OSPF Area and LSA Types

CCNP Lab 2

2018-2019

Nipun Chhajed

Cisco CCNP - Hoffman and Mason - Periods 6 and 7

1. What is a LSA and what are the different types?

Link-state advertisements (LSAs) are the ways that OSPF communicates updates to the routing topology throughout the network, to the routers located in the same area. Think of it like CNN giving updates about each state's voting percentage, during the presidential election, that all the civilians can see and hear about. The 6 main types of LSAs are:

Type 1: Router LSA	The router communicates its presence and shows the links to other routers/networks in the same area.
Type 2: Network LSA	The designated router (DR) or the area border router (ABR) lists which routers are joined together by some segment, such as ethernet.
Type 3: Summary LSA	The area border router summarizes all the information of an area, before sending it out to the other areas it is connected to.
Type 4: ASBR Summary LSA	This works in conjunction with type 5 LSA. Since routers that use type 5 LSA might not have information about next-hops, type 4 must be used as well. It allows for an ABR to flood the information for a router, such as an autonomous system border router (ASBR), where the type 5 originated from.
Type 5: External LSA	This LSA distributes information that is imported into OSPF from other routing processes, and these area flooded to all areas unchanged (except in stubby and not so stubby areas)..

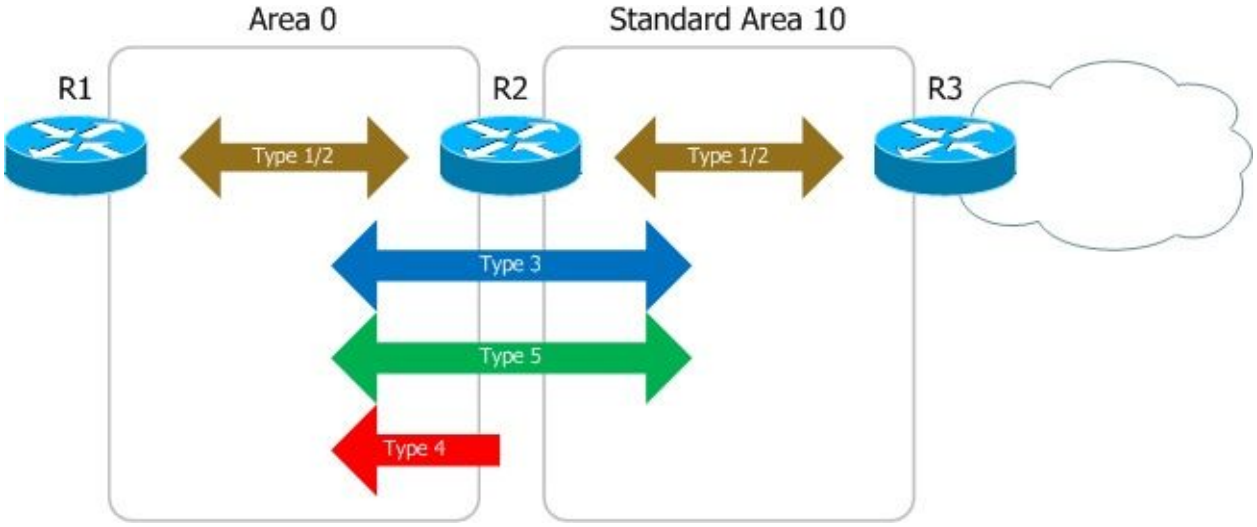
Type 7: Not So Stubby Area LSA	Routers that are in a not so stubby area, do not get information about external LSAs (type 5) from the ABR, but they are allowed to tell information about external routes to the ABR, so that it can distribute that info to the rest of the network, by translating it to a type 5 LSA.

2. What are the different types of OSPF areas, and how area LSA's used in them? How do they compare and contrast?

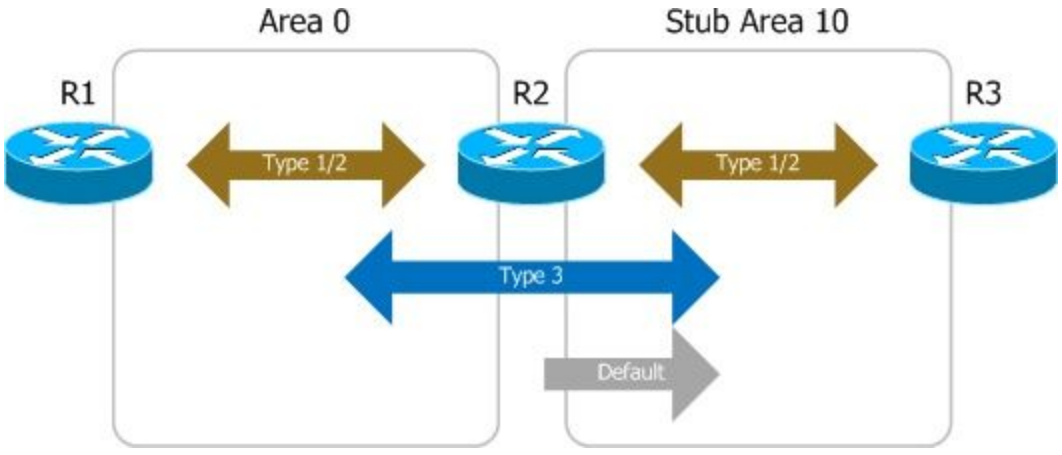
There are 4 main types of OSPF areas. They are stubby areas, not so stubby areas (NSSA), totally stubby areas and standard areas.

Standard areas are what OSPF makes all areas by default (besides area 0 which is always backbone). The area border router (ABR) is basically what connects the areas in a regular ospf network, like how a tunnel connects different places. The ABR floods type 1 and type 2 LSAs to routers that are located in a common area, so like, a router in area 1 will not get area 2 LSA information. This is comparable to watching live french news in France, which cannot be watched in the USA. Type 3 LSAs, which describe internal summarized routes are automatically distributed through all areas, and type 5 LSAs, which are external routes, are automatically distributed through all areas. Type 4 LSAs, which give information about OSPF to routers that may not have the full information, are also distributed into areas, that have an autonomous system border router (ASBR), which is sort of like an ambassador that represents some country in another. However, this at times can cause router's to have to carry out multiple computations, which can

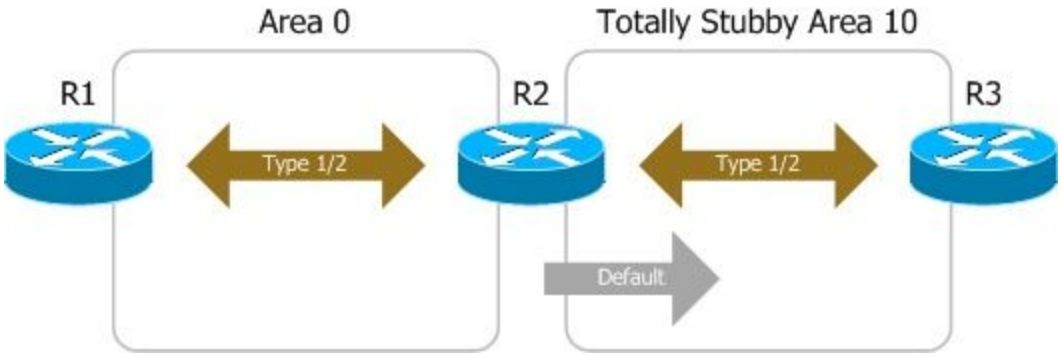
damage routers, and some routers might even be incapable of carrying a lot of information in their database. This is where stubby areas come in since, they block certain LSAs creating less entries in the database.



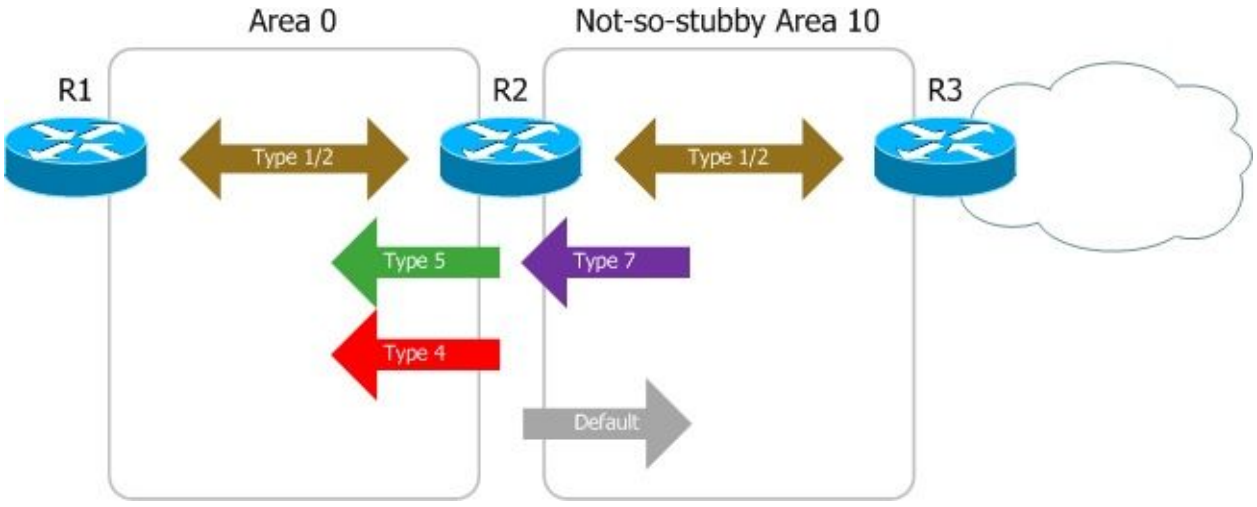
Stubby areas are areas that do not contain excessive information about OSPF. They restrict the internal route LSAs (type 3 LSA) to only one default route, so that routers in a stubby area can route to external destination without having to maintain each individual route in the link-state database. It's like an organization giving general information about some topics to its employees. An extension of this is where for many specific external routes, only a single default route is applied, and this can work for internal routes, which is what defines a totally stubby area.



Totally stubby areas are even more restricted, only allowing type 1 and 2 LSAs to be distributed within the same area. All external and internal routes are converted into a single default route, which makes the database of each router extremely small. The drawback is that you can't use an ASBR since type 4 and 5 LSAs are restricted, and this is where a not-so-stubby area (NSSA) comes in.



Finally, there are not-so-stubby areas (NSSA) which uses type 7 LSAs so that an ASBR can send information about external links to an ABR, and the ABR converts that information to type 5 LSAs so that it can be distributed to the rest of the network. Type 3 LSAs, can passin in and out of areas, usually however, a default route is configured so that the link-state database size is reduced.



Stubby, totally stubby, and NSSAs were all made to improve the scalability of OSPF, so that routers did not have to undergo the

computational stress of handling a large amount of routes that occur in standard areas. Basically routers in standard areas, receive and hold all information in OSPF, including external routes. In contrast, stubby areas only communicate one type 3 LSA which is a default route, so that all external routes can be stored as one, not individually stored. Totally stubby areas take this a step further by compressing all internal and external routes into one default route, eliminating the need to communicate type 3 LSAs. And finally, since stubby and totally stubby areas are very restrictive, there are not-so-stubby areas which can communicate external and internal routes, and allow the use of ASBRs, while reducing the size of each router's database.

3. How to view OSPF in wireshark

In a wireshark capture, you can easily find OSPF packets, as they have their own packets denoted by "ospf". When you click on this packet for more information you can find out the LSA types from "LS Type" and from the link state id. This will in turn allow you to figure out which type of OSPF area is in use.

4. Sources:

http://packetlife.net/blog/2008/jun/24/ospf-area-types/