Benchmarking Methodology for EVPN and PBB-EVPN
draft-kishjac-bmwg-evpntest-06

Abstract

   This document defines the methodologies for benchmarking performance
   of EVPN and PBB-EVPN.EVPN is defined in [RFC 7432].It is being deployed
   in provider network.This document provides the benchmarking
   methodologies for EVPN/PBB-EVPN convergence,data plane,control plane
   learning of mac.

Status of this Memo

      This Internet-Draft is submitted in full conformance with the
   provisions of [BCP 78] and [BCP 79].

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      This Internet-Draft will expire on October 1,2017.

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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 has been
implemented with many varying designs in order to achieve their
intended network functionality.The scope of this document is to
provide methodologies for benchmarking evpn data,control plane mac
learning,mac flush,mac ageing,convergence,high availability,scale.
The methodologies defined for evpn can be used for benchmarking the
 performance of PBB-EVPN.PBB-EVPN is defined in RFC 7623.It is
being deployed in provider network.The difference between PBB-EVPN
and EVPN is the former learns the customer mac in data plane the
later learns in control plane.

1.1 Terminology

    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

          | Traffic Generator layer 2 traffic send to each sub interface.
     +----------+
     | |
     | R1 |
     | |
     +----------+
         |
         |
     +----------+
     | |
     | RR |
     | |
     +----------+-------------|
         | |
         | |
     +----------+   +-----------+
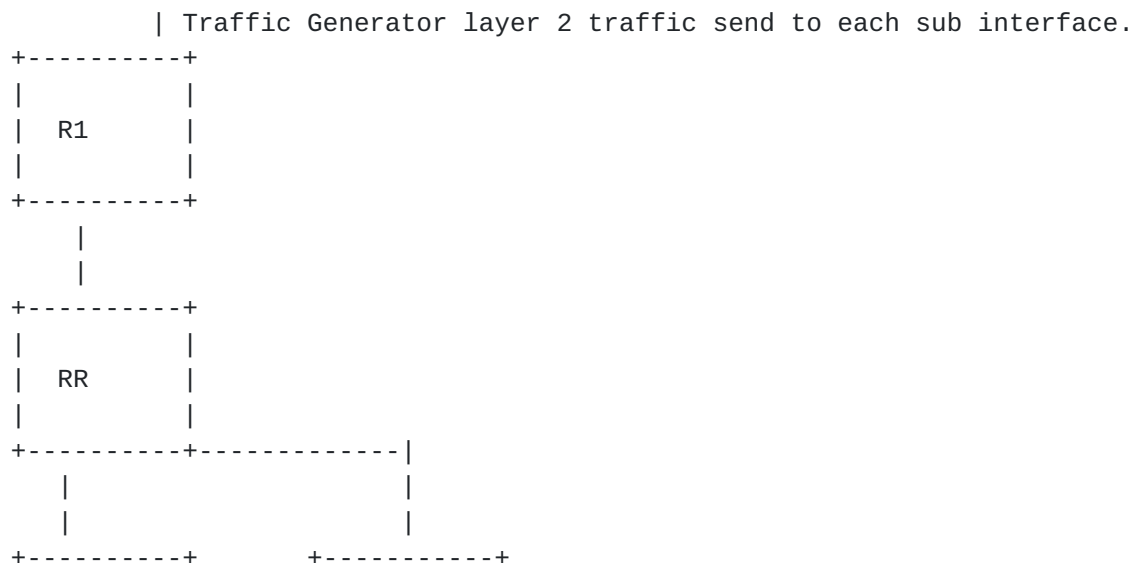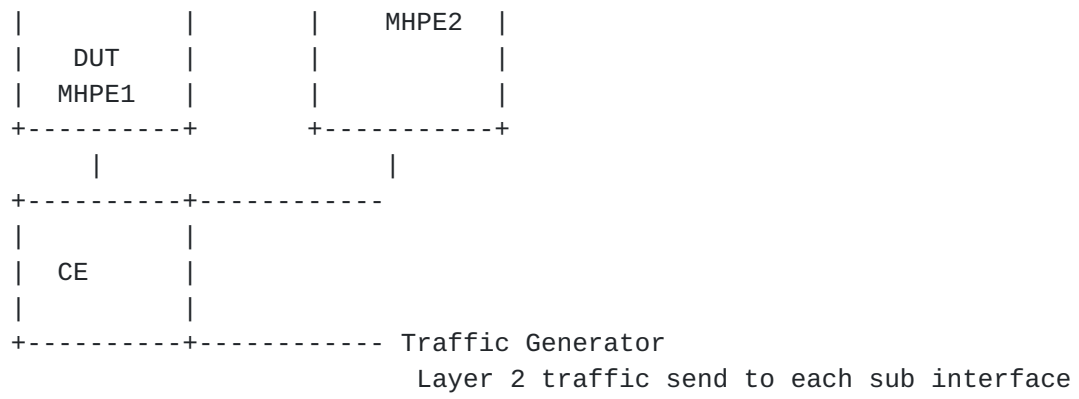
```
|          |         |      MHPE2  |
|   DUT    |         |             |
|  MHPE1   |         |             |
+----------+     +-----------+
     |                 |
+----------+------------
|          |
|   CE     |
|          |
+----------+------------ Traffic Generator
                          Layer 2 traffic send to each sub interface


                       Topology Diagram

          Figure 1
```

2.1 Terminologies

MHPE Multi homed Provide Edge router.

RR   Route Reflector

CE Customer Router/Devices

PE2 Provider Edge router 2

AA EVPN Terminologies AA All-Active

SA EVPN Terminologies SA Single-Active

RT Router Tester

3. Network

The network consists of 5 routers and 2 traffic generator
ports.DUT is acting as one of the MHPE 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 emulating a
provider scenario.CE is a dual home connected to DUT and MHPE2.The
testing will be done on DUT in order to bench mark the service. DUT
and the MHPE2 is running EVPN with SA/AA, CE will be configured
with layer 2 bridge.In AA EVPN there will be LAG running from CE to
both MHPE's.The DUT and other PE's will be running X EVI's (EVPN
instances) on X sub interfaces.The traffic generator will be
connected to R1 and the CE, which is capable of sending layer 2
frames.The traffic will be send either uni directional or bi
directional based on the benchmark parameters to be measured.

3.1 PBB-EVPN Network Setup

The network consists of 5 routers and 2 traffic generator
ports.DUT is acting as one of the MHPE to CE.The RR is acting as
route reflector and core router.R1 is a Single home router running
pbbevpn. All four routers except CE are running mpls,bgp emulating
a provider scenario.CE is a dual home connected to DUT and
MHPE2.DUT and MHPE2 is running PBB-EVPN with SA/AA with CE.CE will
be configured with layer 2 bridge.In AA PBB-EVPN there will be LAG
running from CE to both MHPE's.The DUT and other PE's will be
running X EVI's (PBB-EVPN instances) on X sub interfaces.The
traffic generator will be connected to R1 and the CE, which is
capable of sending layer 2 frames.The traffic will be send either
uni directional or bi directional based on the benchmark parameters
to be measured.

4. Test Procedure

The test defined to bench mark the performance of EVPN mac learning
in control pland and data plane. Mac flush,High Availability,
convergence time in link failures,scale scenarios.

4.1 MAC Learning in Control plane and Data Plane

The MAC will be learned in data plane and control plane, test is to
measure the time taken to learn the "X" number of mac's in time "T"
sec. The data plane learning will from the locally connected
interface. The control plane learning is through BGP advertisements
from the remote PE. Let the local learning time be "T" and control
plane learning time be "T'". The data plane mac learning can be
measured using the parameters defined in RFC 2889 section 5.8.

4.2 MAC flush for locally learned and remote learned MAC

The time taken to flush the "X" locally learned mac, let it be "T1"
sec, once the traffic is stopped. The time taken to flush the remote
mac which is learned by control plane let it be "X" macs.The time
taken to flush the "X" remote macs, which is measured as "T2" sec.

4.3 High Availability

The traffic is flowing bi direction. The bgp is converged,consider
there are "X" numbers of macs learned locally and remotely.
Then traffic is flowing at "P" packets per sec. The traffic generator
is measuring the Tx and Rx packets, while the routing engine fail over there
should not any packet loss the router tester must show both "P"
packet per seconds.

4.4 Convergence Time

During any events like link failure, hard reset measure the time
taken to learn "X" mac's locally and remotely.

4.5 Scale

This is to measure the performance of DUT in scaling to "X" EVPN
instances. The measured parameters are CPU usage, memory
leak,crashes.

4.6 SOAK

This test is used to measure the performance of DUT over a period of
time,with scaled configuration and traffic over a period of time
"T'". In each interval "t1" the parameters measured are CPU usage,
memory usage and crashes.

4.7 Measurement Statistics

The test is repeated for "N" times and the value is taken by
averaging the values.

5 Test Cases

The following tests are conducted to measure mac learning of local as
well as remote.

5.1.1 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 X 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 in control plane.
 The data plane learning is measured using RFC 2889 section 5.8.
Sending frames to the limit of bridge domain of particular EVI.
Measure the time taken to learn all X mac in data plane/hardware.
The Range of MAC is known from RT and this is verified in DUT.

   b. Measure the time taken to send these X 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 CE. The traffic is unidirectional.Since CE
is working in bridge mode,frames will be send to ingress sub
interface of DUT.

Measurement

The DUT mac table must learn the X macs in data plane in T time
frame.The DUT must send type 2 routes to remote router in T' time
frame.Repeat the test and plot the data.The data plane measurement
is taken by considering DUT as black box the range of X mac is
known from RT and the same is learned in DUT, the time to learn
that is measured.

PBB-EVPN To check the time taken to learn the mac address in DUT

Objective:

To check the time taken to learn the mac address locally.

a. Send X 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.The data plane
learning is measured using RFC 2889 section 5.8.Sending frames to
the limit of bridge domain of particular EVI.Measure the time
taken to learn all X mac in data plane/hardware.The Range of
MAC is known from RT and this is verified in DUT.

Procedure:

Configure PBB-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 X macs in data plane in T time
frame. Repeat the test and plot the data.The data plane measurement
is taken by considering DUT as black box the range of X mac is
known from RT and the same is learned in DUT, the time to learn
that is measured.

5.1.2. To check the time taken to learn X macs from remote peer by DUT

Objective:

Send X frames with different SA and DA to DUT from R1 using
traffic generator.Measure the time taken to learn these X
 macs 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)
send the traffic to R1. The traffic is uni directional. There   wont
be any traffic flow from CE to DUT during this test.

Measurement:

The DUT mac table must learn the X mac address in T time frame.
Repeat these test and plot the data.

PBB-EVPN To check the time taken to learn X mac's from remote peer
      by DUT.

Objective:

Send X frames with different SA and DA to DUT from R1 using
traffic generator.Measure the time taken to learn these X macs from
remote peer and program the mac address table.

 Procedure:

Configure PBB-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 pbb-evpn table. For MHPE ESI
must be configured per IFD/Interface.Using RT(traffic generator)
send the traffic to R1. The traffic is uni directional. There   wont
be any traffic flow from CE to DUT during this test.

   Measurement:

   The DUT mac table must learn the X mac address in T time frame.
Repeat these test and plot the data.

   The following test cases are executed to measure the time taken to
   flush the mac table in case of an event

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

   Objective:

   Send X frames with different SA and DA to DUT from CE using
traffic generator.Wait for a while to learn all X mac address.
Then fail the DUT CE link and measure the time taken to flush these
X macs 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.In this traffic will be only send from
CE.

   Measurement:

    Measure the time taken for flushing these X mac address.Repeat
the test and plot the data.

   PBB-EVPN To check the time taken to flush the local entry due to CE
            link failure

   Objective:

   Send X frames with different SA and DA to DUT from CE using
traffic generator.Wait for a while to learn all X mac address.Then

    fail the DUT CE link and measure the time taken to flush these X
    macs from the mac table.

       Procedure:

        Configure PBB-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 pbb-evpn table. For MH PE
    ESI must   be configured per IFD/Interface. Using RT(traffic
    generator) to send   the traffic to the routers.In this traffic will
    be only send from CE.

       Measurement:

        The DUT mac table must learn the X mac address and measure the
    time taken for flushing these X mac address.

**5.1.4. To check the time taken by DUT to flush X routes learned from
    remote PE after R1 traffic generator link failure**

       Objective:

        Send X 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 R1.There wont be any traffic flowing to CE
    from RT.

       Measurement:

        Measure the time taken to flush X remote routes from mac table
    of DUT.Repeat the test and plot the data.

PBB-EVPN To check the time taken by DUT to flush X macs learned
 from remote PE after R1 traffic generator link failure

   Objective:

   Send X 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.The remote macs will be learned by Data plane,but the B-MAC
will be learned by control plane.

   Procedure:

  Configure PBB-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 pbb-evpn table.For MH PE
ESI must   be configured per IFD/Interface. Using RT(traffic
generator) to send   the traffic to the routers.In this traffic will
be only send from CE.

   Measurement:

   Measure the time taken to flush X remote macs from mac table of
DUT.

   The following test cases are executed to measure the mac ageing in
   locally learned and remote mac learned by control plane.

5.1.5. To measure the mac ageing time.

   Objective:

   Send X frames with different SA and DA to DUT from CE using
traffic generator.Wait to learn all X 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.The traffic will be flowing from CE
to DUT.There wont be any traffic from R1.

   Measurement:

   Measure the time taken to flush X mac address due to ageing.Repeat
the   test and plot the data.

    PBB-EVPN To measure the mac ageing time.

   Objective:

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

   Procedure:

   Configure PBB-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 mac 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 X mac address, measure the time
taken for flushing these X mac address due to ageing.

5.1.6. **To check the time taken by DUT to age X routes learned from
    remote PE after stopping the traffic at remote PE.**

      Objective:

      Send X 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 remove these macs 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 R1.There wont be any traffic from CE.

      Measurement:

      Measure the time taken to flush X remote macs from mac table of
    DUT due to ageing.Repeat the test and plot the data.

      PBB-EVPN To check the time taken by DUT to age X mac from remote
    PE after stopping the traffic at remote PE.

      Objective:

      Send X frames with different SA and DA to DUT from R1 using
    traffic generator.After stopping the traffic at remote PE(R1) traffic
      generator.Measure the time taken to remove these macs from DUT mac
     table.

      Procedure:

      Configure PBB-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 mac 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 the remote macs from mac table of
     DUT due to ageing.

The following tests are executed to measure the convergence time in
case of an event or by lerning the mac without any external trigger.

5.1.7. **To check the time taken by DUT to learn X routes from local and
X from remote and measure the time of flood from DUT.**

   Objective:

   Send X frames with different SA and DA to DUT from R1 using
traffic generator.Send X 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 2X in mac table and in control plane.Measure the flood
time period of DUT.

   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.The traffic is bi directional.

   Measurement:

   Measure the time taken to learn 2X routes in control and mac
address table in DUT and measure the flood time of DUT.Repeat the
test and plot the data.

   PBB-EVPN To check the time taken by DUT to learn X macs from
 local and X from remote and measure the time of flood from
DUT.

   Objective:

   Send X frames with different SA and DA to DUT from R1 using
traffic generator. Send X 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 2X in mac table.Measure the flood time period of   DUT.

Procedure:

Configure PBB-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 2X mac address table in DUT.   and
measure the flood time of DUT.Repeat the test and plot the data.

5.1.8. To measure the time taken to elect a new DF by adding a a MHPE.

Objective:

Send X frames from CE to DUT from traffic generator with
different SA and DA.Wait to learn all X mac address.Then add a new
router configured with evpn to the same ethernet segment.Configure
same ESI value which is configured in DUT and in MHPE1 on 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.Measure
the time taken to elect 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 MHPE 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.

PBB-EVPN To measure the time taken to elect a new DF by adding a a
MHPE.

  Objective:

  Send X frames from CE to DUT from traffic generator with
different SA and DA.Wait to learn all X mac address.Then   add a new
router 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.Measure the time taken to elect
the new   DF.

  Procedure:

  Configure PBB-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.

5.2   High Availability

     These tests are conducted to check after an event there wont be
  any change in functionality.

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

     Objective:

     Send X frames from CE to DUT from traffic generator with
  different SA and DA. Send X frames from traffic generator to R1
  with different SA and DA so that 2X mac address will be   learned in
  DUT. There is a bi directional traffic flow with X   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 be 0 traffic loss which is the ideal case,No
  change in the DF role.No withdraw of any routes.

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

     Objective:

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

     Procedure:

     Configure PBB-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 be 0 packet loss loss which is a ideal case,No change
in the DF role. No withdraw of any routes.

5.3 ARP/ND Scaling

   These tests are conducted to check the scaling parameter of arp/ND
of the DUT.

EVPN: To check the ARP/ND scale of the DUT when the gateway is
configured.

   Objective:

   Send X arp/icmpv6 request from RT to DUT,that with different
sender ip/ipv6 address to the same target gateway ip address.

   Procedure:

   Configure EPN 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 arp request to the DUT which has gateway configured.

   Measurement:

   The DUT must learn X mac+ip/mac+ipv6 and it must advertise the X
mac+ip/mac+ipv6 to the remote router.

5.4 Type 5 Route scaling

   These tests are conducted to scale the type 5 route or the IP
   prefixes in DUT.

   EVPN: To check the scale of ip prefixes advertised by DUT to the peer
   router.

     Objective:

   To check the scale of IP Prefixes advertised by the DUT to the peer
   router.

     Procedure:

     Configure EPN 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.Configure the X IRB sub interface
    in the DUT which is not extended to peer router.

     Measurement:

     The DUT must advertise X IP prefixes of the IRB to the peer
   router.

 6. Scale
 6.1. To Scale the DUT to N EVI and clear bgp in DUT with out traffic.

     Objective:

The main purpose of the test the DUT performance to scale N 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 MHPE,DUT 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.

PBB-EVPN To Scale the DUT to N PBB-EVPN instances and clear bgp in
DUT   without traffic.

Objective:

The main purpose of the test the DUT performance to scale N PBB-
EVPN instances.Then clear bgp neighbor.There should not be any loss
of routes or any crashes.

Procedure:

Configure PBB-EVPN instances 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 2,3 and 4 in DUT.

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

   Objective:

   The main purpose of the test the DUT performance to scale N EVI's
 with traffic. Then clear bgp neighbor.There should not be any loss
 of routes or any crashes. Send F frames from CE to DUT from
 traffic generator with different SA and DA for N EVI's. Send   F
 frames from traffic generator to R1 with different SA and DA   for N
 EVI's.so that 2F number of mac address will be learned in DUT.
 There is a bi directional traffic flow with F 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
 2F 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 2F mac address.Measure the time taken   to
learn 2F mac in DUT, measure the flood traffic time "t" of DUT

   PBB-EVPN To Scale the DUT to "N" PBB-EVPN instances and clear bgp
in DUT with traffic.Measure the convergence time

   Objective:

   The main purpose of the test the DUT performance to scale N pbb-
evpn   instances with traffic.Then clear bgp neighbor.There should
not be   any loss of routes or any crashes.Send F frames from CE to
DUT from traffic generator with different SA and DA for N pbb-evpn
instances.Send F frames from traffic generator to R1 with   different
SA and DA for N pbb-evpn instances.so that F mac address will be
learned in DUT.There is a bi directional traffic flow with F 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 2F macs in DUT.

    Procedure:

    Configure PBB-EVPN instances 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 2F mac address.Measure the time taken
  to learn 2F mac in DUT, measure the flood traffic time "t"   of DUT

 7. Soak Test

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

    Objective:

    The main purpose of the test the DUT performance to scale N EVI's
   with traffic. Then clear bgp neighbor. There should not be any
  loss   of routes or any crashes. Send F frames from CE to DUT from
   traffic generator with different SA and DA for N EVI's. Send   F
  frames from traffic generator to R1 with different SA and DA   for N
  EVI's.so that 2F mac address will be learned in DUT.   There is a bi
  directional traffic flow with F 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.

PBB-EVPN To Scale the DUT to N PBB-EVPN instances in DUT with
traffic and run the set up for 24hrs

   Objective:

   The main purpose of the test the DUT performance to scale N EVI's
 with traffic. Then clear bgp neighbor. There should not be any
loss of routes or any crashes.Send F frames from CE to DUT from
 traffic generator with different SA and DA for N EVI's.Send F
frames from traffic generator to R1 with different SA and DA for N
EVI's.so that 2F mac address will be learned in DUT.   There is a bi
directional traffic flow with F pps in each direction.Keep the
setup up and running for 24 hrs,take hourly CPU utilization,memory
usage.

   Procedure:

   Configure PBB-EVPN instances 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

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9. IANA Considerations

This memo includes no request to IANA.

10. Security Considerations

There is no additional consideration from RFC 6192.

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