

LSAs and Stubbiness

CCNP LAB 2

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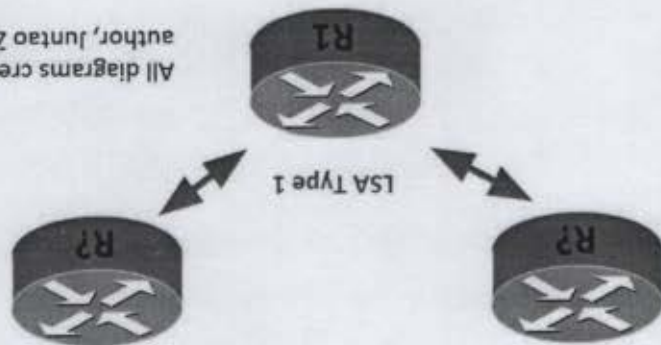
What are LSAs?

LSAs (Link-State Advertisements) are bits of information exchanged through routers running the OSPF routing protocol. These bits of information transfer information about the topology of the current running network that the router is currently based in. Each LSA routing packet contains information about the current section of the OSPF network that the router is based in. All routers within the OSPF network will exchange LSA update packets until all routers in the network have the exact same topology database stored within the hard drive of the routers.

Different types of LSAs

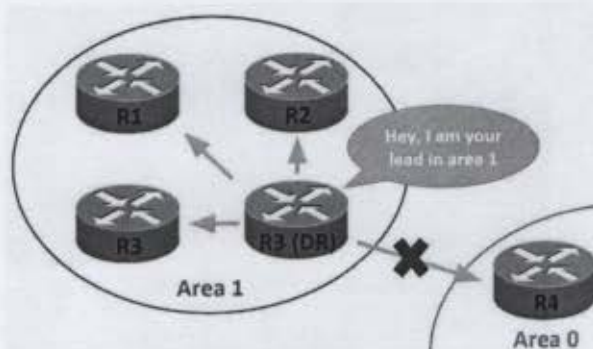
All OSPF routers don't send the same kind of LSA packet to other routers. There are currently 6 main types of LSAs that OSPF routers output.

Type 1 LSAs get sent to other routers to acknowledge that the originating router is part of the OSPF network. This type of LSA stays in the same OSPF area that it was sent through. This LSA essentially tells other routers that the current router has just joined the topology.

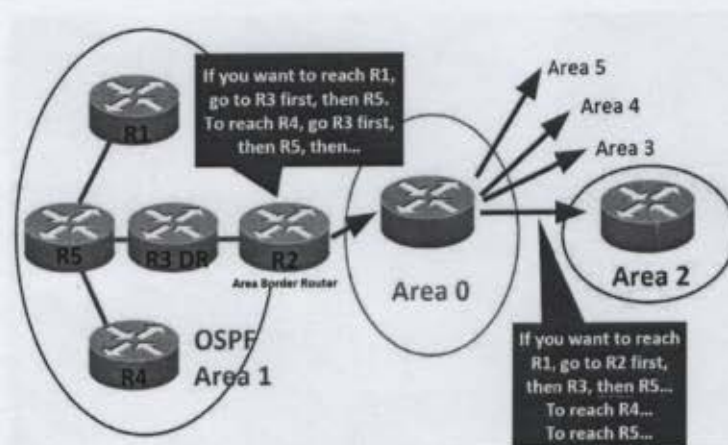


All diagrams created by
author, Juntao Zhong

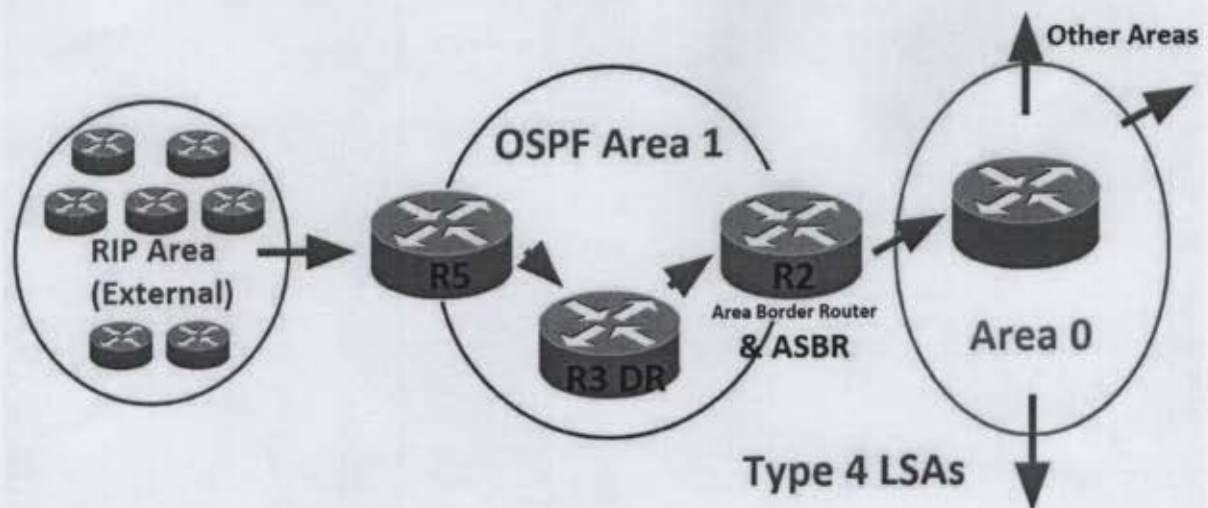
Type 2 LSAs are sent to other routers from the DR (Designated Router). This type of packet explains that the originating router is the DR of all other routers in the current OSPF area. These are constantly sent from the DR to the other routers.



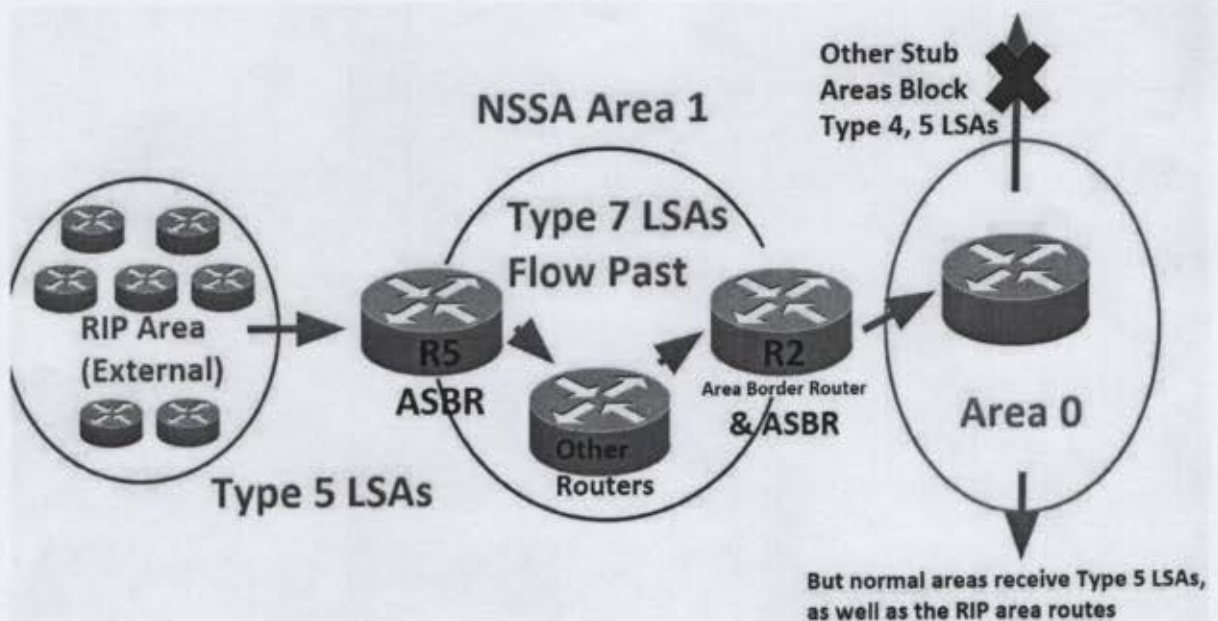
Type 3 LSAs are sent by the ABR (Area Border Router). ABRs are routers that border the current OSPF area. These LSAs summarize information gathered about the network into a small packet of information that is sent to other routers. These LSAs also tell other routers the best way to reach routers within the current area to other routers in different areas. (A roadmap, essentially.)



Type 4 LSAs are sent by ABRs. These kinds of packets contain the summarized information on Type 5 packets. (Since type 5 packets are external) These types of packets are sent to other OSPF areas.



Type 5 LSAs are received by routers that border another routing protocol, (EIGRP, RIP, etc.) and these packets are transformed into Type 4 packets to be sent to the OSPF network.



Type 7 LSAs are present in routers in an NSSA (Not So Stubby Area). These routers do not receive type 7 packets from the ABRs, but they send external routes for redistribution. On the other hand, Type 7 LSAs are sent to ABRs to notify them that the NSSA routers have received routing information.

The different kinds of OSPF Areas

Standard OSPF areas =

These areas route LSA Types 1 – 5. Standard OSPF routers route all of these routes to all of the routers in the OSPF network. This type of OSPF is optimal for small to medium scale topologies, but when the OSPF topology becomes too big, each router in the network will experience performance issues. In this situation, the topology should be modified to include Stubby areas such as the Stubby area, the NSSA, and Totally Stubby areas.

Stubby OSPF areas =

Instead of routing all common LSA types, Stubby area routers only route Type 1, 2, and for Type 3 LSA packets, the router summarizes all external routes into one default route, thus reducing the load on the routers in the Stubby area.

NSSA areas =

NSSA (Not So Stubby Area) areas only route Type 7 LSAs. These routers convert Type 7 LSAs (Raw networking information) into Type 5 LSAs, which are readable by the main OSPF network. These routers also eliminate the need for Type 3 LSAs to be transmitted throughout the main network, thus reducing the CPU load on most routers within the OSPF network.

Totally Stubby areas =

Routers in Totally stubby areas only route LSAs Type 4 & 5, thus making them more restrictive than Stubby areas and NSSAs. These routers sole purpose is to summarize all of the LSAs received by other routers into Type 1 and Type 2 LSA packets. These routers also help alleviate performance issues on the routers in other OSPF areas.

In short, Stubiness in OSPF networks exist to help alleviate excessive but necessary routing information from over encumbering all of the routers within the OSPF network.

Observing Stubiness and LSAs through Wireshark

Using the program Wireshark, you can observe OSPF packets since they come with their own tag, "OSPF". When you click on the packet, the LSA type would be revealed through the "LS type" header and the displayed link state id. This would allow you to find out which OSPF area the packet originated from and its destination.

Image sources

All graphics and images are provided by Juntao Zhong "Jimmy".