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Benchmarking Methodology for EVPN
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Abstract

This document defines the methodologies for benchmarking performance of EVPN. EVPN been implemented with many varying designs in order to achieve their intended network functionality.

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1. Introduction

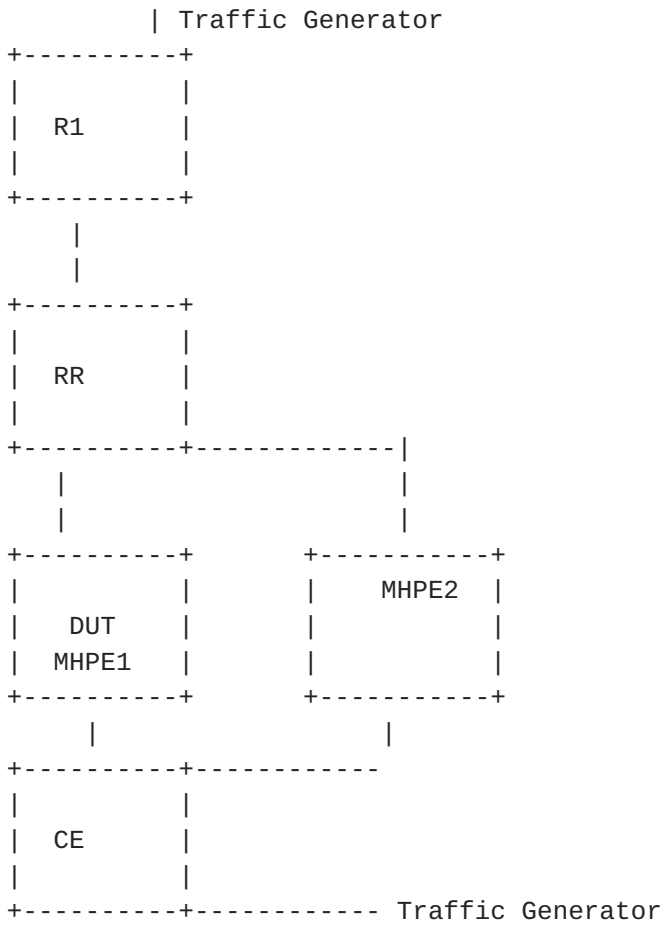
EVPN which is defined in RFC7432 which describes procedures for BGP MPLS-based Ethernet VPNs(EVPN). This document defines the methodologies for benchmarking performance of EVPN. EVPN been implemented with many varying designs in order to achieve their intended network functionality. Hence, the authors have taken the approach of considering EVPN as a black box, defining the methodology to benchmark the evpn feature using various testing methodologies.

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

2. Test Topology

Topology Diagram



Topology Diagram

Figure 1

3. Network

The network consists of 5 routers and 2 traffic generator ports. UT is acting as one of MH PE to CE. The RR is acting as route reflector and core router.R1 is a Single home router running evpn. All four routers except CE are running mpls,bgp. CE is a dual home connected to DUT and MH PE1. The testing will be done on DUT to bench mark the service. UT and MHPE2 is running EVPN with SA/AA with CE.The DUT and and other PE's will be running 100 EVI's(EVPN instances) on 100 sub interfaces.

4. Test Procedure

The test defined to bench mark the performance of EVPN mac learning,convergence time in link failures,scale scenarios.

4.1. To check the time taken to learn the mac address in DUT

Objective:

To check the time taken to learn the mac address locally and time taken to send the locally learned routes to peers.

a. Send 1,00,000 unicast frames from CE to MHPE1(DUT) working in SA mode with different source and destination address, where DUT is the DF so that it can forward the traffic. Measure the time taken to learn these mac in forwarding table and control plane.

b. Measure the time taken to send these 1,00,000 type 2 routes from DUT to its peers.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT.All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table.For MH PE ESI must be configured per IFD/Interface. Using RT (traffic generator) to send the traffic to the routers. Measurement The DUT mac table must learn the 1,00,000 mac address and measure the time taken to send 1,00,000 routes to its peers by DUT.

4.2. To check the time taken to flush the mac address

Objective:

Send 1,00,000 frames with different SA and DA to DUT from CE using traffic generator. Then wait to learn all 1,00,000 mac address. Then stop the traffic.Wait to see how long it takes to flush these mac entries due to ageing.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT. All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table. For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

The DUT mac table must learn the 1,00,000 measure the time taken for flushing these 1,00,000 mac address due to ageing.

4.3. To check the time taken to flush the local entry due to CE link failure

Objective:

Send 1,00,000 frames with different SA and DA to DUT from CE using traffic generator. Then wait to learn all 1,00,000 mac address. Then fail the DUT CE link and measure the time taken to flush these 1,00,000 routes from the mac table and from control plane.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT. All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT. Once the bgp comes up check the DUT evpn table. For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

The DUT mac table must learn the 1,00,000 measure the time taken for flushing these 1,00,000 mac address.

4.4. To check the time taken to learn 1,00,000 routes from remote peer by DUT

Objective:

Send 1,00,000 frames with different SA and DA to DUT from R1 using traffic generator. Measure the time taken to learn these 1,00,000 routes from remote peer and program the mac address table.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT. All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table. For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

The DUT mac table must learn the 1,00,000 measure the time taken to learn the 1,00,000 mac address from remote peers.

4.5. To check the time taken by DUT to flush 1,00,000 routes learned from remote PE after stopping the traffic at remote PE

Objective:

Send 1,00,000 frames with different SA and DA to DUT from R1 using traffic generator. After stopping the traffic at remote PE R1 traffic generator due to mac ageing it will withdraw its routes from remote PE's. Measure the time taken to flush these routes from DUT mac table.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT.All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table.For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

Measure the time taken to flush 1,00,000 remote routes from mac table of DUT due to ageing.

4.6. To check the time taken by DUT to flush 1,00,000 routes learned from remote PE after R1 traffic generator link failure

Objective:

Send 1,00,000 frames with different SA and DA to DUT from R1 using traffic generator. Bring down the link between R1 and traffic generator. Then measure the time taken to flush the DUT mac address table.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT. All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table.For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

Measure the time taken to flush 1,00,000 remote routes from mac table of DUT.

4.7. To check the time taken by DUT to learn 1,00,000 routes from local and 1,00,000 from remote.

Objective:

Send 1,00,000 frames with different SA and DA to DUT from R1 using traffic generator. Send 1,00,000 frames with different SA and DA from traffic generator connected to CE. The SA and DA of flows must be complimentary to have unicast flows. Measure the time taken by the DUT to learn 2,00,000 in mac table and in control plane.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT.All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table. For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

Measure the time taken to learn 2,00,000 routes in control and mac address table in DUT

4.8. To check the time taken by DUT to flush 1,00,000 routes from remote when R1 traffic generator link failure.

Objective:

Send 1,00,000 frames with different SA and DA to DUT from R1 using traffic generator. Send 1,00,000 frames with different SA and DA from traffic generator connected to CE. The SA and DA of flows must be complimentary to have unicast flows.Fail the R1 traffic generator link and measure the time taken to flush 2,00,000 routes in DUT mac address table.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT.All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table. For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

Measure the time taken to flush 1,00,000 routes from control plane and mac address table due to remote link failure.

4.9. To check the loop formation due to DF election by adding a a MHPE.

Objective:

Send 1,00,000 frames from CE to DUT from traffic generator with different SA and DA. Wait to learn all 1,00,000 mac address. Then add R1 to the same Ethernet segment by configuring the same ESI value configured in DUT,MHPE2 in IFD. Then the new DF election take place during that time there should not be any loop and measure the time taken to come up the new DF.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT.All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table. For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

Measure the time taken for new DF election in DUT and there should not be any loop or forwarding the BUM traffic back to the same segment.

5. Reliability

5.1. To check the whether there is traffic loss due to routing engine failover for redundancy test.

Objective:

Send 1,00,000 frames from CE to DUT from traffic generator with different SA and DA. Send 1,00,000 frames from traffic generator to R1 with different SA and DA so that 2,00,000 mac address will be learned in DUT. There is a bi directional traffic flow with 1,00,000 pps in each direction. Then do a routing engine failover.
Procedure:

Configure EVPN EVI in R1,MHPE2,DUT.All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table.For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

There should not be any traffic loss,No change in the DF role. No withdraw of any routes.

5.2. To check the whether DF election is taking place properly after the one of the MH PE reboot.

Objective:

Send 1,00,000 frames from CE to DUT from traffic generator with different SA and DA. Send 1,00,000 frames from traffic generator to R1 with different SA and DA so that 2,00,000 mac address will be learned in DUT. There is a bi directional traffic flow with 1,00,000 pps in each direction. Then reboot DUT since there are 2 MH PE's the other PE will become the DF then after DUT comes back, then DF election has to re initiate.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT.All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table.For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement

The DF election has to take place again once the DUT comes back online.There should not be any DF stuck casefor 100 EVI's.

6. Scale

6.1. To Scale the DUT to 32k EVI and clear bgp in DUT with out traffic.

Objective:

The main purpose of the test the DUT performance to scale 32k EVI's. Then clear bgp neighbor. There should not be any loss of routes or any crashes.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT.All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table.For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement

There should not be any loss of route types 1,2,3 and 4 in DUT.

6.2. To Scale the DUT to 32k EVI and clear bgp in DUT with traffic. Measure the convergence time

Objective:

The main purpose of the test the DUT performance to scale 32k EVI's with traffic. Then clear bgp neighbor. There should not be any loss of routes or any crashes. Send 1,00,000 frames from CE to DUT from traffic generator with different SA and DA for 5 EVI's. Send 1,00,000 frames from traffic generator to R1 with different SA and DA for 5 EVI's.so that 10,00,000 mac address will be learned in DUT. There is a bi directional traffic flow with 5,00,000 pps in each direction. Then clear the bgp nei in DUT after the bgp comes up and started learning the routes, measure the time taken to learn all 10,00,000 mac routes.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT.All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table.For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

The DUT must learn all 10,00,000 mac address.Measure the time taken to learn 10,00,000 mac.

7. Soak Test

7.1. To Scale the DUT to 32k EVI in DUT with traffic and run the set up for 24hrs

Objective:

The main purpose of the test the DUT performance to scale 32k EVI's with traffic. Then clear bgp neighbor. There should not be any loss of routes or any crashes. Send 1,00,000 frames from CE to DUT from traffic generator with different SA and DA for 5 EVI's. Send 1,00,000 frames from traffic generator to R1 with different SA and DA for 5 EVI's.so that 10,00,000 mac address will be learned in DUT. There is a bi directional traffic flow with 5,00,000 pps in each direction.Keep the setup up and running for 24 hrs,take hourly CPU utilization,memory usage.

Procedure:

Configure EVPN EVI in R1,MHPE2,DUT.All 4 routers except CE are running mpls,bgp,RR is acting as route reflector to R1,MHPE2 and DUT.Once the bgp comes up check the DUT evpn table.For MH PE ESI must be configured per IFD/Interface. Using RT(traffic generator) to send the traffic to the routers.

Measurement:

Take the hourly reading of CPU,process memory.There should not be any leak,crashes,CPU spikes.

8. Acknowledgements

We would like to thank Bhuvaneswaran Vengainathan of Veryx Technologies and Al Morton of (ATT) for their support and encouragements.

9. IANA Considerations

This memo includes no request to IANA.

10. Security Considerations

There is no additional consideration from RFC 6192.

11. References

11.1. Normative References

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11.2. Informative References

[RFC7432] Sajassi, A., Ed., Aggarwal, R., Bitar, N., Isaac, A., Uttaro, J., Drake, J., and W. Henderickx, "BGP MPLS-Based Ethernet VPN", RFC 7432, DOI 10.17487/RFC7432, February 2015, <http://www.rfc-editor.org/info/rfc7432>.

Appendix A. Appendix

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