ROUTING CONSORTIUM TEST SUITE

Routing Information Protocol (RIP)
Over Internet Protocol Version 6
Multi-System Interoperability Test Suite

Technical Document

Version 2.1

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MODIFICATION RECORD

Version 2.1 — July 23, 2008
- Added Host Route Tests to Test Route Origination, and Test Route Learning and Propagation

Version 2.0 — March 12, 2007
- Rewrote test suite based on new topology
- Combined tests 1.3 and 1.4

Version 1.1 — March 22, 2005
- Modified Tests 1.3 and 1.4

Version 1.0 — April 14, 2004
- Added Test 1.4

Version 0.1 — May 30, 2003
- Initial Version

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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 RIPng based products. This test suite has been designed to test interoperability of the device under test with other RIPng 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 RIPng standard but they are designed as interoperability tests. These tests provide one method to isolate problems within the RIPng 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 RIPng capable devices. However, these tests do provide a reasonable level of confidence that the RUT will function well in most RIPng environment.

Abbreviations and Acronyms

Acronyms used in this Test Suite:

TR: **T**esting **R**outer
TN: **T**esting **N**ode

When several entities of the same type are present in a test configuration, a number is appended to the acronym to yield a label for each entity. For example, if there were three testing routers in the test configuration, they would be labeled TR1, TR2 and TR3.

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 RIPng_INTEROP.1.2 refers to the second test of the first test group in the RIPng InterOperability 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.

Resource Requirements: The Resource Requirements section specifies the software, hardware, and test equipment that will be needed to perform the test.

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

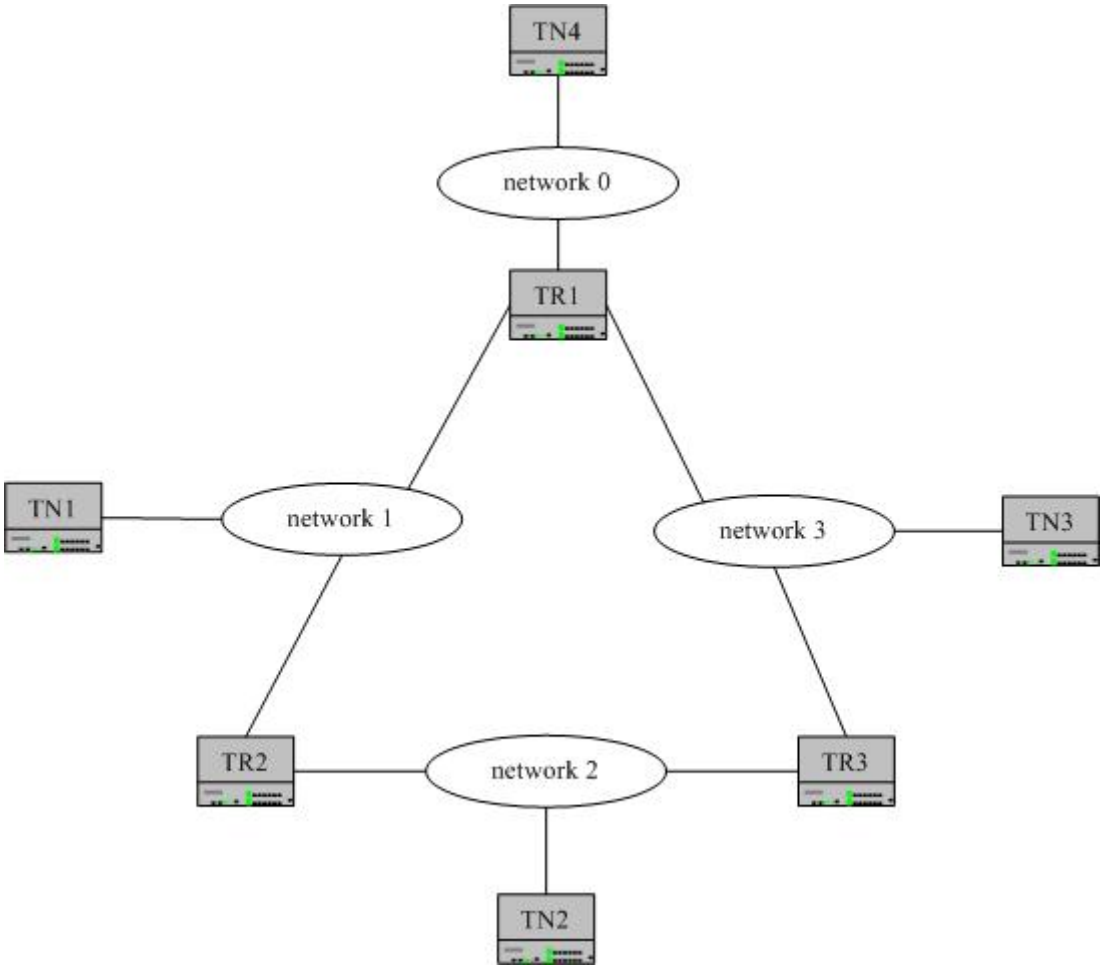
The following documents are referenced in this text:

- [RIPng] G. Malking, R. Minnear, RIPng for IPv6, RFC 2080, January 1997

- [IPv6-SPEC] Hinden, R., S. Deering, Internet Protocol, Version 6 (IPv6) Specification, RFC 2460, December 1998.

Common Topology

This topology is used for all tests in this test suite.



Common Test Setup

Test in this test suite may refer common test setup procedure defined for this section.

Common Test Setup

Summary: This minimal setup procedure provides the routers with routes to all networks on the Common Topology

1. Configure TR1 to send Router Advertisements on network 0 and suppress Router Advertisements on network 1 and network 3.
2. Configure TR2 to send Router Advertisements on network 1 and network 2.
3. Configure TR3 to send Router Advertisements on network 3 and suppress Router Advertisements on network 2.
4. Configure TR3 interfaces on network 2 and network 3 to have a metric of 2.
5. Enable RIPng on TR1, TR2, and TR3.
6. Wait for the devices synchronize.

Common Test Cleanup (for all tests)

Summary: The cleanup procedure causes the devices to remove any RIPng information.

1. Disable RIPng on all devices.
2. Remove any special configurations not specified in the common test setup.

Group 1: RIPng Interoperability

Scope

Tests in this group verify that the devices are able to engage in various aspects of the RIPng protocol.

Overview

The following tests verify operations such as Route Origination, Route Learning and Propagation, routing convergence, and routing calculation.

Test RIPng_INTEROP.1.1: Route Origination

Purpose: To verify that a router correctly communicates RIPng routes to other routers on the network running RIPng, including routes for directly attached networks and redistributed static routes.

References:

- [RIPng] – Section 2

Discussion: This test verifies that the RUT can successfully communicate route information to other routers with which it shares a link. A router should be able to communicate several different kinds of routes to its peers, including routes to directly connected networks, host routes, aggregated (supernet) routes, and default routes. Route tag, next hop, and metric information should be correctly originated in all cases.

Test Setup: Common Test Setup is performed at the beginning of each part. Disable TR3 for this test. Configure TR1 to send Router Advertisements on network 3. Configure TR1 to not advertise its connection to network 3. Common Test Cleanup is performed after each part.

Procedure:

Part A: Network Route Advertisement

1. TN2 transmits an ICMP Echo Request with destination IP address for TN4 to the link layer address of TR2.
2. Observe the traffic transmitted on all networks.

Part B: Default Route Advertisement

3. Configure TR1 to have a default route to TN3.
4. Configure TR1 to advertise a default route.
5. Wait for the devices to synchronize.
6. TN2 transmits an ICMP Echo Request with destination IP address for TN3 to the link layer address of TR2.
7. Observe the traffic transmitted on all networks.

Part C: Aggregate Route Forwarding

8. Configure TR1 to advertise a network range containing network 3.
9. Wait for the devices to synchronize.
10. TN2 transmits an ICMP Echo Request with destination IP address for TN3 to the link layer address of TR2.
11. Observe the traffic transmitted on all networks.

Part D: Host Route Advertisement

12. Configure TR1 not to advertise its connection to network 3.
13. Configure TR1 to have a host route to TN3.
14. Configure TR1 to advertise the host route.
15. Wait for the devices to synchronize.
16. TN2 transmits an ICMP Echo Request with destination IP address for TN3 to the link layer address of TR2.
17. Observe the traffic transmitted on all networks.

Observable Results:

Parts A:

Step 2: TR2 forwards the ICMP Echo Request to TR1 on Network 1. TR1 then forwards the ICMP Echo Request to TN4 on network 0.

Parts B, C, and D

Step 7, 11, and 17 TR2 forwards the ICMP Echo Request to TR1 on Network 1. TR1 then forwards the ICMP Echo Request to TN3 on network 3.

Possible Problems:

- None.

Test RIPng_INTEROP.1.2: Route Learning and Propagation

Purpose: To verify that a router can interoperate with other RIPng implementations.

References:

- [RIPng] – Section 2

Discussion: This test verifies that the RUT can successfully learn and propagate route information from other routers with which it shares a link.

Test Setup: Common Test Setup is performed at the beginning of each part. Disable TR2's interface on network 2. Configure TR3 to advertise Router Advertisements on network 2. Configure TR3 to not advertise its connection to network 2. Common Test Cleanup is performed after each part.

Procedure:

Part A: Default Route Processing

1. Configure TR3 to have a default route to TN2.
2. Configure TR3 to advertise a default route.
3. Wait for the devices to synchronize.
4. TN4 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR1.
5. Observe the traffic transmitted on all networks.

Part B: Default Route Forwarding

6. Configure TR3 to have a default route to TN2.
7. Configure TR3 to advertise a default route.
8. Wait for the devices to synchronize.
9. TN1 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR2.
10. Observe the traffic transmitted on all networks.

Part C: Aggregate Route Processing

11. Configure TR3 to advertise a network range containing network 2.
12. Wait for the devices to synchronize.
13. TN4 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR1.
14. Observe the traffic transmitted on all networks.

Part D: Aggregate Route Forwarding

15. Configure TR3 to advertise a network range containing network 2.
16. Wait for the devices to synchronize.
17. TN1 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR2.
18. Observe the traffic transmitted on all networks.

Part E: Host Route Processing

19. Configure TR3 not to advertise its connection to network 2.
20. Configure TR3 to have a host route to TN2.

21. Configure TR3 to advertise the host route.
22. Wait for the devices to synchronize.
23. TN4 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR1.
24. Observe the traffic transmitted on all networks.

Part F: Host Route Forwarding

25. Configure TR3 not to advertise its connection to network 2.
26. Configure TR3 to have a host route to TN2.
27. Configure TR3 to advertise a host route.
28. Wait for the devices to synchronize.
29. TN1 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR2.
30. Observe the traffic transmitted on all networks.

Part G: Network Route Processing

31. Configure TR3 to advertise its connection to network 2.
32. Wait for the devices to synchronize.
33. TN4 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR1.
34. Observe the traffic transmitted on all networks.

Part H: Network Route Forwarding

35. Configure TR3 to advertise its connection to network 2.
36. Wait for the devices to synchronize.
37. TN1 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR2.
38. Observe the traffic transmitted on all networks.

Observable Results:

- *Part A, C, E, and G:*

  Step 5, 14, 24, and 34 TR1 forwards the ICMP Echo Request to TR3 on network 3. TR3 then forwards the ICMP Echo Request to TN2 on network 2.
- *Part B, D, F, and H:*

  Step 10, 18, 30, and 38 TR2 forwards the ICMP Echo Request to TR1 on network 1. TR1 then forwards the ICMP Echo Request to TR3 on network 3. TR3 then forwards the ICMP Echo Request to TN2 on network 2. Alternatively, TR2 may send an ICMP redirect to TN1. After which TR1 forwards the ICMP Echo Request to TR3 on network 3.

Possible Problems:

- None.

Test RIPng_INTEROP.1.3: Routing Convergence and Calculation

Purpose: To verify that a router can interoperate with other RIPng implementations.

References:

- [RIPng] – Section 2

Discussion: This test verifies that the RUT can successfully detect and adjust to changes in network topology.

Test Setup: Common Test Setup is performed at the beginning of each part. Common Test Cleanup is performed after each part.

Procedure:

Part A: Basic Forwarding

1. TN4 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR1.
2. Observe the traffic transmitted on all networks.

Part B: Better Path Available

3. Change TR3's metric on network 2 and network 3 to 1.
4. Change TR2's metric on network 1 and network 2 to 2.
5. Wait for the devices to synchronize.
6. TN4 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR1.
7. Observe the traffic transmitted on all networks.
8. Change TR3's metric on network 2 and network 3 to 2.
9. Change TR2's metric on network 1 and network 2 to 1.
10. Wait for the devices to synchronize.
11. TN4 transmits an ICMP Echo Request with destination IP address for TN2 to the link layer address of TR1.
12. Observe the traffic transmitted on all networks.

Part C: Basic Forwarding

13. TN4 transmits an ICMP Echo Request with destination IP address for TN3 to the link layer address of TR1.
14. Observe the traffic transmitted on all networks.

Part D: Link Down and Link Reestablished

15. Disable TR1's interface on network 3.
16. Wait for the devices to synchronize.
17. TN4 transmits an ICMP Echo Request with destination IP address for TN3 to the link layer address of TR1.
18. Observe the traffic transmitted on all networks.
19. Enable TR1's interface on network 3.
20. Wait for the devices to synchronize.
21. TN4 transmits an ICMP Echo Request with destination IP address for TN3 to the link layer address of TR1.

22. Observe the traffic transmitted on all networks.

Observable Results:

- *Part A:*
  Step 2: TR1 forwards the ICMP Echo Request to TR2 on network 1. TR2 forwards the ICMP Echo Request to TN2 on network 2.
- *Part B:*
  Step 7: TR1 forwards the ICMP Echo Request to TR3 on network 3. TR3 forwards the ICMP Echo Request to TN2 on network 2.
  Step 12: TR1 forwards the ICMP Echo Request to TR2 on network 1. TR2 forwards the ICMP Echo Request to TN2 on network 2.
- *Part C:*
  Step 14: TR1 forwards the ICMP Echo Request to TN3 on network 3.
- *Part D:*
  Step 18: TR1 forwards the ICMP Echo Request to TR2 on network 1. TR2 forwards the ICMP Echo Request to TN3 on network 2. TR3 forwards the ICMP Echo Request to TN3 on network 3.
  Step 22: TR1 forwards the ICMP Echo Request to TN3 on network 3.

Possible Problems:

- None.