IPv4 CONSORTIUM

OSPF Interoperability Test Report Revision 1.4

InterOperability Lab – 121 Technology Drive, Suite 2 – Durham NH, 03824 – +1-603-862-3941

Consortium Managers:	Erica Williamsen Timothy Winters	ericaw@iol.unh.edu twinters@iol.unh.edu
Technician:	Technician A	techniciana@iol.unh.edu

Month Date, Year

Member Contact Name
COMPANY NAME
ADDRESS

Mr(s). Vendor,

Enclosed are the results from the Open Shortest Path First (OSPF) testing performed on:

RUT HERE. Identified as "SHORT RUT HERE" MAC Address 01-02-03-04-05-06 s/n 1234567. Console "system" command reports software version 1.2.3.

This testing pertains to a set of OSPF requirements, put forth in RFC 2328 and RFC 1583. The tests performed are part of the OSPF Interoperability Test Suite, which is available on the UNH InterOperability Lab's website:

ftp://public.iol.unh.edu/pub/ipv4/testsuites/OSPF_Interop.pdf

During the testing process, the following issues were uncovered:

Test #	Result
Test OSPF_INTEROP1.2c,e:	Interoperability problems were encountered with certain Testing Routers.

As always, we welcome any comments regarding this Test Suite. If you have any questions about the test procedures or results, please feel free to contact me via e-mail at techniciana@iol.unh.edu or by phone at +1-603-862-3941.

Regards,

Technician A

Digital Signature Information

This document was created using an Adobe digital signature. A digital signature helps to ensure the authenticity of the document, but only in this digital format. For information on how to verify this document's integrity proceed to the following site:

http://www.iol.unh.edu/certifyDoc/

If the document status still indicates "Validity of author NOT confirmed", then please contact the UNH-IOL to confirm the document's authenticity. To further validate the certificate integrity, Adobe 6.0 should report the following fingerprint information:

MD5 Fingerprint: A569 F807 031D B1EC E509 4110 95E3 5362
SHA-1 Fingerprint: F007 7D91 2FAA A22C A3D9 F93F 05AC 09DB E219 84B2

The following table contains possible results and their meanings. If a test passes, the RUT passes with all test routers involved. If the test fails, the report will indicate the test router(s) that the failure involved.

Result	Interpretation
PASS	No Interoperability problems were discovered with any Test Routers.
FAIL	Interoperability problems were encountered with certain Test Routers. This resulted in undesirable behavior.
N/S	Not Supported. This test was not run due to features not implemented on the RUT.
N/T	Not tested. The specified behavior cannot be tested due to a(n) (un)related failure.
NOTE	Interoperability problems were encountered with certain Test Routers, which did not necessarily result in undesirable behavior being demonstrated.

The following devices were tested against:

TR1	TR2
TR3	TR4

Test #	
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.

Comments on Test Procedure

a. The RUT and TR1 are configured to have the same Area ID (which is not a stub area), Network Mask, HelloInterval and RouterDeadInterval. Traffic is transmitted from G1 to G2.
b. The RUT and TR1 are configured to have the same Network Mask, HelloInterval and RouterDeadInterval. The RUT is configured to have a different Area ID than TR1. Traffic is transmitted from G1 to G2.
c. The RUT and TR1 are configured to have the same Area ID, HelloInterval and RouterDeadInterval. The RUT is configured to have a different Network Mask than TR1. Traffic is transmitted from G1 to G2.
d. The RUT and TR1 are configured to have the same Area ID, Network Mask and RouterDeadInterval. The RUT is configured to have a different HelloInterval than TR1. Traffic is transmitted from G1 to G2.
e. The RUT and TR1 are configured to have the same Area ID, HelloInterval and Network Mask. The RUT is configured to have a different RouterDeadInterval than TR1. Traffic is transmitted from G1 to G2.
f. The RUT and TR1 are configured to have the same Area ID, Network Mask, HelloInterval and RouterDeadInterval. The RUT is configured to be in a stub area. TR1 should not be in a stub area. Traffic is transmitted from G1 to G2.
g. The RUT and TR1 are configured to have the same Area ID, Network Mask, HelloInterval and RouterDeadInterval. The RUT and TR1 are configured to be in a stub area. Traffic is transmitted from G1 to G2.

Comments on Test Results	RFC 2328 – Sections 9.5 and 10.5 RFC 1583 – Sections 9.5 and 10.5

a. PASS: he RUT and TR1 became neighbors and then synchronized their databases. The E bit was set in the RUT and TR1's Hello packets. Traffic was transmitted from G1 to G2 through network 1.
b. PASS: The RUT and TR1 did not become neighbors and did not synchronize their databases. Traffic was not transmitted from G1 to G2 through network 1.
c. PASS: The RUT and TR1 did not become neighbors and did not synchronize their databases. Traffic was not transmitted from G1 to G2 through network 1.
d. PASS: The RUT and TR1 did not become neighbors and did not synchronize their databases. Traffic was not transmitted from G1 to G2 through network 1.
e. PASS: The RUT and TR1 did not become neighbors and did not synchronize their databases. Traffic was not transmitted from G1 to G2 through network 1.
f. PASS: The RUT and TR1 did not become neighbors and did not synchronize their databases. The RUT did not have the E bit set in its Hello packets. Traffic was not transmitted from G1 to G2 through network 1.
g. PASS: The RUT and TR1 became neighbors and then synchronized their databases. The E bit was not set in the RUT and TR1's Hello packets. Traffic was transmitted from G1 to G2 through network 1.

Test #	
Test OSPF_INTEROP.1.2	**RFC 2328 Authentication Type**
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.	
Comments on Test Procedure	

a. The RUT is configured with AuType 0 on network 1 and TR1 is configured with AuType 1 on network 1. Traffic is transmitted from G1 to G2.
b. The RUT is configured with AuType 0 on network 1 and TR1 is configured with AuType 2 on network 1. Traffic is transmitted from G1 to G2.
c. The RUT and TR1 are configured with AuType 1 on network 1. The password is configured to be the same for the RUT and TR1. Traffic is transmitted from G1 to G2.
d. The RUT and TR1 are configured with AuType 1 on network 1. The password is configured to be different for the RUT and TR1. Traffic is transmitted from G1 to G2.
e. The RUT and TR1 are configured with AuType 2 on network 1. The password is configured to be the same for the RUT and TR1. Traffic is transmitted from G1 to G2.
f. The RUT and TR1 are configured with AuType 2 on network 1. The password is configured to be different for the RUT and TR1. Traffic is transmitted from G1 to G2.

Comments on Test Results	RFC 2328 – Appendix D

a. PASS: The RUT and TR1did not become neighbors on network 1. Traffic was not transmitted from G1 to G2 through network 1.
b. PASS: The RUT and TR1 did not become neighbors on network 1. Traffic was not transmitted from G1 to G2 through network 1.
c. FAIL: (TR1) The RUT and TR1 did not become neighbors on network 1. The RUT began listing the TR as a neighbor and it self as DR, and did not go through the Database Description Process. According to RFC 2328, Section D, *"All OSPF protocol exchanges are authenticated. The OSPF packet header includes an authentication type field, and 64-bits of data for use by the appropriate authentication scheme. The authentication type is configurable on a per-interface basis…Authentication types 0, 1 and 2 are defined by this specification."* Section D.2 states *"All packets sent on a particular network must have this configured value in their OSPF header 64-bit authentication field.* Traffic should be transmitted form G1 to G2 through all networks.
d. PASS: The RUT and TR1 did not become neighbors on network 1. Traffic was not transmitted from G1 to G2 through network 1.
e. FAIL: (TR1) The RUT and TR1 became neighbors on network 1. However, Traffic was not transmitted from G1 to G2 or from G2 to G1 through network 1. Refer to the quote in Part C. Therefore, the RUT and TR1 should become neighbors and synchronize their databases on network 1. Traffic should be transmitted form G1 to G2 through all networks.
f. PASS: The RUT and TR1 did not become neighbors on network 1. Traffic was not transmitted from G1 to G2 through network 1.

Test #	
Test OSPF_INTEROP.1.3	**RFC 2328 Authentication Type with a Virtual Link**

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

Comments on Test Procedure

a. The virtual link should not be configured between the RUT and TR1 through Area 1. Traffic is transmitted from G1 to G2.
b. A virtual link is configured between the RUT and TR1 through Area 1 with AuType 0. Traffic is transmitted from G1 to G2.
c. A virtual link is configured between the RUT and TR1 through Area 1 with AuType 1. The password is configured to be the same for the RUT and TR1. Traffic is transmitted from G1 to G2.
d. A virtual link is configured between the RUT and TR1 through Area 1 with AuType 1. The password is configured to be different for the RUT and TR1. Traffic is transmitted from G1 to G2.
e. A virtual link is configured between the RUT and TR1 through Area 1 with AuType 2. The password is configured to be the same for the RUT and TR1. Traffic is transmitted from G1 to G2.
f. A virtual link is configured between the RUT and TR1 through Area 1 with AuType 2. The password is configured to be different for the RUT and TR1. Traffic is transmitted from G1 to G2.
g. A virtual link is configured between the RUT and TR1 through Area 1. The RUT is configured with AuType 0 and TR1 is configured with AuType 1 to the virtual link.

Comments on Test Results	RFC 2328 – Appendix D

a. PASS: The RUT and TR1 became neighbors and synchronized their databases in network 1 and network 2. Traffic was transmitted from G1 to G2 through network 1.
b. PASS: The RUT and TR1 became neighbors and the virtual link became active. Traffic was transmitted from G1 to G2 through the virtual link.
c. PASS: The RUT and TR1 became neighbors and the virtual link became active. Traffic was transmitted from G1 to G2 through the virtual link.
d. PASS: The virtual link did not become active. Traffic was transmitted from G1 to G2 through network 1.
e. PASS: The RUT and TR1 became neighbors and the virtual link became active. Traffic was transmitted from G1 to G2 through the virtual link.
f. PASS: The virtual link did not become active. Traffic was transmitted from G1 to G2 through network 1.
g. PASS: The virtual link did not become active. Traffic was transmitted from G1 to G2 through network 1.

Test #	Label
Test OSPF_INTEROP.1.4:	**RFC 1583 Authentication Type**

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

Comments on Test Procedure

a. The RUT and TR1 are configured with AuType 0 in Area 0 and AuType 1 in Area 1. The passwords are configured to be the same for the RUT and TR1 in both areas. Traffic is transmitted from G1 to G2.
b. The RUT and TR1 are configured with AuType 0 in Area 0 and AuType 1 in Area 1. The passwords are configured to be different for the RUT and TR1 in both areas. Traffic is transmitted from G1 to G2.
c. The RUT is configured with AuType 0 in Area 0 and AuType 1 in Area 1. TR1 is configured with AuType 1 in Area 0 and with AuType 0 in Area 1. Traffic is transmitted from G1 to G2.
d. A virtual link is configured between the RUT and TR1 through Area 1 with AuType 1. The password is the same for the RUT and TR1. Traffic is transmitted from G1 to G2.
e. A virtual link is configured between the RUT and TR1 through Area 1. The RUT is configured with AuType 0 and TR1 is configured with AuType 1 to the virtual link. Traffic is transmitted from G1 to G2.

Comments on Test Results	RFC 1583 – Appendix D

a. PASS: The RUT and TR1 should become neighbors in both areas. Traffic should be transmitted from G1 to G2 through network 1.
b. PASS: The RUT and TR1 should not become neighbors in both areas. Traffic should not be transmitted from G1 to G2 through network either of the networks.
c. PASS: The RUT and TR1 should not become neighbors in both areas. Traffic should not be transmitted from G1 to G2 through network either of the networks.
d. PASS: The RUT and TR1 should become neighbors in Area 1, and the virtual link should become active. Traffic should be transmitted from G1 to G2 through the virtual link.
e. PASS: The RUT and TR1 should not become neighbors and the virtual link should not become active. Traffic should not be transmitted from G1 to G2 through the virtual link.

Test #	Label
Test OSPF_INTEROP1.5:	**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.

Comments on Test Procedure

a. TR1's interface on network 1 is enabled. After 40 or more seconds passes, it should become DR. OSPF is enabled on the RUT's interface to network 1.
b. OSPF is disabled on the RUT's interface to network 1. OSPF is enabled on TR2's interface to network 1. After 40 or more seconds pass, it should become the BDR. TR2's interface to network 1 is unplugged. OSPF is enabled on the RUT's interface to network 1. After RouterDeadInterval, traffic is transmitted from G1 to G2.
c. The RUT's interface to network 1 is unplugged. OSPF is reset. The RUT's interface to network is plugged back in to network 1. TR1 should still list the RUT as the BDR.
d. OSPF is disabled on the RUT's interface to network 1. OSPF is enabled on TR2's interface to network 1. After 50 seconds passes, TR2 should become the DR. OSPF is enabled on the RUT's interface to network 1.
e. OSPF is disabled on all of the interfaces on network 1. The RUT, TR1 and TR2 are configured so that they become DR, BDR and DR Other, respectively. OSPF is disabled on TR1's interface to network 1.

Comments on Test Results	RFC 2328 – Sections 7.4, 9.1, 9.2 and 9.3 RFC 1583 – Sections 7.4, 9.1, 9.2 and 9.3

a. PASS: The RUT promotes itself to BDR after TR1 sends a Hello packet with the RUT listed as a neighbor, itself as DR, and no BDR.
b. PASS: The RUT waited for about 40 seconds before it claimed itself to be the BDR on network 0.
c. PASS: The RUT waited for about 40 seconds before it claimed itself to be the BDR on network 0.
d. PASS: The RUT listed TR2 as the BDR on network 0 in its 2nd or 3rd Hello packet.
e. PASS: The RUT and TR2 became DR and BDR respectively. They did not resynchronize their databases.

Test #	Label
Test OSPF_INTEROP1.6	**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.

Comments on Test Procedure

a. OSPF is enabled on TR1 and TR2. After they exchange their databases, TR1 should send the AS-external-LSA with the forwarding address set. OSPF is disabled on TR1. OSPF is enabled on the RUT.
b. OSPF is enabled on TR1. The RUT's routing table is checked.
c. TR1's next hop for network 3 is configured with the forwarding address set to a router on network 0. TR1 should originate a new AS-external- LSA for network 3 with the forwarding address set to a router on network 0. The RUT's routing table is checked.
d. TR2 is configured to send an AS-external-LSA for network 3 with type 1 without the forwarding address set. The RUT's routing table is checked.
e. The RUT's cost to network 1 is configured to be 3. The RUT's routing table is checked.

Comments on Test Results	RFC 2328 – Section 16.4 RFC 1583 – Section 16.4

a. PASS: The RUT received TR1's AS-external-LSA from TR2 but did not install a route to network 3.
b. PASS: The RUT had a route to network 4 with the next hop set to TR2's IP Address on network 2. (The RUT used its least cost path to network 0 as the path to network 3).
c. PASS: The RUT had a route to network 3 with the next hop set to the forwarding address of the ASE.
d. PASS: The RUT had a route to network 3 with the next hop set to TR2's IP Address on network 2.
e. PASS: The RUT had a route to network 3 with the next hop set to the forwarding address advertised in TR1's AS-external-LSA.

Test #	Label
Test OSPF_INTEROP.1.7	**ASBR Intra Area Route**

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

Comments on Test Procedure

a. RFC 1583 compatibility is enabled on the RUT. OSPF is enabled on the RUT and TR1.
b. The RUT's cost to network 1 is configured to be 2.
c. RFC 1583 is disabled on the RUT. OSPF is disabled on the RUT and TR1. The RUT's costs from networks 1, 2 and 3 are configured to be 1, 2 and 3 respectively. OSPF is enabled on the RUT and TR1.
d. The RUT's cost to network 2 is configured to be 3.

Comments on Test Results	RFC 2328 – Sections 16.4 (3) and 16.4.1

a. PASS: The RUT chose the path with the lower cost. It had a route to the external network with TR1's interface on network 1 as the next hop.
b. PASS: Since there are two paths with the least cost, the RUT chose the path through the area with the largest Area ID. The RUT had a route to the external network with TR1's interface on network 2 as the next hop.
c. PASS: The RUT preferred intra-area paths through non-backbone areas. The RUT had a route to the external network with TR1's interface on network 2 as the next hop.
d. PASS: Since there are two intra-area non-backbone paths with equal cost, the RUT chose the path through the area with the largest Area ID. The RUT had a route to the external network with TR1's interface on network 3 as the next hop.

Test #	Label
Test OSPF_INTEROP.1.8	**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.

Comments on Test Procedure

a. TR1 and TR2 are configured to originate default summary-LSAs with metrics 1 and 8 respectively. OSPF is enabled on the RUT, TR1 and TR2. Traffic is transmitted from G1 to G2.
b. TR2's StubDefaultCost is configured to 14. Traffic is transmitted from G1 to G2.

Comments on Test Results	RFC 2328 – Section 12.4.3.1 RFC 1583 – Section 12.4.4

a. PASS: The RUT had a default route in its routing table with the next hop set to TR2's interface on network 2.
b. PASS: The RUT had a default route in its routing table with the next hop set to TR1's interface on network 1.