OSPF(Open Shortest Path First)

Create OSPF on Backbone area
Topology:
image2021-2-3_18-42-10.png

Procedure:
Step 1. Set the Vlan and ip as topology(reference Management-and-front-port-IPv4-IPv6-Address and VLAN-Inter-VLAN-Routing)

Step 2. Init FRR(reference FRRouting-and-config-initialization)

Step 3. Login to vtysh to do the ospf setting.

OS1:

```
admin@sonic:~$ vtysh
Hello, this is FRRouting (version 7.2.1-sonic).
Copyright 1996-2005 Kunihiro Ishiguro, et al.
sonic#
sonic# config
sonic(config)# router ospf
sonic(config-router)# network 10.0.0.0/31 area 0
sonic(config-router)# network 192.168.10.0/24 area 0
sonic(config-router)# network 192.168.20.0/24 area 0
sonic(config-router)# network 192.168.30.0/24 area 0
```

OS2:

```
admin@sonic:~$ vtysh
Hello, this is FRRouting (version 7.2.1-sonic).
Copyright 1996-2005 Kunihiro Ishiguro, et al.
sonic#
sonic# config
sonic(config)# router ospf
sonic(config-router)# network 10.0.0.0/31 area 0
sonic(config-router)# network 192.168.5.0/24 area 0
sonic(config-router)# network 192.168.15.0/24 area 0
sonic(config-router)# network 192.168.25.0/24 area 0
```

Step 4. Check OSPF neighbors

OS1:

```
sonic# show ip ospf neighbor
Neighbor ID     Pri State           Dead Time Address         Interface
RXmtL RqstL DBsmL
192.168.25.1      1 Full/DR           31.440s 10.0.0.1
Ethernet56:10.0.0.0      0     0     0
```

OS2:

```
sonic# show ip ospf neighbor
Neighbor ID     Pri State           Dead Time Address         Interface
RXmtL RqstL DBsmL
188.188.98.39     1 Full/Backup       33.721s 10.0.0.0
Ethernet56:10.0.0.1      0     0     0
```

Step 5. Check routing table

OS1:

```
sonic# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, E - EIGRP, N - NHRP,
       T - Table, v - VNC, V - VNC-Direct, A - Babel, D - SHARP,
```

```
       F - PBR, f - OpenFabric,
       > - selected route, * - FIB route, q - queued route, r - rejected route
K>* 0.0.0.0/0 [0/202] via 188.188.1.1, eth0, 00:07:45
C>* 1.1.1.1/32 is directly connected, Loopback0, 00:07:25
O   10.0.0.0/31 [110/10] is directly connected, Ethernet56, 00:06:42
C>* 10.0.0.0/31 is directly connected, Ethernet56, 00:07:25
C>* 188.188.0.0/16 is directly connected, eth0, 00:07:46
O>* 192.168.5.0/24 [110/20] via 10.0.0.1, Ethernet56, 00:06:32
O   192.168.10.0/24 [110/10] is directly connected, Vlan10, 00:04:54
C>* 192.168.10.0/24 is directly connected, Vlan10, 00:07:24
O>* 192.168.15.0/24 [110/20] via 10.0.0.1, Ethernet56, 00:06:32
O   192.168.20.0/24 [110/10] is directly connected, Vlan20, 00:04:50
C>* 192.168.20.0/24 is directly connected, Vlan20, 00:07:24
O>* 192.168.25.0/24 [110/20] via 10.0.0.1, Ethernet56, 00:06:32
O   192.168.30.0/24 [110/10] is directly connected, Vlan30, 00:04:47
C>* 192.168.30.0/24 is directly connected, Vlan30, 00:07:24
OS2:

sonic# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, E - EIGRP, N - NHRP,
       T - Table, v - VNC, V - VNC-Direct, A - Babel, D - SHARP,
       F - PBR, f - OpenFabric,
       > - selected route, * - FIB route, q - queued route, r - rejected route
K>* 0.0.0.0/0 [0/202] via 188.188.1.1, eth0, 02:15:38
C>* 2.2.2.2/32 is directly connected, Loopback0, 02:15:18
O   10.0.0.0/31 [110/10] is directly connected, Ethernet56, 00:08:47
C>* 10.0.0.0/31 is directly connected, Ethernet56, 00:08:47
C>* 188.188.0.0/16 is directly connected, eth0, 02:15:39
O   192.168.5.0/24 [110/10] is directly connected, Vlan5, 00:35:34
C>* 192.168.5.0/24 is directly connected, Vlan5, 00:35:34
O>* 192.168.10.0/24 [110/20] via 10.0.0.0, Ethernet56, 00:06:14
O   192.168.15.0/24 [110/10] is directly connected, Vlan15, 00:35:34
C>* 192.168.15.0/24 is directly connected, Vlan15, 00:35:34
O>* 192.168.20.0/24 [110/20] via 10.0.0.0, Ethernet56, 00:06:10
O   192.168.25.0/24 [110/10] is directly connected, Vlan25, 00:35:34
C>* 192.168.25.0/24 is directly connected, Vlan25, 00:35:34
O>* 192.168.30.0/24 [110/20] via 10.0.0.0, Ethernet56, 00:06:07


Setup authentication with simple password(Clear-text) for OSPF
Procedure:
Step 1. Base on "Example 1" setting

Step 2. Modify hello time and dead time(This step is optional)

OS1 and OS2 setting in FRR:

sonic# configure
sonic(config)# interface Ethernet56
sonic(config-if)# ip ospf hello-interval 20
sonic(config-if)# ip ospf dead-interval 20
Note. Default time about "hello-interval" and "dead-interval" is 40s.

Step 3. Enable authentication on router seting.

OS1 and OS2 setting in FRR:

sonic# configure
sonic(config)# router ospf
sonic(config-router)# area 0 authentication
Step 4. Enable and set the key on connect interface.

sonic# configure
```

```
sonic(config)# interface Ethernet56
sonic(config-if)# ip ospf authentication
sonic(config-if)# ip ospf authentication-key edgecorets
```
Step 5. Check the authentication with simple password, we can capture packet to check the OSPF header information.

image2021-2-4_10-49-4.png

Caution: In current version, the authentication information can't be check by "show ip ospf interface"

Setup authentication with message-digest for OSPF
Procedure:
Step 1. Base on "Example 1" setting

Step 2. Enable authentication in router setting.

OS1 and OS2 in FRR:

```
sonic# configure
sonic(config)# router ospf
sonic(config-router)# area 0 authentication message-digest
```
Step 3. Set the key on connect interface.

```
sonic# configure
sonic(config)# interface Ethernet56
sonic(config-if)# ip ospf message-digest-key 1 md5 edgecorets
```
Step 4. Check the authentication with simple password, we can capture packet to check the OSPF header information.

image2021-2-4_10-59-59.png
Caution: In current version, the authentication information can't be check by "show ip ospf interface"

Setup OSPF with virtual link
Topology:
image2021-2-4_15-34-30.png

Procedure:
Step 1. Set the Vlan and ip as topology(reference Management-and-front-port-IPv4-IPv6-Address and VLAN-Inter-VLAN-Routing)

Step 2. Init FRR(reference FRRouting-and-config-initialization)

Step 3. Set the OSPF on switchs.

OS1:

```
admin@sonic:~$ vtysh
Hello, this is FRRouting (version 7.2.1-sonic).
Copyright 1996-2005 Kunihiro Ishiguro, et al.
sonic#
sonic# config
sonic(config)# router ospf
sonic(config-router)# ospf router-id 1.1.1.1
sonic(config-router)# network 10.0.0.0/31 area 0
sonic(config-router)# network 192.168.10.0/24 area 0
sonic(config-router)# network 192.168.20.0/24 area 0
sonic(config-router)# network 192.168.30.0/24 area 0
```
OS2:

```
admin@sonic:~$ vtysh
Hello, this is FRRouting (version 7.2.1-sonic).
Copyright 1996-2005 Kunihiro Ishiguro, et al.
```

```
sonic#
sonic# config
sonic(config)# router ospf
sonic(config-router)# ospf router-id 2.2.2.2
sonic(config-router)# network 10.0.0.0/31 area 0
sonic(config-router)# network 192.168.5.0/24 area 1
sonic(config-router)# network 192.168.15.0/24 area 1
sonic(config-router)# network 192.168.25.0/24 area 1
OS3:

admin@sonic:~$ vtysh
Hello, this is FRRouting (version 7.2.1-sonic).
Copyright 1996-2005 Kunihiro Ishiguro, et al.
sonic#
sonic# config
sonic(config)# router ospf
sonic(config-router)# ospf router-id 3.3.3.3
sonic(config-router)# network 192.168.5.0/24 area 1
sonic(config-router)# network 192.168.16.0/24 area 2
sonic(config-router)# network 192.168.26.0/24 area 2
Step 4. Check the routing in OS1, we can find it won't have OS3(area 2) routing
information. It is caused by OS3 didn't connect to area0 directly.

sonic# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, E - EIGRP, N - NHRP,
       T - Table, v - VNC, V - VNC-Direct, A - Babel, D - SHARP,
       F - PBR, f - OpenFabric,
       > - selected route, * - FIB route, q - queued route, r - rejected route
K>* 0.0.0.0/0 [0/202] via 188.188.1.1, eth0, 00:25:48
C>* 1.1.1.1/32 is directly connected, Loopback0, 00:25:28
O   10.0.0.0/31 [110/10] is directly connected, Ethernet56, 00:25:26
C>* 10.0.0.0/31 is directly connected, Ethernet56, 00:25:26
C>* 188.188.0.0/16 is directly connected, eth0, 00:25:49
O>* 192.168.5.0/24 [110/20] via 10.0.0.1, Ethernet56, 00:00:08
O   192.168.10.0/24 [110/10] is directly connected, Vlan10, 00:25:27
C>* 192.168.10.0/24 is directly connected, Vlan10, 00:25:27
O>* 192.168.15.0/24 [110/20] via 10.0.0.1, Ethernet56, 00:00:08
O   192.168.20.0/24 [110/10] is directly connected, Vlan20, 00:25:27
C>* 192.168.20.0/24 is directly connected, Vlan20, 00:25:27
O>* 192.168.25.0/24 [110/20] via 10.0.0.1, Ethernet56, 00:00:08
O   192.168.30.0/24 [110/10] is directly connected, Vlan30, 00:25:27
C>* 192.168.30.0/24 is directly connected, Vlan30, 00:25:27
Step 5. Create a virtual link between OS2 and OS3.

OS2:

sonic# config
sonic(config)# router ospf
sonic(config-router)# area 1 virtual-link 3.3.3.3
OS3:

sonic# configure
sonic(config)# router ospf
sonic(config-router)# area 1 virtual-link 2.2.2.2
Step 6. Check all routing information on switches, we can find the routing from
OS3 to OS1 is ok.

OS1:

sonic# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, E - EIGRP, N - NHRP,
       T - Table, v - VNC, V - VNC-Direct, A - Babel, D - SHARP,
```

```
       F - PBR, f - OpenFabric,
       > - selected route, * - FIB route, q - queued route, r - rejected route
K>* 0.0.0.0/0 [0/202] via 188.188.1.1, eth0, 00:06:34
C>* 1.1.1.1/32 is directly connected, Loopback0, 00:06:14
O   10.0.0.0/31 [110/10] is directly connected, Ethernet56, 00:05:28
C>* 10.0.0.0/31 is directly connected, Ethernet56, 00:06:11
C>* 188.188.0.0/16 is directly connected, eth0, 00:06:35
O>* 192.168.5.0/24 [110/20] via 10.0.0.1, Ethernet56, 00:00:41
O   192.168.10.0/24 [110/10] is directly connected, Vlan10, 00:06:13
C>* 192.168.10.0/24 is directly connected, Vlan10, 00:06:13
O>* 192.168.15.0/24 [110/20] via 10.0.0.1, Ethernet56, 00:00:41
O>* 192.168.16.0/24 [110/30] via 10.0.0.1, Ethernet56, 00:00:23
O   192.168.20.0/24 [110/10] is directly connected, Vlan20, 00:06:13
C>* 192.168.20.0/24 is directly connected, Vlan20, 00:06:13
O>* 192.168.25.0/24 [110/20] via 10.0.0.1, Ethernet56, 00:00:41
O>* 192.168.26.0/24 [110/30] via 10.0.0.1, Ethernet56, 00:00:23
O   192.168.30.0/24 [110/10] is directly connected, Vlan30, 00:06:13
C>* 192.168.30.0/24 is directly connected, Vlan30, 00:06:13
OS2:

sonic# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, E - EIGRP, N - NHRP,
       T - Table, v - VNC, V - VNC-Direct, A - Babel, D - SHARP,
       F - PBR, f - OpenFabric,
       > - selected route, * - FIB route, q - queued route, r - rejected route
K>* 0.0.0.0/0 [0/202] via 188.188.1.1, eth0, 00:07:12
C>* 2.2.2.2/32 is directly connected, Loopback0, 00:06:51
O   10.0.0.0/31 [110/10] is directly connected, Ethernet56, 00:06:51
C>* 10.0.0.0/31 is directly connected, Ethernet56, 00:06:51
C>* 188.188.0.0/16 is directly connected, eth0, 00:07:12
O   192.168.5.0/24 [110/10] is directly connected, Vlan5, 00:03:56
C>* 192.168.5.0/24 is directly connected, Vlan5, 00:06:36
O>* 192.168.10.0/24 [110/20] via 10.0.0.0, Ethernet56, 00:01:23
O   192.168.15.0/24 [110/10] is directly connected, Vlan15, 00:06:36
C>* 192.168.15.0/24 is directly connected, Vlan15, 00:06:36
O>* 192.168.16.0/24 [110/20] via 192.168.5.2, Vlan5, 00:00:16
O>* 192.168.20.0/24 [110/20] via 10.0.0.0, Ethernet56, 00:01:23
O   192.168.25.0/24 [110/10] is directly connected, Vlan25, 00:06:36
C>* 192.168.25.0/24 is directly connected, Vlan25, 00:06:36
O>* 192.168.26.0/24 [110/20] via 192.168.5.2, Vlan5, 00:00:16
O>* 192.168.30.0/24 [110/20] via 10.0.0.0, Ethernet56, 00:01:23
OS3:

sonic# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, E - EIGRP, N - NHRP,
       T - Table, v - VNC, V - VNC-Direct, A - Babel, D - SHARP,
       F - PBR, f - OpenFabric,
       > - selected route, * - FIB route, q - queued route, r - rejected route
K>* 0.0.0.0/0 [0/0] via 188.188.1.1, eth0, 00:07:56
C>* 3.3.3.3/32 is directly connected, Loopback0, 00:07:39
O>* 10.0.0.0/31 [110/20] via 192.168.5.1, Vlan5, 00:00:13
C>* 188.188.0.0/16 is directly connected, eth0, 00:07:56
O   192.168.5.0/24 [110/10] is directly connected, Vlan5, 00:07:13
C>* 192.168.5.0/24 is directly connected, Vlan5, 00:07:38
O>* 192.168.10.0/24 [110/30] via 192.168.5.1, Vlan5, 00:00:13
O>* 192.168.15.0/24 [110/20] via 192.168.5.1, Vlan5, 00:00:23
O   192.168.16.0/24 [110/10] is directly connected, Vlan16, 00:07:38
C>* 192.168.16.0/24 is directly connected, Vlan16, 00:07:38
O>* 192.168.20.0/24 [110/30] via 192.168.5.1, Vlan5, 00:00:13
O>* 192.168.25.0/24 [110/20] via 192.168.5.1, Vlan5, 00:00:23
O   192.168.26.0/24 [110/10] is directly connected, Vlan26, 00:07:38
C>* 192.168.26.0/24 is directly connected, Vlan26, 00:07:38
```

```
O>* 192.168.30.0/24 [110/30] via 192.168.5.1, Vlan5, 00:00:13
```