OSPF Demand Circuit Feature

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Contents

Introduction

Demand circuit options were introduced for Open Shortest Path First (OSPF) in Cisco IOS® Software release 11.2 in response to the OSPF RFC 1793 . OSPF sends hellos every 10 seconds and refreshes its link−state advertisements (LSAs) every 30 minutes. These functions maintain neighbor relationships and ensure that the link−state databases are accurate and use far less bandwidth than similar functions in Routing Information Protocol (RIP) and Interior Gateway Routing Protocol (IGRP). However, even this amount of traffic is undesirable on demand circuits. Using OSPF demand circuit options suppresses hello and LSA refresh functions. OSPF can establish a demand link to form an adjacency and perform initial database synchronization, the adjacency remains active even after Layer 2 of the demand circuit goes down.

Cisco IOS version 12.1(2)T introduces the flooding reduction feature for OSPF. This feature is intended to minimize traffic created by a periodic refresh of LSAs in OSPF domains with large number of LSAs. Unlike the OSPF demand circuit feature, flooding reduction is usually configured on leased lines. Flooding reduction uses same technique as demand circuits to suppress the periodic LSA refresh. This feature is submitted for standardization into the IETF OSPF working group.

Prerequisites

Requirements

Readers of this document should have knowledge of these topics:

- OSPF
- IGRP
- RIP

Components Used

The information in this document is based on these software and hardware versions:

- Cisco IOS version 12.1(2)T and later

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

For more information on document conventions, refer to the Cisco Technical Tips Conventions.

How Is OSPF over Demand Circuit Different from a Normal Circuit?

There are two main features of OSPF over demand circuit that make it different from a normal circuit.

- Suppressed periodic hellos
- Suppressed periodic LSA refresh

Suppressed Periodic Hellos

When an OSPF demand circuit is configured on a link, the periodic OSPF hellos are suppressed. Periodic hellos are suppressed only on a point–to–point and point–to–multipoint network type. *On any other network type, OSPF hellos are still sent over the interface.*

Suppressed Periodic LSA Refresh

Periodic LSA refreshes that take place every 30 minutes do not occur with OSPF demand circuit. When a demand circuit link is established a unique option bit (the DC bit) is exchanged between neighboring routers. If two routers negotiate the DC bit successfully they make a note of it and set a specific bit in the LSA Age called the DoNotAge bit (DNA). The DNA bit is the most significant bit in the LS Age field. By setting this bit the LSA stops aging, and no periodic updates are sent.

When Is a Periodic LSA Refresh Sent over an OSPF Demand Circuit?

There are only two scenarios where the periodic LSA refresh occurs when using the OSPF demand circuit feature:

- If there is a change in network topology
- If there is a router in the OSPF domain that can not understand demand circuits

Firstly, not much can be done to stop the LSA refresh because the router has to send the new LSA information to update the neighbor about the topology change.

However, there is a special way to handle the second scenario. The area border router (ABR), which is Router D in the network diagram below, knows that Router C is incapable of understanding DNA LSAs because it sees the DC bit is clear in the option field in the LSA originated by Router C. In this situation the ABR,

Router D, notifies the routers capable of demand circuit not to originate the LSA with the DNA bit set because there is a router that doesn't understand the DNA bit.

This network diagram shows a scenario where the periodic LSA refresh is sent across a demand circuit:
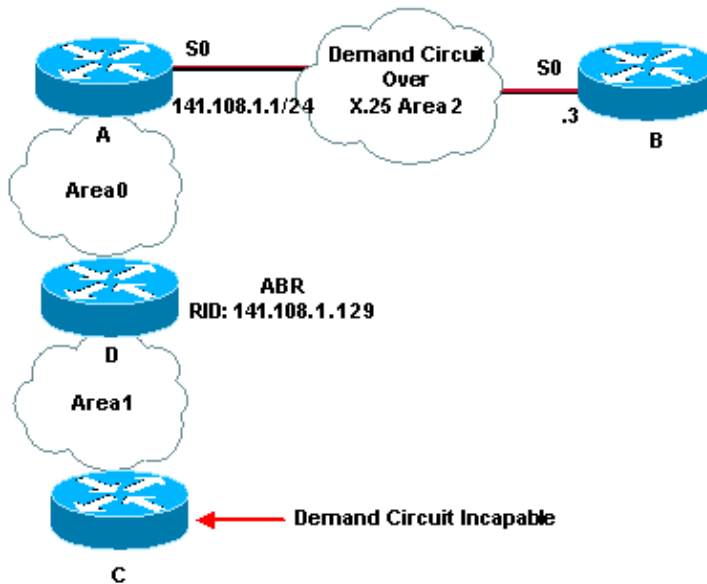
Indication LSA

The ABR, Router D, originates an indication LSA in the backbone telling all routers in the backbone not to originate any DNA LSAs. When Router A (another ABR), sees this indication LSA it originates the indication LSA into other areas, excluding the backbone and any stub or not–so–stubby area (NSSA) area. This indication LSA for Router D is shown below. The indication LSA is a type 4 Summary LSA in which the link–state ID is the ABR itself instead of the autonomous system boundary router (ASBR). In other words, both the link–state ID and the advertising router field are the same, as shown here:

```
RouterD# show ip ospf database asbr-summary
   Adv Router is not-reachable
   LS age: 971
   Options: (No TOS-capability, No DC)
   LS Type: Summary Links(AS Boundary Router)
   Link State ID: 141.108.1.129 (AS Boundary Router address)
   Advertising Router: 141.108.1.129
   LS Seq Number: 80000004
   Checksum: 0xA287
   Length: 28
   Network Mask: /0
     TOS: 0  Metric: 16777215
```

The metric of an indication LSA is set to infinity. The link–state ID and the advertising router field is always the router ID of the ABR originating the indication LSA. In the network diagram above, the link between Routers A and B is configured as demand circuit, but since there is a router in Area 1 that is incapable of understanding the DNA LSA, there will not be any DNA LSAs originated in Area 1. As a result, the periodic LSA refreshes, originated in Area 1, are sent across the demand circuit.

There are only two conditions that cause an OSPF ABR to generate an indication LSA:

- There is a router in the network running IOS 11.2 or earlier.
- There is a non–Cisco router in the network that does not support demand circuit.

Solution

Configure Area 2 as a stub or NSSA area. This prevents the indication LSA originated by Router D from being sent into Area 2 by Router A because Area 2 is a stub area and the indication LSA, being a type 4 Summary LSA, cannot be flooded into the stub area. Now, since Area 2 does not see any indication LSA, it continues to generate the DNA LSAs within Area 2 and the link between Routers A and B does not come up because the periodic LSA refresh is suppressed.

Cisco recommends that you configure OSPF demand circuit in non−backbone areas and make these areas NSSA, stub or totally stubby (the latter is preferable). This is to minimize the information injected from other areas into the area containing demand circuits. Thus, you minimize the scope of changes, which can bring the OSPF demand circuit up. Refer to Why OSPF Demand Circuit Keeps Bringing Up the Link for troubleshooting scenarios involving the OSPF demand circuit feature.

If you have a situation similar to that shown above, and the demand circuit is also part of the backbone, you cannot use this solution because the backbone area cannot be configured as stub or NSSA.

Configuration Task

The configuration task example in this section shows the necessary configuration to create a demand circuit. Only one side is required to have the demand circuit command under the interface because if the other side is capable of understanding demand circuit, it automatically negotiates this capability in the hello packet. If it is not capable of understanding demand circuit, it ignores this option.

```
RouterA# show run interface Serial0
 interface Serial 0
  encapsulation frame-relay
  ip address 141.108.1.1 255.255.255.0
  ip ospf network-type point-to-mutipoint
  ip ospf demand-circuit
 !
```

Note: You can use demand circuit on any network type although it is only on point−to−point or point−to−multipoint network types that hellos are suppressed.

How Is the Flooding Reduction Feature different from the Demand Circuit Feature?

The OSPF flooding reduction feature is a slight modification of the demand circuits designed to reduce additional traffic on links arising from a periodic LSA refresh. It uses the same mechanism to eliminate the need for the periodic LSA refresh. Generally routers are not immediately connected to the link and cannot identify if it is configured as a demand circuit or a flooding reduction link – the database representation of both types of links is the same.

The main difference between flooding reduction and demand circuits is that former suppresses only periodic LSA refreshes; it does not suppress periodic hello packets. Thus, the flooding reduction feature does not impair the detection of a neighbor router going down.

Flooding reduction links have the same constraints as demand circuits. In particular, all routers in the area must support the demand circuit feature in order for flooding reduction to work. Troubleshooting techniques for both demand circuits and flooding reduction links are also common.

This example shows an OSPF flooding reduction feature configuration:

```
interface POS 0/0
 ip address 192.168.122.1 255.255.255.0
 ip ospf flood-reduction
```

As above, interface POS 0/0 of the router is configured for OSPF flooding reduction. No periodic LSA refreshes are sent over the link but hellos are sent.

Related Information

- **OSPF Support Page**
- **Technical Support – Cisco Systems**

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