SAG(static anycast gateway)

Overview:

The SAG(Static anycast gateway) feature for EVPN/VXLAN is a default gateway address mechanism that enables the use of the same gateway IP address across all the leaf switches that are part of a VXLAN network. This ensures that every leaf switch can function as the default gateway for the workloads directly connected to it from Host machines.

Please not the design of SAG between 202111 branch and 202211 branch are different.
In the 202111 design, SAG has its own interface for specifying the MAC and IP addresses.
And in the 202211 design, SAG can be directly enabled on a VLAN interface with specific MAC and IP addresses.

Symmetric IRB with SAG
Topology:
mceclip0.png

Procedure:
Step 1. Init FRR and set the loopback interface(reference Management port and front port ipv4/ipv6 and FRR init)

Step 2. Create the VLAN and IP binding as topology

SW 1:

```
admin@sonic:~$ sudo config vlan add 10
admin@sonic:~$ sudo config vlan add 1000
admin@sonic:~$ sudo config vlan member add -u 10 Ethernet0
admin@sonic:~$ sudo config interface ip add Ethernet48 10.1.0.2/31
```

SW 2:

```
admin@sonic:~$ sudo config vlan add 10
admin@sonic:~$ sudo config vlan add 1000
admin@sonic:~$ sudo config vlan member add -u 10 Ethernet0
admin@sonic:~$ sudo config interface ip add Ethernet48 10.1.0.3/31
```

Step 3. Configure VRF Setting

SW 1:

```
admin@sonic:~$ sudo config vrf add Vrf01
admin@sonic:~$ sudo config interface vrf bind Vlan10 Vrf01
admin@sonic:~$ sudo config interface vrf bind Vlan1000 Vrf01
```

SW 2:

```
admin@sonic:~$ sudo config vrf add Vrf01
admin@sonic:~$ sudo config interface vrf bind Vlan10 Vrf01
admin@sonic:~$ sudo config interface vrf bind Vlan1000 Vrf01
```

Step 4. Create Vxlan interface

SW 1:

```
admin@sonic:~$ sudo config vxlan add vtep 1.1.1.1
admin@sonic:~$ sudo config vxlan evpn_nvo add nvo vtep
admin@sonic:~$ sudo config vxlan map add vtep 10 100
admin@sonic:~$ sudo config vxlan map add vtep 1000 10000
```

SW 2:

```
admin@sonic:~$ sudo config vxlan add vtep 2.2.2.2
admin@sonic:~$ sudo config vxlan evpn_nvo add nvo vtep
admin@sonic:~$ sudo config vxlan map add vtep 10 100
```

```
admin@sonic:~$ sudo config vxlan map add vtep 1000 10000
```
Step 6: Set the layer3 VNI on both switches.

```
admin@sonic:~$ sudo config vrf add_vrf_vni_map Vrf01 10000
```
Step 7: Establish BGP environment for EVPN.

SW 1:

```
admin@sonic:~$ vtysh
Hello, this is FRRouting (version 8.0).
Copyright 1996-2005 Kunihiro Ishiguro, et al.
sonic# configure terminal
sonic(config)# router bgp 65100
sonic(config-router)# neighbor 10.1.0.3 remote-as 65100
sonic(config-router)# address-family ipv4 unicast
sonic(config-router-af)# network 1.1.1.1/32
sonic(config-router-af)# exit
sonic(config-router)# address-family l2vpn evpn
sonic(config-router-af)# neighbor 10.1.0.3 activate
sonic(config-router-af)# advertise-all-vni
sonic(config-router-af)# end
sonic# configure terminal
sonic(config)# vrf Vrf01
sonic(config-vrf)# vni 10000
sonic(config-vrf)# end
sonic# configure terminal
sonic(config)# router bgp 65100 vrf Vrf01
sonic(config-router)# address-family ipv4 unicast
sonic(config-router-af)# redistribute connected
sonic(config-router-af)# exit
sonic(config-router)# address-family l2vpn evpn
sonic(config-router-af)# advertise ipv4 unicast
sonic(config-router-af)# end
sonic# write
```
SW 2:

```
admin@sonic:~$ vtysh
Hello, this is FRRouting (version 8.0).
Copyright 1996-2005 Kunihiro Ishiguro, et al.
sonic# configure terminal
sonic(config)# router bgp 65100
sonic(config-router)# neighbor 10.1.0.2 remote-as 65100
sonic(config-router)# address-family ipv4 unicast
sonic(config-router-af)# network 2.2.2.2/32
sonic(config-router-af)# exit
sonic(config-router)# address-family l2vpn evpn
sonic(config-router-af)# neighbor 10.1.0.2 activate
sonic(config-router-af)# advertise-all-vni
sonic(config-router-af)# end
sonic# configure terminal
sonic(config)# vrf Vrf01
sonic(config-vrf)# vni 10000
sonic(config-vrf)# end
sonic# configure terminal
sonic(config)# router bgp 65100 vrf Vrf01
sonic(config-router)# address-family ipv4 unicast
sonic(config-router-af)# redistribute connected
sonic(config-router-af)# exit
sonic(config-router)# address-family l2vpn evpn
sonic(config-router-af)# advertise ipv4 unicast
sonic(config-router-af)# end
sonic# write
```
Step 8: Enable SAG on both switch

For 202111 branch

```
admin@sonic:~$ sudo config sag mac_address add 00:11:22:33:44:55
admin@sonic:~$ sudo config sag ipv4 enable
admin@sonic:~$ sudo config interface sag ip add Vlan10 192.168.10.254/24
```

For 202211 branch

```
admin@sonic:~$ sudo config static-anycast-gateway mac_address add
00:11:22:33:44:55
admin@sonic:~$ sudo config interface ip add Vlan10 192.168.10.254/24
admin@sonic:~$ sudo config vlan static-anycast-gateway enable 10
```

Step 9: Check the SAG status.

For 202111 branch

```
admin@sonic:~$ show sag

Static Anycast Gateway Information
MacAddress         IPv4   IPv6
------------------ ------ ------
00:11:22:33:44:55  enable N/A

admin@sonic:~$ show sag ip
Vlan Interface Name    IPv4 address/mask
---------------------  -------------------
Vlan10                 192.168.10.254/24
```

For 202211 branch

```
admin@sonic:~$ show static-anycast-gateway
Static Anycast Gateway Information
MacAddress         Interfaces
-----------------  ------------
00:11:22:33:44:55  Vlan10
```

Step 10: Check the interface status.

For 202111 branch

```
admin@sonic:~$ show ip int
Interface    Master    IPv4 address/mask    Admin/Oper    BGP Neighbor
Neighbor IP
-----------  --------  -------------------  ------------  --------------
-------------
Ethernet48             10.1.0.2/31          up/up         N/A             N/A
Loopback0              1.1.1.1/32           up/up         N/A             N/A
Sag10        Vrf01     192.168.10.254/24    up/up         N/A             N/A
docker0                240.127.1.1/24       up/down       N/A             N/A
eth0                   188.188.36.204/16    up/up         N/A             N/A
lo                     127.0.0.1/16         up/up         N/A             N/A
```

For 202211 branch

```
admin@sonic:~$ show ip int
Interface    Master    IPv4 address/mask    Admin/Oper    BGP Neighbor
Neighbor IP
-----------  --------  -------------------  ------------  --------------
-------------
Ethernet48             10.1.0.2/31          up/up         N/A             N/A
```

Loopback0		1.1.1.1/32	up/up	N/A	N/A
Vlan10	Vrf01	192.168.10.254/24	up/up	N/A	N/A
docker0		240.127.1.1/24	up/down	N/A	N/A
eth0		188.188.36.204/16	up/up	N/A	N/A
lo		127.0.0.1/16	up/up	N/A	N/A