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1



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2

# Agenda

- **LSA Details**
- **Troubleshooting Commands**
- **Common Issues**
- **Troubleshooting Tips**



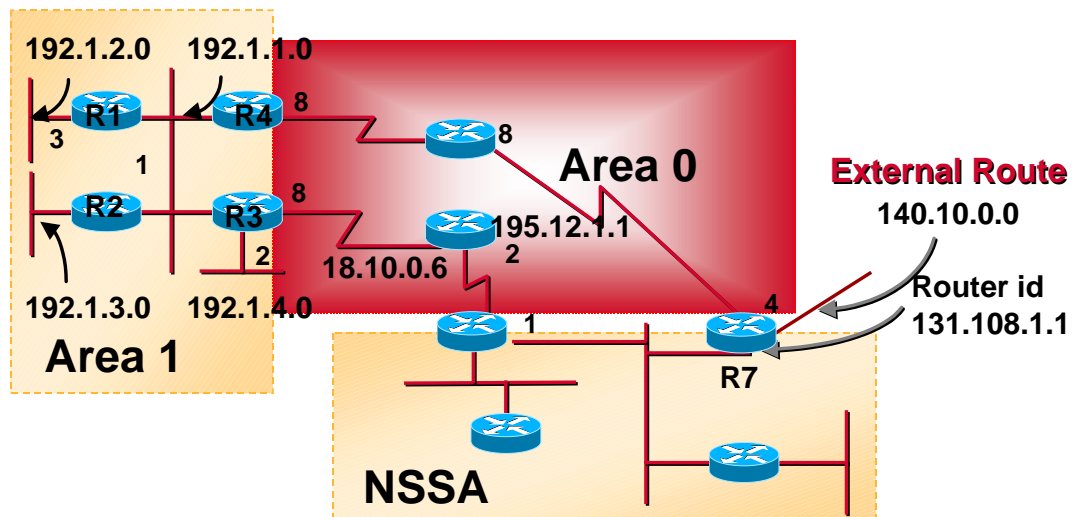
## LSA Details

# LSA Type Review

Type	LSA
1	Router
2	Network
3	Summary Network
4	Summary ASBR
5	External
7	NSSA
Others?	

## Different Types of LSAs

### Sample Network for Each LSA



## Common LSA Header

- **Common LSA 20 byte header**

<b>LS Age</b>	<b>Options</b>	<b>LS Type</b>
<b>Link State ID</b>		
<b>Advertising Router</b>		
<b>LS Sequence Number</b>		
<b>LS Checksum</b>	<b>Length</b>	

## Router LSA Details

- **Router LSA (Type 1)**

**Describes the state and cost of the router's links to the area**

**All of the router's links in an area must be described in a single LSA**

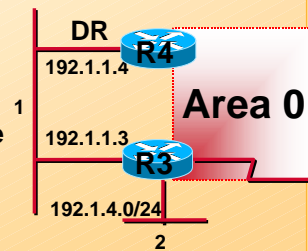
**Flooded throughout the particular area and no more**

**Router indicates whether it is an ASBR, ABR, or end point of virtual link**

# Router LSA of R3 for Area 1

## show ip ospf database router 192.1.1.3

**LS age = 0** Always 0 at origination  
**Options = (E-bit)** This is a router LSA  
**LS type = 1** Router ID of R3  
**Link State ID = 192.1.1.3** Router ID of R3  
**Advertising Router = 192.1.1.3** Not an ASBR  
**bit E = 0** This is an ABR  
**bit B = 1**  
**# links = 2**  
     **Link ID = 192.1.1.4** IP address of the DR  
     **Link Data = 192.1.1.3** Interface address of this router  
     **Type = 2** This is a transit network  
     **# TOS metrics = 0**  
     **metric = 1** Cost to reach the interface  
     **Link ID = 192.1.4.0** IP network number  
     **Link Data = 255.255.255.0** Subnet mask of the interface  
     **Type = 3** Stub network  
     **# TOS metrics = 0**  
     **metric = 2**



# Route LSA Details

Type	Description	Link ID	Link Data
1	Point-to-Point numbered	Neighbors' RID	Interface IP Address
1	Point-to-Point Unnumbered	Neighbors' RID	MIB-II Ifindex Value
2	Transit	IP Address of the DR	Interface IP Address
3	Stub	IP Network Number	Subnet Mask
4	Virtual Link	Neighbors' RID	Interface IP Address

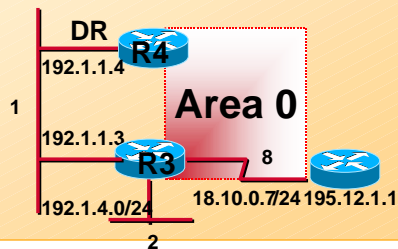
# Router LSA of R3 for Area 0

**show ip ospf database router 192.1.1.3**

```
LS age = 0
Options = (E-bit)
LS type = 1
Link State ID = 192.1.1.3
Advertising Router = 192.1.1.3
bit E = 0
bit B = 1
# links = 1
  Link ID = 195.12.1.1
  Link Data = 18.10.0.7
  Type = 1
  # TOS metrics = 0
  metric = 8
  Link ID = 18.10.0.0
  Link Data = 255.255.255.0
  Type = 3
  # TOS metrics = 0
  metric = 8
```

Router id of the neighbor  
IP interface address of the router  
This is a point-to-point link

IP subnet address  
Subnet mask  
This is a stub link



# Network LSA

- **Network LSA (Type 2)**

**Generated for every transit broadcast and NBMA network**

**Describes all the routers attached to the network**

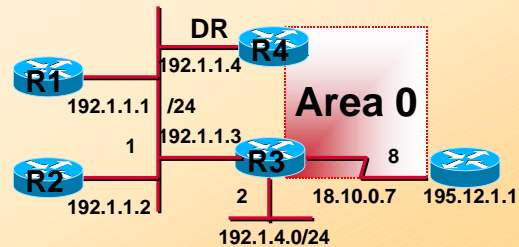
**Only the designated router originates this LSA**

**Flooded throughout the area and no more**

# Network LSA for 192.1.1.0

**show ip ospf database network 192.1.1.4**

LS age = 0  
Options = (E-bit)  
LS type = 2  
Link State ID = 192.1.1.4      IP interface address of DR  
Advertising Router = 192.1.1.4      RID of DR  
Network Mask = 255.255.255.0  
Attached Router = 192.1.1.4  
Attached Router = 192.1.1.3      RID of attached routers FULL with the DR  
Attached Router = 192.1.1.2  
Attached Router = 192.1.1.1



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13

# Summary LSA

- Describes the destination outside the area but still in the AS
- Flooded throughout a single area
- Originated by an ABR
- Only intra-area routes are advertised into the backbone (to avoid loops)
- Type 4 is the information about the ASBR

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14

# Type 3 and 4

- **Summary LSA**

In Stub area: **O IA\* 0.0.0.0/0**

**Link State ID: 0.0.0.0 Network Mask: 0.0.0.0**

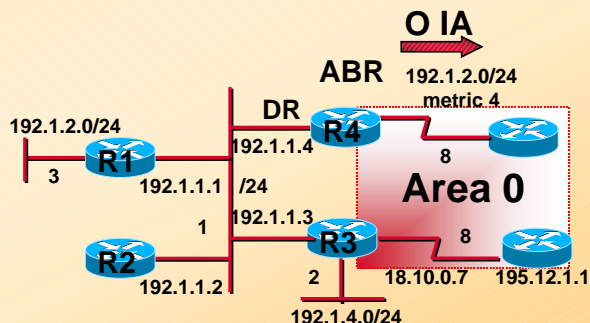
**Network mask field is always 0.0.0.0 for summary LSA Type 4**

# Type 3 Details

**show ip ospf database summary 192.1.2.0**

LS age = 0  
Options = (E-bit)  
LS type = 3  
Link State ID = 192.1.2.0  
Advertising Router = 192.1.1.4  
Network Mask = 255.255.255.0  
metric = 4

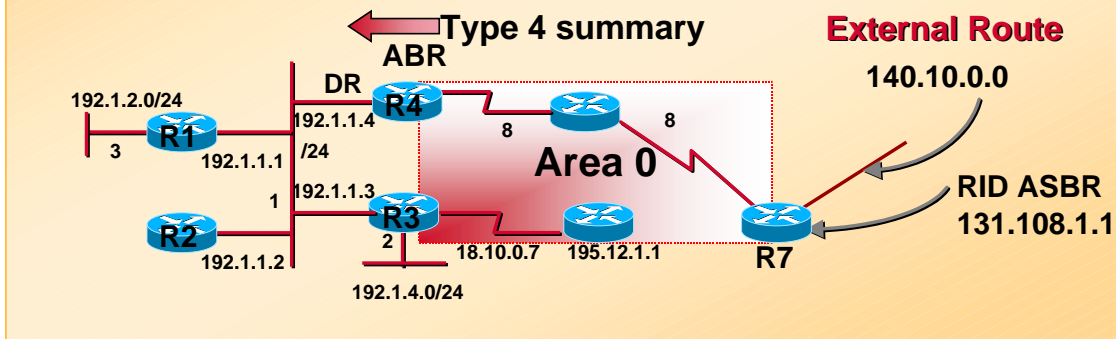
IP network number  
RID of ABR



# Type 4 Details

**show ip ospf database summary-asbr 192.1.2.0**

LS age = 0  
Options = (E-bit)  
LS type = 4  
Link State ID = 131.108.1.1      RID of ASBR  
Advertising Router = 192.1.1.4      RID of ABR  
Network Mask = 0.0.0.0  
metric = 16



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17

# External LSA

- **External LSA (Type 5)**
  - Defines routes to destination external to the AS
  - Default route is also sent as external
  - Two types of external LSA:
    - E1:** Consider the total cost up to the external destination
    - E2:** Considers only the cost of the outgoing interface to the external destination

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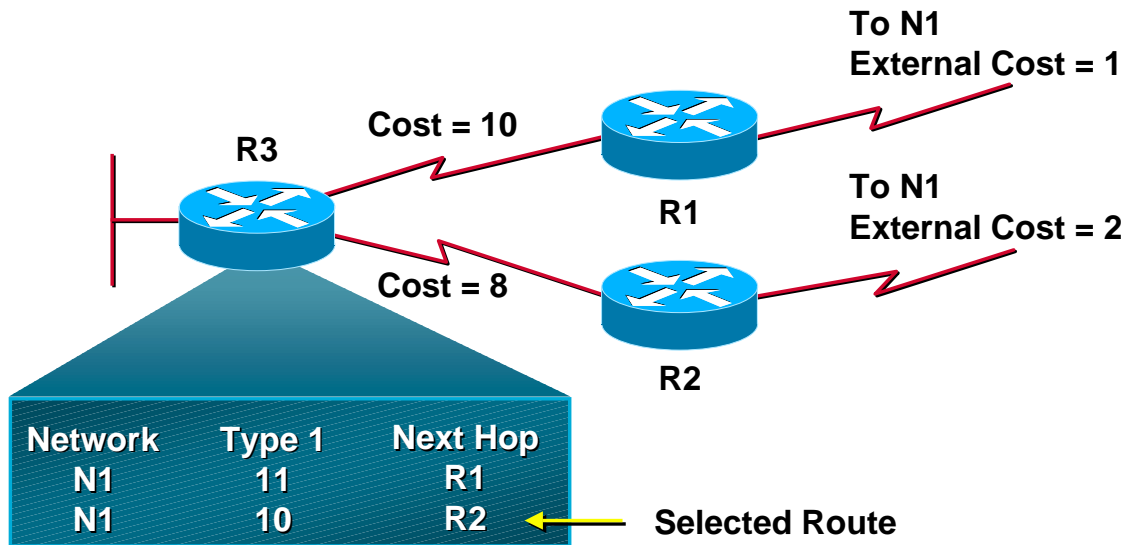
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18

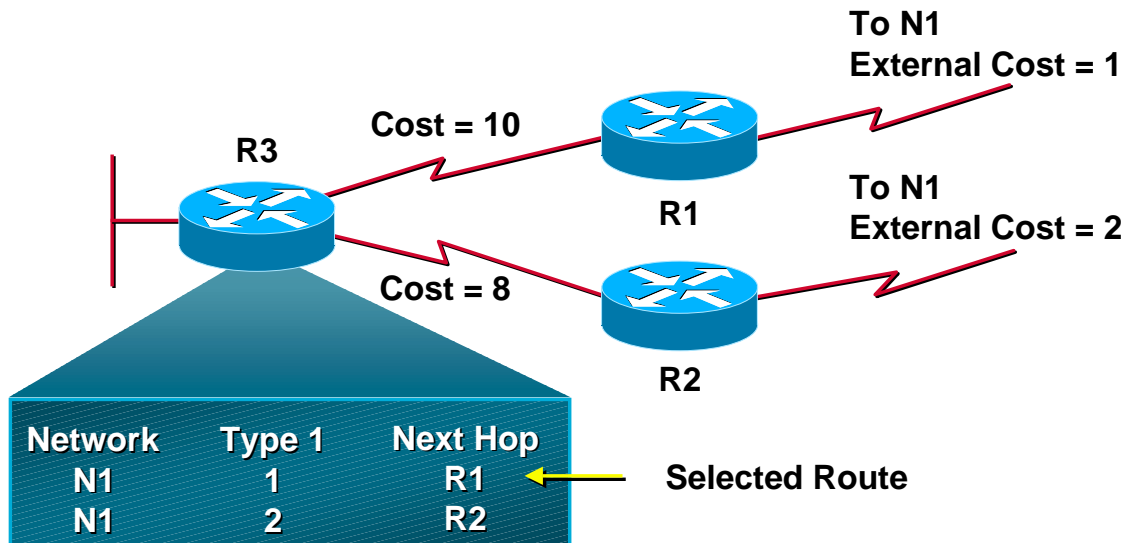
# External LSA

## External Type 1



# External LSA

## External Type 2



# Type 5 Details

**show ip ospf database external 140.10.0.0**

**LS age = 0**  
**Options = (E-bit)**  
**LS type = 5**  
**Link State ID = 140.10.0.0**  
**Advertising Router = 131.108.1.1**  
**Network Mask = 255.255.0.0**  
**bit E = 1**  
**metric = 4**  
**Forwarding address = 0.0.0.0**

**IP network number**  
**Router ID of R7**  
**E = 1 -> O E2 (Default)**  
**Traffic should be forwarded to the ASBR**

**External Route**  
**140.10.0.0**  
**RID ASBR**  
**131.108.1.1**  
**External Type 5**

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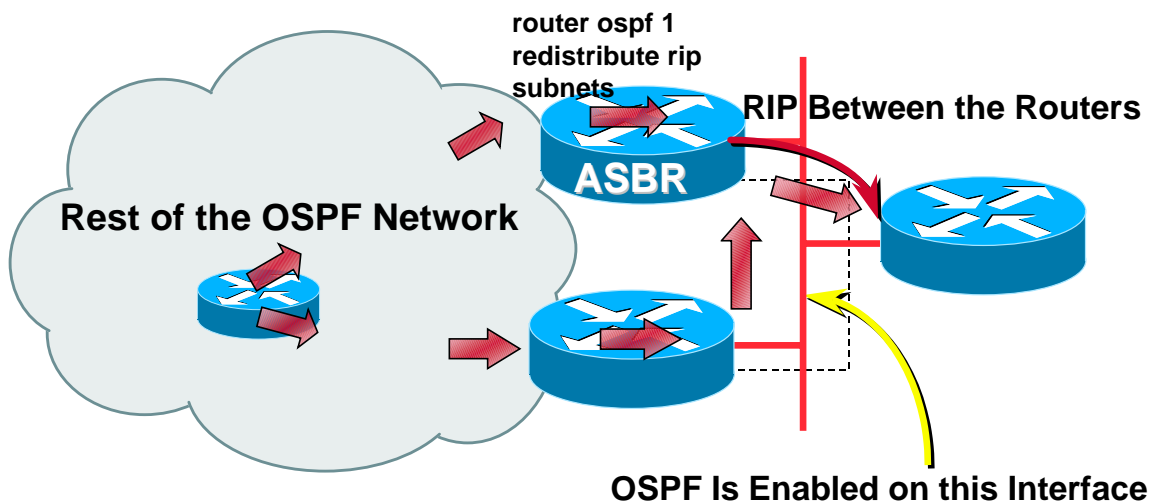
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21

# Type 5 Details

- **Forwarding address**

**Must be known via intra or inter area route**



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# Type 7 Details

## show ip ospf database nssa-external 140.10.0.0

LS age = 0

Options = (No TOS-capability, No Type 7/5 translation, DC)

LS type = 7

Link State ID = 140.10.0.0

Advertising Router = 131.108.1.1

Network Mask = 255.255.0.0

bit P = 0

IP network number

Router ID of R7(NSSA ASBR)

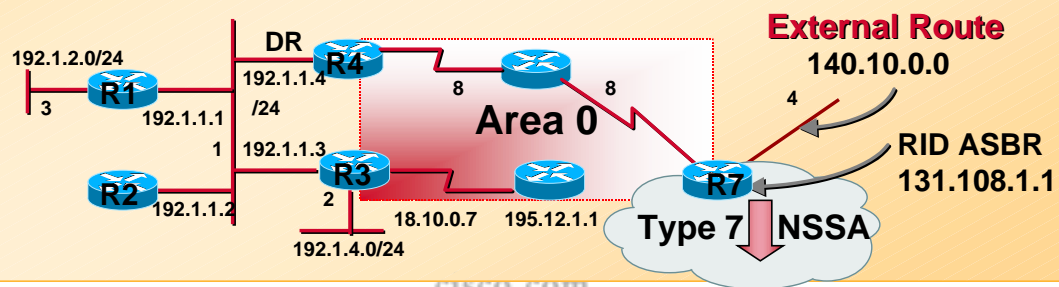
P = 0 -> This router is an NSSA ABR+ASBR

P = 1 -> This router is an NSSA ASBR

metric = 4

Forwarding address = 0.0.0.0

Traffic should be forwarded to the ASBR



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23

# Troubleshooting Commands

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# Show IP OSPF

## GR-3#sh ip ospf

Routing Process "ospf 100" with ID 10.10.128.3  
Supports only single TOS(TOS0) routes  
Supports opaque LSA  
It is an area border router  
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs  
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs  
Number of external LSA 0. Checksum Sum 0x0  
Number of opaque AS LSA 0. Checksum Sum 0x0  
Number of DCbitless external and opaque AS LSA 0  
Number of DoNotAge external and opaque AS LSA 0  
Number of areas in this router is 2. 2 normal 0 stub 0 nssa  
External flood list length 0  
Area BACKBONE(0)  
Number of interfaces in this area is 5  
Area has no authentication  
SPF algorithm executed 2773 times  
Area ranges are  
Number of LSA 97. Checksum Sum 0x2B19E3  
Number of opaque link LSA 0. Checksum Sum 0x0  
Number of DCbitless LSA 0  
Number of indication LSA 0  
Number of DoNotAge LSA 0  
Flood list length 0

# Show IP OSPF (Cont.)

## Area 8

Number of interfaces in this area is 2  
It is a stub area, no summary LSA in this area  
Area has no authentication  
SPF algorithm executed 11 times  
Area ranges are  
Number of LSA 5. Checksum Sum 0x22812  
Number of DCbitless LSA 0  
Number of indication LSA 0  
Number of DoNotAge LSA 0  
Flood list length 0

# OSPF Database

3600-g1#sh ip ospf data

OSPF Router with ID (30.8.1.1) (Process ID 1)

Router Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
30.8.1.1	30.8.1.1	1592	0x800001D0	0xA180	0

Router Link States (Area 8)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
30.8.1.1	30.8.1.1	1592	0x8000023F	0xC782	1
30.8.1.2	30.8.1.2	298	0x800003D1	0x2967	2
30.8.3.2	30.8.3.2	666	0x800002B8	0xE52B	1

Net Link States (Area 8)

Link ID	ADV Router	Age	Seq#	Checksum
30.8.1.2	30.8.1.2	299	0x80000203	0x4153
30.100.1.2	30.8.3.2	666	0x8000027A	0x10AB

# OSPF Database

GR-3#show ip ospf database database-summary

OSPF Router with ID (10.10.128.3) (Process ID 100)

Area 0 database summary

LSA Type	Count	Delete	Maxage
Router	63	0	0
Network	4	0	0
Summary Net	30	0	0
Summary ASBR	0	0	0
Type-7 Ext	0	0	0
Opaque Link	0	0	0
Opaque Area	0	0	0
Subtotal	97	0	0

# OSPF Neighbor

GSR-3#sh ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
10.64.1.2	1	FULL/DR	00:00:38	10.128.16.2	GigabitEthernet3/0
10.10.128.1	1	2WAY/DROTHER	00:00:31	10.128.1.1	Ethernet 6/0
10.10.128.2	1	FULL/BDR	00:00:36	10.128.1.2	Ethernet 6/0
10.10.128.4	1	FULL/DR	00:00:38	10.128.1.4	Ethernet 6/0

GSR-3#

# OSPF Adjacency Changes

r4-1#

router ospf 1  
ospf log-adjacency-changes

%OSPF-5-ADJCHG: Process 1, Nbr 172.16.16.2 on Serial0.1 from FULL to DOWN, Neighbor Down

%OSPF-5-ADJCHG: Process 1, Nbr 0.0.0.0 on Serial0.1 from DOWN to ATTEMPT, NBMA Start

# Neighbor Details

## r4-1#sh ip ospf nei det

```
Neighbor 172.16.133.5, interface address 172.16.133.5
  In the area 0 via interface Ethernet0
  Neighbor priority is 1, State is FULL, 6 state changes
  DR is 172.16.133.29 BDR is 172.16.133.6
  Options is 0x2
  Dead timer due in 00:00:37
  Neighbor is up for 00:01:24
  Index 2/2, retransmission queue length 0, number of retransmission 1
  First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
  Last retransmission scan length is 1, maximum is 1
  Last retransmission scan time is 4 msec, maximum is 4 msec
Neighbor 172.16.133.29, interface address 172.16.133.29
  In the area 0 via interface Ethernet0
  Neighbor priority is 1, State is FULL, 6 state changes
  DR is 172.16.133.29 BDR is 172.16.133.6
  Options is 0x2
  Dead timer due in 00:00:31
  Neighbor is up for 00:01:58
  Index 1/1, retransmission queue length 0, number of retransmission 2
  First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
  Last retransmission scan length is 1, maximum is 1
  Last retransmission scan time is 0 msec, maximum is 0 msec
r4-1#
```

# Show IP OSPF Interface

## r4-1#show ip ospf int

```
Serial0.1 is up, line protocol is up
  Internet Address 172.16.7.1/24, Area 0
  Process ID 1, Router ID 172.16.14.1, Network Type NON_BROADCAST, Cost: 64
  Transmit Delay is 1 sec, State DR, Priority 100
  Designated Router (ID) 172.16.14.1, Interface address 172.16.7.1
  No backup designated router on this network
  Timer intervals configured, Hello 30, Dead 120, Wait 120, Retransmit 5
  Hello due in 00:00:12
  Neighbor Count is 2, Adjacent neighbor count is 2
  Adjacent with neighbor 172.16.30.1
  Adjacent with neighbor 172.16.16.2
  Suppress hello for 0 neighbor(s)
Serial0.2 is up, line protocol is up
  Internet Address 172.16.14.1/24, Area 33
  Process ID 1, Router ID 172.16.14.1, Network Type NON_BROADCAST, Cost: 64
  Transmit Delay is 1 sec, State DR, Priority 100
  Designated Router (ID) 172.16.14.1, Interface address 172.16.14.1
  No backup designated router on this network
  Timer intervals configured, Hello 30, Dead 120, Wait 120, Retransmit 5
  Hello due in 00:00:11
  Neighbor Count is 1, Adjacent neighbor count is 1
  Adjacent with neighbor 172.16.100.2
  Suppress hello for 0 neighbor(s)
```

# Virtual Links

```
r4-1#sh ip ospf virtual-links
Virtual Link OSPF_VL0 to router 172.16.100.2 is up
Run as demand circuit
DoNotAge LSA allowed.
Transit area 33, via interface Serial0.2, Cost of using 64
Transmit Delay is 1 sec, State POINT_TO_POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit
5
Hello due in 00:00:09
Adjacency State FULL (Hello suppressed)
r4-1#
```

# Other show Commands

**R6-2500#sh ip ospf database self-originate** (shows the LSAs this router is generating)

OSPF Router with ID (192.168.6.1) (Process ID 100)

## Router Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
192.168.6.1	192.168.6.1	773	0x8000005B	0xC608	1

## Net Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum
135.4.1.2	192.168.6.1	773	0x80000056	0x4D14

## Router Link States (Area 5)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
192.168.6.1	192.168.6.1	264	0x80000053	0xC745	0

## Summary Net Link States (Area 5)

Link ID	ADV Router	Age	Seq#	Checksum
135.4.1.0	192.168.6.1	774	0x8000005C	0xDDFC

## Summary ASB Link States (Area 5)

Link ID	ADV Router	Age	Seq#	Checksum
5.5.5.5	192.168.6.1	774	0x8000002B	0x681B

## Type-5 AS External Link States

Link ID	ADV Router	Age	Seq#	Checksum	Tag
1.1.1.0	192.168.6.1	266	0x8000002C	0x31D0	0

# Other show Commands

**R6-2500#sh ip ospf database adv-router 5.5.5.5**  
 (shows the LSAs neighbor is generating)

OSPF Router with ID (192.168.6.1) (Process ID 100)

### Router Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
5.5.5.5	5.5.5.5	1479	0x80000034	0xA52A	1

### Type-5 AS External Link States

Link ID	ADV Router	Age	Seq#	Checksum	Tag
1.1.1.0	5.5.5.5	1478	0x80000032	0xACCB	0
5.5.5.0	5.5.5.5	1478	0x80000030	0x204E	0
135.4.1.0	5.5.5.5	1478	0x80000032	0xB33B	0

R6-2500#

# Show IP OSPF stat

**r4-1#sh ip ospf stat**

Area 0: SPF algorithm executed 16 times

Area 33: SPF algorithm executed 8 times

### SPF calculation time

Delta T	Intra	D-Intra	Summ	D-Summ	Ext	D-Ext	Total	Reason
3d18h	4	0	4	4	8	0	20	R, SN,
3d18h	8	0	4	0	8	0	20	R, N, SN,
3d18h	4	0	4	0	8	0	16	N,
3d18h	4	0	4	0	8	0	20	N, SN,
3d18h	4	0	4	0	8	0	16	R, N,
3d18h	4	0	4	0	8	0	16	R, SN,
3d17h	4	0	4	0	8	0	28	R, N, SN, SA, X
00:04:45	4	0	4	8	8	0	24	N, SN,
00:02:51	4	0	4	0	8	0	20	R, N,
00:02:41	4	0	8	8	8	0	28	R, SN,



# Common Issues

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37

## Troubleshooting

- **Most common issues**
  - Adjacency is not coming up**
  - OSPF neighbor stuck in ? state**
  - Information is in database not in routing table**
  - CPU Hogs, SPF running constantly**
  - Seq # mismatch**
  - Neighbor flapping (Frame-relay)**
  - NSSA ABR not translating**
  - DC is constantly bringing up the link**

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38

# Troubleshooting

- **Adjacencies not coming up**

**Command to look for the neighbor adj**

**show ip ospf neighbor**

**show ip ospf interface**

**debug ip ospf adjacency**

# Troubleshooting

- **Layer 2 is down**

```
r4-4k#show ip ospf neighbor
```

```
r4-4k#
```

```
no neighbor
```

```
r4-4k#show ip ospf interface s2
```

```
Serial2 is down, line protocol is down
```

```
Internet Address 10.10.1.4/16, Area 0
```

```
Process ID 1, Router ID 10.34.1.1, Network Type POINT_TO_POINT, Cost: 64
```

```
Transmit Delay is 1 sec, State DOWN,
```

```
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
```

# Troubleshooting

- OSPF not enabled on the interface

```
r4-4k#show ip ospf neighbor
```

```
r4-4k#
```

```
no neighbor
```

```
r4-4k#show ip ospf interface s0
```

```
Serial0 is up, line protocol is up
```

```
OSPF not enabled on this interface
```

In 12.0:

```
r4-4k#show ip ospf interface s0
```

```
r4-4k#
```

**Tip: check for the wrong network statement  
re-enter the network statement**

# Troubleshooting

- Interface is defines as passive

```
r4-4k#show ip ospf neighbor
```

```
r4-4k#
```

```
no neighbor
```

```
r4-4k#show ip ospf interface e0
```

```
Ethernet0 is up, line protocol is up
```

```
Internet Address 172.16.133.6/26, Area 0
```

```
Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 10
```

```
Transmit Delay is 1 sec, State DR, Priority 1
```

```
Designated Router (ID) 1.1.1.1, Interface address 172.16.133.6
```

```
No backup designated router on this network
```

```
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
```

```
No Hellos (Passive interface)
```

# Troubleshooting

- **Mismatched subnet mask**

```
r4-4k#debug ip ospf adj
```

```
OSPF adjacency events debugging is on
```

```
r4-4k#
```

```
OSPF: Mismatched hello parameters from 172.16.133.6
```

```
Dead R 40 C 40, Hello R 10 C 10 Mask R 255.255.255.0 C 255.255.255.192
```

# Troubleshooting

- **Mismatched hello/dead interval**

```
r4-4k#debug ip ospf adj
```

```
OSPF adjacency events debugging is on
```

```
r4-4k#
```

```
OSPF: Mismatched hello parameters from 172.16.133.6
```

```
Dead R 40 C 40, Hello R 15 C 10 Mask R 255.255.255.192 C 255.255.255.192
```

# Troubleshooting

- **Mismatched Authentication key**

```
r4-4k#debug ip ospf adj
OSPF adjacency events debugging is on
r4-4k#
OSPF: Rcv pkt from 172.16.133.6, Ethernet0: Mismatch Authentication Key
- Clear Text
```

**Tip: Watch for the "space" at the end of the Authentication key**

# Troubleshooting

- **Mismatched area ID**

```
r9-2500#show ip ospf neighbor
r9-2500#
no neighbors
r9-2500#debug ip ospf adj
OSPF adjacency events debugging is on

r9-2500#
OSPF: Rcv pkt from 172.16.133.6, Ethernet0, area 0.0.0.1
      mismatch area 0.0.0.2 in the header
```

**Neighbor is in area 0 but we are not:**

```
%OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from backbone
area must be virtual-link but not found from 172.16.133.29, Ethernet0
```

# Troubleshooting

- **Mismatched Transit/Stub area**

```
r9-2500#show ip ospf neighbor
r9-2500#
no neighbors
r9-2500#debug ip ospf adj
OSPF adjacency events debugging is on

r9-2500#
OSPF: Hello from 172.16.133.6 with mismatched Stub/Transit area option bit
```

# Troubleshooting

- **OSPF neighbor stuck in ? state**

**Command to look for the neighbor adj**

**show ip ospf neighbor**

**debug ip ospf adjacency**

# Bringing Up Adjacencies

- **Neighbor states**

**Down**

No information has been received from the neighbor

**Attempt**

Valid for neighbors on NBMA network, no information is received from the neighbor but serious effort is made to contact the neighbor

**Init**

Hello packet has been received from the neighbor, but the router itself is not listed in that hello packet

# Bringing Up Adjacencies

- **Neighbor States (Cont.)**

**2Way**

Bi-directional communication with the neighbor is established; this is the beginning of adjacency; DR/BDR are elected in this state

**Exstart**

This is used in deciding the DBD sync, which router will be master/slave and what will be the first sequence number for DBD packet

# Bringing Up Adjacencies

- **Neighbor states (Cont.)**

## **Exchange**

In this state the router describes the entire link state database through the DBD packet, each DBD sequence is explicitly acked, only one DBD packet is allowed outstanding at one time, link state request packets are also sent to request the newer LSA

## **Loading**

In this state, link-state request packets are requested for the more recent LSA that have not been received during Exchange

## **Full**

In this state complete information has been exchanged

# Troubleshooting

## **Problem:**

**OSPF stuck in ATTEMPT**

## **Reasons:**

**We are sending hellos to contact neighbor on NBMA but received no reply**

**Neighbor hellos are getting lost in NBMA cloud**

**Neighbor received our hello but rejecting that for some reason (Layer 2)**

**Neighbor is not pingable**

# Troubleshooting

## Problem:

**OSPF stuck in INIT (one way hello)**

## Reasons:

- 1. One side is blocking the hello packet with**
- 2. One side is translating (NAT) ospf hello**
- 3. One side multicast capabilities is broken**
- 4. Must be a Layer 2 problem**
- 5. Dialer map or frame-relay map is missing 'broadcast'**

**<http://www.cisco.com/warp/customer/104/7.html>**

# Troubleshooting

## Problem:

**OSPF stuck in 2-WAY**

## Reasons:

**This is normal on broadcast network types**

**This is to reduce the amount of flooding on the wire**

**Problems can happen if Layer 2 is broken**

**<http://www.cisco.com/warp/customer/104/11.html>**

# Troubleshooting

## Problem:

OSPF stuck in EXSTART/EXCHANGE

## Reasons:

1. If the neighbor is bay router adjust the interface mtu to match bays.

3. Neighbor RID is same as ours

4. Unicast is broken

a. wrong VC/DLCi mapping in frame/ATM environment in highly redundant network

b. mtu problem, can't ping across with more than certain length packet

c. access-list blocking unicast. After 2-way OSPF send unicast packet except p2p links

d. NAT is translating unicast packet

<http://www.cisco.com/warp/customer/104/12.html>

5. Between PRI and BRI/dialer and network type is p2p

<http://www.cisco.com/warp/customer/104/20.html>

# Troubleshooting

## Problem:

OSPF stuck in LOADING

## Reasons:

1. LS request is being made and neighbor is sending bad packet or mem corrupt

a. do show ip ospf request-list <neighbor RID> <interface> to see bad lsa

b. show log will show OSPF-4-BADLSATYPE msg

2. LS request is being made and neighbor is ignoring the request

3. MTU mismatch problem. Old IOS won't detect it (RFC 1583)

# Troubleshooting

- Information is in the database but not in the routing table

Command to look for

**show ip ospf database <x>**

**'x' can be router, network, summary, summary-asbr, external, nssa**

# Troubleshooting

- Mismatched Network Types

```
r9-2500#show ip ospf interface s 0.2
```

```
Serial0.2 is up, line protocol is up
```

```
Internet Address 10.1.2.3/24, Area 0
```

```
Process ID 1, Router ID 10.1.2.3, Network Type BROADCAST, Cost: 64
```

```
r4-4k#show ip ospf interface s 0.1
```

```
Serial0.1 is up, line protocol is up
```

```
Internet Address 10.1.2.1/24, Area 0.0.0.0
```

```
Process ID 1, Router ID 10.1.2.1, Network Type POINT_TO_POINT, Cost: 64
```

**TIP: Adv-router not reachable msg**

**<http://www.cisco.com/warp/customer/104/26.html>**

# Troubleshooting

## Problem:

OSPF routes in the database but not in the routing table

## Reasons:

One side is numbered and the other unnumbered (O, O IA, O E1, O E2)

ip addresses are flipped, dual serial (O, O IA, O E1, O E2)

Forwarding address is not known or is known via external/static (O E1, O E2) - route sum and redistribute conn?

Different mask or ip address in p2p (O, O IA, O E1, O E2)

Distribute-list in is configured

Backbone area became discontinuous (O, OIA, OE1, OE2)

OSPF is enabled on secondary but not on primary

# Troubleshooting

- **SPF is running constantly**

Look at **sh ip ospf stat, Seq #, LS Age**

**Debug ip ospf monitor**

**show ip ospf database database-sum**

**For CPU hogs:**

**summarize if too many inter area or external routes**

**12.0 LSA group pacing**

# Show IP OSPF stat

**r4-1#sh ip ospf stat**

Area 0: SPF algorithm executed 16 times

Area 33: SPF algorithm executed 8 times

SPF calculation time

Delta T	Intra	D-Intra	Summ	D-Summ	Ext	D-Ext	Total	Reason
3d18h	4	0	4	4	8	0	20	R, SN,
3d18h	8	0	4	0	8	0	20	R, N, SN,
3d18h	4	0	4	0	8	0	16	N,
3d18h	4	0	4	0	8	0	20	N, SN,
3d18h	4	0	4	0	8	0	16	R, N,
3d18h	4	0	4	0	8	0	16	R, SN,
3d17h	4	0	4	0	8	0	28	R, N, SN, SA, X
00:04:45	4	0	4	8	8	0	24	N, SN,
00:02:51	4	0	4	0	8	0	20	R, N,
00:02:41	4	0	8	8	8	0	28	R, SN,

# Debug ip ospf monitor

**r4-1#deb ip ospf mon**

OSPF: Schedule SPF in area 0

Change in LS ID 1.1.1.1, LSA type R,

OSPF: schedule SPF: spf\_time 0ms wait\_interval 861421816s

OSPF: Begin SPF at 0x33585480ms, process time 752ms

spf\_time 0ms, wait\_interval 861421816s

OSPF: End SPF at 0x33585488ms, Total elapsed time 8ms

Intra: 4ms, Inter: 0ms, External: 0ms

# LSA Group Pacing

- All LSA refresh every 30 min (bad!)
- Timers of each LSA get sync (worse!)
- With group pacing only LSAs that reach max-age get refreshed periodically
- interval is configurable

# Troubleshooting

- **Seq # mismatch**  
Command to look for  
**debug ip ospf adjacency**

# Troubleshooting

- **Seq # mismatch:**
  1. LSA should one of 5 LSAs
  2. If LSA is type 5 and the neighbor is associated with a stub area
  3. If one of the options change
  4. If the state of MS bit is inconsistent with master slave connection

# Troubleshooting

- **Seq # mismatch**
  5. If the I-bit is set
  6. If the master receives a DBD packet after a dead interval
  7. If the requested LSA is not found, then something has gone wrong with the database exchange

# Troubleshooting

- **Neighbor flapping**

**Command to look for**

**debug ip ospf adjacency**

**ospf log-adjacency-change**

**show ip ospf neighbors det**

**show interface**

# Troubleshooting

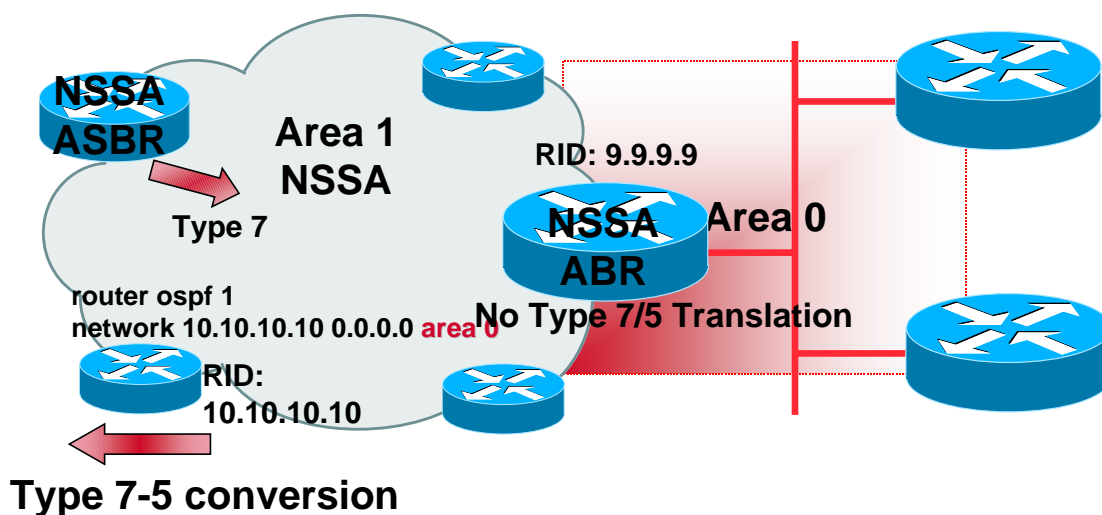
- **If the media is Frame Relay look for broadcast queue drops:**

```
Serial0 is up, line protocol is up
Hardware is MK5025
Description: Charlotte Frame Relay Port DLCI 100
MTU 1500 bytes, BW 1024 Kbit, DLY 20000 usec, rely 255/255, load 44/255
Encapsulation FRAME-RELAY, loopback not set, keepalive set (10 sec)
LMI enq sent 7940, LMI stat recvd 7937, LMI upd recvd 0, DTE LMI up
LMI enq recvd 0, LMI stat sent 0, LMI upd sent 0
LMI DLCI 1023 LMI type is CISCO frame relay DTE
Broadcast queue 64/64, broadcasts sent/dropped 1769202/1849660, interface broadcasts 3579215
```

<http://www.cisco.com/warp/customer/104/6.shtml>

## Troubleshooting NSSA

- Only NSSA ABR with the highest RID does the conversion



2206  
1209\_05\_2000\_c3

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69

## Troubleshooting Demand Circuits



- DC is bringing up the link
- There is a change in OSPF topology
- **debug ip ospf monitor** is helpful in this case
- network type on DC is defined broadcast
- The reduces flooding but doesn't suppress hellos

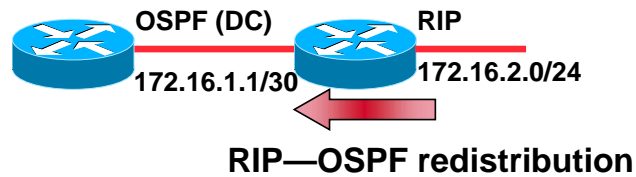
2206  
1209\_05\_2000\_c3

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70

# Troubleshooting Demand Circuits



- DC is bringing up the link
- PPP host route is also own by RIP
- When PPP host route disappears, the database is change
- Solution1: no peer neighbor-route
- Solution2: distribute-list
- Solution3: Use different majornet for RIP

## Troubleshooting Tips

# Troubleshooting Tips

- Cannot allocate router ID
- OSPF unknown routing protocol
- OSPF and secondary address
- Options and flags
- How to read **debug ip ospf adj**
- Route Preference

# Troubleshooting Tips

## **Problem:**

**OSPF: Could not allocate router id**

## **Reasons:**

**Common new install problem**

**If no interface up/up with valid ip address**

**if no ip addresses assigned**

**Configure a loopback with an ip address**

## Troubleshooting Tips

### **Problem:**

**OSPF unknown routing protocol**

### **Reason:**

**OSPF is not supported on low end platform**

**For 1000 and 1600 routers download plus version**

**800 routes are not supported to run ospf**

**<http://www.cisco.com/warp/customer/471/99.html>**

## Troubleshooting Tips

- **OSPF and secondary addresses**

**Primary and secondary address should be in same area**

**OSPF hellos are always send from primary interface**

**To form neighbors on secondary interface configure sub-interface**

**Use ISL or dot1Q encapsulation**

# Troubleshooting Tips

## Problem:

OSPF not sending hellos on async interface

## Reasons:

'async default routing' is not configured under the interface

## Problem:

OSPF not redistributing default static route

## Reasons:

need default-information originate to propagate default

## Problem:

OSPF-4-ERRRCV msg on the console

## Reasons:

Mismatch area ID, BAD Checksum etc.

<http://www.cisco.com/warp/customer/104/19.html>

# OSPF Protocol Packets

## • Options

**Normal area:** OSPF: Send DBD to 141.108.97.1 on Serial0 seq 0xBC4 opt 0x2 flag 0x3 len 492

E bit is 1, Allow externals, option: 0x2(HEX) = 00000010(Bin)

**Stub area:** OSPF: Send DBD to 141.108.97.1 on Serial0 seq 0x1866 opt 0x0 flag 0x3 len 372

E bit is 0, no external allowed, options: 0x0 = 00000000

**MC not supported - ospf ignore lsa mospf command**

**NSSA:** OSPF: Send DBD to 141.108.97.1 on Serial0 seq 0x118 opt 0x8 flag 0x3 len 372

N/P bit is on, options: 0x8 = 00001000

**EA not supported yet**

**Demand circuit :** OSPF: Send DBD to 141.108.97.1 on Serial0 seq 0x1A1E opt 0x20 flag 0x3 len 392

DC bit is negotiated, options: 0x20 = 00100000



# OSPF Protocol Packets

- **Flags**
- **Useful in debugging, defines I, M and MS bits**

OSPF: Send DBD to 141.108.97.1 on Serial0 seq 0xBC4 opt 0x2 flag 0x3 len 492

Flag 0x7 --> 111 means I(Initial) = 0, M = 1(More), MS = 1(Master)

Flag 0x6 --> 110 not possible

Flag 0x5 --> 101 not possible

Flag 0x4 --> 100 not possible

Flag 0x3 --> 011 means master has more data to send

Flag 0x2 --> 010 means slave has more data to send

Flag 0x1 --> 001 means master has no more data left to send

Flag 0x0 --> 000 means slave has no more data left to send



# How to read debug ip ospf adj?

OSPF: Rcv hello from 141.108.10.2 area 0 from Serial0.1 141.108.10.2

OSPF: 2 Way Communication to 141.108.10.2 on Serial0.1, state 2WAY

OSPF: Neighbor change Event on interface Serial0.1

OSPF: DR/BDR election on Serial0.1

OSPF: Elect BDR 0.0.0.0

OSPF: Elect DR 141.108.10.2

DR: 141.108.10.2 (Id) BDR: none

OSPF: Send DBD to 141.108.10.2 on Serial0.1 seq 0x236D opt 0x2 flag 0x7 len 32

OSPF: Rcv DBD from 141.108.10.2 on Serial0.1 seq 0x1996 opt 0x2 flag 0x7 len 32 state EXSTART

OSPF: First DBD and we are not SLAVE

OSPF: Rcv DBD from 141.108.10.2 on Serial0.1 seq 0x236D opt 0x2 flag 0x2 len 352 state EXSTART

OSPF: NBR Negotiation Done. We are the MASTER

OSPF: Send DBD to 141.108.10.2 on Serial0.1 seq 0x236E opt 0x2 flag 0x3 len 352

OSPF: Rcv DBD from 141.108.10.2 on Serial0.1 seq 0x236E opt 0x2 flag 0x0 len 32 state EXCHANGE

OSPF: Send DBD to 141.108.10.2 on Serial0.1 seq 0x236F opt 0x2 flag 0x1 len 32

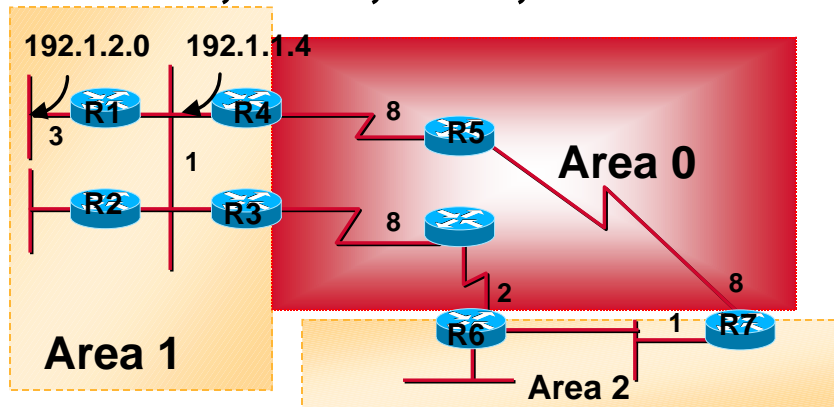
OSPF: Rcv DBD from 141.108.10.2 on Serial0.1 seq 0x236F opt 0x2 flag 0x0 len 32 state EXCHANGE

OSPF: Exchange Done with 141.108.10.2 on Serial0.1

OSPF: Synchronized with 141.108.10.2 on Serial0.1, state FULL

# Route Preference

- O, O IA, OE1, OE2



R7 routing table: O IA 192.1.2.0/24 via R5 metric 20 ???

Summary LSA through R6 has a metric of 15!

How to reach the Advertising router R4 (ABR)? O vs O IA

## Troubleshooting OSPF

### Session 2206



# Please Complete Your Evaluation Form

## Session 2206

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