Selective QinQ

QinQ is a feature designed for service providers who carry traffic of multiple customers across their networks and are required to maintain the VLAN and Layer 2 protocol configurations of each customer without impacting the traffic of other customers. The SPVLAN (Service Provider VLAN) tags will be inserted in the customer frames when they enter the service provider network, and the tags will be stripped after they leave the service provider network.

Select QinQ configuration
Topology:
QINQ.png

Pre-configuration:
Ethernet0 on AS7326-56X down-speed to 10G.(refer to [Edgecore SONiC] Switch Port Attributes)

```
admin@AS7326-56X:~$ show interfaces status Ethernet0
  Interface    Lanes    Speed    MTU    Oper FEC         Alias    Vlan    Oper
Admin    ProtoDown    Eff Admin            Type    Asym PFC    Oper Speed
-----------  -------  -------  -----  ----------  -------------  ------  ------
-------  -----------  -----------  --------------  ----------  ------------
  Ethernet0        3      10G   9100        none  Eth6/3(Port1)  routed      up
up        False           up  SFP/SFP+/SFP28         N/A           10G
```

VLAN setting as topology, all of connect ports are VLAN100(service VLAN) member. (refer to [Edgecore SONiC] VLAN & Inter-VLAN Routing)
AS7326-56X:

```
admin@AS7326-56X:~$ show vlan brief
+-----------+--------------+------------+-----------+----------+--------------
+----------------------------+
|   VLAN ID | IP Address   | Ports      | Port      | Proxy    | DHCP Helper   |
DHCP Relay Configuration   |
|           |              |            | Tagging   | ARP      | Address       |
|
+===========+==============+============+===========+==========+===============+
============================+
|       100 |              | Ethernet0  | tagged    | disabled |               |
Source Interface:          |
|           |              | Ethernet48 | tagged    |          |               |
Link Selection:            |
|           |              |            |           |          |               |
Server Vrf:                |
|           |              |            |           |          |               |
Server ID Override:        |
+-----------+--------------+------------+-----------+----------+--------------
+----------------------------+
```

AS7726-32X:

```
admin@AS7726-32X:~$ show vlan brief
+-----------+--------------+------------+-----------+----------+--------------
+----------------------------+
|   VLAN ID | IP Address   | Ports      | Port      | Proxy    | DHCP Helper   |
DHCP Relay Configuration   |
|           |              |            | Tagging   | ARP      | Address       |
|
+===========+==============+============+===========+==========+===============+
============================+
|       100 |              | Ethernet0  | tagged    | disabled |               |
Source Interface:          |
|           |              | Ethernet4  | tagged    |          |               |
Link Selection:            |
|           |              |            |           |          |               |
Server Vrf:                |
|           |              |            |           |          |               |
```

```
Server ID Override:        |
+-----------+-------------+------------+-----------+---------+--------------
+----------------------------+
```

Expect result:
The traffic can be forwarding between PC1 and PC2 with VLAN10 tag.
The traffic between AS7326-56X and AS7726-32X are double tag.(Service tag is 100 and customer tag is 10)
Procedure:
Before the 202012.3 versions, please follow below the steps to set the QinQ.

Steps 1. Create a JSON file to select the QinQ configuration for the input port. When you enter traffic using the VLAN10 tag, it pushes the VLAN100 tag and forwards it according to the MAC address table. When exiting from the port, VLAN100 is popped and output.

AS7326-56X:

```
admin@AS7326-56X:~$ cat qinq.json
{
    "VLAN_STACKING": {
        "Ethernet0|ingress|10": {
            "action": "push",
            "s_vlanid": "100"
        },
        "Ethernet0|egress|100": {
            "action": "pop"
        }
    }
}
```

AS7726-32X:

```
admin@AS7726-32X:~$ cat qinq.json
{
    "VLAN_STACKING": {
        "Ethernet4|ingress|10": {
            "action": "push",
            "s_vlanid": "100"
        },
        "Ethernet4|egress|100": {
            "action": "pop"
        }
    }
}
```

Steps 2. Apply the configuration with "config load"

AS7326-56X:

```
admin@AS7326-56X:~$ sudo config load qinq.json -y

Running command: /usr/local/bin/sonic-cfggen -j qinq.json --write-to-db
```

AS7726-32X:

```
admin@AS7726-32X:~$ sudo config load qinq.json -y
Running command: /usr/local/bin/sonic-cfggen -j qinq.json --write-to-db
```

202012.3 or later version support CLI, here's the CLI for setting QinQ.
AS7326-56X:

```
admin@AS7326-56X:~$ sudo config vlan-stacking add Ethernet0 ingress 10 push 100
admin@AS7326-56X:~$ sudo config vlan-stacking add Ethernet0 egress 100 pop
```

AS7726-32X:

```
admin@AS7726-32X:~$ sudo config vlan-stacking add Ethernet4 ingress 10 push 100
admin@AS7726-32X:~$ sudo config vlan-stacking add Ethernet4 egress 100 pop
```

Check status:

```
admin@AS7326-56X:~$ show vlan-stacking
Interface   Stage   Match VLAN   Action     Apply VLAN
----------- ------- ------------ -------- ------------
```

```
Ethernet0   egress           100 pop
Ethernet0   ingress           10 push             100
```

Result:
MAC table learning:
AS7326-56X:

```
admin@AS7326-56X:~$ show mac
  No.    Vlan  MacAddress         Port         Type
-----  ------  -----------------  ----------  -------
    1     100  8C:EA:1B:30:DA:4F  Ethernet0   Dynamic
    2     100  8C:EA:1B:30:DA:50  Ethernet48  Dynamic
Total number of entries 2
```

AS7726-32X:

```
admin@AS7726-32X:~$ show mac
  No.    Vlan  MacAddress         Port        Type
-----  ------  -----------------  ---------  -------
    1     100  8C:EA:1B:30:DA:50  Ethernet4  Dynamic
    2     100  8C:EA:1B:30:DA:4F  Ethernet0  Dynamic
Total number of entries 2
```

Packet capture between AS7326-56X and AS7726-32X.
QQ.png

Selective QinQ configuration with TPID
Topology:

mceclip0.png

Pre-configuration:
Refer to the configurations in "Selective QinQ configuration".

Expect result:
The traffic can be forwarded between PC1 and PC2 with VLAN10 tag.
The traffic between AS7326-56X and AS7726-32X is double tag. (Service tag is 100 with TPID is 0x9100 and customer tag is 10)
Procedure:
Steps 1. Modify TPID on ports that connect between AS7326-56X and AS7726-32X.

AS7326-56X:

```
admin@AS7326-56X:~$ sudo config interface tpid Ethernet48 0x9100
```

AS7726-32X:

```
admin@AS7726-32X:~$ sudo config interface tpid Ethernet0 0x9100
```

Note: there is Error handling for this command, please refer to "CLI Error handling with TPID configuration".

Result:
MAC table learning:
AS7326-56X:

```
admin@AS7326-56X:~$ show mac
  No.    Vlan  MacAddress         Port         Type
-----  ------  -----------------  ----------  -------
    1     100  8C:EA:1B:30:DA:4F  Ethernet0   Dynamic
    2     100  8C:EA:1B:30:DA:50  Ethernet48  Dynamic
Total number of entries 2
```

AS7726-32X:

```
admin@AS7726-32X:~$ show mac
  No.    Vlan  MacAddress         Port        Type
```

```
-----  ------  -----------------  ---------  -------
    1     100  8C:EA:1B:30:DA:50  Ethernet4  Dynamic
    2     100  8C:EA:1B:30:DA:4F  Ethernet0  Dynamic
Total number of entries 2
TPID configuration status:
AS7326-56X:
admin@AS7326-56X:~$ show interface tpid Ethernet48
Interface           Alias  Oper   Admin   TPID
----------- ------------- ------ ------- ------
Ethernet48  Eth49(Port49)     up      up 0x9100
admin@AS7326-56X:~$ show interface tpid Ethernet0
Interface           Alias  Oper  Admin    TPID
----------- ------------- ------ ------- ------
Ethernet0   Eth6/3(Port1)     up      up   N/A
AS7726-32X:
admin@AS7726-32X:~$ show interface tpid Ethernet0
Interface           Alias  Oper   Admin   TPID
----------- ------------- ------ ------- ------
Ethernet0   Eth1/1(Port1)     up      up 0x9100
admin@AS7726-32X:~$ show interface tpid Ethernet4
Interface          Alias   Oper   Admin   TPID
----------- ------------- ------ ------- ------
Ethernet4   Eth2/1(Port2)     up      up   N/A
```

CLI Error handling with TPID configuration
There is a warning message when the system isn't ready and configures the TPID by CLI.

```
admin@SONiC:~$ sudo config interface tpid Ethernet64 0x9200
System not ready to accept TPID config. Please try again later.
```

There is a warning message when we configure the TPID on the device which didn't support TPID configuration on LAG.

```
admin@SONiC:~$ sudo config interface tpid PortChannel0002 0x9200
HW is not capable to support PortChannel TPID config.
```

Once a port is already bound as part of a LAG, TPID configure directly to the LAG member port is not allowed or it will trigger the warning message.

```
admin@SONiC:~$ sudo config interface tpid Ethernet4 0x9200
Ethernet4 is already member of PortChannel0002. Set TPID NOT allowed.
```

TPID values support: 0x8100 (default), 0x9100, 0x9200, and 0x88A8. once the user attempts to configure any TPID value other than these 4 values, it will trigger the warning message.

```
admin@SONiC:~$ sudo config interface tpid Ethernet64 0x0800
TPID 0x0800 is not allowed. Allowed: 0x8100, 0x9100, 0x9200, or 0x88A8.
```