also 10.104.3.102. Link count is 2 for 10.104.4.103, with links as- 10.104.2.0 and 10.104.4.0; both as stub networks.

Type-2 or Network LSA is present here. As its link id is 10.104.2.101, the address of DR is also 10.104.2.101, as this is the link id of Network LSA. BDR is 10.104.2.102.