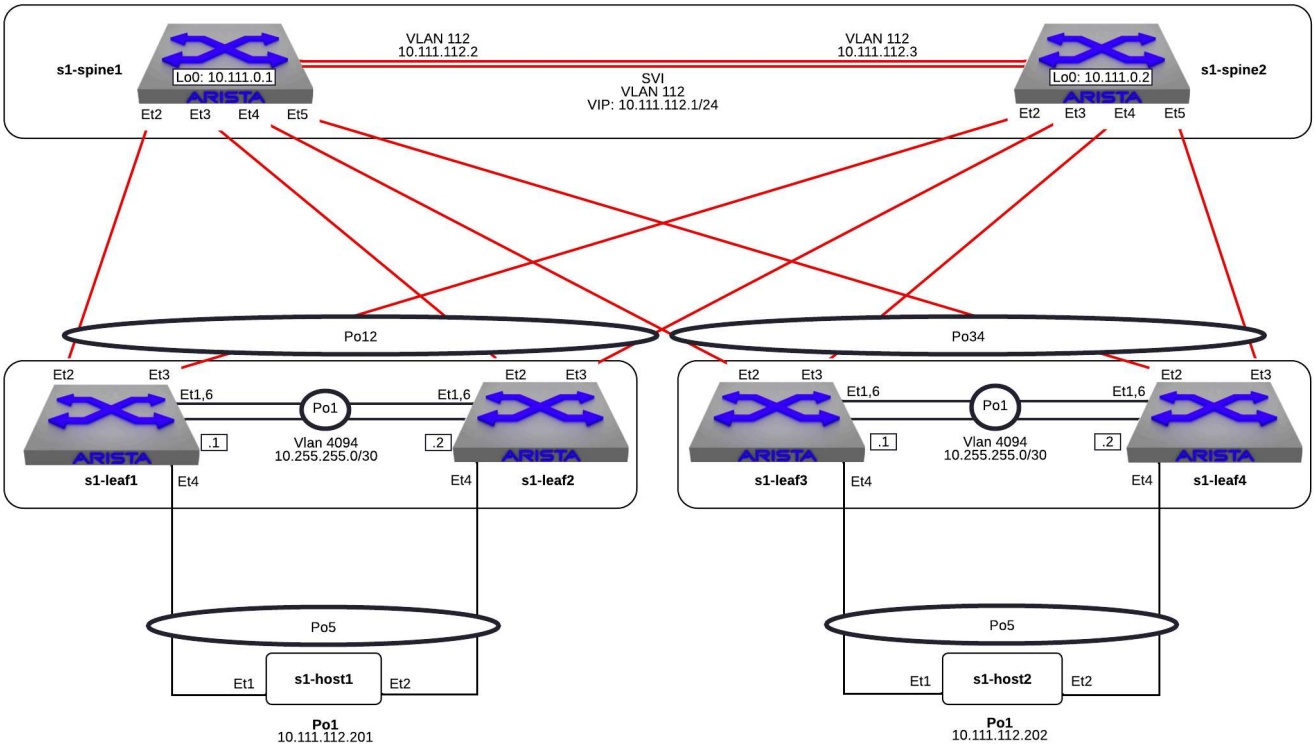
Layer 2 Leaf-Spine



(_images/nested_l2ls_topo.png)

1. Log into the **LabAccess** jumpserver to prepare the lab environment:

    a. Type `l2ls` at the prompt. The script will configure the datacenter with the exception of **s1-leaf4**.

    Note

    Did you know the "l2ls" script is composed of Python code that uses the CloudVision REST API to automate the provisioning of CVP Configlets? The configlets that are configured via the REST API are `L2LS_s1-spine1`, `L2LS_s1-spine2`, `L2LS_s1-leaf1`, `L2LS_s1-leaf2`, `L2LS_s1-leaf3`.

    Note

    The manually-entered commands below that are part of this lab are equivalent to `L2LS_s1-leaf4_complete`.

2. Prior to configuration, verify the current operational status of the environment.

    a. On **s1-leaf3**, verify EOS MLAG operational details. Since configuration is not complete yet, it will not be up.

Note

Full commands will be typed for reference in lab steps, but commands in EOS can be shortened or tab-completed at the user's discretion.

```
s1-leaf3#show mlag
MLAG Configuration:
domain-id                          :               MLAG
local-interface                    :           Vlan4094
peer-address                       :       10.255.255.2
peer-link                          :      Port-Channel1
peer-config                        :

MLAG Status:
state                              :           Inactive
negotiation status                 :         Connecting
peer-link status                   :     Lowerlayerdown
local-int status                   :     Lowerlayerdown
system-id                          :   00:00:00:00:00:00
dual-primary detection             :           Disabled
dual-primary interface errdisabled :              False

MLAG Ports:
Disabled                           :                  2
Configured                         :                  0
Inactive                           :                  0
Active-partial                     :                  0
Active-full                        :                  0

s1-leaf3#show mlag interfaces
                                                                  local/remote
mlag   desc                               state   local   remote        status
----- -------------------------------- ---------- ------- -------- ------------
5    MLAG Downlink - s1-host2         disabled     Po5        -          up/-
34   MLAG Uplink - s1-spine1 and s1   disabled    Po34        -          up/-
```

3. Configure the MLAG domain on **s1-leaf4** using the following steps.

   a. Configure the layer 2 VLANs for host connectivity.

Note

Arista EOS utilizes the Industry-Standard CLI. When entering configuration commands, be sure to first type `configure` to enter configuration mode.

```
vlan 112
   name Host_Network_112
!
vlan 134
   name Host_Network_134
```

   b. Configure the layer 2 VLANs MLAG communication between the peer switches.

Note

Arista best practices leverage a `trunk group` to limit layer 2 forwarding of the MLAG peering VLAN to only the peer-link, which we will see later. This is because we also recommend disabling STP operation on the MLAG peering VLAN to ensure MLAG adjacency can form immediately as EOS comes up without waiting for the STP learning process to complete.

```
vlan 4094
   trunk group MLAGPEER
!
no spanning-tree vlan-id 4094
```

c. Configure the MLAG Peer-link Port-Channel on **s1-leaf4** to connect to **s1-leaf3**.

Note

Here, the `trunk group` applied to the MLAG peering VLAN is applied to the peer- link to ensure the MLAG VLAN is only forwarded on this link. Note we also can do interface ranges and groups when applying similar configurations as shown. Member interfaces of a port-channel will inherit all configuration of the parent so there is no need to apply things like switchport commands to the individual interfaces.

```
interface Port-Channel1
   description MLAG Peer-link - s1-leaf3
   switchport mode trunk
   switchport trunk group MLAGPEER
!
interface Ethernet1,6
   description MLAG Peer-link - s1-leaf3
   channel-group 1 mode active
```

d. Verify Port-Channel and L2 forwarding status.

Note

In EOS, any command can be run from any CLI mode. Here we can run show commands directly from interface configuration mode.

```
s1-leaf4(config-if-Et1,6)#show interfaces status
Port       Name                      Status       Vlan     Duplex Speed  Type
Et1        MLAG Peer-link - s1-leaf3 connected    in Po1   full   1G     EbraTestPhyPor
Et2                                  connected    1        full   1G     EbraTestPhyPor
Et3                                  connected    1        full   1G     EbraTestPhyPor
Et4                                  connected    1        full   1G     EbraTestPhyPor
Et6        MLAG Peer-link - s1-leaf3 connected    in Po1   full   1G     EbraTestPhyPor
Ma0                                  connected    routed   a-full a-1G   10/100/1000
Po1        MLAG Peer-link - s1-leaf3 connected    trunk    full   2G     N/A

s1-leaf4(config-if-Et1,6)#show port-channel dense

                 Flags
------------------------- ---------------------------- -------------------------
   a - LACP Active           p - LACP Passive          * - static fallback
   F - Fallback enabled      f - Fallback configured   ^ - individual fallback
   U - In Use                D - Down
   + - In-Sync               - - Out-of-Sync           i - incompatible with agg
   P - bundled in Po         s - suspended             G - Aggregable
   I - Individual            S - ShortTimeout          w - wait for agg
  E - Inactive. The number of configured port channels exceeds the config limit
   M - Exceeds maximum weight

Number of channels in use: 1
Number of aggregators: 1

   Port-Channel       Protocol    Ports
------------------ ------------- ------------------
   Po1(U)             LACP(a)     Et1(PG+) Et6(PG+)

s1-leaf4(config-if-Et1,6)#show interfaces trunk
Port            Mode            Status          Native vlan
Po1             trunk           trunking        1

Port            Vlans allowed
Po1             All

Port            Vlans allowed and active in management domain
Po1             1,112,134,4094

Port            Vlans in spanning tree forwarding state
Po1             1,112,134,4094
```

e. Configure the MLAG Layer 3 peering network.

Note

The MLAG VLAN and peering network are used **only** for communication between the peer switches. As such, the IP network that is used does not need to be unique or routable (though it can be if customers choose). In the lab, we re-use 10.255.255.252/30 on all MLAG pairs.

```
interface Vlan4094
   description MLAG Peer Network
   ip address 10.255.255.2/30
```

f. Verify layer 3 connectivity between the peer switches on the MLAG VLAN.

```
s1-leaf4(config-if-Vl4094)#ping 10.255.255.1
PING 10.255.255.253 (10.255.255.1) 72(100) bytes of data.
80 bytes from 10.255.255.1: icmp_seq=1 ttl=64 time=7.33 ms
80 bytes from 10.255.255.1: icmp_seq=2 ttl=64 time=6.82 ms
80 bytes from 10.255.255.1: icmp_seq=3 ttl=64 time=5.65 ms
80 bytes from 10.255.255.1: icmp_seq=4 ttl=64 time=7.16 ms
80 bytes from 10.255.255.1: icmp_seq=5 ttl=64 time=7.53 ms

--- 10.255.255.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 29ms
rtt min/avg/max/mdev = 5.659/6.903/7.530/0.663 ms, ipg/ewma 7.281/7.135 ms
```

g. Define the MLAG Domain parameters to establish the peering.

Note

Similar to the peering network, the MLAG `domain-id` can be re-used across pairs as it is a locally-significant value. The other values describe the connectivity between the peer switches.

```
mlag configuration
   domain-id MLAG
   local-interface Vlan4094
   peer-address 10.255.255.1
   peer-link Port-Channel1
```

h. Verify the MLAG relationship between **s1-leaf3** and **s1-leaf4**.

```
s1-leaf4(config-mlag)#show mlag
MLAG Configuration:
domain-id                          :               MLAG
local-interface                    :           Vlan4094
peer-address                       :       10.255.255.1
peer-link                          :      Port-Channel1
peer-config                        :         consistent

MLAG Status:
state                              :             Active
negotiation status                 :          Connected
peer-link status                   :                 Up
local-int status                   :                 Up
system-id                          :   02:1c:73:c0:c6:14
dual-primary detection             :           Disabled
dual-primary interface errdisabled :              False

MLAG Ports:
Disabled                           :                 0
Configured                         :                 0
Inactive                           :                 0
Active-partial                     :                 0
Active-full                        :                 0
```

4. With the MLAG domain established, configure the MLAG uplink to the spines on **s1-leaf4**.

   a. Configure a Port-Channel and member interfaces on **s1-leaf4** connecting to **s1-spine1** and **s1-spine2**.

   Note

   What matters is that the `mlag` ID of the Port-Channel matches between the MLAG peers. The `Port-Channel` ID is only locally-significant to the switch, but best practice is to match all `mlag` and `Port-Channel` IDs.

```
interface Port-Channel34
   description MLAG Uplink - s1-spine1 and s1-spine2
   switchport mode trunk
   mlag 34
!
interface Ethernet2
   description MLAG Uplink - s1-spine1
   channel-group 34 mode active
!
interface Ethernet3
   description MLAG Uplink - s1-spine2
   channel-group 34 mode active
```

   b. Verify the MLAG Port-Channel is negotiated between the peers and all interfaces are aggregated.

```
s1-leaf4(config-if-Et3)#show mlag | begin Ports
MLAG Ports:
Disabled                        :                0
Configured                      :                0
Inactive                        :                0
Active-partial                  :                0
Active-full                     :                1

s1-leaf4(config-if-Et3)#show mlag interfaces

   mlag       desc                                    state       local       remote
---------- ---------------------------------- ---------------- ----------- ---------
     34       MLAG Uplink - s1-spine1 and s1       active-full        Po34         Po34
s1-leaf4(config-if-Et3)#show port-channel dense

                  Flags
------------------------- ---------------------------- -------------------------
   a - LACP Active            p - LACP Passive           * - static fallback
   F - Fallback enabled       f - Fallback configured    ^ - individual fallback
   U - In Use                 D - Down
   + - In-Sync                - - Out-of-Sync            i - incompatible with agg
   P - bundled in Po          s - suspended              G - Aggregable
   I - Individual             S - ShortTimeout           w - wait for agg
  E - Inactive. The number of configured port channels exceeds the config limit
   M - Exceeds maximum weight

Number of channels in use: 2
Number of aggregators: 2

   Port-Channel       Protocol    Ports
------------------ -------------- ----------------------------------
   Po1(U)             LACP(a)     Et1(PG+) Et6(PG+)
   Po34(U)            LACP(a)     Et2(PG+) Et3(PG+) PEt2(P) PEt3(P)
```

5. Now that uplinks to the spines are established, configure downstream host connectivity on **s1-leaf4**.

   a. Configure a Port-Channel and member interface on **s1-leaf4** connecting to **s1-host2**.

```
interface Port-Channel5
   description MLAG Downlink - s1-host2
   switchport access vlan 112
   mlag 5
!
interface Ethernet4
   description MLAG Downlink - s1-host2
   channel-group 5 mode active
```

   b. Verify the host-facing MLAG Port-Channel is negotiated between the peers and all interfaces are aggregated.

```
s1-leaf4(config-if-Et4)#show mlag interfaces 5
                                                                                lo
   mlag       desc                                 state       local       remote
---------- ------------------------------ ----------------- ----------- ------------ --
      5       MLAG Downlink - s1-host2       active-full         Po5          Po5
s1-leaf4(config-if-Et4)#show port-channel 5
Port Channel Port-Channel5:
  Active Ports: Ethernet4 PeerEthernet4
```

6. Validate connectivity from **s1-host1** to **s1-host2** by logging into **s1-host1** through the menu (option 1 in ssh menu) or using screen.

```
s1-host1#ping 10.111.112.202
PING 10.111.112.202 (10.111.112.202) 72(100) bytes of data.
80 bytes from 10.111.112.202: icmp_seq=1 ttl=64 time=47.7 ms
80 bytes from 10.111.112.202: icmp_seq=2 ttl=64 time=38.8 ms
80 bytes from 10.111.112.202: icmp_seq=3 ttl=64 time=30.7 ms
80 bytes from 10.111.112.202: icmp_seq=4 ttl=64 time=21.7 ms
80 bytes from 10.111.112.202: icmp_seq=5 ttl=64 time=19.1 ms

--- 10.111.112.202 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 41ms
rtt min/avg/max/mdev = 19.128/31.636/47.743/10.637 ms, pipe 5, ipg/ewma 10.272/38.948
```

7. Verify layer 2 forwarding information on the spines.

```
s1-spine1#show mac address-table vlan 112
          Mac Address Table
------------------------------------------------------------------

Vlan    Mac Address       Type        Ports      Moves   Last Move
----    -----------       ----        -----      -----   ---------
 112    001c.73c0.c611    STATIC      Po1
 112    001c.73c0.c616    DYNAMIC     Po12       1       0:01:08 ago
 112    001c.73c0.c617    DYNAMIC     Po34       1       0:03:02 ago
Total Mac Addresses for this criterion: 3

          Multicast Mac Address Table
------------------------------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       ----        -----
Total Mac Addresses for this criterion: 0
```

8. Explore other command outputs related to MLAG Operation on **s1-leaf4**.

   a. Verify MLAG peer roles and detailed state information.

> **Note**
>
> The `show mlag detail` output contains a wealth of information. Notice that while there is a `primary` and `secondary` role for the MLAG peers, it is not a configurable value. The peers automatically negotiate this between themselves. The MLAG primary device is responsible for all STP processing for both peers. The `Reload delay` value is also very important in upgrade and maintenance scenarios.

```
s1-leaf4#show mlag detail
MLAG Configuration:
domain-id                          :               MLAG
local-interface                    :            Vlan4094
peer-address                       :        10.255.255.1
peer-link                          :       Port-Channel1
peer-config                        :          consistent

MLAG Status:
state                              :              Active
negotiation status                 :           Connected
peer-link status                   :                  Up
local-int status                   :                  Up
system-id                          :   02:1c:73:c0:c6:14
dual-primary detection             :            Disabled
dual-primary interface errdisabled :               False

MLAG Ports:
Disabled                           :                   0
Configured                         :                   0
Inactive                           :                   0
Active-partial                     :                   0
Active-full                        :                   2

MLAG Detailed Status:
State                          :           secondary
Peer State                     :             primary
State changes                  :                   2
Last state change time         :         0:42:12 ago
Hardware ready                 :                True
Failover                       :               False
Failover Cause(s)              :             Unknown
Last failover change time      :               never
Secondary from failover        :               False
Peer MAC address               :   00:1c:73:c0:c6:14
Peer MAC routing supported     :               False
Reload delay                   :         300 seconds
Non-MLAG reload delay          :         300 seconds
Ports errdisabled              :                False
Lacp standby                   :               False
Configured heartbeat interval  :             4000 ms
Effective heartbeat interval   :             4000 ms
Heartbeat timeout              :            60000 ms
Last heartbeat timeout         :               never
Heartbeat timeouts since reboot :                   0
UDP heartbeat alive            :                True
Heartbeats sent/received       :             633/635
Peer monotonic clock offset    :    0.000013 seconds
Agent should be running        :                True
P2p mount state changes        :                   1
Fast MAC redirection enabled   :               False
```

b. Configure a VLAN on **s1-leaf4** only to see how MLAG tracks consistency between the peer switches.

> **Note**
>
> It is critical that the MLAG peers be consistent to ensure proper forwarding and operation. The `show mlag config-sanity` command helps to track values that are not consistent. These values should be rectified in production environments unless guided otherwise by an Arista SE.

```
s1-leaf4(config)#vlan 999
s1-leaf4(config-vlan-999)#name TEMP
s1-leaf4(config-vlan-999)#show mlag config-sanity
No per interface configuration inconsistencies found.

Global configuration inconsistencies:
    Feature                   Attribute       Local value    Peer value
------------- -------------------------- ----------------- ----------
   bridging        admin-state vlan 999            active             -
   bridging       mac-learning vlan 999              True             -


s1-leaf4(config-vlan-999)#no vlan 999
s1-leaf4(config)#show mlag config-sanity
No global configuration inconsistencies found.

No per interface configuration inconsistencies found.
```

LAB COMPLETE!

Back to top