



NETWORKERS 2004

TROUBLESHOOTING OSPF

SESSION RST-3301

RST-3301
9721_05_2004_c2

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Agenda

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- LSA Overview
- Troubleshooting Commands
- Common Issues

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LSA OVERVIEW



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LSA Type Review

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Type	LSA
1	Router
2	Network
3	Summary Network
4	Summary ASBR
5	External
6	Group Membership
7	NSSA
8	External Attributes
9-11	Opaque

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Router LSA Details

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- **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

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Router LSA of R3 for Area 1

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```
R3#show ip ospf database router 3.3.3.3
```

Router Link States (Area 1)

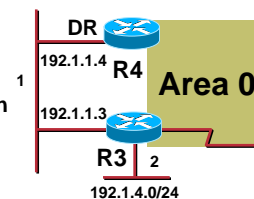
```
LS age = 0
Options = (E-bit)
LS type = 1
Link State ID = 3.3.3.3
Advertising Router = 3.3.3.3
It is an area border router
# links = 2
  Link ID = 192.1.1.4
  Link Data = 192.1.1.3
  Type = 2
  # TOS metrics = 0
  metric = 1
  Link ID = 192.1.4.0
  Link Data = 255.255.255.0
  Type = 3
  # TOS metrics = 0
  metric = 2
```

Always 0 at origination

This is a router LSA
Router ID of R3
Router ID of R3
bit B = 1

IP address of the DR
Interface address of this router
This is a transit network

Cost to reach the interface
IP network number
Subnet mask of the interface
Stub network



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Router LSA of R3 for Area 0 (Cont.)

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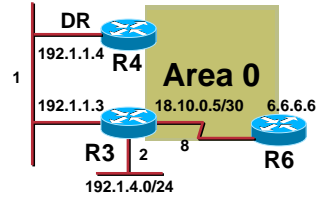
Router Link States (Area 0)

LS age = 0
Options = (E-bit)
LS type = 1
Link State ID = 3.3.3.3
Advertising Router = 3.3.3.3
It is an area border router
links = 2
 Link ID = 6.6.6.6
 Link Data = 18.10.0.5
 Type = 1
 # TOS metrics = 0
 metric = 8
 Link ID = 18.10.0.4
 Link Data = 255.255.255.252
 Type = 3
 # TOS metrics = 0
 metric = 8

bit B = 1

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



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Router LSA Details

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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

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Network LSA

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- **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

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Network LSA for 192.1.1.0

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R3#show ip ospf database network 192.1.1.4

Network Link States (Area 1)

LS age = 948

Options = (E-bit)

LS type = 2

Link State ID = 192.1.1.4

Advertising Router = 4.4.4.4

Network Mask = 255.255.255.0

Attached Router = 4.4.4.4

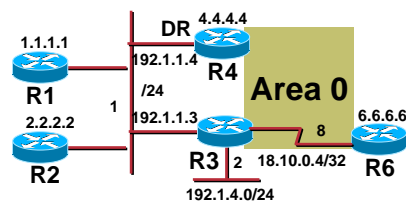
Attached Router = 3.3.3.3

Attached Router = 2.2.2.2

Attached Router = 1.1.1.1

IP interface address of DR
RID of DR

RID of attached routers FULL with the DR



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Summary LSA

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- Describes the destination outside the area but still in the AS
- Summary is created for each IP subnets in one area and is flooded out in all other areas
- Originated by an ABR
- Only intra-area routes are advertised into the backbone
- Type 4 is the information about the ASBR

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Type 3 Details

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R4#show ip ospf database summary 192.1.2.0

Summary Net Link States (Area 0)

LS age = 1514

Options = (E-bit)

LS type = 3

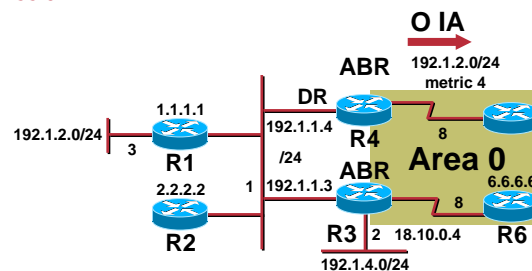
Link State ID = 192.1.2.0

Advertising Router = 4.4.4.4

Network Mask = 255.255.255.0

metric = 4

IP network number
RID of ABR



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Type 4 Details

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```
R4#show ip ospf database asbr-summary 7.7.7.7
```

Summary ASB Link States (Area 0)

LS age = 1548

Options = (E-bit)

LS type = 4

Link State ID = 7.7.7.7

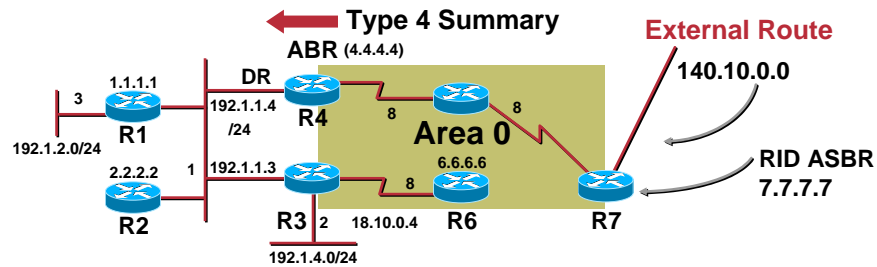
Advertising Router = 4.4.4.4

Network Mask = 0.0.0.0

Metric = 16

RID of ASBR

RID of ABR



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External LSA

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- 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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Type 5 Details

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```
R4#show ip ospf database external 140.10.0.0
```

LS age = 1156

Options = (E-bit)

LS type = 5

Link State ID = 140.10.0.0

Advertising Router = 7.7.7.7

Network Mask = 255.255.0.0

Metric Type: 2

metric = 20

Forwarding address = 0.0.0.0

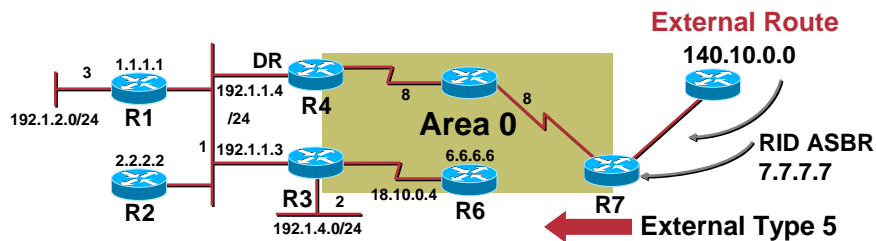
IP network number

Router ID of R7

bit E = 1 -> O E2 (Default)

The metric is 20 in all redistributed E2 routes

Traffic should be forwarded to the ASBR



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NSSA External LSA

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- **NSSA External LSA (Type 7) RFC1587**

NSSA was created to inject external routes from stub area into OSPF domain

Redistribution in NSSA creates Type 7 LSA

Generated by the NSSA ASBR

Type 7 can only exist in NSSA area

NSSA ABR does the translation from 7-5

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TROUBLESHOOTING COMMANDS



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Show IP OSPF

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R3#show ip ospf

Routing Process "ospf 1" with ID 3.3.3.3 and Domain ID 0.0.0.1

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 1. Checksum Sum 0x3B57

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 2

Area has no authentication

SPF algorithm executed 2773 times

Area ranges are

Number of LSA 17. Checksum Sum 0x686B5

Number of opaque link LSA 0. Checksum Sum 0x0

Number of DCbitless LSA 0

Number of indication LSA 0

Number of DoNotAge LSA 9

Flood list length 0

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Show IP OSPF (Cont.)

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```
...
Area 1
  Number of interfaces in this area is 2
  Area has no authentication
  SPF algorithm executed 22 times
  Area ranges are
  Number of LSA 19, Checksum Sum 0x8FE73
  Number of DCbitless LSA 0
  Number of indication LSA 0
  Number of DoNotAge LSA 0
  Flood list length 0
```

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Show IP OSPF Database

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```
R3#show ip ospf database
```

```
  OSPF Router with ID (3.3.3.3) (Process ID 1)
```

```
    Router Link States (Area 0)
```

Link ID	ADV Router	Age	Seq#	Checksum	Link count
3.3.3.3	3.3.3.3	106	0x80000009	0xC3F1	3

```
  ...
```

```
    Summary Net Link States (Area 0)
```

Link ID	ADV Router	Age	Seq#	Checksum
18.10.0.0	7.7.7.7	3 (DNA)	0x80000008	0x3DC2
18.10.0.0	8.8.8.8	1396	0x80000004	0x27D8

```
  ...
```

```
    Router Link States (Area 1)
```

Link ID	ADV Router	Age	Seq#	Checksum	Link count
1.1.1.1	1.1.1.1	671	0x80000016	0xE6CD	2

```
  ...
```

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Show IP OSPF Database Database-Summary

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R3#show ip ospf database database-summary

OSPF Router with ID (3.3.3.3) (Process ID 1)

Area 0 database summary

LSA Type	Count	Delete	Maxage
Router	6	0	0
Network	4	0	0
Summary Net	10	0	0
Summary ASBR	0	0	0
Type-7 Ext	0	0	0
Opaque Link	0	0	0
Opaque Area	0	0	0
Subtotal	20	0	0

Area 1 database summary

LSA Type	Count	Delete	Maxage
Router	4	0	0
Network	1	0	0
Summary Net	10	0	0
Summary ASBR	4	0	0

...

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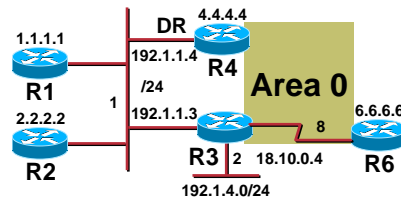
Show IP OSPF Neighbor

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R3#show ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
1.1.1.1	1	FULL/DROTHER	00:00:33	192.1.1.1	FastEthernet0/0
2.2.2.2	1	FULL/DROTHER	00:00:32	192.1.1.2	FastEthernet0/0
4.4.4.4	1	FULL/DR	00:00:39	192.1.1.4	FastEthernet0/0
6.6.6.6	1	FULL/-	00:00:38	18.10.0.6	Serial0/0

R3#



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OSPF Log-Adjacency-Changes

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- Default as of 12.1.3 and 12.0.12S

```
R3#config terminal
```

```
R3(config)#router ospf 1
```

```
R3(config-router)#log-adjacency-changes
```

```
%OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on FastEthernet0/0 from 2WAY to DOWN, Neighbor Down: Interface down or detached
```

```
%OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on FastEthernet0/0 from FULL to DOWN, Neighbor Down: Interface down or detached
```

```
%OSPF-5-ADJCHG: Process 1, Nbr 4.4.4.4 on FastEthernet0/0 from FULL to DOWN, Neighbor Down: Interface down or detached
```

```
%OSPF-5-ADJCHG: Process 1, Nbr 4.4.4.4 on OSPF_VL0 from FULL to DOWN, Neighbor Down: Interface down or detached
```

```
%LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
```

```
%OSPF-5-ADJCHG: Process 1, Nbr 4.4.4.4 on FastEthernet0/0 from LOADING to FULL, Loading Done
```

```
%OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on FastEthernet0/0 from LOADING to FULL, Loading Done
```

```
%OSPF-5-ADJCHG: Process 1, Nbr 4.4.4.4 on OSPF_VL0 from LOADING to FULL, Loading Done
```

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Show IP OSPF Neighbor Detail

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```
R3#show ip ospf neighbor detail
```

```
Neighbor 1.1.1.1, interface address 192.1.1.1
```

```
In the area 1 via interface FastEthernet0/0
```

```
Neighbor priority is 1, State is 2WAY, 2 state changes
```

```
DR is 192.1.1.4 BDR is 192.1.1.2
```

```
Options is 0x2
```

```
Dead timer due in 00:00:39
```

```
Neighbor is up for 00:06:30
```

```
Index 0/0, retransmission queue length 0, number of retransmission 0
```

```
First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
```

```
Last retransmission scan length is 0, maximum is 0
```

```
Last retransmission scan time is 0 msec, maximum is 0 msec
```

```
Neighbor 2.2.2.2, interface address 192.1.1.2
```

```
In the area 1 via interface FastEthernet0/0
```

```
Neighbor priority is 1, State is FULL, 6 state changes
```

```
DR is 192.1.1.4 BDR is 192.1.1.2
```

```
Options is 0x42
```

```
Dead timer due in 00:00:38
```

```
Neighbor is up for 00:06:31
```

```
Index 2/2, retransmission queue length 0, number of retransmission 0
```

```
First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
```

```
Last retransmission scan length is 0, maximum is 0
```

```
Last retransmission scan time is 0 msec, maximum is 0 msec
```

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Show IP OSPF Interface

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```
R3#show ip ospf interface
FastEthernet0/0 is up, line protocol is up
Internet Address 192.1.1.3/24, Area 1
Process ID 1, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DROTHER, Priority 1
Designated Router (ID) 4.4.4.4, Interface address 192.1.1.4
Backup Designated router (ID) 2.2.2.2, Interface address 192.1.1.2
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:03
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 0, maximum is 5
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 3, Adjacent neighbor count is 2
  Adjacent with neighbor 2.2.2.2 (Backup Designated Router)
  Adjacent with neighbor 4.4.4.4 (Designated Router)
Suppress hello for 0 neighbor(s)
```

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Show IP OSPF Virtual-Links

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```
R3#show ip ospf virtual-links
Virtual Link OSPF_VL0 to router 4.4.4.4 is up
Run as demand circuit
DoNotAge LSA allowed.
Transit area 1, via interface FastEthernet0/0, Cost of using 1
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)
Index 1/3, 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 0 msec, maximum is 0 msec
R3#
```

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Show IP OSPF Stat

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- Requires enable mode

R3#sh ip ospf stat

Area 0: SPF algorithm executed 42 times

Area 1: SPF algorithm executed 38 times

SPF calculation time

Delta T	Intra	D-Intra	Summ	D-Summ	Ext	D-Ext	Total	Reason
00:22:00	0	0	0	0	0	0	0	R, N, SN,
00:21:44	0	0	4	0	0	0	4	R, SN, X
00:21:34	0	0	4	0	0	0	4	R, SN, X
00:21:24	0	0	0	4	0	0	4	R, SN, X
00:21:14	0	0	0	0	0	0	0	R,
00:21:04	0	0	0	0	0	0	0	R, N, SN,
00:20:54	0	0	0	0	0	0	0	X
00:20:44	0	0	4	0	0	0	4	R, SN, X
00:20:34	0	0	0	0	0	0	0	X
00:00:17	4	0	0	0	0	0	4	R, N, SN, SA, X

...
R=Router LSA; N=NetworkLSA; SN=Summary Network LSA; SA=Summary ASBR LSA; X=External LSA

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Show IP OSPF Borders

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R3#show ip ospf borders-routers

OSPF Process 1 internal Routing Table

Codes: i - Intra-area route, I - Inter-area route

i 4.4.4.4 [1] via 192.1.1.4, FastEthernet0/0, ABR, Area 0, SPF 42
i 4.4.4.4 [1] via 192.1.1.4, FastEthernet0/0, ABR, Area 1, SPF 38
i 8.8.8.8 [10] via 18.10.0.6, Serial0/0, ABR/ASBR, Area 0, SPF 42
i 7.7.7.7 [17] via 192.1.1.4, FastEthernet0/0, ABR/ASBR, Area 0, SPF 42

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Other Show Commands

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R3#show ip ospf database self-originate

OSPF Router with ID (3.3.3.3) (Process ID 1)

Router Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
3.3.3.3	3.3.3.3	1520	0x80000015	0xABFD	2

Summary Net Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum
192.1.1.0	3.3.3.3	1520	0x80000006	0x4E1A
192.1.2.0	3.3.3.3	1521	0x80000006	0x6103

...

Router Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
3.3.3.3	3.3.3.3	1536	0x80000028	0x612D	2

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Other Show Commands (Cont.)

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R3#show ip ospf database adv-router 7.7.7.7

OSPF Router with ID (3.3.3.3) (Process ID 1)

Router Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
7.7.7.7	7.7.7.7	871(DNA)	0x8000000D	0x8FE2	2

Summary Net Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum
20.10.0.0	7.7.7.7	871 (DNA)	0x8000000A	0x39C4

Type-5 AS External Link States

Link ID	ADV Router	Age	Seq#	Checksum	Tag
140.100.0.0	7.7.7.7	1944	0x80000004	0x3759	0

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COMMON ISSUES



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Common Issues

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- Adjacency is not coming up
- OSPF neighbor stuck in ? state
- Information is in the DB but not in the RT
- SPF running constantly
- Neighbor flapping (Frame Relay)
- NSSA ABR not translating Type 7 LSA
- Demand circuit problems

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Adjacency Is Not Coming Up

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- Useful commands for this problem

Show IP OSPF neighbor
Show IP OSPF interface
Debug IP OSPF adjacency

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Adjacency Is Not Coming Up

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- Layer 2 is down

R3#show ip ospf neighbor
R3#

R3#show ip ospf interface serial 2
Serial2 is down, line protocol is **DOWN**
Internet Address 18.10.0.3/30, Area 0
Process ID 1, Router ID 3.3.3.3, 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

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Adjacency Is Not Coming Up

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- OSPF not enabled on the interface

```
R3#show ip ospf neighbor
R3#
```

```
R3#show ip ospf interface serial 2
Serial2 is up, line protocol is up
OSPF not enabled on this interface
```

In 12.0:

```
R3#show ip ospf interface serial 2
R3#
```

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

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Adjacency Is Not Coming Up

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- Interface is defined as passive

```
R3#show ip ospf neighbor
R3#
```

```
R3#show ip ospf interface e0
Ethernet0 is up, line protocol is up
Internet Address 192.1.1.3/24, Area 1
Process ID 1, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 10
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 192.1.1.4, Interface address 192.1.1.3
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
No Hellos (Passive interface)
```

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Adjacency Is Not Coming Up

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- Mismatched subnet mask

```
R3#show ip ospf neighbor
R3#
```

```
R3#debug ip ospf adj
OSPF adjacency events debugging is on
R3#
OSPF: Mismatched hello parameters from 192.1.1.4
Dead R 40 C 40, Hello R 10 C 10 Mask R 255.255.255.192 C 255.255.255.0
```

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Adjacency Is Not Coming Up

Cisco.com

- Mismatched hello/dead interval

```
R3#show ip ospf neighbor
R3#
```

```
R3#debug ip ospf adj
OSPF adjacency events debugging is on
R3#
OSPF: Mismatched hello parameters from 192.1.1.4
Dead R 40 C 40, Hello R 15 C 10 Mask R 255.255.255.0 C 255.255.255.0
```

```
R4(config-if)#interface ethernet 0
R4(config-if)#no ip ospf hello-interval 15
```

Tip: Default is 10 second on LAN

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Adjacency Is Not Coming Up

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- Mismatched authentication key

```
R3#show ip ospf neighbor  
R3#
```

```
R3#debug ip ospf adj  
OSPF adjacency events debugging is on  
R3#  
OSPF: Rcv pkt from 192.1.1.4, Ethernet0: Mismatch Authentication Key -  
Clear Text
```

Tip: Watch for the “space” at the end of the Authentication key

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Adjacency Is Not Coming Up

Cisco.com

- Mismatched area ID

```
R4#show ip ospf neighbor  
R4#
```

```
R4#debug ip ospf adj  
OSPF adjacency events debugging is on  
OSPF: Rcv pkt from 192.1.1.4, Ethernet0, area 0.0.0.1  
mismatch area 0.0.0.2 in the header
```

Neighbor is in area 2 but we are not:

```
%OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from  
backbone area must be virtual-link but not found from 192.1.1.4,  
Ethernet0
```

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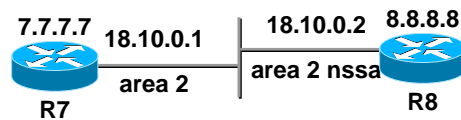
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Adjacency Is Not Coming Up

Cisco.com

- Mismatched transit/stub/NSSA option



```
R7#show ip ospf neighbor
```

```
R7#
```

```
R7#debug ip ospf adj
```

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

```
OSPF: Hello from 18.10.0.2 with mismatched Stub/Transit area option bit
```

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Options

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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

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

DC: 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



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OSPF Neighbor Stuck in ? State

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- Useful commands for this problem

Show IP OSPF neighbor

Debug IP OSPF adjacency

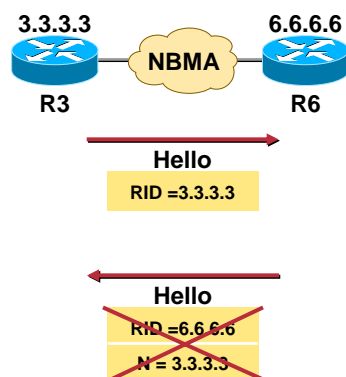
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Stuck in ATTEMPT

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Stuck in ATTEMPT

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- **Reasons:**

Our hellos are getting lost in NBMA cloud

Neighbor hellos are getting lost in NBMA cloud

We received neighbor's hello but rejects it for some reason

Misconfigured neighbor statement

Broken Unicast

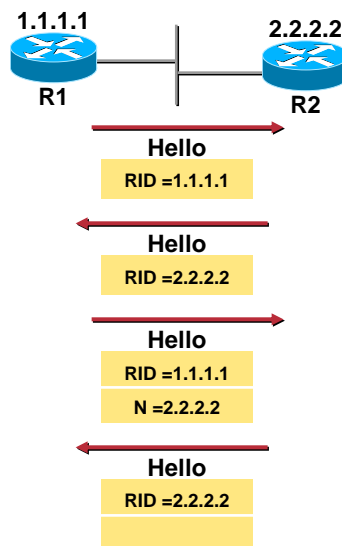
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Stuck in INIT

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Stuck in INIT

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- **Reasons:**

- One side is blocking the hello packet with access-list

- One side is translating (NAT) ospf hello

- One side multicast capabilities is broken (Layer 2)

- Dialer map or frame-relay map is missing keyword 'broadcast'

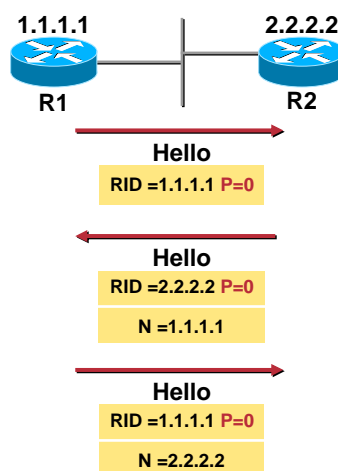
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Stuck in 2-WAY

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Stuck in 2-WAY

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- **Reasons:**

This is normal in broadcast network types

This is to reduce the amount of flooding on the wire

Problem can happen if all the router are configured with priority equal to '0'

In a situation where you have high and low end boxes on the same segment the configure low end routers with priority 0 so they don't participate in DR election

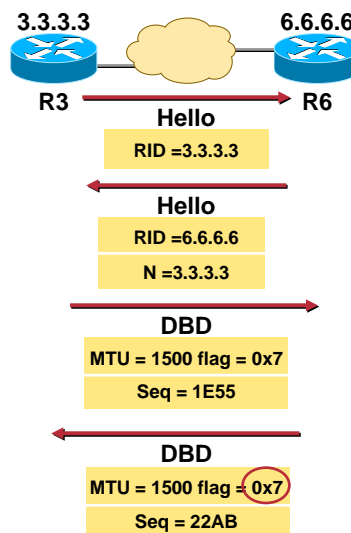
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Stuck in EXSTART/EXCHANGE

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Stuck in EXSTART/EXCHANGE

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- 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) = 1, 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



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Stuck in EXSTART/EXCHANGE

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- Reasons:

- ✓ MTU mismatch

Note: If Cisco IOS is < 12.0.3 neighbor will show stuck in EXCHANGE

- ✓ Neighbor RID is same as ours.

Note: If Cisco IOS is > 12.0.7, it displays msg: %OSPF-3-DUP_RTRID & OSPF neighbor list will be empty

- ✓ 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

- ✓ Between PRI and BRI/dialer and network type is p2p

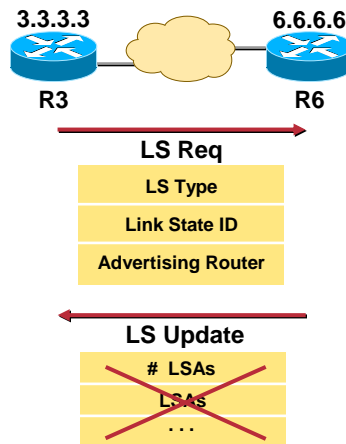
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Stuck in LOADING

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Stuck in LOADING

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- **Reasons:**

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

a. Do **show IP OSPF bad** to see bad lsa

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

LS request is being made and neighbor is ignoring the request

MTU mismatch problem
(RFC 1583 and 2178 compatibility issue)

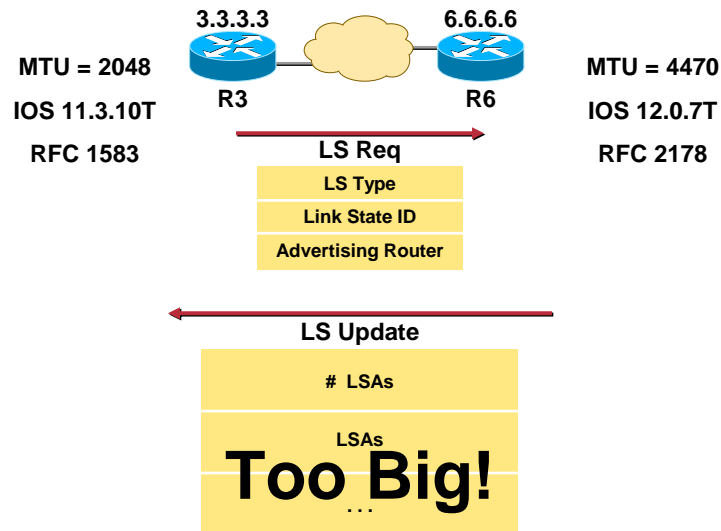
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Stuck in LOADING

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Information Is in the DB but Not in the RT

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- Useful commands for this problem

Show IP OSPF interface <interface>

Show IP OSPF database <x>

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

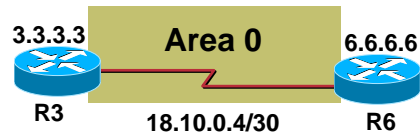
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Mismatched Network Types

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R3#show ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
6.6.6.6	1	FULL/	00:00:30	18.0.0.6	Serial0

R3#show ip ospf interface serial 0

Serial0 is up, line protocol is up
 Internet Address 18.0.0.5/30, Area 0
 Process ID 1, Router ID 3.3.3.3, Network Type **POINT_TO_POINT**, Cost: 64

R6#show ip ospf interface serial 0

Serial0 is up, line protocol is up
 Internet Address 18.0.0.6/30, Area 0
 Process ID 1, Router ID 6.6.6.6, Network Type **BROADCAST**, Cost: 64

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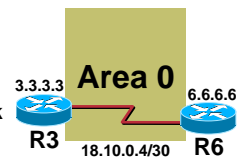
Mismatched Network Types (Cont.)

Cisco.com

R3#show ip ospf database router 3.3.3.3

...
 Link ID = 6.6.6.6
 Link Data = 18.10.0.5
Type = 1
 # TOS metrics = 0
 metric = 8

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



R3#show ip ospf database router 6.6.6.6

...
 Link ID = 18.10.0.6
 Link Data = 18.10.0.6
Type = 2
 # TOS metrics = 0
 metric = 8

IP address of the DR
 Interface address
 This is a transit link

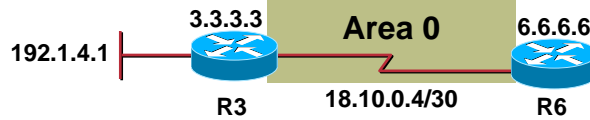
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Point-to-Point Numbered and Unnumbered Links

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R3#show ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
6.6.6.6	1	FULL/-	00:00:30	18.0.0.6	Serial0

R3#show interface serial0

Serial0 is up, line protocol is up
Hardware is HD64570

Interface is unnumbered. Using address of Ethernet1 (192.1.4.1)

R6#show interface serial0

Serial0 is up, line protocol is up
Hardware is HD64570

Internet address is 18.10.0.6/30

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Point-to-Point Numbered and Unnumbered Links (Cont.)

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R3#show ip ospf database router 3.3.3.3

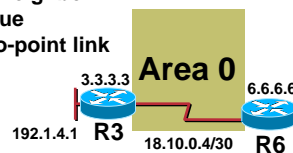
...
Link ID = 6.6.6.6
Link Data = 0.0.0.5
Type = 1
TOS metrics = 0
metric = 8

Router id of the neighbor
MIBII IfIndex Value
This is a point-to-point link

R3#show ip ospf database router 6.6.6.6

...
Link ID = 3.3.3.3
Link Data = 18.10.0.6
Type = 1
TOS metrics = 0
metric = 8

Router id of the neighbor
IP interface address
This is a transit link



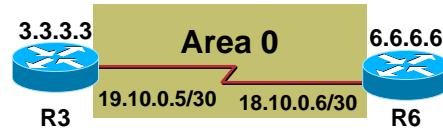
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Different Mask or IP Subnet on p2p Links

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R3#show ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
6.6.6.6	1	FULL/	00:00:30	18.0.0.6	Serial0

R3#show interface serial 0

Serial0 is up, line protocol is up
Hardware is HD64570

Internet address is 19.10.0.5/24

R6#show interface serial 0

Serial0 is up, line protocol is up
Hardware is HD64570

Internet address is 18.10.0.6/30

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Different Mask or IP Subnet on p2p Links (Cont.)

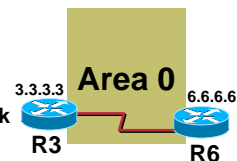
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R3#show ip ospf database router 3.3.3.3

```

...
Link ID = 6.6.6.6
Link Data = 19.10.0.5
Type = 1
# TOS metrics = 0
metric = 8
    
```

Router id of the neighbor
Interface address
This is a point-to-point link



R3#show ip ospf database router 6.6.6.6

```

...
Link ID = 3.3.3.3
Link Data = 18.10.0.6
Type = 1
# TOS metrics = 0
metric = 8
    
```

Router id of the neighbor
Interface address
This is a point-to-point link

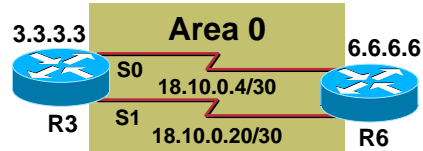
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Address Flipped on Dual Links

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R3#show ip ospf neighbor

Neighbor ID	Pri	State	Dead Time	Address	Interface
6.6.6.6	1	FULL/ -	00:00:30	18.10.0.6	Serial0
6.6.6.6	1	FULL/ -	00:00:33	18.10.0.22	Serial1

R3#show interface serial 0

Serial0 is up, line protocol is up
Hardware is HD64570

Internet address is 18.10.0.21/30

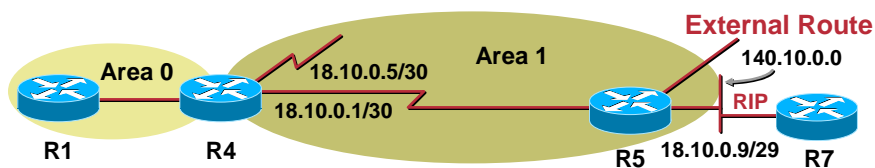
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Forwarding Address Problem

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R1#show ip ospf database external 140.10.0.0

...
Link State ID = 140.10.0.0
Advertising Router = 5.5.5.5
Network Mask = 255.255.0.0
...

Forwarding address = 18.10.0.10

R1#show ip route 18.10.0.10
Routing entry for 18.10.0.8/29

Known via "ospf 1", distance 110, metric 20, type extern 2
forward metric 10
...

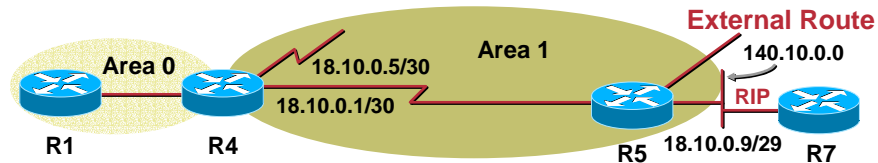
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Forwarding Address Problem

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R5:

```

router ospf 1
network 18.10.0.0 0.0.0.255 area 1
redistribute rip subnets
redistribute connected subnets
!
router rip
network 10.0.0.0
    
```

R4:

```

router ospf 1
area 1 range 18.10.0.0 255.255.255.240
    
```

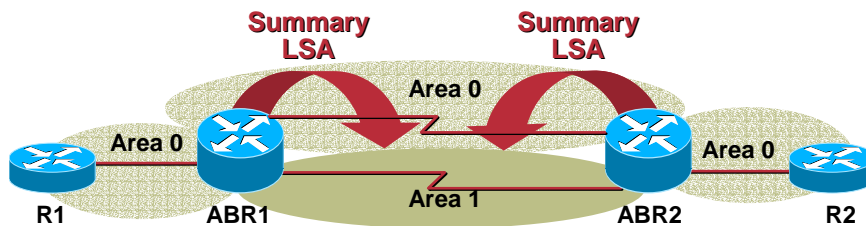
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Discontiguous Backbone

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- R1 and R2 are not be able to see each other
- Summary LSA for Inter-area routes must not be generated into the backbone
- The solution is to create virtual link between ABR1 and ABR2

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Distribute-List in Blocking the Routes

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```
R4#show ip route 18.10.0.9  
% Subnet not in table
```

R4:

```
router ospf 1  
network 18.10.0.0 0.0.0.255 area 1  
distribute-list 1 in  
!
```

```
access-list 1 permit 18.10.0.0 0.0.0.3
```

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SPF Running Constantly

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- Useful commands for this problem

Show IP OSPF stat

Show IP OSPF database

Show IP OSPF database database-sum

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SPF Running Constantly

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- **Reasons:**

LSA flaps due to:

Duplicate RID/IP address

Constant link flapping in an area

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SPF Running Constantly

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- **Requires enable mode**

R3#sh ip ospf stat

Area 0: SPF algorithm executed 42 times

Area 1: SPF algorithm executed 38 times

SPF calculation time

Delta T	Intra	D-Intra	Summ	D-Summ	Ext	D-Ext	Total	Reason
00:22:00	0	0	0	0	0	0	0	R, N, SN,
00:21:44	0	0	4	0	0	0	4	R, SN, X
00:21:34	0	0	4	0	0	0	4	R, SN, X
00:21:24	0	0	0	4	0	0	4	R, SN, X
00:21:14	0	0	0	0	0	0	0	R,
00:21:04	0	0	0	0	0	0	0	R, N, SN,
00:20:54	0	0	0	0	0	0	0	X
00:20:44	0	0	4	0	0	0	4	R, SN, X
00:20:34	0	0	0	0	0	0	0	X
00:00:17	4	0	0	0	0	0	4	R, N, SN, SA, X

...
R=Router LSA; N=NetworkLSA; SN=Summary Network LSA; SA=Summary ASBR LSA; X=External LSA

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SPF Running Constantly

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R3#deb ip ospf mon

OSPF: schedule SPF in area 1

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

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SPF Running Constantly

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R3#show ip ospf database

OSPF Router with ID (3.3.3.3) (Process ID 1)

Router Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
3.3.3.3	3.3.3.3	106	0x80000009	0xC3F1	3

...

Summary Net Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum
18.10.0.0	7.7.7.7	3 (DNA)	0x80000008	0x3DC2
18.10.0.0	8.8.8.8	1396	0x80000004	0x27D8

...

Router Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
1.1.1.1	1.1.1.1	2	0x80000016	0xE6CD	2

...

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SPF Running Constantly

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R3#show ip ospf database database-summary

OSPF Router with ID (3.3.3.3) (Process ID 1)

Area 0 database summary

LSA Type	Count	Delete	Maxage
Router	124	0	0
Network	4	0	0
Summary Net	10	0	0
Summary ASBR	0	0	0
Type-7 Ext	0	0	0
Opaque Link	0	0	0
Opaque Area	0	0	0
Subtotal	138	0	0

Area 1 database summary

LSA Type	Count	Delete	Maxage
Router	4	0	0
Network	1	0	0
Summary Net	10	0	0
Summary ASBR	4	0	0

...

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Neighbor Flapping (Frame Relay)

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- Useful commands for this problem

Debug ip ospf adj

OSPF log-adjacency-change

Show IP OSPF neighbors detail

Show interface

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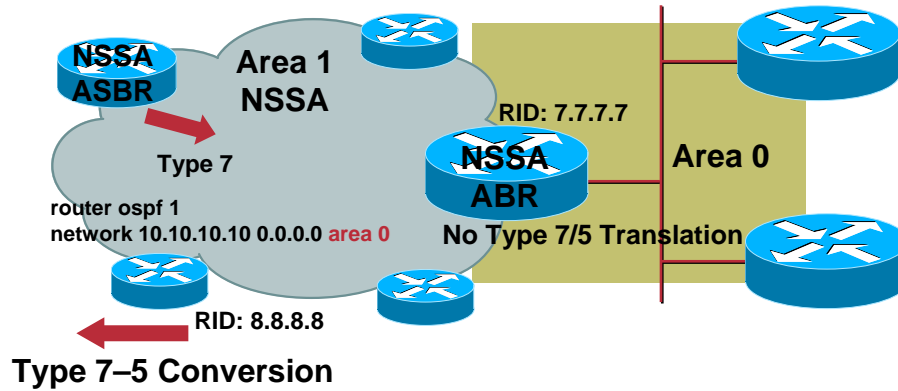
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NSSA ABR Not Translating Type 7 LSA

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- Only NSSA ABR with the highest RID does the conversion



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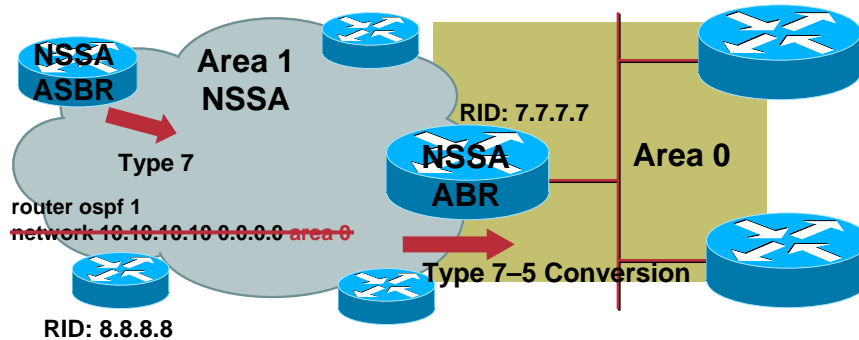
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NSSA ABR Not Translating Type 7 LSA

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- Only NSSA ABR with the highest RID does the conversion



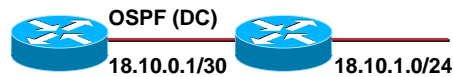
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Demand Circuit Problems

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- **The 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
 - There is a router in the network that is incapable to understand DC bit
 - The DC is configured over async interface (need to configure a dialer interface as a solution)

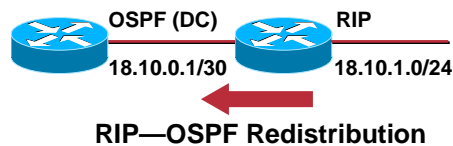
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Demand Circuit Problems

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- **DC is bringing up the link (cont.)**
 - PPP host route is also owned by RIP, when PPP host route disappears, the database is change
 - Solution 1:** no peer neighbor-route
 - Solution 2:** Block /32 route getting into OSPF with route-map
 - Solution 3:** Use different majornet for RIP

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Summary

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- **What we learned?**

Overview of OSPF LSAs

Different troubleshooting commands and what to look for in those commands while troubleshooting?

Common issues in OSPF networks; e.g adjacency problems, CPU hogs and SPF problems, NSSA and DC problems etc and how to correct those problems

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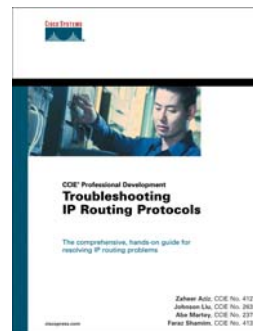
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Recommended Reading

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- RFC 2328 (OSPF)
- 1587 (NSSA) **New RFC 3101**
- 1793 (Demand Circuit)
- RFC 2370 (for opaque support)
- **Troubleshooting IP Routing Protocols by Faraz Shamim, Zaheer Aziz, Johnson Liu and Abe Martey. ISBN: 1587050196**



Available on-site at the Cisco Company Store

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TROUBLESHOOTING OSPF



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Troubleshooting OSPF: Cisco Technical Support Website www.cisco.com/techsupport

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Troubleshooting section for Open Shortest Path First (OSPF)

- Known problems
- Troubleshooting steps (e.g., Troubleshooting OSPF document)
- Troubleshooting tools (e.g., TAC Case Collection)

TECHNICAL SUPPORT +
TECHNOLOGY SUPPORT +
IP ROUTING +
OSPF (OPEN SHORTEST PATH FIRST) +
Overview
Network Design
Implementation and Configuration
Verification and Troubleshooting
Operating and Maintaining
Documentation

OSPF (Open Shortest Path First)

Known Problems

- [Common Routing Problem with OSPF Forwarding Address](#)
- [New interfaces default to no passive-interface when passive-interface default enabled](#)
- [NSSA ASBR \(not ABR\) router can't generate a default route](#)
- [OSPF fail to flood LSA to neighbors](#)
- [OSPF & EIGRP neighbor loss, RIP & IGRP update loss after upgrading to 11.2 or later](#)
- [OSPF Neighbors stuck in Exstart/Exchange State](#)
- [OSPF show Commands Respond Slowly](#)
- [passive-interface default command doesnt work on MSFC](#)
- [Problems with running OSPF in NBMA mode over Frame Relay](#)
- [Redistributing Between Classful and Classless Protocols: EIGRP or OSPF into RIP or IGRP](#)

Troubleshooting Steps

- [Troubleshooting TCP/IP](#)
- [Troubleshooting OSPF](#)

Troubleshooting Tools

- [Bug Toolkit](#)
- [Command Lookup Tool for Cisco IOS](#)
- [Error Message Decoder](#)
- [IP Subnet Calculator](#)
- [Output Interpreter](#)
- [Software Advisor - Choose The Software For Your Network Device](#)
- [Software Center](#)
- [TAC Case Collection](#)

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TAC Case Collection: Troubleshooting OSPF Issue

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- Free text query
- Guided search
- Search by solution number
- View all solutions
- Suggests solutions that come from actual service requests taken by TAC engineers

The screenshot shows the Cisco Systems Technical Support page. The navigation menu includes 'TECHNICAL SUPPORT', 'TOOLS & UTILITIES', and 'TAC Case Collection'. The main content area is titled 'TAC Case Collection' and contains the following text:

The TAC Case Collection, an evolution of the Troubleshooting Assistant tool, helps you interactively identify and troubleshoot common problems involving hardware, configuration, and performance issues. These solutions, provided directly by TAC engineers, have resolved actual networking problems. Please select a technology or product area from the list below to begin troubleshooting. To view a short video on demand on how to use the TAC Case Collection, [click here](#).

Note: Supported browser versions - IE 5.5 and above or Netscape 6.x and above.

Dial (Access)
DDR & non-DDR callout using external modem, CAS T1/E1, PRI, or BRI. Local and AAA server based authentication and authorization, LCP and NCP negotiations, authentication failure, link stability, and routing packets

Frame Relay
PVCs, SVCs, Traffic Shaping, dial-backup, PPP over Frame Relay, configuration, performance and connectivity issues

IP Routing Protocols
Common issues on configuration, routes missing from routing table, route not being redistributed, network not being advertised, neighbor not forming or flapping, Internet and network connectivity, NAT, PBR, HSRP and error messages. Routing protocols covered include EIGRP, OSPF, BGP and RIP

LAN Switching
Configuration, connectivity, VLANs, trunking, autonegotiation, passwords and catalyst hardware issues

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Complete Your Online Session Evaluation!

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- WHAT:** Complete an online session evaluation and your name will be entered into a daily drawing
- WHY:** Win fabulous prizes! Give us your feedback!
- WHERE:** Go to the Internet stations located throughout the Convention Center
- HOW:** Winners will be posted on the onsite Networkers Website; four winners per day

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