IPv4 CONSORTIUM

OSPF NSSA Operations Test Report Revision 1.7

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Mr(s). Vendor,

Enclosed are the results from the Open Shortest Path First NSSA Option Test Suite 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 standard requirements, put forth in RFC 3101 and RFC 2328. The tests performed are part of the OSPF NSSA Test Suite.

During the testing process, the following issues were uncovered:

Test #	Result
OSPF_NSSA.1.3 b:	The RUT did not properly transmit default summary LSAs.
OSPF_NSSA.1.12	The RUT does not properly implement Address Ranges.

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

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The following table contains the test results and their meanings.

Result	Interpretation
PASS	The SUT was observed to exhibit conformant behavior.
FAIL	The SUT was observed to exhibit non-compliant behavior.
PASS with Comments	The SUT was observed to exhibit conformant behavior, however this behavior deviated from previous compliant results. An additional explanation of the situation is included.
Warning	The SUT was observed to exhibit behavior that is not recommended.
NOTE	From the observations, a valid pass or fail could not be determined. An additional explanation of the situation is included.
N/S	Not Supported: The specified behavior is optional and is applicable but not implemented.
N/T	Not Tested: The specified behavior cannot be tested due to a(n) (un)related failure.

Test #		Result	
OSPF_NSSA.1.1	**N-Bit**	**a**	**PASS**
		b	**PASS**
		c	**PASS**
		d	**PASS**
		e	**PASS**

Purpose: To verify that a router sets the N-bit in it's Options field of a Hello packet, and can transmit and receive Type-7 LSAs.

Comments on Test Procedure

a. OSPF is enabled on the routers. Traffic is observed on network 0.
b. TR1 no longer considers area 0.0.0.1 to be an NSSA. OSPF is restarted on all of the routers. Traffic is observed on network 0.
c. TR1 considers area 0.0.0.1 to be an NSSA. The RUT is configured to no longer consider area 0.0.0.1 to be an NSSA. OSPF is restarted on the routers. Traffic is observed on network 0.
d. The RUT is configured to consider area 0.0.0.1 to be an NSSA. The RUT is configured to export an external route into OSPF. Traffic is observed on network 0.
e. TR1 exports an external route into OSPF. Traffic is observed on network 0.

Comments on Test Results | RFC 3101 - Section 1.3

a. The RUT lists TR1 as a neighbor and has the N-bit set and the E-bit cleared in its Hello packets.
b. The RUT does not list TR1 as a neighbor. The RUT has the N-bit set in its Hello packets.
c. The RUT does not list TR1 as a neighbor. The RUT has the E-bit set and the N-bit cleared in its Hello packets.
d. The RUT originates a new Type-7 LSA.
e. The RUT accepts the Type-7 LSA originated by TR1 and adds it to its database.

Test #		Result	
OSPF_NSSA.1.2	**Type-5 LSAs are not flooded into NSSA**	**a**	**PASS**
		b	**PASS**
		c	**PASS**

Purpose: To verify that a router does not flood Type-5 LSAs into an NSSA area, and does not flood Type-7 LSAs out of the originating NSSA area.

Comments on Test Procedure

a. OSPF is enabled on the routers. TR1 exports an external route into OSPF. Traffic is observed on network 0.
b. TR2 exports an external route into OSPF as a Type-7 LSA. Traffic is observed on network 1.
c. Area 0.0.0.1 is an NSSA area. TR2 exports an external route into OSPF as a Type-7 LSA. Traffic is observed on network 1.

Comments on Test Results | RFC 3101 - Section 1.3

a. The RUT does not flood the Type-5 LSA from TR1 to network 1
b. The RUT does not flood the Type-7 LSA from TR2 to network 0.
c. The RUT does not flood the Type-7 LSA from TR2 to network 0.

Test #		Result	
OSPF_NSSA.1.3	**Flooding a default route**	**a**	**PASS**
		b	**FAIL**
		c	**N/T**

Purpose To verify that a router properly floods a default route into an NSSA area.

Comments on Test Procedure

a. The RUT is configured to transmit a default summary-LSA with summary routes disabled. OSPF is enabled on the routers. Traffic is observed on network 1.
b. The RUT is configured to transmit a default summary-LSA with summary routes enabled. Traffic is observed on network 1.
c. The header options of the Type-7 default LSA is observed.

Comments on Test Results | RFC 3101 - Section 1.3

a. The RUT originates a summary-LSA on network 1 with the Link State ID of 0.0.0.0 and a netmask of 0.0.0.0.
b. The RUT originated only a Type-3 default summary LSA on network 1. Section 1.3 of RFC 3101 states "*An NSSA border router should originate a default LSA (IP network is 0.0.0.0/0) into the NSSA. Note that a Type-7 default LSA originated by an NSSA border router is never translated into a Type-5 LSA, however, a Type-7 default LSA originated by an NSSA internal AS boundary router (one that is not an NSSA border router) may be translated into a Type-5 LSA.*" Therefore, the RUT should have originated a Type-7 default LSA on network 1 with the Link State ID of 0.0.0.0 and a netmask of 0.0.0.0.
c. Due to the failure in part b, this was not tested.

Test #		Result	
OSPF_NSSA.1.4	**Configuring of summary LSAs**	**a**	**PASS**
		b	**PASS**
		c	**PASS**
		d	**PASS**

Purpose: To verify that a router does not originate Type-3 summary-LSAs when it is configured not to, and to verify that a router does not flood Type-4 summary-LSAs into an NSSA area.

Comments on Test Procedure

a. The RUT is configured to import summary routes into NSSA. OSPF is enabled on the routers. Traffic is observed on network 1.
b. The RUT is configured not to import summary routes into NSSA. OSPF is restarted on the routers. Traffic is observed on network 1.
c. TR1 exports an external route to OSPF. Traffic is observed on network 1.
d. OSPF is enabled on the routers. The RUT is configured to export an external route to NSSA. Traffic is observed on network 0.

Comments on Test Results | RFC 3101 - Section 1.3

a. The RUT originates a Type-3 summary-LSA to network 1 for network 0.
b. The RUT does not originate a Type-3-summary-LSA to network 1.
c. The RUT does not originate a Type-4-summary-LSA to network 1.
d. The RUT does not originate a Type-4 summary LSA on network 0.

Test #		Result	
OSPF_NSSA.1.5	**Type-7 Address Range Parameters**	**a**	**PASS**
		b	**PASS**
		c	**PASS**

Purpose: To verify that Type-7 address ranges can be configured with the appropriate options.

Comments on Test Procedure

a-c. All tests in this section are implicitly tested by other tests. They are here only as a checklist.

Comments on Test Results | RFC 3101 - Section 2.2

a. An [address, mask] pair is configurable on the RUT.
b. A status indication of either Advertise or DoNotAdvertise is configurable on the RUT.
c. An external route tag is configurable on the RUT.

Test #		Result	
OSPF_NSSA.1.6	**Originating Type-7 AS-External LSAs**	**a**	**PASS**

Purpose: To verify that a router with a Type-7 LSA will originate a new LSA if the connection is lost.

Comments on Test Procedure

a. The RUT is configured to advertise an external route to network 1 with a forwarding address set. OSPF is enabled on the routers. The forwarding address of the RUT's Type-7 LSA on network 0 is observed. The external route on the RUT is removed. The RUT is configured to advertise a route to network 1 without the forwarding address set. Traffic is observed on network 0.

Comments on Test Results | RFC 3101 - Section 2.3

a. The RUT max-Ages the first LSA and originates a new LSA where the forwarding address is set different.

Test #		Result	
OSPF_NSSA.1.7	**Type-7 Priority Rules**	**a**	**PASS**
		b	**PASS**
		c	**PASS**
		d	**PASS**

Purpose: To verify that of two functionally equivalent Type-7 LSAs the router with the highest router-id, and that a Type-7 LSA with the P-bit set is preferred over one with the P-bit clear.

Comments on Test Procedure

a. TR1 and TR2 are set to advertise external routes to network 2, with the same cost and forwarding address on network 0. TR1 has a higher router-id than TR2. OSPF is restarted on the routers. The routing table on the RUT is observed.
b. TR2's interface to network 0 is disabled. OSPF is restarted on the routers. The routing table on the RUT is observed.
c. TR2's interface to network 0 is enabled. TR1 has a lower router-id than TR2. OSPF is restarted on the routers. The routing table on the RUT is observed.
d. TR1's interface to network 0 is disabled. OSPF is restarted on the routers. The routing table on the RUT is observed.

Comments on Test Results	RFC 3101 - Section 2.4 RFC 2328 - Section 12.4.4.1

a. TR1's Type-7 LSA is preferred. The RUT has a path to the external route with TR1 as the next hop.
b. TR2's Type-7 LSA is preferred. The RUT has a path to the external route with TR2 as the next hop.
c. TR2's Type-7 LSA is preferred. The RUT has a path to the external route with TR2 as the next hop.
d. TR1's Type-7 LSA is preferred. The RUT has a path to the external route with TR1 as the next hop.

Test #		Result	
OSPF_NSSA.1.8	**NSSATranslatorRole Always**	**a**	**PASS**
		b	**PASS**
		c	**PASS**
		d	**PASS**

Purpose: To verify that a router properly implements the configuration parameter NSSATranslatorRole.

Comments on Test Procedure

a. TR1 is an ASBR advertising an external route. The RUT's NSSATranslatorRole is configured to Always. TR1's NSSATranslatorRole is set to Candidate. OSPF is enabled on the RUT and TR1. Traffic is observed on all networks.
b. The RUT's interface to network 0 is disabled. Traffic is observed on all networks.
c. The RUT's interface to network 0 is enabled. Traffic is observed on all networks.
d. TR1's NSSATranslatorRole is set to Always. OSPF is restarted on the routers. Traffic is observed on network 0.

Comments on Test Results | RFC 3101 - Section 3.1

a. The RUT's NSSATranslatorState is "enabled" and the Nt-bit is set in the router-LSA for network 1. The RUT translates TR2's Type-7 LSA into a Type-5 LSA and transmits it to network 0.
b. The RUT's NSSATranslatorState is "disabled" and it transmits a router-LSA to network 1 without the Nt-bit.
c. The RUT's NSSATranslatorState is "enabled" and it transmits a router-LSA to network 1 with the Nt-bit set. The RUT translates TR2's Type-7 LSA and transmits it to network 0.
d. The RUT continues to translate TR2's Type-7 LSA into a Type-5 LSA and transmits it to network 0.

Test #		Result	
OSPF_NSSA.1.9	**NSSATranslatorRole Candidate**	**a**	**PASS**
		b	**PASS**
		c	**PASS**

Purpose: To verify that a router properly implements the parameter NSSATranslatorRole when set to Candidate.

Comments on Test Procedure

a. TR1 Is an ASBR advertising an external route. The RUT is configured to have a higher router-id than TR1. The TR1's NSSATranslatorRole is set to Candidate. OSPF is enabled on the routers. Traffic is observed on network 1.
b. The RUT is configured to have a lower router-id than TR1. Traffic is observed on network 1.
c. OSPF is restarted on the routers. After the RUT transmits TR1's Type-7 LSA, TR1's NSSATranslatorRole is set to Always. Traffic is observed on network 1.

Comments on Test Results | RFC 3101 - Section 3.1

a. The RUT sets its NSSATranslatorState to "enabled" and translates TR2's Type-7 LSA into a Type-5 LSA, which is transmitted on network 0. The RUT transmits a Router LSA with the Nt-bit set on network 1.
b. The RUT continues to transmit the Type-5 LSA for 40 seconds after it synchronizes with TR1. The RUT transmits a router-LSA without the Nt-bit set on network 1.
c. After TR1 transmits a router-LSA with the Nt-bit set, the RUT waits 40 seconds before it ceases to transmit the Type-7 LSA.

Test #		Result	
OSPF_NSSA.1.10	**Translating Type-7 LSAs**	**a**	**PASS**
		b	**PASS**

Purpose: To verify that a router properly translates Type-7 LSAs.

Comments on Test Procedure

a. TR2 is an ASBR advertising an external route. OSPF is started on the routers. Traffic is observed on network 0.
b. The RUT is configured with an address range, and is also set to DoNotAdvertise. OSPF is restarted on the routers. Traffic is observed on network 0.

Comments on Test Results	RFC 3101 - Section 3.2 (1)

a. The RUT does not translate TR2's Type-7 LSA into a Type-5 LSA.
b. The RUT does not translate TR2's Type-7 LSA into a Type-5 LSA.

Test #		Result	
OSPF_NSSA.1.11	**Originating Type-5 LSAs**	**a**	**PASS**
		b	**PASS**
		c	**PASS**
		d	**PASS**
		e	**PASS**
		f	**PASS**
		g	**PASS**

Purpose: To verify that a router properly originates Type-5 LSAs.

Comments on Test Procedure

a. TR2 is an ASBR advertising a Type-7 LSA with a path type 1 and metric 1. TR1's NSSATranslatorRole is set to Always. The RUT is an ASBR; it is not be advertising any routes at this time. The RUT's NSSATranslator-Role is configured to be Always and it's router-id is higher than that of TR1 OSPF is started on the routers. Traffic is observed on network 0.
b. A Type-7 address range is configured on the RUT, which contains the network in TR2's Type-7 external LSA. OSPF is restarted on the routers. Traffic is observed on network 0.
c. The address range is removed on the RUT. The RUT's router-id is configured to be lower than that of TR1. OSPF is restarted on the routers. Traffic is observed on network 0.
d. The RUT is configured to advertise a Type-5 LSA for the same network as the Type-7 LSA originated by TR2. The LSA has the same forwarding address as that of TR2 with a path type of 2 and a metric of 10. The RUT is configured to have a higher router-id than that of TR1. OSPF is restarted on the routers. Traffic is observed on network 0.
e. TR2's external route has a path type of 2 and a metric of 15. OSPF is restarted on the routers. Traffic is observed on network 0.
f. The RUT is configured to no longer be an ASBR. Traffic is observed on network 0 and network 1. TR2's external metric is set to 12. Traffic is observed on network 0 and network 1.
g. TR2's AS external path type is set to 2. Traffic is observed on network 0 and network 1.

Comments on Test Results | RFC 3101 - Section 3.2 (2), (3)

a. The RUT originates a Type-5 LSA on network 0, which describes the same network, network mask, path type, metric, forwarding address and external route tag as the Type-7 LSA. The advertising router field is set to the RUT's router-id. The link-state ID is the same as the LSA's network address..
b. The RUT does not translate TR2's Type-7 LSA.
c. The RUT translates TR2's Type-7 LSA and originates an equivalent Type-5 LSA on network 0.
d. The RUT translates TR2's Type-7 LSA and originates an equivalent Type-5 LSA on network 0.
e. The RUT does not translate TR2's Type-7 LSA. It only sends it's own, locally sourced, Type-5 LSA to network 0.
f. After the RUT flushes its LSA and the cost has been changed in TR2's external LSA, the RUT translates TR2's updated Type-7 LSA into an equivalent Type-5 LSA.
g. The RUT translates TR2's updated Type-7 LSA into an equivalent Type-5 LSA.

Test #		Result	
OSPF_NSSA.1.12	**Type-7 Address Range Translation**	**a**	**FAIL**
		b	**FAIL**
		c	**FAIL**

Purpose: To verify that a router properly translates a Type-7 address range into a single Type-5 LSA.

Comments on Test Procedure

a. An address range is configured on the RUT for all of the networks advertised by the RUT and its neighbors. OSPF is started on the routers. Traffic is observed on network 0.
b. TR2's LSA path type is set to 1 and its metric is set to 3. Traffic is observed on network 0.
c. TR3's LSA path type is set to 1 and its metric is set to 1. Traffic is observed on network 0.

Comments on Test Results | RFC 3101 - Section 3.2 (3)

a. The RUT did not use the configured address range. Section 3.2 (3) of RFC 3101 states "*A Type-5 LSA is generated from the Type-7 address range when there is currently no Type-5 LSA originated by this router whose network has the same [address,mask] pair as the range or there is but either its path type or metric has changed or its forwarding address is non-zero*." Therefore, the RUT should transmit a Type-5 LSA to network 0 for the Type-7 address range.
b. After TR2 updates its router-LSA, the RUT did not transmit a Type-5 LSA. According to the quote in part a, the RUT should retransmit the Type-5 LSA to network 0 with an updated metric of 2. All other values should remain the same.
c. After TR3 updates its router-LSA, the RUT did not transmit a Type-5 LSA. According to the quote in part a, the RUT should retransmit the Type-5 LSA to network 0 with an updated path type of 1 and a metric of 5. All other values should remain the same.