

IPv4 CONSORTIUM

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VRRP Test Report

Revision 2.4

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Mr(s). Vendor,

Enclosed are the results from the Virtual Router Redundancy Protocol (VRRP) 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 VRRP requirements, put fourth in RFC 3768. The tests performed are part of the VRRP Test Suite, which is available on the UNH InterOperability Lab's website:

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

During the testing process, the following issues were uncovered:

| Test # | Result |
|----------------|---|
| Test VRRP.3.1: | The time interval between the ADVERTISEMENTS that the RUT transmits is incorrect. |

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 <u>techniciana@iol.unh.edu</u> or by phone at +1-603-862-3941.

Regards,

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The following table contains the test results and their meanings.

| Result | Interpretation |
|---|--|
| PASS | The RUT was observed to exhibit conformant behavior. |
| FAIL | The RUT was observed to exhibit non-compliant behavior. |
| PASS with | The RUT was observed to exhibit conformant behavior, however this behavior deviated from |
| Comments | previous compliant results. An additional explanation of the situation is included. |
| Warning | The RUT was observed to exhibit behavior that is not recommended. |
| NOTE From the observations, a valid pass or fail could not be determined. An additional explant tion 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. |

The RUT was tested with the following pair(s) of devices for tests 1.1a-e and 1.2a-d :

- TR1
- TR2
- TR3

The result listed for each of the tests is for all of these devices, unless noted otherwise on the test in question.



Group 1: Interoperability

The Following tests verify Interoperability of the Virtual Router Redundancy Protocol of the RUT.

| Te | st # | | | | | | |
|-----|--|---|--|--|--|--|--|
| Tes | st VRRP.1.1 | Basic VRRP Interoperability | | | | | |
| Pu | Purpose To verify that a router can interoperate with other VRRP implementations in a setup with a single virtual | | | | | | |
| rou | ter. | | | | | | |
| Co | mments on Test Procedure | | | | | | |
| a. | TR1 is configured to associa figured with a Priority of 25 with a Priority of 100 for the RUT, TR1 and TR2. A ping | tte a virtual router { $VRID = 1$ } with the IP address of its first interface. TR1 is con- 5; it owns the IP address of the virtual router. The RUT is configured as backup, e virtual router. TR2 is configured to have a Priority of 99. VRRP is enabled on the g is sent from station A to station B. Packets are observed on network 0 and network | | | | | |
| b. | TR1's interface on network on network 0 and network 1 | 1 is disconnected. A ping is sent from station A to station B. Packets are observed | | | | | |
| c. | TR2 is configured as backup served on network 0 and net | with Priority of 101. A ping is sent from station A to station B. Packets are ob- work 1. | | | | | |
| d. | VRRP is disabled on TR1, T backup a virtual router {VR interface. The Priority on T tual router {VRID = 1} with RUT, TR1 and TR2. A ping 1. | R2 and the RUT. The original test setup is configured. TR1 is configured to $ID = 1$ } with one virtual router IP address equal to the IP address of the RUT's first R1 is 100 and the Priority on TR2 is 99. The RUT is configured to associate the virtue IP address of its first interface with a Priority of 255. VRRP is enabled on the g is sent from station A to station B. Packets are observed on network 0 and network | | | | | |
| e. | The RUT is power off. A pi work 1. | ng is sent from station A to station B. Packets are observed on network 0 and net- | | | | | |
| Co | mments on Test Results | RFC 3768 - Sections 3, 4 and 5 | | | | | |
| | | | | | | | |
| a. | PASS: The RUT remained in forwarded onto network 1 by | n the Backup state. IP packets transmitted by station A destined for station B were y TR1. | | | | | |
| b. | PASS: After a delay of no m ted by station A destined for state. | ore than 4 seconds, the RUT transitioned into the Master state. IP packets transmit- station B were forwarded onto network 1 by the RUT. TR2 remained in the Backup | | | | | |
| c. | PASS: After a delay of no m packets transmitted by static | ore than 4 seconds, TR2 transitioned into the Master state, preempting the RUT. IP on A destined for station B were forwarded onto network 1 by TR2. | | | | | |
| d. | PASS: The RUT entered intered intered onto network 1 b | o the Master state. IP packets transmitted by station A destined for station B were y the RUT. | | | | | |
| e. | PASS: After a delay of no m by station A destined for stat path from B to A failed once | iore than 4 seconds, TR1 transitioned into the Master state. IP packets transmitted into B were forwarded onto network 1 by TR1. The ping failed because the reverse the RUT is down. | | | | | |



| Tes | st # | | | | | | |
|----------------|---|---|--|--|--|--|--|
| Tes | t VRRP.1.2 | Advanced VRRP Inter | operability | | | | |
| Pu | Purpose To verify that a router can interoperate with other VRRP implementations on multiple subnets. | | | | | | |
| Co | mments on Test Procedure | | | | | | |
| a. b. c. | a. TR1 is configured as the Master on network 0, TR3 is configured as the Master on network 1 and TR2 is configured as the Master on network 2. VRRP is enabled on the RUT, TR1, TR2 and TR3. Valid IP packets are passed between stations A, B and C. Packets are observed on network 0 and network 1 and network 2. b. TR1 is disconnected from network 0 and TR2 is disconnected from network 2. After Master_Down_Interval, valid IP packets are passed between stations A, B and C. Packets are observed on network 0 and network 1 and network 1 and network 2. c. TR1 is configured with an interface to network 0 with a Priority of 100 and an IP address of a value higher than that of the RUT. TR2 is configured with an interface on network 2 with a Priority of 100 and an IP address of a value higher than that of the RUT. TR1 is reconnected on network 0 and TR2 is reconnected on network 2. After Master_Down_Interval, valid IP packets are passed between stations A, B and C. Packets are observed on network 2 with a Priority of 100 and an IP address of a value higher than that of the RUT. TR1 is reconnected on network 0 and TR2 is reconnected on network 2. After Master_Down_Interval, valid IP packets are passed between stations A, B and C. Packets are observed on | | | | | | |
| | network 0 and network 1 and | a network 2. | | | | | |
| Co | mments on Test Results | | RFC 3768 - Sections 3, 4 and 5 | | | | |
| a. | PASS: The RUT remained in tions as follows: $B \rightarrow C$ via TR: $A \rightarrow B$ via TR $C \rightarrow A$ via TR Packets were not observed of | n the Backup state. Packe 3 1 2 n any other stations or via | ts transmitted from each station were observed by the sta- | | | | |
| b. c. | PASS: The RUT transitioned to the Master state on network 0. TR3 was the Master on both network 1 and network 2. Packets transmitted from each station were observed by the stations as follows: A → B via the RUT (all replies were dropped) A → C via the RUT (all replies were dropped) B → C via TR3 C → B via TR3 Packets were not observed on any other stations or via any other routes. PASS: The RUT transitioned to the Backup state on network 0. Packets transmitted from each station were ob- | | | | | | |
| | served by the stations as foll $A \rightarrow B$ via TR $B \rightarrow C$ via TR $C \rightarrow B$ via TR Packets were not observed of | ows: | any other routes. | | | | |

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Group 2: State Transition Diagram

The following tests cover the State Transition Diagram in section 6.3.

| Test # | | | Re | sult | | |
|--|-----------------|---------------------------------------|---|------|------|--|
| VRRI | P.2.1 | The Initialize State | | a | PASS | |
| | | | | b | PASS | |
| Purpo | ose: To verify | that a router operates properly while | in the Initialize state. | | | |
| Comn | nents on Test | Procedure | | | | |
| a. VRRP is enabled on the RUT with a Priority of 255. The RUT is the owner of the virtual router IP address. Packets are observed on network 0. b. VRRP is enabled on the RUT with a Priority of 254. The RUT is not the owner of the virtual router IP address. Packets are observed on network 0. | | | | | | |
| Comn | nents on Test 1 | Results | RFC 3768 - Sections 6.1, 6.2, 6.3 and 6.4.1 | | | |
| a. The RUT transmitted an ADVERTISEMENT and broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated with the virtual router. b. The RUT waited approximately Master, Down, Interval (3.0078125 seconds) before it transmitted an AD- | | | | | | |

| each IP address | associated with the virtual router. | - | | $\cap $ |
|-----------------|--------------------------------------|---|------------------------|---------|
| | | | $\left \right\rangle$ | |
| Test # | | | Re | sult |
| VRRP.2.2 | Packet Reception in the Backup State | | a | PASS |

VERTISEMENT and broadcasted a gratuitous ARP request containing the virtual router MAC address for

| | b | PASS | | | | | |
|---|---|------|--|--|--|--|--|
| | с | PASS | | | | | |
| Purpose : To verify that a router properly discards frames destined to the virtual router while in the Backup state. | | | | | | | |
| Comments on Test Procedure | | | | | | | |

- a. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. Properly formatted ARP packets are transmitted for the IP address associated with the virtual router. Packets are observed on network 0.
- b. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. Properly formatted IP packets are transmitted with a destination link layer MAC address equal to the virtual router MAC address, to a destination IP address on one of the RUT's directly connected networks. Packets are observed on network 0.
- c. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. An Echo Request is transmitted to the IP address associated with the virtual router. Packets are observed on network 0.

| Comme | nts o | on T | est Results | RFC 3768 - Sections 6.1, 6.2, 6.3 and 6.4.2 |
|-------|-------|------|-------------|---|

a. The RUT did not respond to the ARP packets.

 \checkmark

- b. The RUT did not forward the packets with a destination link layer MAC address equal to the virtual router MAC address.
- c. The RUT did not respond to the Echo Request.

| Test # | | | Result | | | |
|--|--|---------------------|--------|------|--|--|
| VRRP.2.3 | Master Down in the Backup State | | a | PASS | | |
| Purpose: To verify | that a router operates properly while it | n the Backup state. | | | | |
| Comments on Test | Procedure | | | | | |
| a. TR1 transmits A ADVERTISEM are observed on | a. TR1 transmits ADVERTISEMENTS to the put the RUT in the Backup State, and then ceases transmission of ADVERTISEMENTS (without transmitting a last ADVERTISEMENT with Priority equal to zero). Packets are observed on network 0. | | | | | |
| Comments on Test Results RFC 3768 - Sections 6.1, 6.2, 6.3 and 6.4.2 | | | | | | |
| A manuficient de la constate de from other TD1 transmitted ite la ct VDDD A DVEDTISEMENT des DUT transmitted | | | | | | |

a. Approximately 4 seconds from when TR1 transmitted its last VRRP ADVERTISEMENT, the RUT transmitted an ADVERTISEMENT, broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated with the virtual router, and transitioned to the Master state.

| | st # | | Result |
|-----------------------------------|--|--|---|
| VR | RP.2.4 | Advertisement Reception in the Backup State | a PASS |
| | | | b PASS |
| | | | c PASS |
| | | | d PASS |
| Pu | rpose: To verify | hat a router properly receives ADVERTISEMENTS w | hile in the Backup state. |
| Co | mments on Test | Procedure | |
| a. | TR1 transmits A MENTS with a TR1 transmits A | DVERTISEMENTS to the put the RUT in the Backup Priority higher than that of the RUT. Packets are obser | State. TR1 transmits ADVERTISE- ved on network 0. |
| D. | MENTE mith al | DVERTISEMENTS to the put the RUT in the Backup | State. 1K1 transmits ADVERTISE- |
| 0 | TP1 transmits | DVEDTISEMENTS to the put the DUT in the Packup | State TP1 stops transmitting AD |
| C. | VERTISEMEN' | DVERTISEMENTS to the put the ROT in the Backup S via a Shutdown Event (transmitting a last ADVERT | State. TKT stops transmitting AD- |
| | zero) Packets a | re observed on network 0 | ISEMENT with a Friority equal to |
| d. | TR1 transmits A | DVEDTISEMENTS to the put the DUT in the Declar | |
| | | DVERTISEMENTS to the but the RU1 hit the backup | State. TR1 transmits ADVERTISE- |
| | MENTS with a | Priority lower than that of the RUT. Packets are observ | State. TR1 transmits ADVERTISE- yed on network 0. |
| Co | MENTS with a mments on Test | Priority lower than that of the RUT. Packets are observ Results RFC 3768 - Sections | State. TR1 transmits ADVERTISE- ved on network 0. |
| Co a. b. c. d. | MENTS with a meets on Test a The RUT did no The RUT did no The RUT set Ma ADVERTISEM each IP address The RUT discar ter_Down_Time | Priority lower than that of the RUT. Packets are observ Results RFC 3768 - Sections t transmit any ADVERTISEMENTS. t transmit any ADVERTISEMENTS. ster_Down_Timer to Skew_Time. When Master_Dow ENT and broadcast a gratuitous ARP request containing associated with the virtual router before it transitioned the tech the ADVERTISEMENT upon reception. After Martine and ADVERTISEMENT and ADVERTISEMENT | State. TR1 transmits ADVERTISE- ved on network 0. s 6.1, 6.2, 6.3 and 6.4.2 vn_Timer fired, the RUT transmitted an g the virtual router MAC address for to the Master state. aster_Down_Interval, the Mas- Γ, broadcasted a gratuitous ARP request |



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| Test # | | | Re | sult | | | |
|--|--|---|---------|---------------------|--|--|--|
| VRRP.2.5 | Packet Reception in the Master S | tate | a | PASS | | | |
| | | | b | PASS | | | |
| | | | с | PASS | | | |
| | | | d | PASS | | | |
| Purpose : To verify | Purpose: To verify that a router properly discards frames destined to the virtual router while in the | | | | | | |
| Comments on Test | Procedure | | | | | | |
| a. The RUT transit associated with b. The RUT transit dress equal to th connected netwo c. The RUT transit associated with address of the vi d. The RUT transit sociated with the address of the vi | a. The RUT transitions into the Master state. Properly formatted ARP packets are transmitted for the IP address associated with the virtual router. Packets are observed on network 0. b. The RUT transitions into the Master state. An IP packet is transmitted with destination link layer MAC address equal to the virtual router MAC address to the destination IP address on one of the RUT's directly connected networks. Packets are observed on network 0. c. The RUT transitions into the Master state. The RUT is configured so that it is not the owner of the IP address associated with the virtual router. An ICMP echo request is transmitted to the MAC address and destination IF address of the virtual router. Packets are observed on network 0. d. The RUT transitions into the Master state. The RUT is configured so that it is the owner of the IP address associated with the virtual router. An ICMP echo request is transmitted to the MAC address and destination IF address of the virtual router. An ICMP echo request is transmitted to the MAC address and destination IP address of the virtual router. An ICMP echo request is transmitted to the MAC address and destination IP address of the virtual router. An ICMP echo request is transmitted to the MAC address and destination IP address of the virtual router. An ICMP echo request is transmitted to the MAC address and destination IP address of the virtual router. An ICMP echo request is transmitted to the MAC address and destination IP address of the virtual router. An ICMP echo request is transmitted to the MAC address and destination IP address of the virtual router. An ICMP echo request is transmitted to the MAC address and destination IP address of the virtual router. An ICMP echo request is transmitted to the MAC address and destination IP address of the virtual router. | | | | | | |
| Comments on Test | Results | RFC 3768 - Sections 6.1, 6.2, 6.3 and 6.4.3 | | | | | |
| a. The RUT responding to the replication of the replication o | nded to the ARP packet for the IP add y was the MAC address of the virtual rded the packets with the destination appropriate network for the destinati t reply to the ICMP echo request. d to the ICMP echo request. | ress associated with the virtual router. l link. link layer MAC address equal to the vi on IP address. | The MAC | C address or MAC | | | |
| | | | | | | | |
| Test # | Test # Result | | | | | | |
| VRRP.2.6 | Shutdown Event in the Master St | ate | a | PASS | | | |
| Purpose: To verify | that a router properly handles a shutd | own event while in the Master state. | | | | | |
| Comments on Test | Procedure | | | | | | |
| a. VRRP is shutdo | a. VRRP is shutdown on the RUT. Packets are observed on network 0. | | | | | | |

Comments on Test Results RFC 3768 - Sections 6.1, 6.2, 6.3 and 6.4.2

a. The RUT transmitted an ADVERTISEMENT with a Priority equal to zero.

| Tes | st # | | Re | sult |
|-----|------------------|---|--------------|--------------|
| VR | RP.2.7 | Advertisement Reception in the Master State | a | PASS |
| | | | b | PASS |
| | | | c | PASS |
| | | | d | PASS |
| | | | e | PASS |
| | | | f | PASS |
| Pu | rpose: To verify | that a router properly receives ADVERTISEMENTS while in the Master sta | ate. | |
| Co | mments on Test | Procedure | | |
| | | | | |
| a. | The RUT transit | ions to the Master state. TR1 transmits an ADVERTISEMENT with a Prio | rity highei | than |
| | that of the RUT. | Packets are observed on network 0. | | |
| b. | The RUT transit | ions to the Master state. TR1 transmits an ADVERTISEMENT with a Prio | rity lower | than that |
| | of the RUT. Pac | ckets are observed on network 0. | | |
| c. | The RUT transit | ions to the Master state. TR1 transmits an ADVERTISEMENT with a Prio | rity equal | to zero. |
| J. | Packets are obse | erved on network U. | | ((1 |
| a. | the DUT and a m | ions to the Master state. IRI transmits an ADVERTISEMENT with a Prio | rity equal | to that of |
| | the RU1 and a p | minary IP address nigher than the primary IP address of the RUT. Packets a | re observe | ed on net- |
| 0 | The DIT transit | ions to the Mester state. TP1 transmits on ADVEDTISEMENT with a Price | rity oqual | to that of |
| с. | the RUT and a n | rimary IP address equal to the primary IP address of the RUT Packets are of | bserved o | n net- |
| | work 0 | similary if address equal to the primary if address of the KOT. Fackets are t | JUSCI VCU U | n net- |
| f | The RUT transit | ions to the Master state TR1 transmits an ADVERTISEMENT with a Prio | rity equal | to that of |
| 1. | the RUT and a n | rimary IP address less than the primary IP address of the RUT Packets are | observed (| on net- |
| | work 0. | rinnary in address less than the printary in address of the refer nations are | | |
| | | | \cup | |
| Co | mments on Test | Results RFC 3768 - Sections 6,1, 6,2, 6,3 and 6,4,3 | | |
| | | | | |
| a. | The RUT cancel | led the Adver_Timer, set Master_Down_Timer to Master_Down Interval and | nd transitio | oned to |
| | the Backup state | e. The RUT ceased transmission of ADVERTISEMENTS. | | |
| b. | The RUT discar | ded the ADVERTISEMENTS transmitted by TR1 and remained in the Mas | ter state. | |
| c. | The RUT transm | nitted an ADVERTISEMENT and reset the Adver_Timer to Advertisement | _Interval a | nd re- |
| | mained in the M | aster state. | | |
| d. | The RUT cancel | led the Adver_Timer, set the Master_Down_Timer to Master_Down Interva | al and tran | sitioned |
| | to the Backup st | | | |
| e. | The RUT discar | ded the ADVERTISEMENTS transmitted by TRT and remained in the Mas | ter state. | |
| I. | The RUT discar | ded the ADVERTISEMENTS transmitted by TR1 and remained in the Mas | ter state. | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |



Group 3: Parameters Per Virtual Router

The following tests cover the values discussed in section 6.1.

| Test | # | | | | R | esult |
|----------|--|--|---|--|--------------------------------------|---------------------|
| VRI | RP.3.1 | Advertisement_Interval | | | а | FAIL |
| | | | | | b | FAIL |
| Purj | oose: To observ | ve the Advertisement_Interval value | | | | |
| Con | ments on Test | Procedure | | | | |
| a. b. | The RUT is con interval between The RUT is con ADVERTISEM | figured with the default value of th the ADVERTISEMENTS that the figured with an Advertisement_Into ENTS that the RUT transmits are r | e Advertisement_I RUT transmits ar erval other than on ecorded and obser | Interval, which is on e recorded and obse he second. The time rved. | e second. T rved. interval bet | he time ween the |
| Con | ments on Test | Results | RFC 3768 - Section | ons 5.3.7 and 6.1 | | |
| | ment_Interval v Reset the Adver every 5 seconds | vas set to 5 seconds. According to F _ <i>Timer to Advertisement_Interval.</i> ' | EFC 3768, " <i>If an A</i> Therefore, the ad | ADVERTISEMENT of a should have | is received, t ave been trig | then : gered |
| | | | 0 | | | |

| Tes | t # | | | Re | sult | |
|----------------|--|------------------------|-----------------------------------|----|------|--|
| VR | RP.3.2 | Skew_Time | | a | PASS | |
| | | | | b | PASS | |
| | | | | с | PASS | |
| Pu | pose : To observ | e the Skew_Time value. | | | | |
| Co | mments on Test | Procedure | | | | |
| a. b. c. | a. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. The RUT is configured with a Priority of 1. TR1 transmits a final ADVERTISEMENT with a Priority of zero. Packets are observed on network 0. b. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. The RUT is configured with a Priority of 254. TR1 transmits a final ADVERTISEMENT with Priority of zero. Packets are observed on network 0. c. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. The RUT is configured with a Priority of 100. TR1 transmits a final ADVERTISEMENT with Priority of zero. Packets are observed on network 0. | | | | | |
| Co | mments on Test | Results | RFC 3768 - Sections 6.1 and 6.4.2 | | | |
| a. b. c. | 20mments on Test Results RFC 3768 - Sections 6.1 and 6.4.2 k. Upon reception of an ADVERTISEMENT with a Priority of zero, the RUT set the Master_Down_Timer to Skew_Time. The RUT transmitted an ADVERTISEMENT with Master_Down_Timer fires. The time between the last ADVERTISEMENT transmitted from TR1 and the first ADVERTISEMENT transmitted from the RUT was 255/256 second (approximately one second). b. Upon reception of an ADVERTISEMENT with a Priority of zero, the RUT set the Master_Down_Timer to Skew_Time. The RUT transmitted an ADVERTISEMENT with Master_Down_Timer fires. The time between the last ADVERTISEMENT transmitted from TR1 and the first ADVERTISEMENT transmitted from the RUT was 2/256 second (approximately 7.8 ms). c. Upon reception of an ADVERTISEMENT with a Priority of zero, the RUT set the Master_Down_Timer to Skew_Time. The RUT transmitted an ADVERTISEMENT with Master_Down_Timer fires. The time between the last ADVERTISEMENT with a Priority of zero, the RUT set the Master_Down_Timer to Skew_Time. The RUT transmitted an ADVERTISEMENT with A Priority of zero, the RUT set the Master_Down_Timer to Skew_Time. The RUT transmitted an ADVERTISEMENT with Master_Down_Timer fires. The time between the last ADVERTISEMENT transmitted from TR1 and the first ADVERTISEMENT transmitted from the RUT was 156/256 second (approximately 609 ms). | | | | | |
| | 5 | | | | | |



| Tes | st # | | | Re | sult | | | |
|----------|--|----------------------|-----------------------------------|----|------|--|--|--|
| VR | RP.3.3 | Master_Down_Interval | | a | PASS | | | |
| | | | | b | PASS | | | |
| Pu | Purpose: To observe the Master_Down_Interval value. | | | | | | | |
| Co | mments on Test | Procedure | | | | | | |
| a. b. | a. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. TR1 ceases transmission of AD-VERTISEMENTS (without transmitting a last ADVERTISEMENT with Priority of zero). Packets are observed on network 0. b. The RUT is configured with an Advertisement_Interval of 4 seconds. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. TR1 ceases transmission of ADVERTISEMENTS (without transmitting a last ADVERTISEMENTS to put the RUT in the Backup state. TR1 ceases transmission of ADVERTISEMENTS (without transmitting a last ADVERTISEMENTS to put the RUT in the Backup state. TR1 ceases transmission of ADVERTISEMENTS (without transmitting a last ADVERTISEMENT with Priority of zero). Packets are observed on network 0. | | | | | | | |
| Co | mments on Test | Results | RFC 3768 - Sections 6.1 and 6.4.2 | | | | | |
| a. b. | a. ADVERTISEMENTS were not received during Master_Down_Interval causing the Master_Down_Timer to fire. The RUT transmitted an ADVERTISEMENT, broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated with the virtual router and transitioned to the Master state. (Master_Down_Interval was calculated as (3x1) + Skew-Time (approximately 1 second) = 4 seconds.) b. ADVERTISEMENTS were not received during Master_Down_Interval causing the Master_Down_Timer to fire. The RUT transmitted an ADVERTISEMENT, broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated with the virtual router and transitioned to the Master to fire. The RUT transmitted an ADVERTISEMENT, broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated with the virtual router and transitioned to the Master | | | | | | | |

state. (Master_Down_Interval was calculated as (3x4) + Skew-Time (approximately 1 second) = 13 seconds.)

| Test | t # | | | | Re | sult | |
|------|---|---------------------------|----------------------------|-----------------------------------|-------------|----------|--|
| VR | RP.3.4 | Preempt_Mode | | | а | PASS | |
| | | | | | b | PASS | |
| Pur | Purpose: To verify that a router properly implements Preempt_Mode. | | | | | | |
| Con | nments on Test l | Procedure | | | | | |
| | | | | | | | |
| a. | The RUT is conf | igured with Preempt_Mo | de to True. While the RI | UT is in the INITIALIZE | E state, TR | l trans- | |
| | mits ADVERTIS | SEMENTS with a Priority | less than that of the RU | T. Packets are observed | on network | с O. | |
| b. | The RUT is conf | igured with Preempt_Mo | de to False. While the R | UT is in the INITIALIZ | E state, TR | 1 trans- | |
| | mits ADVERTIS | EMENTS with a Priority | v less than that of the RU | T. Packets are observed | on network | c 0. | |
| | | | | | | | |
| Con | nments on Test l | Results | RFC 3768 - Se | ections 6.1, 6.4.1, 6.4.2 and 6.4 | .3 | | |
| | | | | | | | |
| a. | The RUT preem | pted TR1 and transitioned | d to the Master state. The | e RUT transmitted an AI | OVERTISE | EMENT, | |
| | broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated | | | | | | |
| | with the virtual router and transitioned to the Master state. | | | | | | |

b. The RUT remained in the Backup state. The RUT did not originate any ADVERTISEMENTS.

Group 4: VRRP Transmission and Reception

The following tests cover the transmission and reception of VRRP packets.

| | | | Re | esult |
|--|---|--|-------------------------|-------------------|
| VRRP.4.1 | Reception of Invalid TTL field | | а | PASS |
| Purpose: To verify | that a router discards VRRP ADVER | TISEMENTS with an invalid TTL fiel | d value. | |
| Comments on Tes | Procedure | | | |
| a. VRRP is enabl transmits VRR | ed on the RUT. TR1 transmits VRRP P packets with the IP TTL field set to | packets with the IP TTL field value set a value less than 255. Packets are obse | t to 255. erved on r | TR1 network 0. |
| Comments on Tes | Results | RFC 3768 - Sections 5, 5.2.3, 6.4.2 and 7.1 | | |
| the Master stat | e. | | | |
| Test # | | | Re | esult |
| VRRP.4.2 | Reception of Invalid Version field | d | а | PASS |
| | that a router properly discards VRRF | ADVERTISEMENTS containing an i | nvalid ve | rsion |
| Purpose : To verify field. | | | | 151011 |
| Purpose: To verif field. Comments on Tes | Procedure | | | |

a. The RUT discarded the packets containing the version field not equal to 2. Within 4 seconds of TR1's last valid ADVERTISEMENT, the RUT transmitted an ADVERTISEMENT, broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated with the virtual router and transitioned to the Master state.



| Test # | Test # | | Re | sult | |
|---|--|--|--|----------------------------------|--|
| VRRP.4.3 | Reception of Invalid Complete V | RRP Packet length | a | PASS | |
| Purpose: To verify | Purpose: To verify that a router properly discards VRRP ADVERTISEMENTS containing an invalid complete | | | | |
| VRRP packet length | | - | | | |
| Comments on Test | Procedure | | | | |
| transmits VRRP packets with the complete VRRP packet length of 40. TR1 transmits VRRP packets with the complete VRRP packet length less than 40. Packets are observed on network 0. | | | | | |
| Comments on Test | Results | RFC 3768 - 5, 6.4.2 and 7.1 | | | |
| a. The RUT discar seconds of TR1 gratuitous ARP tual router and t | ded the VRRP packets containing the 's last valid ADVERTISEMENT, the request containing the virtual router l ransitioned to the Master state. | e complete VRRP packet length less that RUT transmitted an ADVERTISEME MAC address for each IP address assoc | an 40. Wit NT, broad viated with | hin 4 lcasted a 1 the vir- | |

| Test # | | Re | sult | | |
|---------------------|---|----|------|--|--|
| VRRP.4.4 | Reception of Invalid checksum field | а | PASS | | |
| Purpose: To verify | Purpose : To verify that a router properly discards VRRP ADVERTISEMENTS containing an invalid complete | | | | |
| VRRP packet length. | | | | | |
| Comments on Test I | Procedure | | | | |
| | | | | | |

a. VRRP is enabled on the RUT. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. TR1 transmits VRRP packets with a valid VRRP checksum. TR1 transmits VRRP packets with an invalid VRRP checksum. Packets are observed on network 0.

Comments on Test Results

RFC 3768 - 5, 5.3.8, 6.4.2 and 7.1

a. The RUT discarded the packets containing the invalid VRRP checksum. Within 4 seconds of TR1's last valid ADVERTISEMENT, the RUT transmitted an ADVERTISEMENT, broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated with the virtual router and transitioned to the Master state.



| Test # | | | Re | esult | | |
|---|--|---|----|-------|--|--|
| VRRP.4.5 | VRRP.4.5 Reception of Invalid VRID field | | | PASS | | |
| Purpose: To verify t | Purpose : To verify that a router properly discards datagrams containing an invalid VRID field. | | | | | |
| Comments on Test l | Procedure | | | | | |
| a. VRRP is enabled on the RUT. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. TR1 transmits VRRP packets with a valid VRID. TR1 transmits VRRP packets with an invalid VRID. Packets are observed on network 0. | | | | | | |
| Comments on Test 1 | Results | RFC 3768 - 5, 5.3.3, 6.1, 6.4.2 and 7.1 | | | | |
| a. The RUT discarded the packets containing the invalid VRID. Within 4 seconds of TR1's last valid ADVER- TISEMENT, the RUT transmitted an ADVERTISEMENT, broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated with the virtual router and transitioned to the Master state. | | | | | | |

| Test # | | Result | | | |
|---|---|------------------------------------|------------|---------|--|
| VRRP.4.6 | RRP.4.6 Reception of Invalid Auth Type Information | | | PASS | |
| Purpose : To verify that a router properly discards datagrams containing Auth Type that conflict with the local con- | | | | | |
| figuration. | figuration. | | | | |
| Comments on Test Procedure | | | | | |
| | | | | | |
| a. VRRP is enabled | d on the RUT. TR1 transmits ADVE | RTISEMENTS to put the RUT in the l | Backup sta | te. TR1 | |
| transmits VRRP | packets with a VRRP authentication | type 0. TR1 transmits VRRP packets | with a VR | RP au- | |
| thentication type | thentication type 1. Packets are observed on network 0. | | | | |
| | | | | | |
| Comments on Test Results RFC 3768 - 5, 5.3.6, 6.1, 6.4.2 and 7.1 | | | | | |
| | | | | | |

a. The RUT discarded the packets with an authentication type 1. Within 4 seconds of TR1's last valid ADVER-TISEMENT, the RUT transmitted an ADVERTISEMENT, broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated with the virtual router and transitioned to the Master state.

| Test # | | | Res | sult | | |
|---|--|-------------------------------|-----|------|--|--|
| VRRP.4.7 | Reception of Invalid Adver Interval Inform | nation a | ι I | PASS | | |
| Purpose: To verify t | Purpose: To verify that a router properly discards datagrams containing Adver Interval fields that conflict with the | | | | | |
| local configuration. | | - | | | | |
| Comments on Test | Procedure | | | | | |
| a. VRRP is enabled on the RUT. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. TR1 transmits VRRP packets with an Adver Interval of 1 second. TR1 transmits VRRP packets with an Adver Interval of 7 seconds. Packets are observed on network 0. | | | | | | |
| Comments on Test | Results RFC 3768 | -5, 5.3.7, 6.1, 6.4.2 and 7.1 | | | | |
| a. The RUT discarded the packets with an Adver Interval of 7 seconds. Within 4 seconds of TR1's last valid ADVERTISEMENT, the RUT transmitted an ADVERTISEMENT, broadcasted a gratuitous ARP request con- taining the virtual router MAC address for each IP address associated with the virtual router and transitioned to the Master state. | | | | | | |

| Test # | | Res | sult |
|----------------------------|---|-----|------|
| VRRP.4.8 | Reception of Invalid Unknown Type Field | a | PASS |
| Purpose: To verify t | | | |
| Comments on Test Procedure | | | |

a. VRRP is enabled on the RUT. TR1 transmits ADVERTISEMENTS to put the RUT in the Backup state. TR1 transmits VRRP packets with the Type field set to 1. TR1 transmits VRRP packets with the Type field set to an unknown value. Packets are observed on network 0.

Comments on Test Results

RFC 3768 -5, 5.3.2 and 6.4.2

a. The RUT discarded the packets with the unknown Type fields. Within 4 seconds of TR1's last valid ADVER-TISEMENT, the RUT transmitted an ADVERTISEMENT, broadcasted a gratuitous ARP request containing the virtual router MAC address for each IP address associated with the virtual router and transitioned to the Master state.

| VRRP.4.9 Proper Transmission of VRRP packet Purpose: To verify that a router transmits VRRP packets with Comments on Test Procedure a. VRRP is enabled on the RUT. The RUT transitions to the Comments on Test Results RFC a. The RUT transmitted VRRP packets with the following fie - TTL equal to 255 - IP protocol number equal to 112 - VRRP version equal to 2 District Comments on 10 | Master state. Packets are observ | a ved on netw | PASS work 0. |
|--|---|----------------------|-----------------|
| Purpose: To verify that a router transmits VRRP packets with Comments on Test Procedure a. VRRP is enabled on the RUT. The RUT transitions to the Comments on Test Results RFC a. The RUT transmitted VRRP packets with the following fie - TTL equal to 255 - IP protocol number equal to 112 - VRRP version equal to 2 District G the packet of the DUT | Naster state. Packets are observ | ved on netw | work 0. |
| Comments on Test Procedure a. VRRP is enabled on the RUT. The RUT transitions to the Comments on Test Results RFC a. The RUT transmitted VRRP packets with the following fie - TTL equal to 255 - IP protocol number equal to 112 - Type field equal to 1 - VRRP version equal to 2 - Drive field equal to 2 | Master state. Packets are observ | ved on netw | work 0. |
| a. VRRP is enabled on the RUT. The RUT transitions to the Comments on Test Results a. The RUT transmitted VRRP packets with the following fie TTL equal to 255 IP protocol number equal to 112 Type field equal to 1 VRRP version equal to 2 | Master state. Packets are observ | ved on netw | work 0. |
| Comments on Test Results RFC a. The RUT transmitted VRRP packets with the following fie - - TTL equal to 255 - - IP protocol number equal to 112 - - Type field equal to 1 - - VRRP version equal to 2 - | 3768 -5, 6, 6.4.3 and 7. | | |
| a. The RUT transmitted VRRP packets with the following fie TTL equal to 255 IP protocol number equal to 112 Type field equal to 1 VRRP version equal to 2 | | | |
| Priority field equal to 255 (when the RUT owns the IP a Source IP address equal to the interface primary IP addr Destination IP address equal to the VRRP multicast add Source MAC address equal to the virtual router MAC ad Destination Link Layer address equal to the VRRP link The correct VRRP checksum | ldress associated with the virtua ss ess (224.0.0.18) dress (0:0:5e:0:1:1) ayer multicast address (1:0:5e:0 | ll router) :0:12) | |

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