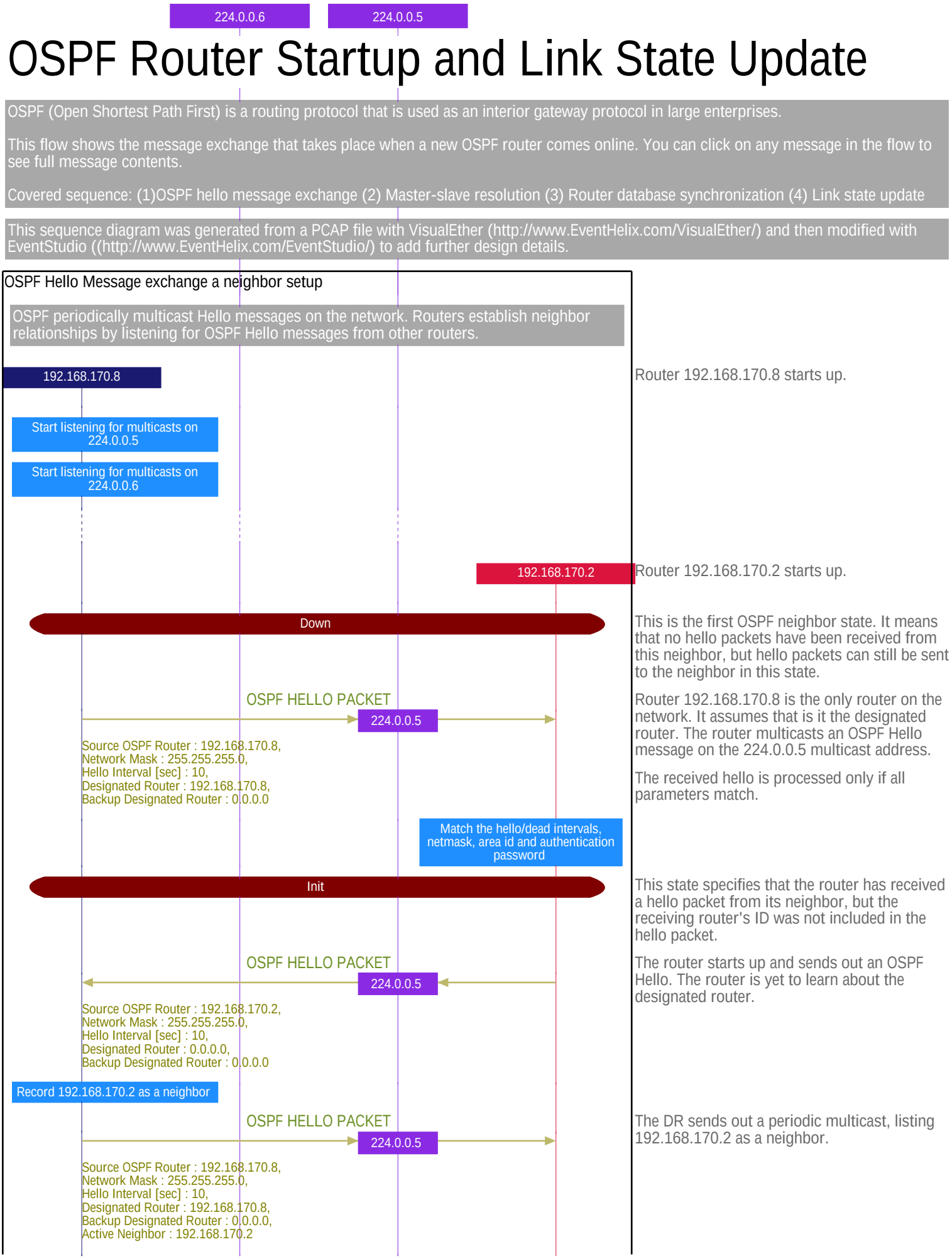
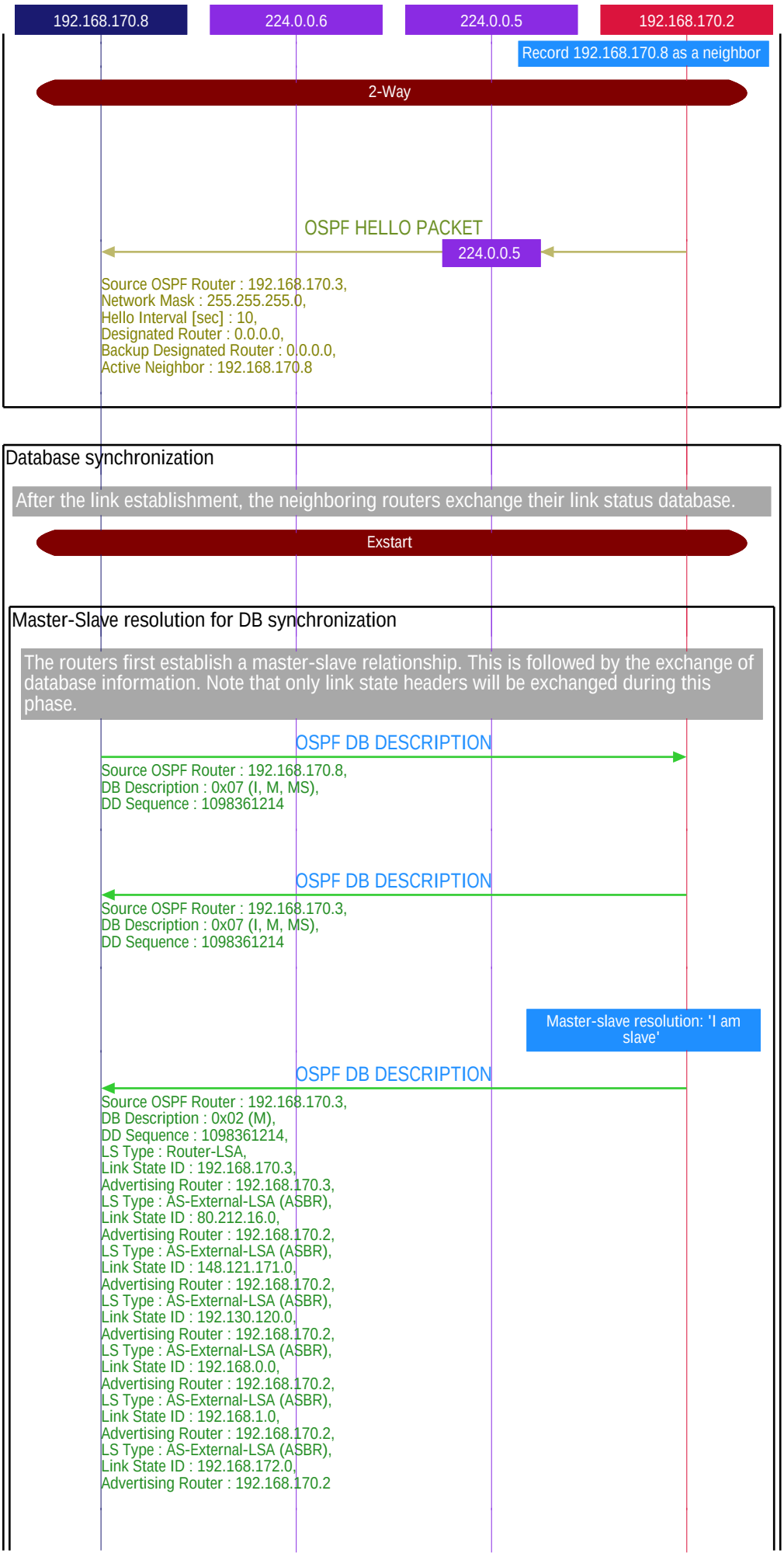

224.0.0.6
224.0.0.5
OSPF Router Startup and Link State Update
OSPF (Open Shortest Path First) is a routing protocol that is used as an interior gateway protocol in large enterprises.
This flow shows the message exchange that takes place when a new OSPF router comes online. You can click on any message in the flow to see full message contents.
Covered sequence: (1)OSPF hello message exchange (2) Master-slave resolution (3) Router database synchronization (4) Link state update
This sequence diagram was generated from a PCAP file with VisualEther (http://www.EventHelix.com/VisualEther/) and then modified with EventStudio ((http://www.EventHelix.com/EventStudio/) to add further design details.
OSPF Hello Message exchange a neighbor setup
OSPF periodically multicast Hello messages on the network. Routers establish neighbor relationships by listening for OSPF Hello messages from other routers.
192.168.170.8
Router 192.168.170.8 starts up.
Start listening for multicasts on 224.0.0.5
Start listening for multicasts on 224.0.0.6
192.168.170.2
Router 192.168.170.2 starts up.
Down
This is the first OSPF neighbor state. It means that no hello packets have been received from this neighbor, but hello packets can still be sent to the neighbor in this state.
OSPF HELLO PACKET
224.0.0.5
Source OSPF Router : 192.168.170.8,
Network Mask : 255.255.255.0,
Hello Interval [sec] : 10,
Designated Router : 192.168.170.8,
Backup Designated Router : 0.0.0.0
Router 192.168.170.8 is the only router on the network. It assumes that is it the designated router. The router multicasts an OSPF Hello message on the 224.0.0.5 multicast address.
The received hello is processed only if all parameters match.
Match the hello/dead intervals, netmask, area id and authentication password
Init
This state specifies that the router has received a hello packet from its neighbor, but the receiving router's ID was not included in the hello packet.
OSPF HELLO PACKET
224.0.0.5
Source OSPF Router : 192.168.170.2,
Network Mask : 255.255.255.0,
Hello Interval [sec] : 10,
Designated Router : 0.0.0.0,
Backup Designated Router : 0.0.0.0
The router starts up and sends out an OSPF Hello. The router is yet to learn about the designated router.
Record 192.168.170.2 as a neighbor
OSPF HELLO PACKET
224.0.0.5
Source OSPF Router : 192.168.170.8,
Network Mask : 255.255.255.0,
Hello Interval [sec] : 10,
Designated Router : 192.168.170.8,
Backup Designated Router : 0.0.0.0,
Active Neighbor : 192.168.170.2
The DR sends out a periodic multicast, listing 192.168.170.2 as a neighbor.



This state is entered when bi-directional communication has been established between two routers. Bi-directional means that each router has seen the other's hello packet (i.e. the hello packet received from another router lists this router's ID as an active neighbor.

192.168.170.2 also reports that 192.168.170.8 is a neighbor.

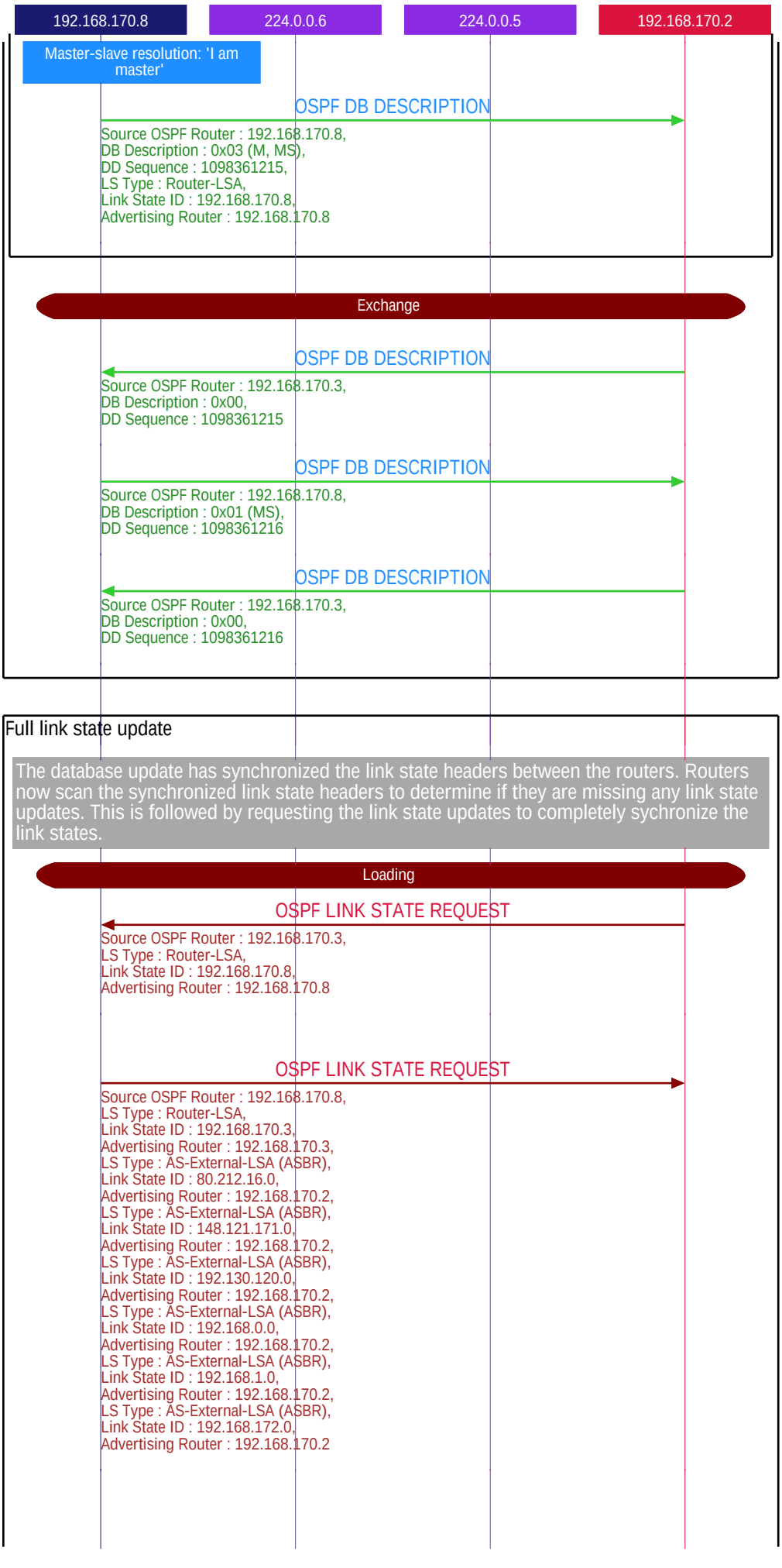
At this point the Designated Router (DR) has been finalized and the routing information exchange can begin.

Router asserts that is the master by setting the MS option bit. The message also sets the I bit signifying that this is the initial message of the Database synchronization handshake. The more bit (M) signals that more data is going to follow.

Router asserts that is the master by setting the MS option bit. The message also sets the I bit signifying that this is the initial message of the Database synchronization handshake. The more bit (M) signals that more data is going to follow.

192.168.0.2 is less than 192.168.170.8 so this router assumes that it is a slave.

Router removes the master assertion by resetting the MS bit. The router also starts sending its database. The more bit(M)signals that their are more database update need to be exchanged.



192.168.170.8 is greater than 192.168.170.2, so the router asserts that it is the master.

The router asserts that it is the master by setting the MS bit. The master also increments the DD sequence.

Master-slave is now settled. The routers initiate the exchange of database information.

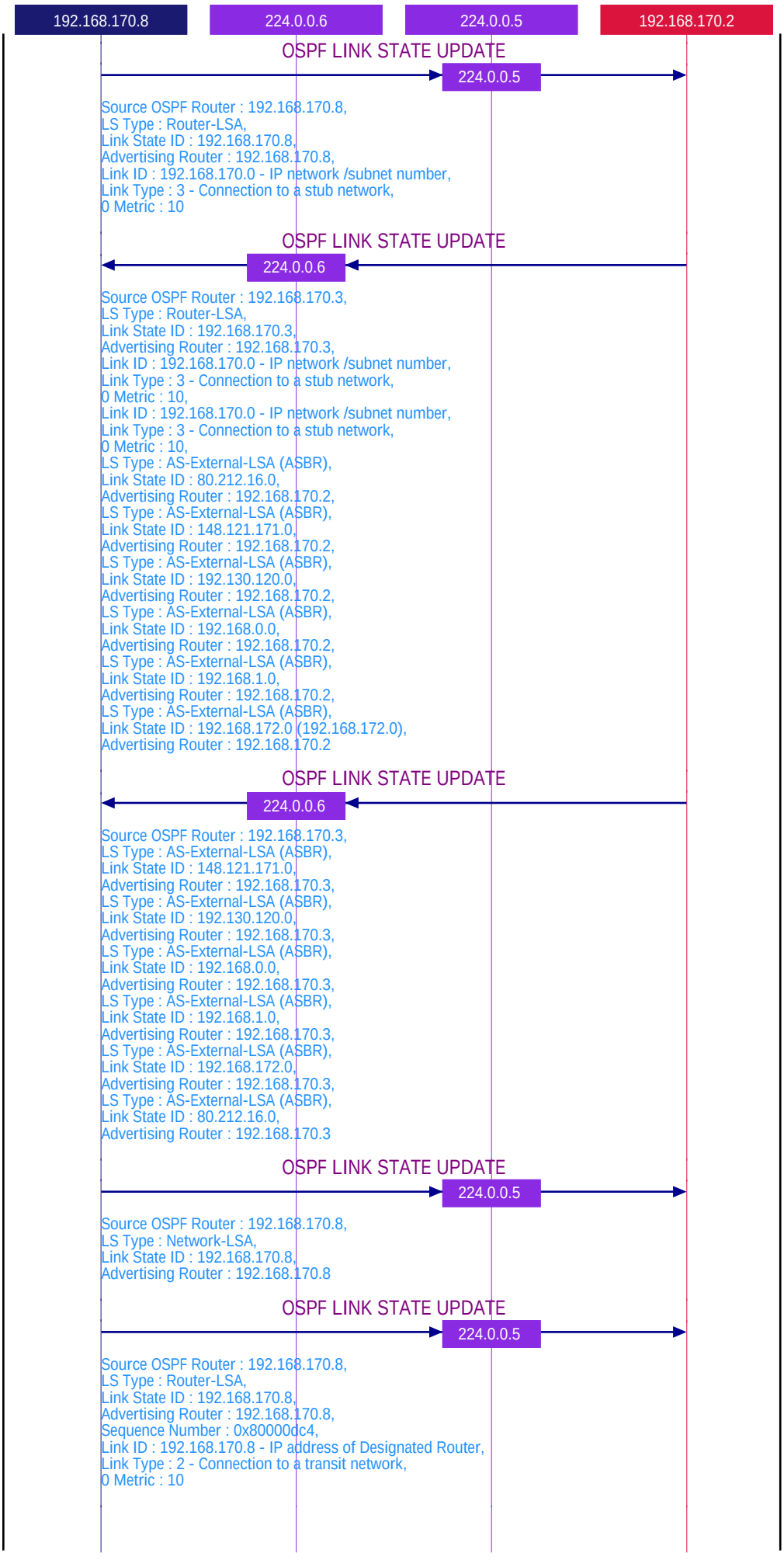
The slave acknowledges the DD sequence.

The master again updates the DD sequence.

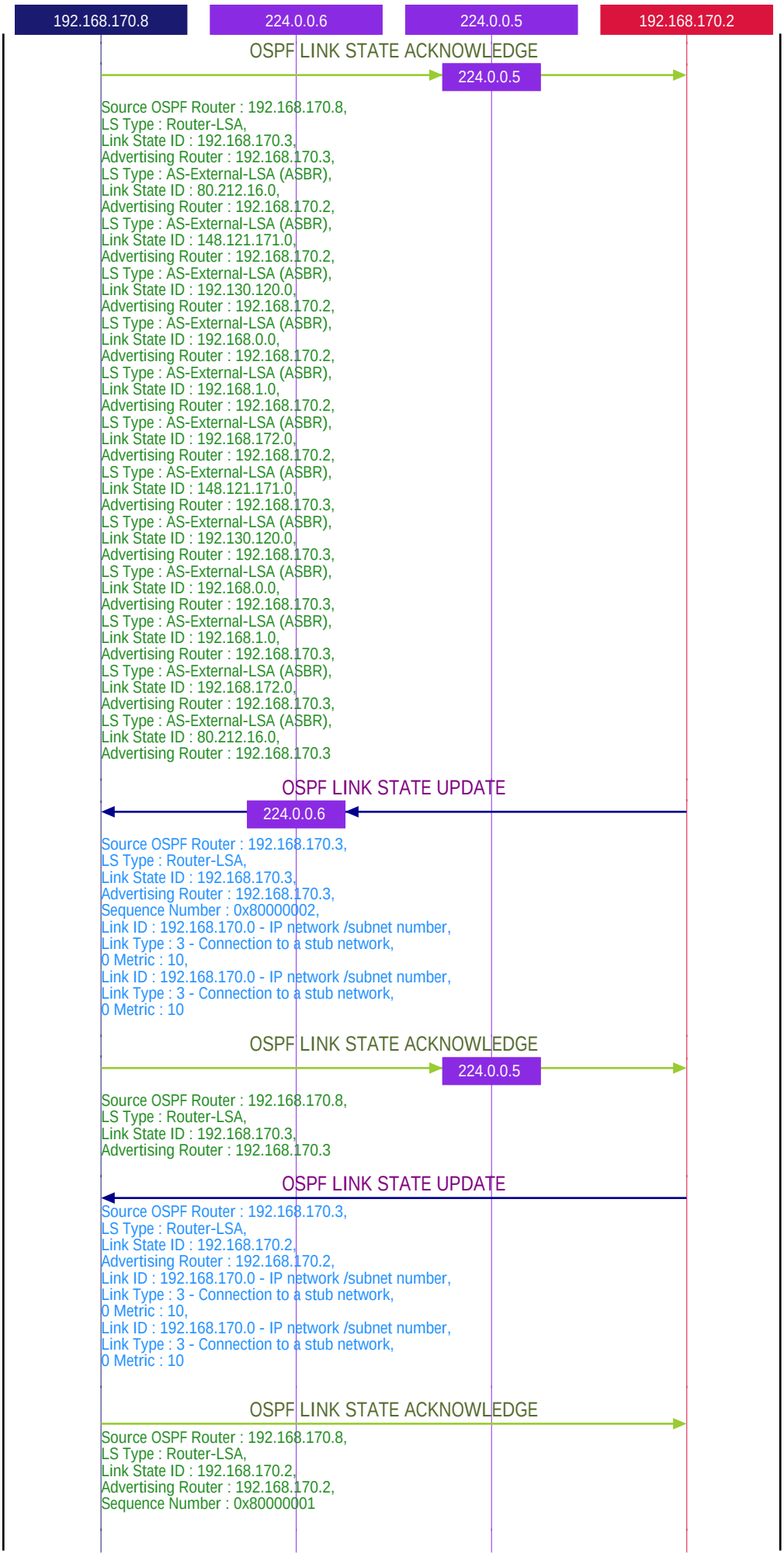
The slave acknowledges the changed DD sequence.

After exchanging Database Description packets with a neighboring router, "192.168.170.2" router finds that parts of its topological database are out of date. The Link State Request packet is used to request the pieces of the neighbor's database that are more up to date.

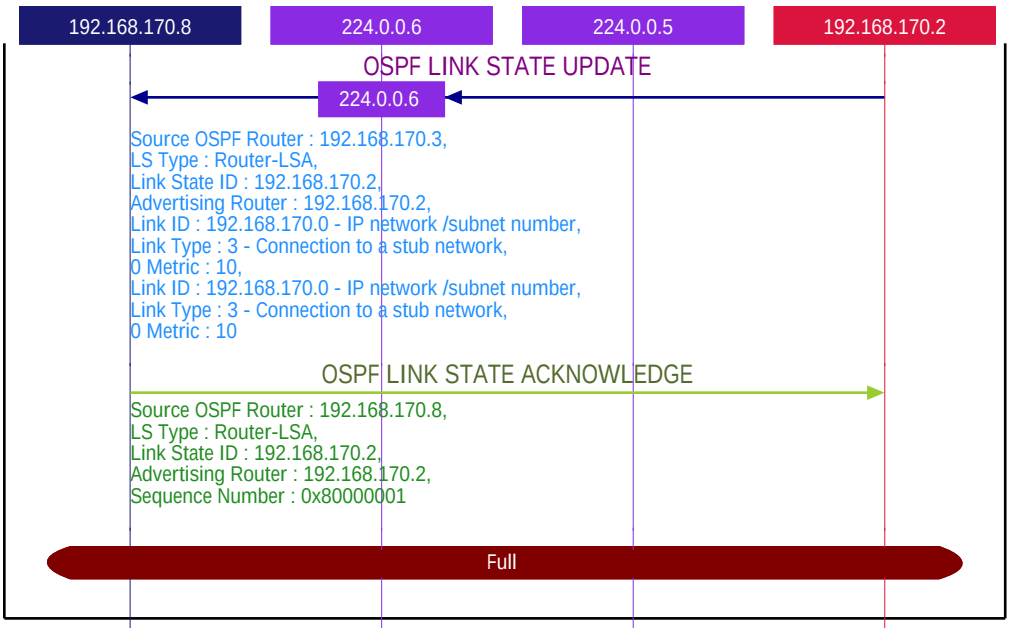
"192.168.170.8" also requests update for its out of date database.



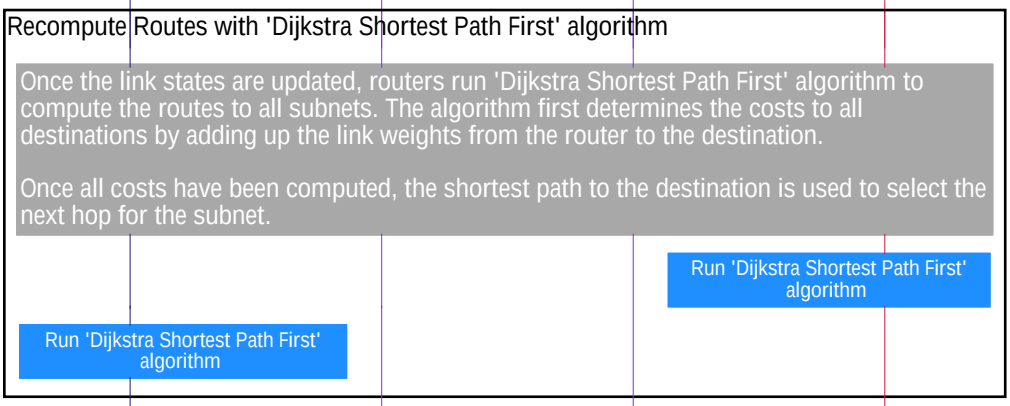
The routers then send out their link state updates as a multicast flood. The Link State Update packets contain a collection of link state advertisements that are one hop away from the sender.

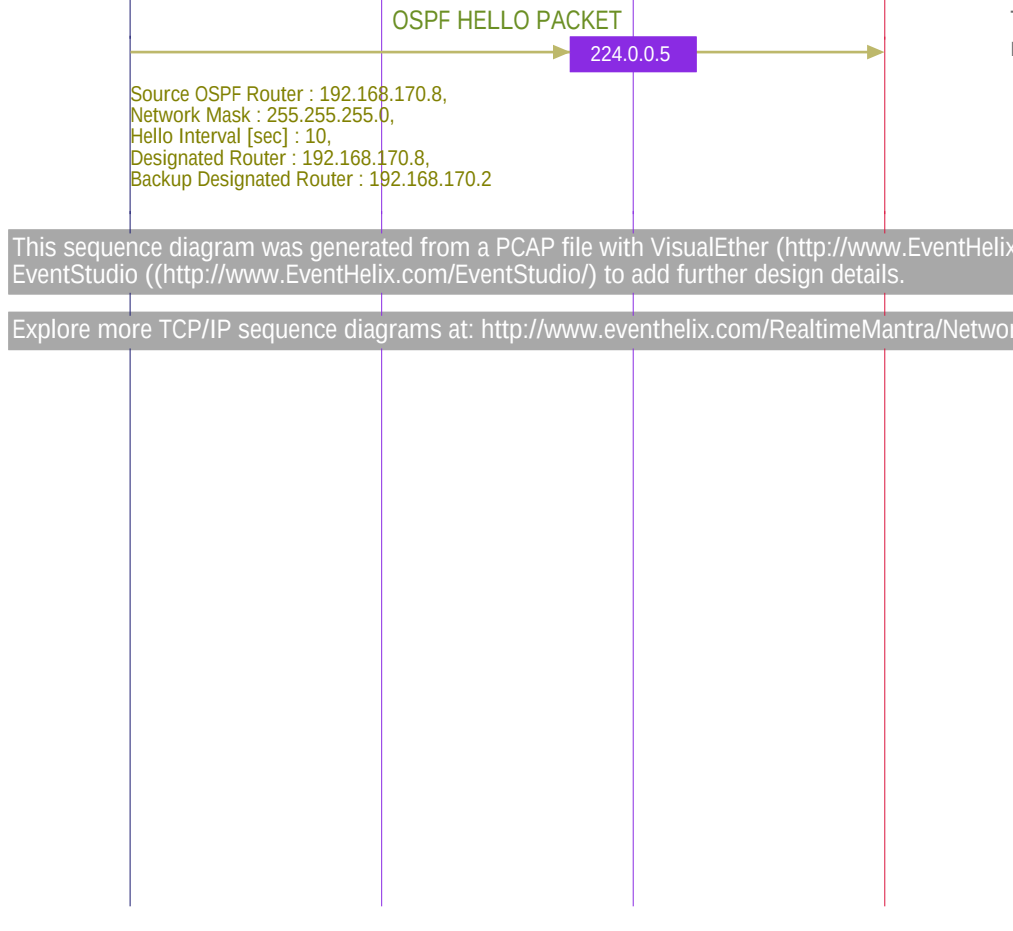


All routers acknowledge the link state updates. The acknowledgements contain link state headers to identify the link state updates that are being acknowledged.



The neighbor state is changed to "Full" when the two routers are completely synchronized.





The routers periodically multicast the hello message.

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Explore more TCP/IP sequence diagrams at: http://www.eventhelix.com/RealtimeMantra/Networking/