

ROUTING CONSORTIUM

Open Shortest Path First (OSPF)
Multi-System Interoperability Test Suite

Technical Document

Revision 1.6



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Version 1.5	June 24, 2007 <ul style="list-style-type: none">• Removed test 1.4• Removed RFC 1583 References• Updated all tests• Updated Table of Contents
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Adam Lowe	University of New Hampshire
Kari Revier	University of New Hampshire
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INTRODUCTION

Overview

The University of New Hampshire's InterOperability Laboratory (IOL) is an institution designed to improve the interoperability of standards based products by providing an environment where a product can be tested against other implementations of a standard. This suite of tests has been developed to help implementers evaluate the functionality of their OSPF based products. This test suite has been designed to test the Interoperability of the device under test with other OSPF Capable devices. This test suite focuses on testing configurations of the network that could cause problems when deployed if the device under test does not operate properly with the devices that it is connected to.

The tests do not determine if a product conforms to the OSPF standard but they are designed as interoperability tests. These tests provide one method to isolate problems within the OSPF capable device that will affect the interoperability performance. Successful completion of all tests contained in this suite does not guarantee that the tested device will operate with other OSPF capable devices. However, these tests do provide a reasonable level of confidence that the RUT will function well in most OSPF capable environments.

ABBREVIATIONS AND ACRONYMS

ASBR: **AS** Boundary **R**outer
ABR: Area **B**order **R**outer
BDR: **B**ackup **D**esignated **R**outer
DD: **D**atabase **D**escription
DR: **D**esignated **R**outer
G: **G**enerator
LSA: **L**ink **S**tate **A**dvertisement
M: **M**onitor or packet capturer
MTU: **M**aximum **T**ransmission **U**nit
N: **N**etwork
NBMA: **N**on-**B**roadcast **M**ulti-**A**ccess
RUT: **R**outer **U**nder **T**est
summary-ASBR-LSA: type 4 summary-LSA
summary-network-LSA: type 3 summary-LSA
TR: **T**esting **R**outer

TEST ORGANIZATION

This document organizes tests by group based on related test methodology or goals. Each group begins with a brief set of comments pertaining to all tests within that group. This is followed by a series of description blocks; each block describes a single test. The format of the description block is as follows:

- Test Label:** The test label and title comprise the first line of the test block. The test label is composed by concatenating the short test suite name, the group number, and the test number within the group, separated by periods. The **Test Number** is the group and test number, also separated by a period. So, test label OSPF_Interop.1.2 refers to the second test of the first test group in the OSPF Conformance suite. The test number is 1.2.
- Purpose:** The Purpose is a short statement describing what the test attempts to achieve. It is usually phrased as a simple assertion of the feature or capability to be tested.
- References:** The References section lists cross-references to the specifications and documentation that might be helpful in understanding and evaluating the test and results.
- Discussion:** The Discussion is a general discussion of the test and relevant section of the specification, including any assumptions made in the design or implementation of the test as well as known limitations.
- Test Setup:** The Test Setup section describes the configuration of all devices prior to the start of the test. Different parts of the procedure may involve configuration steps that deviate from what is given in the test setup. If a value is not provided for a protocol parameter, then the protocol's default is used for that parameter.
- Procedure:** This section of the test description contains the step-by-step instructions for carrying out the test. These steps include such things as enabling interfaces, unplugging devices from the network, or sending packet from a test station. The test procedure also cues the tester to make observations, which are interpreted in accordance with the observable results given for that test part.
- Observable Results:** This section lists observable results that can be examined by the tester to verify that the RUT is operating properly. When multiple observable results are possible, this section provides a short discussion on how to interpret them. The determination of a pass or fail for each test is usually based on how the RUT's behavior compares to the results described in this section.
- Possible Problems:** This section contains a description of known issues with the test procedure, which may affect test results in certain situations.

REFERENCES

The following documents are referenced in this text:

- Request for Comments 2328 – OSPF, Version 2
- Open Shortest Path First (OSPF), Version 2 Operations and Parametric Test Suite. UNH Interoperability Lab. April 2000.

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Test OSPF_Interop.1.1: Hello Mismatch

Purpose: To verify that any mismatch between the Hello packets causes the packets to be dropped as long as the interface is not part of a point-to-point network.

References: [OSPF 2328] Sections 9.5 and 10.5

Resource Requirements: RUT and an analyzer

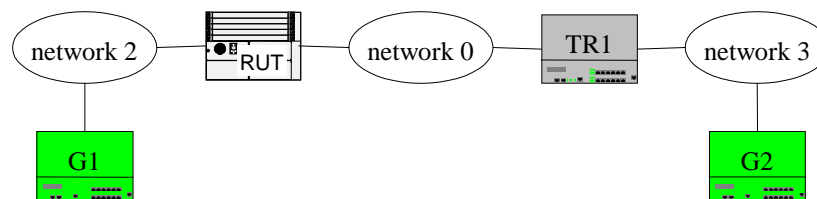
Last Modification: July 24, 2007

Discussion: On a multi-access network, the Area ID, Network Mask, HelloInterval, and RouterDeadInterval defined in an incoming Hello packet should match the configuration of the receiving interface. Otherwise, the Hello packet should be dropped and the sender should not be accepted as a neighbor.

The Hello packet's Options field describes the router's optional OSPF capabilities. The E bit should be set if and only if the attached area is capable of processing AS external advertisements (i.e. it is not a stub area). Incoming Hello packets that have the E bit set differently than the setting on the receiving interface should be dropped.

Please note that this test is an interoperability test. Therefore, failure against any one device does not necessarily indicate nonconformance. Rather, it indicates that the two devices are unable to work "properly" together and that further work should be done to isolate the cause of the failure.

Test Setup: Configure the routers as shown below. The RUT's interface to network 3 is disabled. TR1's interface to network 2 is disabled. If a network is not assigned to a particular area in the setup, the default area of 0.0.0.0 is used.



Procedure:

Part A: Synchronizing of databases

1. Configure the RUT and TR1 to have the same Area ID (which is not a stub area), Network Mask, HelloInterval and RouterDeadInterval.
2. Enable OSPF on the RUT and TR1.
3. Transmit traffic from G1 to G2.
4. Observe the traffic transmitted on all networks.

Part B: Different Area ID

5. Configure the RUT and TR1 to have the same Network Mask, HelloInterval and RouterDeadInterval. Configure the RUT to have a different Area ID than TR1.
6. Enable OSPF on the RUT and TR1.
7. Transmit traffic from G1 to G2.
8. Observe the traffic transmitted on all networks.

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Part C: Different Network Mask

9. Configure the RUT and TR1 to have the same Area ID, HelloInterval and RouterDeadInterval.
10. Configure the RUT to have a different Network Mask than TR1.
11. Enable OSPF on the RUT and TR1.
12. Transmit traffic from G1 to G2.
13. Observe the traffic transmitted on all networks.

Part D: Different HelloInterval

14. Configure the RUT and TR1 to have the same Area ID, Network Mask and RouterDeadInterval.
15. Configure the RUT to have a different HelloInterval than TR1.
16. Enable OSPF on the RUT and TR1.
17. Transmit traffic from G1 to G2.
18. Observe the traffic transmitted on all networks.

Part E: Different RouterDeadInterval

19. Configure the RUT and TR1 to have the same Area ID, HelloInterval and Network Mask.
20. Configure the RUT to have a different RouterDeadInterval than TR1.
21. Enable OSPF on the RUT and TR1.
22. Transmit traffic from G1 to G2.
23. Observe the traffic transmitted on all networks.

Part F: RUT in stub area

24. Configure the RUT and TR1 to have the same Area ID, Network Mask, HelloInterval and RouterDeadInterval.
25. Configure the RUT to be in a stub area on all networks. TR1 should not be in a stub area.
26. Enable OSPF on the RUT and TR1.
27. Transmit traffic from G1 to G2.
28. Observe the traffic transmitted on all networks.

Part G: RUT and TR1 in stub area

29. Configure the RUT and TR1 to have the same Area ID, Network Mask, HelloInterval and RouterDeadInterval.
30. Enable OSPF on the RUT and TR1.
31. Configure the RUT and TR1 to be in a stub area on all networks.
32. Transmit traffic from G1 to G2.
33. Observe the traffic transmitted on all networks.

Observable Results:

- In Part A, the RUT and TR1 should become neighbors and synchronize their databases. The E bit should be set in the RUT and TR1's Hello packets. Traffic should be transmitted from G1 to G2 through all networks.
- In Parts B, C, D and E, the RUT and TR1 should not become neighbors and not synchronize their databases. Traffic should not be transmitted from G1 to G2 through network 1.
- In Part F, the RUT and TR1 should not become neighbors and not synchronize their databases. The RUT should not have the E bit set in its Hello packets. Traffic should not be transmitted from G1 to G2 through all networks.
- In Part G, the RUT and TR1 should become neighbors and synchronize their databases. The E bit should not be set in the RUT and TR1's Hello packets. Traffic should be transmitted from G1 to G2 through all networks.

Possible Problems: None.

Test OSPF_Interop.1.2: Authentication

Purpose: To verify that a router can interoperate with another router when the authentication type and additional authentication data configured on a per-interface basis.

References: [OSPF 2328] Appendix D

Last Modification: July 24, 2007

Discussion: The OSPF packet header includes an authentication type field and a 64-bit data for use by the appropriate authentication scheme. The authentication type is configurable on a per-interface basis. There are 3 schemes in use:

- AuType 0 (null authentication)
- AuType 1 (simple password)
- AuType 2 (cryptographic authentication)

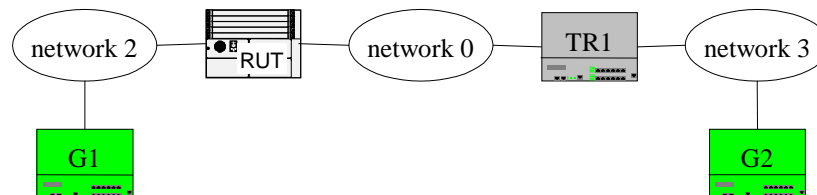
For AuType 1 and 2 the password is configurable on a per-interface basis.

When an OSPF packet has been received on an interface, it must be authenticated. The authentication procedure is indicated by the setting AuType in the standard OSPF packet header, which matches the setting of AuType for the receiving OSPF interface.

If an OSPF protocol packet is accepted as authentic, processing of the packet continues. Packets which fail authentication are discarded.

Please note that this test is an interoperability test. Therefore, failure against any one device does not necessarily indicate nonconformance. Rather, it indicates that the two devices are unable to work "properly" together and that further work should be done to isolate the cause of the failure.

Test Setup: Configure the routers as shown below. The RUT's interface to network 3 is disabled. TR1's interface to network 2 is disabled. If a network is not assigned to a particular area in the setup, the default area of 0.0.0.0 is used.



Procedure:

Part A: The RUT with AuType 0 and TR1 with AuType 1

1. Configure the RUT with AuType 0 and TR1 with AuType 1 on network 1.
2. Transmit traffic from G1 to G2.
3. Observe the traffic transmitted on all networks.

Part B: The RUT with AuType 0 and TR1 with AuType 2

4. Configure the RUT with AuType 0 and TR1 with AuType 2 on network 1.
5. Transmit traffic from G1 to G2.
6. Observe the traffic transmitted on all networks.

Part C: AuType 1 and the same password

7. Configure the RUT and TR1 with AuType 1 on network 1.

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8. Configure the password to be the same for the RUT and TR1.
9. Transmit traffic from G1 to G2.
10. Observe the traffic transmitted on all networks.

Part D: AuType 1 and different password

11. Configure the RUT and TR1 with AuType 1 on network 1.
12. Configure the password to be different for the RUT and TR1.
13. Transmit traffic from G1 to G2.
14. Observe the traffic transmitted on all networks.

Part E: AuType 2 and same password

15. Configure the RUT and TR1 with AuType 2 on network 1.
16. Configure the password to be the same for the RUT and TR1.
17. Transmit traffic from G1 to G2.
18. Observe the traffic transmitted on all networks.

Part F: AuType 2 and different passwords

19. Configure the RUT and TR1 with AuType 2 on network 1.
20. Configure the password to be different for the RUT and TR1.
21. Transmit traffic from G1 to G2.
22. Observe the traffic transmitted on all networks.

Observable Results:

- In Parts A, B, D and F, the RUT and TR1 should not become neighbors and not synchronize their databases on network 1. Traffic should not be transmitted from G1 to G2 through all networks.
- In Parts C and E, the RUT and TR1 should become neighbors and synchronize their databases on network 1. Traffic should be transmitted from G1 to G2 through all networks.

Possible Problems: None.

Test OSPF_Interop.1.3: Authentication with a Virtual Link

Purpose: To verify that a router can interoperate with another router when the authentication type and additional authentication data are configured on a virtual link.

References: [OSPF 2328] Appendix D

Last Modification: July 24, 2007

Discussion: The OSPF packet header includes an authentication type field and a 64-bit data for use by the appropriate authentication scheme. The authentication type is configurable on a per-interface basis. There are 3 schemes in use:

- AuType 0 (null authentication)
- AuType 1 (simple password)
- AuType 2 (cryptographic authentication)

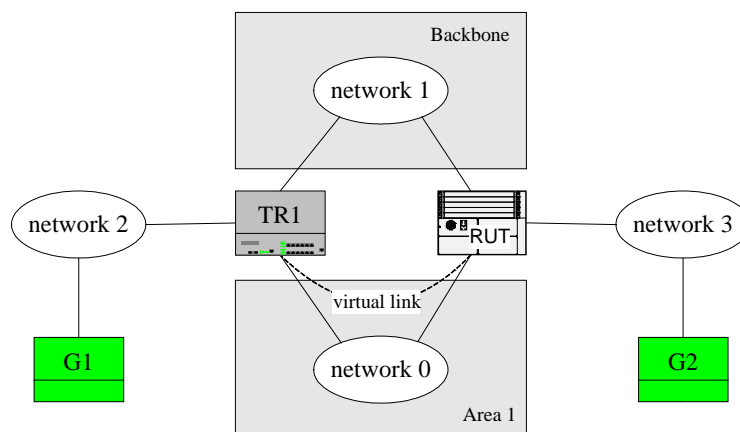
For AuType 1 and 2 the password is configurable on a per-interface basis. For a virtual link, a password in addition to and independent of the password used in the transit area must be used.

When an OSPF packet has been received on an interface, it must be authenticated. The authentication procedure is indicated by the setting AuType in the standard OSPF packet header, which matches the setting of AuType for the receiving OSPF interface.

If an OSPF protocol packet is accepted as authentic, processing of the packet continues. Packets which fail authentication are discarded.

Please note that this test is an interoperability test. Therefore, failure against any one device does not necessarily indicate nonconformance. Rather, it indicates that the two devices are unable to work "properly" together and that further work should be done to isolate the cause of the failure.

Test Setup: Configure the routers as shown below. The RUT's interface to network 3 is disabled. TR1's interface to network 2 is disabled. If a network is not assigned to a particular area in the setup, the default area of 0.0.0.0 is used. Configure the RUT and TR1 to have a cost of 2 on network 1. All other costs should be configured to 1.



Procedure:

Part A: No virtual link configured

1. The virtual link should not be configured between the RUT and TR1 through Area 1.

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2. Transmit traffic from G1 to G2.
3. Observe the traffic transmitted on all networks.

Part B: AuType 0 on a virtual link

4. Configure a virtual link between the RUT and TR1 through Area 1 with AuType 0.
5. Transmit traffic from G1 to G2.
6. Observe the traffic transmitted on all networks.

Part C: AuType 1 on a virtual link

7. Configure a virtual link between the RUT and TR1 through Area 1 with AuType 1.
8. Configure the password to be the same for the RUT and TR1.
9. Transmit traffic from G1 to G2.
10. Observe the traffic transmitted on all networks.

Part D: AuType 1 with different passwords

11. Configure a virtual link between the RUT and TR1 through Area 1 with AuType 1.
12. Configure the password to be different for the RUT and TR1.
13. Transmit traffic from G1 to G2.
14. Observe the traffic transmitted on all networks.

Part E: AuType 2 on a virtual link

15. Configure a virtual link between the RUT and TR1 through Area 1 with AuType 2.
16. Configure the password to be the same for the RUT and TR1.
17. Transmit traffic from G1 to G2.
18. Observe the traffic transmitted on all networks.

Part F: AuType 2 with different passwords

19. Configure a virtual link between the RUT and TR1 through Area 1 with AuType 2.
20. Configure the password to be different for the RUT and TR1.
21. Transmit traffic from G1 to G2.
22. Observe the traffic transmitted on all networks.

Part G: Different AuTypes on a virtual link

23. Configure a virtual link between the RUT and TR1 through Area 1.
24. Configure the RUT with AuType 0 and TR1 with AuType 1 to the virtual link.
25. Transmit traffic from G1 to G2.
26. Observe the traffic transmitted on all networks.

Observable Results:

- In Part A, the RUT and TR1 should become neighbors and synchronize their databases in network 1 and network 2. Traffic should be transmitted from G1 to G2 through network 1.
- In Parts B, C and E, the RUT and TR1 should become neighbors, synchronize their databases and the virtual link should become active. Traffic should be transmitted from G1 to G2 through the virtual link.
- In Parts D, F and G, the virtual link should not become active. Traffic should not be transmitted from G1 to G2 through the virtual link, it should be transmitted from G1 to G2 through network 1.

Possible Problems: None.

Test OSPF_Interop.1.4: Event Backup Seen

Purpose: To verify that event BackupSeen occurs properly and brings an interface out of state Waiting and to verify that the BDR becomes DR when the previous DR fails.

References: [OSPF 2328] Sections 7.4, 9.1, 9.2 and 9.3

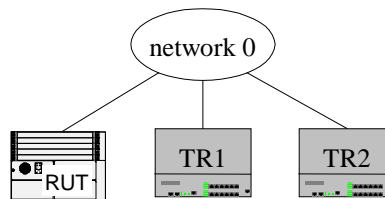
Last Modification: July 24. 2007

Discussion: Event BackupSeen occurs in when a Hello packet is received from a neighbor claiming to be itself the BDR. Event Backup Seen also occurs when a Hello packet is received from a neighbor claiming to be itself the DR, and indicating that there is no BDR. In either case, the router attempting to transition out of state Waiting must itself be listed in the neighboring router's field of the appropriate Hello packet.

In order to make the transition to a new Designated Router smoother, there is a Backup Designated Router for each multi-access network. When the Designated Router fails, the BDR is promoted to DR, and a new BDR is elected (if there are any eligible routers). Similar to the Designated Router, the Backup Designated Router is adjacent to all routers on the network. Therefore, when it promotes itself to DR, it does not need to go through the database description process again with any of the routers on the network.

Please note that this test is an interoperability test. Therefore, failure against any one device does not necessarily indicate nonconformance. Rather, it indicates that the two devices are unable to work "properly" together and that further work should be done to isolate the cause of the failure.

Test Setup: Configure the RUT, TR1 and TR2 to have priority 1, HelloInterval 10 and RouterDeadInterval 40. If a network is not assigned to a particular area in the setup, the default area of 0.0.0.0 is used.



Procedure:

Part A: The RUT transitions out of state waiting

1. Disable OSPF on all of the interfaces to network 0.
2. Enable OSPF on TR1's interface to network 0 and wait for more than 40 seconds, so that it becomes DR.
3. Enable OSPF on the RUT's interface to network 0.
4. Observe the traffic transmitted on the network.

Part B: The RUT transitions to BDR

5. Disable OSPF on the RUT's interface to network 0.
6. Enable OSPF on TR2's interface to network 0 and wait for more than 40 seconds so that TR2 becomes the BDR.
7. Unplug TR2's interface on network 0.
8. Enable OSPF on the RUT's interface to network 0 and wait longer than RouterDeadInterval.
9. Observe the traffic transmitted on the network.

Part C: The RUT transitions to BDR

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10. TR2's interface to network 0 is disabled.
11. Unplug the RUT's interface on network 0.
12. Reset OSPF.
13. Plug the RUT's interface back in on network 0 (TR1 should still list RUT as BDR).
14. Observe the traffic transmitted on the network.

Part D: TR2 transitions to BDR

15. Disable OSPF on the RUT's interface to network 0.
16. Enable OSPF on TR2's interface to network 0 and wait for 50 seconds so that TR2 becomes BDR.
17. Enable OSPF on the RUT's interface to network 0 and wait for more than 20 seconds.
18. Observe the traffic transmitted on the network.

Part E: BDR become DR

19. Disable OSPF on all the interfaces to network 0.
20. Configure the TR1, RUT and TR2 so that they become DR, BDR and DR Other, respectively.
21. Disable OSPF on TR1's interface to network 0.
22. Observe the traffic transmitted on the network.

Observable Results:

- In Part A, the RUT should promote itself to BDR after TR1 sends a Hello packet with the RUT listed as a neighbor, itself as DR, and no BDR. However, it is possible that instead of sending such a packet, TR1 will run DR election as soon as it sees the RUT, and will therefore send a Hello with the RUT as BDR (instead of 0.0.0.0). In such a case, the RUT should wait for RouterDeadInterval to expire before transitioning out of state Waiting.
- In Parts B and C, The RUT should wait for about 40 seconds before it begins to claim itself to be the BDR on network 0.
- In Part D, The RUT should list TR2 as the BDR on network 1 in its 2nd or 3rd Hello packet.
- In Part E, the RUT and TR2 should become DR and BDR respectively. They should not resynchronize their databases.

Possible Problems: None.

Test OSPF_Interop.1.5: ASE Forwarding Address Route

Purpose: To verify that a router properly uses the ForwardingAddress field in AS-external-LSAs when connected to a neighboring router.

References: [OSPF 2328] Section 16.4

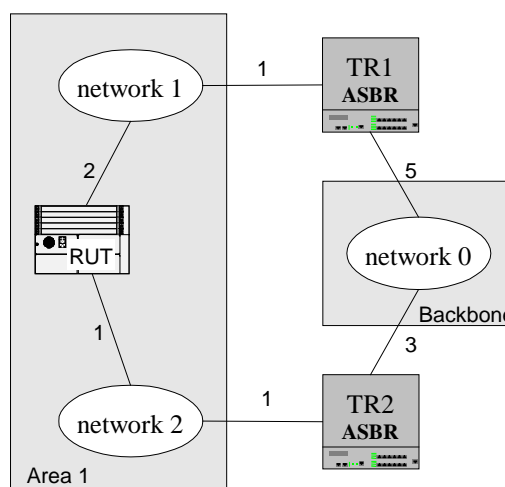
Last Modification: July 24, 2007

Discussion: When originating AS-external-LSAs, the advertising ASBR can set the forwarding address to the IP address of its own next hop if it resides on a network reachable through OSPF. This can eliminate unnecessary hops when other OSPF routers can reach the router specified by the forwarding address with less hops than if they were to first try to go to the ASBR, who would then forward it to its next hop. If the forwarding address is not set (it is left at 0.0.0.0), OSPF routers should choose their best route to the advertising ASBR as their route to the destination being advertised.

The forwarding address can be considered the Autonomous System's exit point for that particular destination. The router specified in the forwarding address is not itself running OSPF, yet it must be reachable through OSPF. So, when an ASBR originates an AS-external-LSA, it sets its own next hop as the forwarding address only if that next hop resides on a network that is part of the OSPF autonomous system (i.e. reachable via an intra-area or inter-area route).

Please note that this test is an interoperability test. Therefore, failure against any one device does not necessarily indicate nonconformance. Rather, it indicates that the two devices are unable to work "properly" together and that further work should be done to isolate the cause of the failure.

Test Setup: Configure TR1 as an ASBR with an external route to 2.2.2.0/24 through a router on network 0. The AS-external-LSA should be configured with a type 1 cost of 1 and should have the forwarding address set to the next hop's IP address on network 0. Configure the appropriate cost that is listed next to the router's link to a network. Configure TR2 not to send any AS-external-LSAs at this time. If a network is not assigned to a particular area in the setup, the default area of 0.0.0.0 is used.



Procedure:

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Part A: The RUT uses the available path

1. Enable OSPF on TR1 and TR2, and wait until they exchange their databases.
2. TR1 should send the AS-external-LSA with the forwarding address set.
3. Disable OSPF on TR1
4. Enable OSPF on the RUT.
5. Observe the traffic transmitted on all networks.

Part B: The RUT uses the least cost path

6. Enable OSPF on TR1.
7. Check the RUT's routing table.
8. Observe the traffic transmitted on all networks.

Part C: The RUT uses the ASE

9. Configure TR1's next hop for 2.2.2.0/24 to be a router on network 1.
10. TR1 should originate a new AS-external-LSA for 2.2.2.0/24 with the forwarding address set to a router on network 1.
11. Check the RUT's routing table.
12. Observe the traffic transmitted on all networks.

Part D: The RUT uses the correct path

13. Configure TR2 to send an AS-external-LSA for 2.2.2.0/24 with type 1 metric 1 without the forwarding address set.
14. Check the RUT's routing table.
15. Observe the traffic transmitted on all networks.

Part E: The RUT uses TR1's forwarding address

16. Configure the RUT's cost to network 2 to be 3.
17. Check the RUT's routing table.
18. Observe the traffic transmitted on all networks.

Observable Results:

- In Part A, the RUT should receive TR1's AS-external-LSA from TR2 but should not install a route to 2.2.2.0/24.
- In Part B, the RUT should have a route to 2.2.2.0/24 with the next hop set to TR2's IP Address on network 2. (The RUT uses its least cost path to network 0 as the path to 2.2.2.0/24).
- In Part C, the RUT should have a route to 2.2.2.0/24 with the next hop set to the forwarding address of the ASE.
- In Part D, the RUT should have a route to 2.2.2.0/24 with the next hop set to TR2's IP Address on network 2.
- In Part E, the RUT should have a route to 2.2.2.0/24 with the next hop set to the forwarding address advertised in TR1's AS-external-LSA.

Possible Problems:

- a. If TR1 sets the Next Hop in its AS External LSA to 0.0.0.0 on part b, the test is invalid.

Test OSPF_Interop.1.6: ASBR Intra Area Route

Purpose: To verify that when multiple intra-area paths to an ASBR are available, a router chooses the correct path.

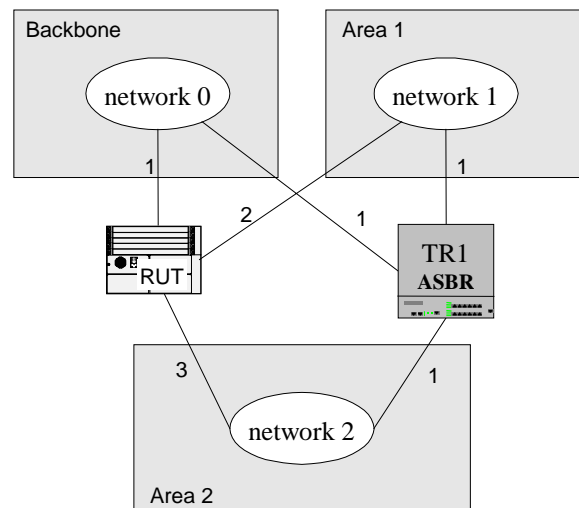
References: [OSPF 2328] Sections 16.4 (3) and 16.4.1

Last Modification: July 24, 2007

Discussion: AS external routes are calculated by examining AS external LSAs. A router may have several paths to the ASBR that originated the LSA. When RFC 1583 compatibility is enabled, a router should choose the path with the lowest cost. If there are multiple paths with the lowest cost, a router should choose the path through the area with the largest Area ID. When RFC 1583 compatibility is disabled, a router should prefer the lowest cost intra-area path through a non-backbone area. If there are multiple lowest cost paths through non-backbone areas, a router should choose the path with the largest Area ID.

Please note that this test is an interoperability test. Therefore, failure against any one device does not necessarily indicate nonconformance. Rather, it indicates that the two devices are unable to work "properly" together and that further work should be done to isolate the cause of the failure.

Test Setup: Parts **A** and **B** should be run with RFC 1583 compatibility enabled. Parts **C** and **D** should be run with RFC 1583 compatibility disabled. Configure TR1 to be an ASBR advertising an AS external LSA. Configure the appropriate cost that is listed next to the router's link to a network. If a network is not assigned to a particular area in the setup, the default area of 0.0.0.0 is used.



Procedure:

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Part A: Least cost path

1. Enable RFC 1583 compatibility on the RUT.
2. Enable OSPF on the RUT and TR1.
3. Observe the traffic transmitted on all networks.

Part B: Largest Area ID

4. Configure the cost of the RUT to network 0 to be 2.
5. Observe the traffic transmitted on all networks.

Part C: Intra-area path

6. Disable OSPF on the RUT and TR1.
7. Configure the RUT's costs to networks 0, 1 and 2 to be 1, 2 and 3, respectively.
8. Disable RFC 1583 compatibility on the RUT.
9. Enable OSPF on the RUT and TR1.
10. Observe the traffic transmitted on all networks.

Part D: Path with the largest Area ID

11. Configure the cost of the RUT to network 1 to be 3.
12. Observe the traffic transmitted on all networks.

Observable Results:

- In Part A, the RUT should choose the path with the lower cost. It should have a route to the external network with TR1's interface on network 0 as the next hop.
- In Part B, since there are two paths with the least cost, the RUT should choose the path through the area with the largest Area ID. The RUT should have a route to the external network with TR1's interface on network 1 as the next hop.
- In Part C, the RUT should prefer intra-area paths through non-backbone areas. The RUT should have a route to the external network with TR1's interface on network 1 as the next hop.
- In Part D, since there are two intra-area non-backbone paths with equal cost, the RUT should choose the path through the area with the largest Area ID. The RUT should have a route to the external network with TR1's interface on network 2 as the next hop.

Possible Problems: None

Test OSPF_Interop.1.7: Default Summary Use

Purpose: To verify that a router internal to a stub area correctly uses a default summary-LSA when connected to a neighboring router.

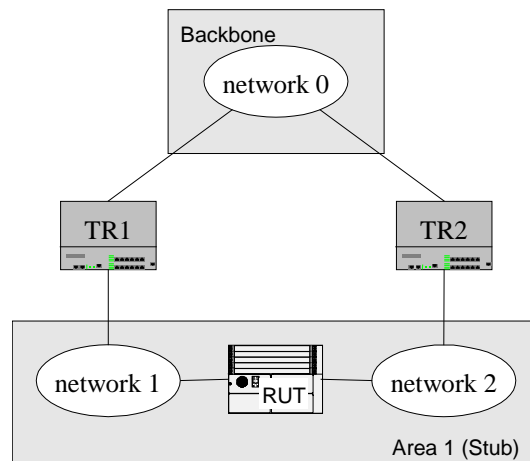
References: [OSPF 2328] Section 12.4.3.1

Last Modification: July 24, 2007

Discussion: Since AS-external-LSAs are not sent into stub areas, attached Area Border Routers may be configured to send a default summary-LSA. This is a summary-network-LSA with the Link State ID set to DefaultDestination (0.0.0.0) and the Network Mask also set to 0.0.0.0. The metric of this default summary-LSA should be configurable (StubDefaultCost). Routers internal to the stub area can then add the preferable default route to their routing tables (preferable based on the sum of their intra-area cost to the ABR and the advertised metric).

Please note that this test is an interoperability test. Therefore, failure against any one device does not necessarily indicate nonconformance. Rather, it indicates that the two devices are unable to work "properly" together and that further work should be done to isolate the cause of the failure.

Test Setup: Configure the cost of the RUT's interfaces to network 1 and network 2 to be 10 and 1, respectively. The RUT should not have a static default route configured. The RUT should not have an IP Address defined for network 0.



Procedure:

Part A: Default summary-LSA with a metric of 8

1. Configure TR1 and TR2 to originate default summary-LSAs with metrics 1 and 8 respectively.
2. Enable OSPF on the RUT, TR1 and TR2.
3. Observe the RUT's routing table.

Part B: Default summary-LSA with a metric of 14

4. Configure the StubDefaultCost on TR2 to 14.

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5. Observe the RUT's routing table.

Observable Results:

- In Part A, the RUT should have a default route in its routing table with the next hop set to TR2's interface on network 2.
- In Part B, the RUT should have a default route in its routing table with the next hop set to TR1's interface on network 1.

Possible Problems: None.