SONiC End-to-End Test

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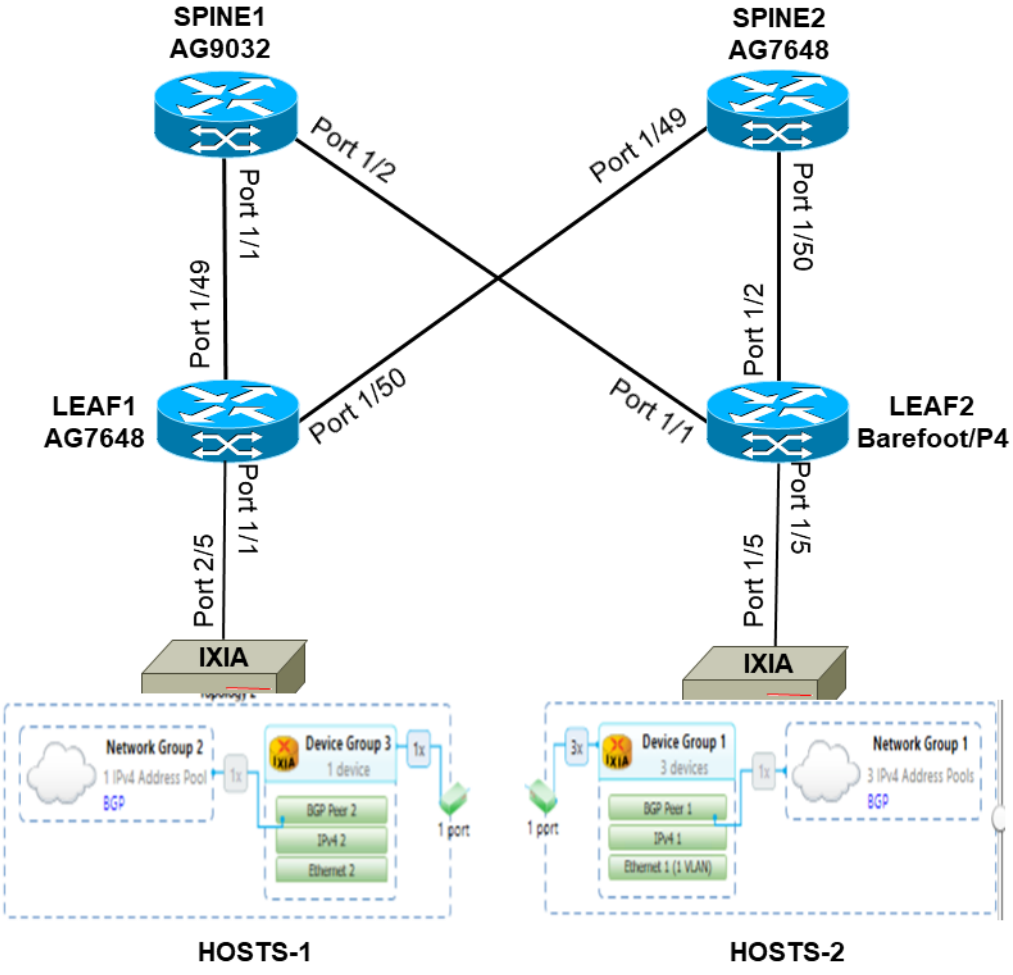
Contents

Background

This document covers the end-to-end L2/L3 system testing of SONiC NOS on Barefoot/P4 switch/router. The L3 test setup is configured with BGP routing in the LEAF-SPINE topology.

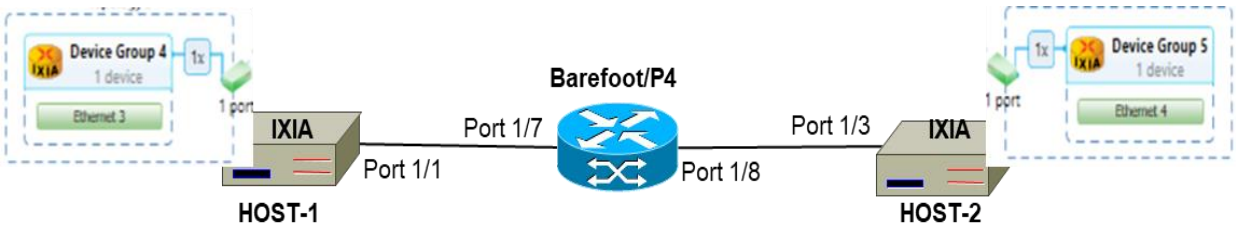
L3 Network Topology



Topology Notes

Device	ASN	Lo IP Address	Port:IP Address	Image
SPINE1	65001	10.10.2.1	1/1:10.100.1.2/24 1/2:10.100.2.2/24	SONiC
SPINE2	65002	10.10.2.2	1/49: 10.100.3.2/24 1/50:10.100.4.2/24	Cumulus Linux 3.5.0
LEAF1	64515	10.10.1.1	1/49:10.100.1.1/24 1/50:10.100.3.1/24 1/1:10.101.1.1/24	Cumulus Linux 3.5.0
LEAF2	64516	10.10.1.2	1/1:10.100.2.1/24 1/2:10.100.4.1/24 1/5: 10.200.1.1/24	SONiC
IXIA-1	64515	-	2/5:10.101.1.2/24	IxNetwork
IXIA-2	64516	-	1/5:10.200.1.2/24	IxNetwork
HOSTS-1	-	-	101.1.1.X/24	-
HOSTS-2	-	-	200.1.1.x/32	-

L2 Network Topology



Topology Notes

Device	Port	Image
AG9064	1/7, 1/8	SONiC
HOST-1	1/1	IxNetwork
HOST-2	1/3	IxNetwork

Test Cases and Findings

Test Case	Reference Topology	Description	Result	Jira Bug	Comments
1	L3	Configure BGP and multiple VLANs on LEAF2 for multiple hosts. Verify that the BGP routes get propagated across the network topology and the configured timers (keepalive and hold time) are reflected correctly.	Passed with exception	SON-4 SON-6 SON-12	CLIs used: ***show ip route*** ***show ip bgp summary |*** ***neighbors***
2	L3	Send bi-directional L3 traffic of around 80% of the link bandwidth from Ixia and then verify the following: • No packet drops, errors, overflow. • The interfaces statistics reflect the traffic rates. • CPU and memory utilization is normal. • ECMP – traffic is spread across the available traffic paths. • Interfaces statistics can be cleared.	Passed with exception	SON-8	CLIs used: ***show interfaces counters*** ***show processes cpu*** ***sonic-clear counters***
3	L3	While traffic is running, impair a link on SPINE2 over which traffic is flowing. Ensure the	Passed		CLI used: ***sudo config interface shutdown***

		following: • Traffic gets redirected over another path while the interface is impaired. • Restore the interface and observe that the traffic is again flowing over all the available paths.			***/ startup <interface name>*** ***show ip route*** ***show interfaces status / summary*** ***show interfaces counters***
4	L3	Flap BGP and ensure the routes recover.	Passed		CLIs used: ***sonic-clear ip bgp*** ***show ip bgp summary***
5	L2	Send bi-directional L2 traffic of around 90% of the link bandwidth from Ixia and then verify the following: • No packet drops, errors, overflow. • The interfaces statistics reflect the traffic rates. • CPU and memory utilization is normal. • ECMP – traffic is spread across the available traffic paths.	Passed	SON-8	CLIs used: ***show interfaces counters*** ***show processes cpu*** ***sonic-clear counters***
6	L2/L3	Longevity test: Keep traffic running overnight and then ensure the following: • The memory/cpu usage remain at normal levels.	Passed		CLIs used: ***show interfaces counters*** ***show processes cpu*** ***sonic-clear***

		• No packet drops, errors, overflow. • The interfaces statistics reflect the traffic rates. • CPU and memory utilization is normal.			***counters***

Network Configurations

Initial Switch/Router Setup

1. Refer to https://github.com/DeltaProducts/SolutionCenter/blob/master/cumulus-linux-dc-whitepaper-v2.pdf for setting up the switches running Cumulus Linux.
2. Log into the switches running Cumulus Linux using the default credentials:
   username: ***cumulus***
   password: ***CumulusLinux!***
3. Refer to https://github.com/Azure/SONiC/wiki/Quick-Start for loading SONiC images.
4. Log into the switches running SONiC using the default credentials:
   username: ***admin***
   password: ***YourPaSsWoRd***

LEAF1 Configurations

1. Execute the following commands to add the networking configurations on the **LEAF1** switch:
   net add interface eth0 ip address 10.62.2.38/24
   net add interface eth0 ip gateway 10.62.2.254
   net add interface swp1 ip address 10.101.1.1/24

net add interface swp49 ip address 10.100.1.1/24
net add interface swp50 ip address 10.100.3.1/24
net add loopback lo ip address 10.10.1.1/32
net add hostname AG7648-38-LEAF1
net add interface swp1-39,41-54 breakout 1x
net add bgp autonomous-system 64515
net add bgp router-id 10.10.1.1
net add bgp timers 10 30
net add bgp neighbor 10.100.1.2 remote-as external
net add bgp neighbor 10.100.3.2 remote-as external
net add bgp neighbor 10.101.1.2 remote-as internal
net add bgp ipv4 unicast network 10.10.1.1/32
net add bgp ipv4 unicast network 10.100.1.0/24
net add bgp ipv4 unicast network 10.100.3.0/24
net add bgp ipv4 unicast network 10.101.1.0/24
net add bgp ipv4 unicast neighbor 10.100.1.2 next-hop-self
net add bgp ipv4 unicast neighbor 10.100.3.2 next-hop-self
net add time zone US/Pacific-New
net add dns nameserver ipv4 10.62.2.1

 # Display the configurations for review before committing
sudo net pending

 # Commit the configurations
sudo net commit

 # Display the configurations
sudo net show configuration

The above configurations using NCLU would produce the following in **/etc/network/interfaces** and **/etc/frr/frr.conf** files:

/etc/network/interfaces

```
source /etc/network/interfaces.d/*.intf

# The loopback network interface
auto lo
iface lo inet loopback
        address 10.10.1.1/32

# The primary network interface
auto eth0
iface eth0
        address 10.62.2.38/24
        gateway 10.62.2.254

auto swp1
iface swp1
        address 10.101.1.1/24

auto swp49
iface swp49
        address 10.100.1.1/24

auto swp50
iface swp50
        address 10.100.3.1/24
```

/etc/frr/frr.conf

```
hostname AG7648-38-LEAF1
username cumulus nopassword
!
```

```
service integrated-vtysh-config
!
log syslog informational
!
interface swp1
 ipv6 nd ra-interval 10
 no ipv6 nd suppress-ra
!
interface swp49
 ipv6 nd ra-interval 10
 no ipv6 nd suppress-ra
!
router bgp 64515
 bgp router-id 10.10.1.1
 coalesce-time 1200
 timers bgp 10 30
 neighbor 10.100.1.2 remote-as external
 neighbor 10.100.3.2 remote-as external
 neighbor 10.101.1.2 remote-as internal
 !
 address-family ipv4 unicast
  network 10.10.1.1/32
  network 10.100.1.0/24
  network 10.100.3.0/24
  network 10.101.1.0/24
  neighbor 10.100.1.2 next-hop-self
  neighbor 10.100.3.2 next-hop-self
 exit-address-family
!
```

2. If the **/etc/network/interfaces** or the **/etc/frr/frr.conf** file was edited, execute the ***sudo systemctl restart switchd*** to activate the configurations.

SPINE1 Configurations

Copy the following into ***/etc/sonic/config_db.json*** and then reboot the system.

```
{
    "onie_skip_ethmgmt_macs": "no",
    "onie_platform": "x86_64-delta_ag9032v1-r0",
    "DEVICE_METADATA": {
        "localhost": {
            "hwsku": "Delta-ag9032v1",
            "hostname": "AG9032-54-SONIC-SPINE1",
            "mac": "00:18:23:30:e6:2e",
            "bgp_asn": "65001",
            "deployment_id": null,
            "type": "SpineRouter"
        }
    },
    "BGP_PEER_RANGE": {},
    "onie_machine": "delta_ag9032v1",
    "PORT": {
        "Ethernet0": {
            "alias": "hundredGigE1/1",
            "lanes": "41,42,43,44",
            "speed": "40000"
        },
        "Ethernet4": {
            "alias": "hundredGigE1/2",
            "lanes": "45,46,47,48"
        }
```

```
},
"SYSLOG_SERVER": {},
"DEVICE_NEIGHBOR_METADATA": {},
"VLAN_INTERFACE": {},
"BGP_NEIGHBOR": {
    "10.100.1.1": {
        "rrclient": 0,
        "name": "AG7648-38-LEAF1",
        "local_addr": "10.100.1.2",
        "nhopself": 0,
        "holdtime": "30",
        "asn": "64515",
        "keepalive": "10"
    },
    "10.100.2.1": {
        "rrclient": 0,
        "name": "AG9064-45-SONIC-LEAF2",
        "local_addr": "10.100.2.2",
        "nhopself": 0,
        "holdtime": "30",
        "asn": "64516",
        "keepalive": "10"
    }
},
"PORTCHANNEL_INTERFACE": {},
"onie_config_version": "1",
"PORTCHANNEL": {},
"MGMT_INTERFACE": {},
"platform": "x86_64-delta_ag9032v1-r0",
"onie_partition_type": "gpt",
"DHCP_SERVER": {},
"NTP_SERVER": {
```

```
        "2.debian.pool.ntp.org": {},
        "1.debian.pool.ntp.org": {},
        "3.debian.pool.ntp.org": {},
        "0.debian.pool.ntp.org": {}
    },
    "VLAN_MEMBER": {},
    "onie_vendor_id": "2254",
    "VLAN": {},
    "onie_machine_rev": "0",
    "DEVICE_NEIGHBOR": {
        "Ethernet0": {
            "name": "AG7648-38-LEAF1",
            "port": "swp49"
        },
        "Ethernet4": {
            "name": "AG9032-36-LEAF2",
            "port": "Ethernet0"
        }
    },
    "LOOPBACK_INTERFACE": {
        "Loopback0|10.10.2.1/32": {}
    },
    "onie_arch": "x86_64",
    "onie_kernel_version": "4.1.28",
    "onie_version": "V1.00",
    "ACL_TABLE": {},
    "onie_build_date": "\"2017-03-27T10:42+0800\"",
    "MIRROR_SESSION": {},
    "INTERFACE": {
        "Ethernet0|10.100.1.2/24": {},
        "Ethernet4|10.100.2.2/24": {}
    },
```

```
    "onie_switch_asic": "broadcom",
    "onie_firmware": "bios"
}
```

LEAF2 Configurations

Copy the following into ***/etc/sonic/config_db.json*** and then reboot the system.

```
{
    "onie_cli_static_parms": "",
    "onie_boot_reason": "install",
    "onie_platform": "x86_64-delta_ag9064v1-r0",
    "DEVICE_METADATA": {
        "localhost": {
            "hwsku": "Delta-ag9064v1",
            "hostname": "AG9064-45-SONIC-LEAF2",
            "mac": "00:a0:c9:00:00:00",
            "bgp_asn": "64516",
            "deployment_id": "None",
            "type": "LeafRouter"
        }
    },
    "onie_machine": "delta_ag9064v1",
    "onie_installer": "/var/tmp/installer",
    "onie_build_machine": "delta_ag9064v1",
    "onie_skip_ethmgmt_macs": "no",
    "onie_exec_url": "tftp://10.62.2.102/sonic/barefoot/sonic-barefoot_20180420.bin",
    "onie_dev": "/dev/sda2",
    "onie_bin": "",
    "PORT": {
```

```
        "Ethernet0": {
            "alias": "Ethernet0",
            "lanes": "0,1,2,3"
        },
        "Ethernet16": {
            "alias": "Ethernet16",
            "lanes": "16,17,18,19"
        },
        "Ethernet4": {
            "alias": "Ethernet4",
            "lanes": "4,5,6,7",
            "speed": "40000"
        },
        "Ethernet24": {
            "alias": "Ethernet24",
            "lanes": "24,25,26,27"
        },
        "Ethernet28": {
            "alias": "Ethernet28",
            "lanes": "28,29,30,31"
        }
    },
    "onie_grub_image_name": "grubx64.efi",
    "onie_initrd_tmp": "/",
    "BGP_NEIGHBOR": {
        "10.100.4.2": {
            "rrclient": "0",
            "name": "AG7648-39-SPINE2",
            "local_addr": "10.100.4.1",
            "nhopself": "0",
            "holdtime": "30",
            "asn": "65002",
```

```
        "keepalive": "10"
    },
    "10.200.3.2": {
        "rrclient": "0",
        "name": "Ixia",
        "local_addr": "10.200.3.1",
        "nhopself": "0",
        "holdtime": "30",
        "asn": "64516",
        "keepalive": "10"
    },
    "10.200.1.2": {
        "rrclient": "0",
        "name": "Ixia",
        "local_addr": "10.200.1.1",
        "nhopself": "0",
        "holdtime": "30",
        "asn": "64516",
        "keepalive": "10"
    },
    "10.200.2.2": {
        "rrclient": "0",
        "name": "Ixia",
        "local_addr": "10.200.2.1",
        "nhopself": "0",
        "holdtime": "30",
        "asn": "64516",
        "keepalive": "10"
    },
    "10.100.2.2": {
        "rrclient": "0",
        "name": "AG9032-54-SONIC-SPINE1",
```

```
            "local_addr": "10.100.2.1",
            "nhopself": "0",
            "holdtime": "30",
            "asn": "65001",
            "keepalive": "10"
        }
    },
    "onie_config_version": "1",
    "platform": "x86_64-delta_ag9064v1-r0",
    "onie_partition_type": "gpt",
    "NTP_SERVER": {
        "2.debian.pool.ntp.org": {},
        "1.debian.pool.ntp.org": {},
        "3.debian.pool.ntp.org": {},
        "0.debian.pool.ntp.org": {}
    },
    "VLAN_MEMBER": {
        "Vlan11|Ethernet24": {
            "tagging_mode": "untagged"
        },
        "Vlan11|Ethernet28": {
            "tagging_mode": "untagged"
        },
        "Vlan1002|Ethernet16": {
            "tagging_mode": "tagged"
        },
        "Vlan1003|Ethernet16": {
            "tagging_mode": "tagged"
        },
        "Vlan1001|Ethernet16": {
            "tagging_mode": "tagged"
        }
```

```
    },
    "onie_vendor_id": "5324",
    "VLAN": {
        "Vlan11" : {
            "members": [
                "Ethernet24",
                "Ethernet28"
            ],
            "vlanid": "11"
        },
        "Vlan1001": {
            "members": [
                "Ethernet16"
            ],
            "vlanid": "1001"
        },
        "Vlan1002": {
            "members": [
                "Ethernet16"
            ],
            "vlanid": "1002"
        },
        "Vlan1003": {
            "members": [
                "Ethernet16"
            ],
            "vlanid": "1003"
        }
    },
    "onie_machine_rev": "0",
    "VLAN_INTERFACE": {
        "Vlan1001|10.200.1.1/24": {},
```

```
        "Vlan1003|10.200.3.1/24": {},
        "Vlan1002|10.200.2.1/24": {}
    },
    "DEVICE_NEIGHBOR": {
        "Ethernet16": {
            "name": "Ixia",
            "port": "1/5"
        },
        "Ethernet0": {
            "name": "AG9032-54-SPINE1",
            "port": "Ethernet4"
        },
        "Ethernet4": {
            "name": "AG7648-39-SPINE2",
            "port": "swp50"
        },
        "Ethernet24": {
            "name": "Ixia",
            "port": "1/1"
        },
        "Ethernet28": {
            "name": "Ixia",
            "port": "1/3"
        }
    },
    "LOOPBACK_INTERFACE": {
        "Loopback0|10.10.1.2/32": {}
    },
    "onie_arch": "x86_64",
    "onie_kernel_version": "4.9.57",
    "onie_version": "2017.11onie_version_1.0-dirty",
    "onie_cli_static_url": "tftp://10.62.2.102/sonic/barefoot/sonic-barefoot_20180420.bin",
```

```
    "onie_root_dir": "/mnt/onie-boot/onie",
    "onie_build_date": "2018-04-02T19:04+08:00",
    "INTERFACE": {
        "Ethernet0|10.100.2.1/24": {},
        "Ethernet4|10.100.4.1/24": {}
    },
    "onie_switch_asic": "bft",
    "onie_firmware": "bios"
}
```


SPINE2 Configurations

1. Execute the following commands to add the networking configurations on the **SPINE2** switch:

   net add interface eth0 ip address 10.62.2.39/24
   net add interface eth0 ip gateway 10.62.2.254
   net add interface swp49 ip address 10.100.3.2/24
   net add interface swp50 ip address 10.100.4.2/24
   net add loopback lo ip address 10.10.2.2/32
   net add hostname AG7648-39-SPINE2
   net add interface swp1-39,41-54 breakout 1x
   net add bgp autonomous-system 65002
   net add bgp router-id 10.10.2.2
   net add bgp timers 10 30
   net add bgp neighbor 10.100.3.1 remote-as external
   net add bgp neighbor 10.100.4.1 remote-as external
   net add bgp ipv4 unicast network 10.10.2.2/32
   net add bgp ipv4 unicast network 10.100.3.0/24
   net add bgp ipv4 unicast network 10.100.4.0/24
   net add bgp ipv4 unicast neighbor 10.100.3.1 next-hop-self
   net add bgp ipv4 unicast neighbor 10.100.4.1 next-hop-self

net add time zone US/Pacific

net add dns nameserver ipv4 10.62.2.1

The above configurations using NCLU would produce the following in **/etc/network/interfaces** and **/etc/frr/frr.conf** files:

/etc/network/interfaces

```
source /etc/network/interfaces.d/*.intf

# The loopback network interface
auto lo
iface lo inet loopback
        address 10.10.2.2/32

# The primary network interface
auto eth0
iface eth0
        address 10.62.2.39/24
        gateway 10.62.2.254

auto swp49
iface swp49
        address 10.100.3.2/24

auto swp50
iface swp50
        address 10.100.4.2/24
```

/etc/frr/frr.conf

```
hostname AG7648-39-SPINE2
```

```
username cumulus nopassword
!
service integrated-vtysh-config
!
log syslog informational
!
interface swp49
 ipv6 nd ra-interval 10
 no ipv6 nd suppress-ra
!
router bgp 65002
 bgp router-id 10.10.2.2
 coalesce-time 1150
 timers bgp 10 30
 neighbor 10.100.3.1 remote-as external
 neighbor 10.100.4.1 remote-as external
 !
 address-family ipv4 unicast
  network 10.10.2.2/32
  network 10.100.3.0/24
  network 10.100.4.0/24
  neighbor 10.100.3.1 next-hop-self
  neighbor 10.100.4.1 next-hop-self
 exit-address-family
!
```

2. If the **/etc/network/interfaces** or the **/etc/frr/frr.conf** file was edited, execute the ***sudo systemctl restart switchd*** to activate the configurations.