LAB GUIDE

Deploying an Aruba CX Collapsed Core Data Center Solution

!!IMPORTANT!!

THIS GUIDE ASSUMES THAT THE AOS-CX OVA HAS BEEN INSTALLED AND WORKS IN GNS3 OR EVE-NG. PLEASE REFER TO GNS3/EVE-NG INITIAL SETUP LABS IF REQUIRED.

TABLE OF CONTENTS

Lab Objective

Over the years data center architectures have evolved thanks to factors such increased bandwidth loads, virtualization, cloud-based solutions, increased performance expectations. During that time data centers have generally shrunk in physical size/scale because they now are better able to leverage the resources, they have either on site, and/or they have shifted many workloads to the cloud. However, at the same time we expect to see continued data growth in data centers thanks to the performance demands and IoT/Industrial Internet of Things (IIoT). New data center deployments should always leverage high-performance wire speed switches and solutions that can scale to meet the demands of the environment today and tomorrow.

The most common architectures being deployed in today's modern SMB/enterprise environments are 1-Tier Collapsed Core, Traditional 2-Tier Layer 2, and 2-Tier Layer 3 Spine and Leaf solutions. Each architecture is a template, and the devices used in that chosen template may vary based on the demands of the environment, but the solution itself remains the same.

At the end of this workshop, you will be able to implement a configuration for a Data Center 1-Tier Collapsed Core solution using Aruba CX data center switches.

Of course, the AOS-CX switches to be deployed in production environment would depend on interfaces, scale and features required. Aruba networks provides a diverse product portfolio to meet different customer requirements.

Lab Overview

A 1-Tier/DC Collapsed Core architecture provides optimized east-west L2 connectivity between racks since all servers connect to this Layer. The DC Collapsed Core could be either AOS-CX 6400 or 8x00 (recommended) series switches depending on scale, port density and port connectivity requirements. Since this is a critical layer it should leverage VSX to ensure HA support for attached servers.

The 1-Tier/DC Collapsed Core Switches will function as L3 default gateways using Active Gateway redundancy for the different server subnets. Servers should have dual active uplinks into both VSX core switches using VSX MLAGs. Layer 3 routing (EBGP recommended as it provides more options/capabilities) should be used between the 1-Tier/DC Collapsed Core Switches and to the L3 DC Core or Campus switches.

The 1-Tier Collapsed Core Pod architecture can be replicated to other Pods to create separate failure domains. A L3 DC core will connect all the Pods together. Each Pod is assigned its own AS# and EBGP is recommended as the routing protocol to route traffic between the Pods as it provides more options/capabilities. The Pod architecture enables each Pod to have different architectures if desired, e.g. Pod12 requires a L3 Spine/Leaf fabric with VXLAN/EVPN while Pod11 only requires a simple Collapsed Core.

This type of architecture can accommodate both fixed port AOS-CX 8320/8325 switches or modular AOS-CX 6400/8400 switches as VSX core switches depending on scale, port density and port connectivity requirements.

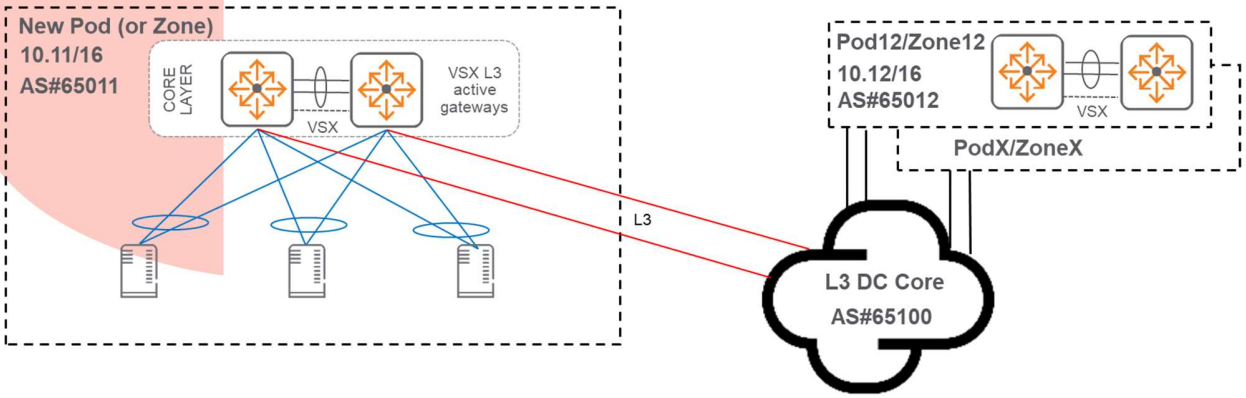
Below are examples of the # of server ports a collapsed core could physically scale when using small fixed or large chassis switches:

Table 1. Collapsed Core physical scale example

Small Collapsed Core – Fixed Switches	Large Collapsed Core - Modular Core Switches
Core Layer = 2 x 8325 VSX (32x100GbE) ports/ea.	Core Layer = 2 x 6410 VSX (120x100GbE) ports/ea.
Server Ports = 128 10/25G ports (requires splitter cables)	Server Ports = 480 ports (requires splitter cables)

Physical scale is one aspect; however, admins should also closely consider the required table scale that the environment demands. Environments will vary, so some may be more demanding of MAC address scale, others may require larger IP routing scale. Understanding the demands of the environment will be critical in determining which product to fit in the chosen architecture.

AOS-CX 8325 or 8400 are recommended as the L3 DC core depending on scale, port density and port connectivity requirements.



In this 1-Tier Collapsed Core Architecture example:

- Interface 1/1/9 and 1/1/8 on each “DC-Core-SwitchA/B” is used for the VSX Inter-Switch-Link (ISL).
    - It is recommended as a best practice that production environments utilize a minimum of 2 VSX ISL interfaces and a separate Keepalive link for maximum VSX HA
- Interface 1/1/7 on each “DC-Core-SwitchA/B” is used as a dedicated VSX Keepalive link (recommended as a best practice)
- VSX Active-gateway is configured to allow the same default gateway IPs to be used on both “DC-Core-SwitchA/B” switches without any protocol exchange overhead (when compared against VRRP)
- The VSX system-mac is enabled so that servers think dual uplinked LACP connections are enabled on the same switch
- Interface 1/1/1 is configured as part of Lag1 on each “DC-Core-SwitchA/B” which connect to “Host-A”.
- Interface 1/1/2 is configured as part of Lag2 on each “DC-Core-SwitchA/B” which connect to “Host-B”.
- The Lags are enabled with LACP fallback which allow an active LACP interface to establish a Link Aggregation (LAG) before it receives LACP PDUs from its peer.
- Each “DC-Core-SwitchA/B” are connected via Layer 3 to the “Core” switch using OSPF.
- Large MTU has been enabled to support applications that may require it
- The server facing ports should be set to the maximum MTU supported by the server (e.g. 9000) when large MTU applications need to be transported across the VSX switches

Lab Network Layout

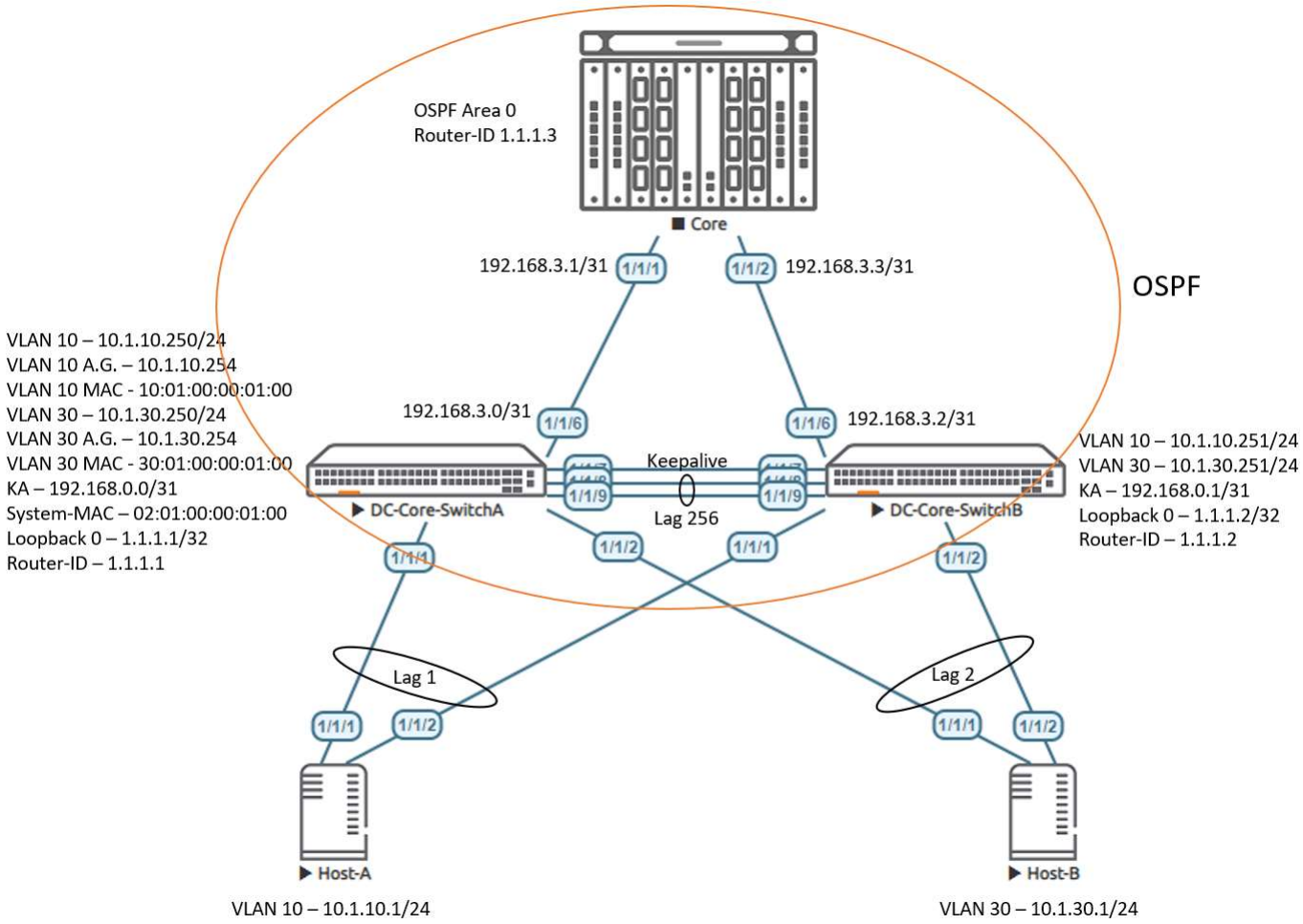


Figure 1. Lab topology and addresses

Lab Tasks

Task 1 - Configure Host-A and Host-B

- Configure Hostnames
- On Host-A configure a simulated VM
    - Configure VLAN 10 with a description
- On Host-B configure a simulated VM
    - Configure VLAN 30 with a description
- On Host-A configure Lag 1
    - Add description

    - Unshut the Lag
    - Apply no routing to Lag
    - Enable VLAN 10 as Trunk
    - Enable LACP mode Fallback
- On Host-B configure Lag 2
    - Add description
    - Unshut the Lag
    - Apply no routing to Lag
    - Enable VLAN 30 as Trunk
    - Enable LACP mode Fallback
- On Host-A configure interfaces 1/1/1 and 1/1/2 for Lag 1
    - Add description
    - Unshut the Lag
    - Set MTU to 9100
    - Enable Lag 1
- On Host-B configure interfaces 1/1/1 and 1/1/2 for Lag 2
    - Add description
    - Unshut the Lag
    - Set MTU to 9100
    - Enable Lag 2
- On Host-A create a VLAN interface for the simulated Host (VLAN 10)
    - Apply IP address to the VLAN interface
- On Host-B create a VLAN interface for the simulated Host (VLAN 30)
    - Apply IP address to each VLAN interface
- Create default route for each Host within each VRF

Host-A

```
hostname Host-A

vlan 10
    description VLAN-10-Host-A

interface lag 1
    no shutdown
    description Host-A to DC-Collapsed-Core-Switch-A-B 1/1/1
    no routing
    vlan trunk native 1
    vlan trunk allowed 10
    lacp mode active

interface 1/1/1
    no shutdown
    mtu 9100
    description To DC-Collapsed-Core-Switch-A
    lag 1

interface 1/1/2
    no shutdown
    mtu 9100
    description To DC-Collapsed-Core-Switch-B
```

```
    lag 1

interface vlan 10
    ip address 10.1.10.1/24

ip route 0.0.0.0/0 10.1.10.254
```

Host-B

```
hostname Host-B

 vlan 30
    description VLAN-30-Host-B

interface lag 2
    no shutdown
    description Host-B to DC-Core-Switch-A-B 1/1/2
    no routing
    vlan trunk native 1
    vlan trunk allowed 30
    lacp mode active

interface 1/1/1
    no shutdown
    mtu 9100
    description To DC-Core-Switch-A
    lag 2

interface 1/1/2
    no shutdown
    mtu 9100
    description To DC-Core-Switch-B
    lag 2

interface vlan 30
    ip address 10.1.30.1/24

ip route 0.0.0.0/0 10.1.30.254
```

Task 2 - Configure VSX on DC-Core-SwitchA/B

- See the VSX Configuration Best Practices for further details around VSX creation
- Add hostnames for each DC-Core Switch
- Create a VRF for the Keepalive
- Create LAG 256 for ISL (interfaces 1/1/8-1/1/9)
- Create the VSX Keepalive link (interface 1/1/7)
    - Example uses VRF KA
- Create VSX Cluster
- Verify that VSX is up and running

DC-Core-SwitchA

```
hostname DC-Core-SwitchA
```

```
vrf KA

interface lag 256
    no shutdown
    description ISL Link
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    lacp mode active

interface 1/1/7
    no shutdown
    vrf attach KA
    description KA Interface
    ip address 192.168.0.0/31

interface 1/1/8-1/1/9
    no shutdown
    mtu 9198
    description ISL Physical Link
    lag 256

vsx
    system-mac 02:01:00:00:01:00
    inter-switch-link lag 256
    role primary
    keepalive peer 192.168.0.1 source 192.168.0.0 vrf KA
    vsx-sync vsx-global
```

DC-Core-SwitchB

```
hostname DC-Core-SwitchB

vrf KA

interface lag 256
    no shutdown
    description ISL Link
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    lacp mode active

interface 1/1/7
    no shutdown
    vrf attach KA
    description KA Interface
    ip address 192.168.0.1/31

interface 1/1/8-1/1/9
    no shutdown
    mtu 9198
    description ISL Physical Link
    lag 256

vsx
    system-mac 02:01:00:00:01:00
    inter-switch-link lag 256
    role secondary
```

```
    keepalive peer 192.168.0.1 source 192.168.0.0 vrf KA
    vsx-sync vsx-global
```

DC-Core-SwitchA

```
DC-Core-SwitchA(config-vsx)# show vsx status
VSX Operational State
---------------------
  ISL channel             : In-Sync
  ISL mgmt channel        : operational
  Config Sync Status      : In-Sync
  NAE                     : peer_reachable
  HTTPS Server            : peer_reachable

Attribute           Local               Peer
------------        --------            --------
ISL link            lag256              lag256
ISL version         2                   2
System MAC          02:01:00:00:01:00   02:01:00:00:01:00
Platform            X86-64              X86-64
Software Version    Virtual.10.07.0010  Virtual.10.07.0010
Device Role         primary             secondary


DC-Core-SwitchA(config)# sho vsx brief
ISL State                              : In-Sync
Device State                           : Peer-Established
Keepalive State                        : Keepalive-Established
Device Role                            : Primary
Number of Multi-chassis LAG interfaces : 0
```

DC-Core-SwitchB

```
DC-Core-SwitchB(config)# show vsx status
VSX Operational State
---------------------
  ISL channel             : In-Sync
  ISL mgmt channel        : operational
  Config Sync Status      : In-Sync
  NAE                     : peer_reachable
  HTTPS Server            : peer_reachable

Attribute           Local               Peer
------------        --------            --------
ISL link            lag256              lag256
ISL version         2                   2
System MAC          02:01:00:00:01:00   02:01:00:00:01:00
Platform            X86-64              X86-64
Software Version    Virtual.10.07.0010  Virtual.10.07.0010
Device Role         secondary           primary

DC-Core-SwitchB(config)# sho vsx brief
ISL State                              : In-Sync
Device State                           : Peer-Established
Keepalive State                        : Keepalive-Established
Device Role                            : Secondary
Number of Multi-chassis LAG interfaces : 0
```

Task 3 - Configure Host VLANs

- The best practice for VLANs configuration is to configure the VLANs on the VSX primary with the vsx-sync attribute and let the VSX config-sync automatically synchronize the VLANs on the VSX secondary.
- For this lab create VLAN 10 and 30 as the host VLANs.
- Ensure VSX-Sync is applied to the VLANs
- Add descriptions to the new VLANs
- Create 2 x VLAN interfaces with descriptions + IP addresses on both switches
- Add the appropriate Active Gateway IP address + MAC addresses to each VLAN interface to Primary VSX switch (DC-Core-SwitchA)
- Add vsx-sync active-gateways to Primary VSX switch (DC-Core-SwitchA)

DC-Core-SwitchA

```
vlan 10,30
    vsx-sync

vlan 10
    description VLAN 10

vlan 30
    description VLAN 30

interface vlan 10
    vsx-sync active-gateways
    description VLAN 10 Interface
    ip address 10.1.10.250/24
    active-gateway ip mac 10:01:00:00:01:00
    active-gateway ip 10.1.10.254

interface vlan 30
    vsx-sync active-gateways
    description VLAN 30 Interface
    ip address 10.1.30.250/24
    active-gateway ip mac 30:01:00:00:01:00
    active-gateway ip 10.1.30.254
```

DC-Core-SwitchB

```
interface vlan 10
    description VLAN 10 Interface
    ip address 10.1.10.251/24
    active-gateway ip mac 10:01:00:00:01:00
    active-gateway ip 10.1.10.254

interface vlan 30
    description VLAN 30 Interface
    ip address 10.1.30.251/24
    active-gateway ip mac 30:01:00:00:01:00
    active-gateway ip 10.1.30.254
```

Task 4 - Configure Host Facing VSX LAG (MCLAG) Configurations

- Create 2 x multi-chassis LAGs (1 for each Host)
- Add the appropriate VLANs for each Lag

- Add LACP active config
- Add the 2 x LAGs to the appropriate interfaces with descriptions
- Verify Host Facing Lag Status
- Verify Host-A and Host-B connectivity

DC-Core-SwitchA

```
interface lag 1 multi-chassis
    no shutdown
    description To Host-A
    no routing
    vlan trunk native 1
    vlan trunk allowed 10
    lacp mode active

interface lag 2 multi-chassis
    no shutdown
    description To Host-B
    no routing
    vlan trunk native 1
    vlan trunk allowed 30
    lacp mode active

interface 1/1/1
    no shutdown
    mtu 9100
    description To Host-A
    lag 1

interface 1/1/2
    no shutdown
    mtu 9100
    description To Host-B
    lag 2
```

DC-Core-SwitchB

```
interface lag 1 multi-chassis
    no shutdown
    description To Host-A
    no routing
    vlan trunk native 1
    vlan trunk allowed 10
    lacp mode active

interface lag 2 multi-chassis
    no shutdown
    description To Host-B
    no routing
    vlan trunk native 1
    vlan trunk allowed 30
    lacp mode active

interface 1/1/1
    no shutdown
    mtu 9100
    description To Host-A
    lag 1
```

```
interface 1/1/2
    no shutdown
    mtu 9100
    description To Host-B
    lag 2
```

DC-Core-SwitchA

```
DC-Core-SwitchA(config)# sho int brie

--------------------------------------------------------------------------------------------------------------
Port      Native  Mode    Type          Enabled Status  Reason                 Speed   Description
          VLAN                                                                 (Mb/s)
--------------------------------------------------------------------------------------------------------------
1/1/1     1       trunk   --            yes     up                             1000    To Host-A
1/1/2     1       trunk   --            yes     up                             1000    To Host-B
1/1/3     --      routed  --            no      down    Administratively down  --      --
1/1/4     --      routed  --            no      down    Administratively down  --      --
1/1/5     --      routed  --            no      down    Administratively down  --      --
1/1/6     --      routed  --            no      down    Administratively down  --      --
1/1/7     --      routed  --            yes     up                             1000    KA Interface
1/1/8     1       trunk   --            yes     up                             1000    ISL Physical Links
1/1/9     1       trunk   --            yes     up                             1000    ISL Physical Links
.
.
.
vlan10    --              --            yes     up                             --      VLAN 10 Interface
vlan30    --              --            yes     up                             --      VLAN 30 Interface
lag1      1       trunk   --            yes     up      --                     1000    To Host-A
lag2      1       trunk   --            yes     up      --                     1000    To Host-B
lag256    1       trunk   --            yes     up      --                     2000    ISL Links


DC-Core-SwitchA(config)# sho lag 1
System-ID       : 08:00:09:8c:4c:ce
System-priority : 65534

Aggregate lag1 is up
 Admin state is up
 Description : To Host-A
 Type                          : multi-chassis
 Lacp Fallback                 : Disabled
 MAC Address                   : 02:01:00:00:01:00
 Aggregated-interfaces         : 1/1/1
 Aggregation-key               : 1
 Aggregate mode                : active
 Hash                          : l3-src-dst
 LACP rate                     : slow
 Speed                         : 1000 Mb/s
 Mode                          : trunk

DC-Core-SwitchA(config)# sho lag 2
System-ID       : 08:00:09:8c:4c:ce
System-priority : 65534

Aggregate lag2 is up
 Admin state is up
 Description : To Host-B
 Type                          : multi-chassis
 Lacp Fallback                 : Disabled
```

```
 MAC Address                   : 02:01:00:00:01:00
 Aggregated-interfaces         : 1/1/2
 Aggregation-key               : 2
 Aggregate mode                : active
 Hash                          : l3-src-dst
 LACP rate                     : slow
 Speed                         : 1000 Mb/s
 Mode                          : trunk
```

DC-Core-SwitchB

```
DC-Core-SwitchB(config-if)# sho int brie
--------------------------------------------------------------------------------------------------------------------
-
Port      Native  Mode    Type           Enabled Status  Reason                 Speed   Description
          VLAN                                                                  (Mb/s)
--------------------------------------------------------------------------------------------------------------------
-
1/1/1     1       trunk   --             yes     up                             1000    To Host-A
1/1/2     1       trunk   --             yes     up                             1000    To Host-B
1/1/3     --      routed  --             no      down    Administratively down  --      --
1/1/4     --      routed  --             no      down    Administratively down  --      --
1/1/5     --      routed  --             no      down    Administratively down  --      --
1/1/6     --      routed  --             no      down    Administratively down  --      --
1/1/7     --      routed  --             yes     up                             1000    KA Interface
1/1/8     1       trunk   --             yes     up                             1000    ISL Physical Links
1/1/9     1       trunk   --             yes     up                             1000    ISL Physical Links
.
.
.
vlan10    --              --             yes     up                             --      VLAN 10 Interface
vlan30    --              --             yes     up                             --      VLAN 30 Interface
lag1      1       trunk   --             yes     up      --                     1000    To Host-A
lag2      1       trunk   --             yes     up      --                     1000    To Host-B
lag256    1       trunk   --             yes     up      --                     2000    ISL Trunk
```

```
DC-Core-SwitchB(config)# sho lag 1
System-ID       : 08:00:09:9f:62:91
System-priority : 65534

Aggregate lag1 is up
 Admin state is up
 Description : To Host-A
 Type                          : multi-chassis
 Lacp Fallback                 : Disabled
 MAC Address                   : 02:01:00:00:01:00
 Aggregated-interfaces         : 1/1/1
 Aggregation-key               : 1
 Aggregate mode                : active
 Hash                          : l3-src-dst
 LACP rate                     : slow
 Speed                         : 1000 Mb/s
 Mode                          : trunk
```

```
DC-Core-SwitchB(config)# sho lag 2
System-ID       : 08:00:09:9f:62:91
System-priority : 65534
```

```
Aggregate lag2 is up
 Admin state is up
 Description : To Host-B
 Type                          : multi-chassis
 Lacp Fallback                 : Disabled
 MAC Address                   : 02:01:00:00:01:00
 Aggregated-interfaces         : 1/1/2
 Aggregation-key               : 2
 Aggregate mode                : active
 Hash                          : l3-src-dst
 LACP rate                     : slow
 Speed                         : 1000 Mb/s
 Mode                          : trunk
```

Host-A

```
HostA# sho lag 1
System-ID       : 08:00:09:56:d0:31
System-priority : 65534

Aggregate lag1 is up
 Admin state is up
 Description : Host-A to DC-Collapsed-Core-Switch-A-B 1/1/1
 Type                          : normal
 Lacp Fallback                 : n/a
 MAC Address                   : 08:00:09:56:d0:31
 Aggregated-interfaces         : 1/1/1 1/1/2
 Aggregation-key               : 1
 Aggregate mode                : active
 Hash                          : l3-src-dst
 LACP rate                     : slow
 Speed                         : 2000 Mb/s
 Mode                          : trunk
```

HostA#

```
sho ip int brie
Interface         IP Address             Interface Status
                                           link/admin
vlan10           10.1.10.1/24              up/up
```

HostA#

```
ping 10.1.30.1
PING 10.1.30.1 (10.1.30.1) 100(128) bytes of data.
108 bytes from 10.1.30.1: icmp_seq=1 ttl=63 time=4.61 ms
108 bytes from 10.1.30.1: icmp_seq=2 ttl=63 time=3.87 ms
108 bytes from 10.1.30.1: icmp_seq=3 ttl=63 time=4.35 ms
108 bytes from 10.1.30.1: icmp_seq=4 ttl=63 time=4.97 ms
108 bytes from 10.1.30.1: icmp_seq=5 ttl=63 time=4.35 ms
```

Host-B

```
Host-B# ping 10.1.10.1
PING 10.1.10.1 (10.1.10.1) 100(128) bytes of data.
108 bytes from 10.1.10.1: icmp_seq=1 ttl=63 time=4.14 ms
108 bytes from 10.1.10.1: icmp_seq=2 ttl=63 time=3.71 ms
108 bytes from 10.1.10.1: icmp_seq=3 ttl=63 time=5.77 ms
108 bytes from 10.1.10.1: icmp_seq=4 ttl=63 time=3.53 ms
108 bytes from 10.1.10.1: icmp_seq=5 ttl=63 time=4.20 ms
```

Task 5 - Configure Connectivity to Core

- Configure interfaces and direct connectivity between Core Switch and DC-Core-SwitchA/B
  - Apply proper IPv4 Addresses to all interfaces at DC-Core SwitchA/B and Core
  - Verify direct connectivity between Core and DC-Core-SwitchA/B
- Configure OSPF on the Core Switch as well as Both DC-Core-SwitchA/B
  - Configure OSPF
  - Configure Loopback & inject into OSPF
  - Ensure direct interfaces between Core and DC-Core-SwitchA/B are added to OSPF
  - Make sure to add OSPF configs to the VLAN interfaces on DC-Core-SwitchA/B
  - Create Transit VLAN FOR OSPF between DC-Core-SwitchA/B
- Verify OSPF neighborships are in Full state on all 3 switches
- Verify that HostA/HostB can now reach the Core switch (1.1.1.3)

DC-Core-SwitchA

```
interface 1/1/6
    no shutdown
    description To Core
    ip address 192.168.3.0/31
    ip mtu 9198
```

DC-Core-SwitchB

```
interface 1/1/6
    no shutdown
    description To Core
    ip address 192.168.3.2/31
    ip mtu 9198
```

Core

```
hostname Core

interface 1/1/1
    no shutdown
    description To DC-Core-SwitchA
    ip address 192.168.3.1/31
    ip mtu 9198


interface 1/1/2
    no shutdown
    description To DC-Core-SwitchB
    ip address 192.168.3.3/31
    ip mtu 9198


Core(config-if)# ping 192.168.3.0
PING 192.168.3.0 (192.168.3.0) 100(128) bytes of data.
108 bytes from 192.168.3.0: icmp_seq=1 ttl=64 time=8.54 ms
108 bytes from 192.168.3.0: icmp_seq=2 ttl=64 time=1.82 ms
```

```
108 bytes from 192.168.3.0: icmp_seq=3 ttl=64 time=1.82 ms
108 bytes from 192.168.3.0: icmp_seq=4 ttl=64 time=1.88 ms
108 bytes from 192.168.3.0: icmp_seq=5 ttl=64 time=1.91 ms

--- 192.168.3.0 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 1.817/3.193/8.538/2.672 ms

Core(config-if)# ping 192.168.3.2
PING 192.168.3.2 (192.168.3.2) 100(128) bytes of data.
108 bytes from 192.168.3.2: icmp_seq=1 ttl=64 time=1.93 ms
108 bytes from 192.168.3.2: icmp_seq=2 ttl=64 time=2.42 ms
108 bytes from 192.168.3.2: icmp_seq=3 ttl=64 time=2.02 ms
108 bytes from 192.168.3.2: icmp_seq=4 ttl=64 time=2.57 ms
108 bytes from 192.168.3.2: icmp_seq=5 ttl=64 time=2.27 ms
```

Core

```
router ospf 1
    router-id 1.1.1.3
    max-metric router-lsa on-startup
    passive-interface default
    graceful-restart restart-interval 300
    trap-enable
    area 0.0.0.0

interface loopback 0
    ip address 1.1.1.3/32
    ip ospf 1 area 0.0.0.0

interface 1/1/1
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
    ip ospf cost 1000
    ip ospf network point-to-point

interface 1/1/2
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
    ip ospf cost 1000
    ip ospf network point-to-point
```

DC-Core-SwitchA

```
router ospf 1
    router-id 1.1.1.1
    max-metric router-lsa on-startup
    passive-interface default
    graceful-restart restart-interval 300
    trap-enable
    area 0.0.0.0

vlan 200
    vsx-sync
    description TRANSIT-VLAN

interface vlan 200
    ip mtu 9100
    ip address 1.1.200.1/30
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
```

```
    ip ospf cost 50
    ip ospf network point-to-point

interface vlan 10
    active-gateway ip mac 10:01:00:00:01:00
    active-gateway ip 10.1.10.254
    ip ospf 1 area 0.0.0.0

interface vlan 30
    active-gateway ip mac 30:01:00:00:01:00
    active-gateway ip 10.1.30.254
    ip ospf 1 area 0.0.0.0

interface loopback 0
    ip address 1.1.1.1/32
    ip ospf 1 area 0.0.0.0

interface 1/1/6
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
    ip ospf cost 1000
    ip ospf network point-to-point
```

DC-Core-SwitchB

```
router ospf 1
    router-id 1.1.1.2
    max-metric router-lsa on-startup
    passive-interface default
    graceful-restart restart-interval 300
    trap-enable
    area 0.0.0.0

vlan 200
    vsx-sync
    description TRANSIT-VLAN

interface vlan 200
    ip mtu 9100
    ip address 1.1.200.2/30
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
    ip ospf cost 50
    ip ospf network point-to-point

interface vlan 10
    active-gateway ip mac 10:01:00:00:01:00
    active-gateway ip 10.1.10.254
    ip ospf 1 area 0.0.0.0

interface vlan 30
    active-gateway ip mac 30:01:00:00:01:00
    active-gateway ip 10.1.30.254
    ip ospf 1 area 0.0.0.0

interface loopback 0
    ip address 1.1.1.2/32
    ip ospf 1 area 0.0.0.0

interface 1/1/6
    ip ospf 1 area 0.0.0.0
```

```
    no ip ospf passive
    ip ospf cost 1000
    ip ospf network point-to-point
```

Verify

Core#

```
ping 1.1.1.1
PING 1.1.1.1 (1.1.1.1) 100(128) bytes of data.
108 bytes from 1.1.1.1: icmp_seq=1 ttl=64 time=3.01 ms
108 bytes from 1.1.1.1: icmp_seq=2 ttl=64 time=2.84 ms
108 bytes from 1.1.1.1: icmp_seq=3 ttl=64 time=2.36 ms
108 bytes from 1.1.1.1: icmp_seq=4 ttl=64 time=1.76 ms
108 bytes from 1.1.1.1: icmp_seq=5 ttl=64 time=1.84 ms

--- 1.1.1.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 1.762/2.362/3.010/0.506 ms

Core# ping 1.1.1.2
PING 1.1.1.2 (1.1.1.2) 100(128) bytes of data.
108 bytes from 1.1.1.2: icmp_seq=1 ttl=64 time=2.41 ms
108 bytes from 1.1.1.2: icmp_seq=2 ttl=64 time=2.19 ms
108 bytes from 1.1.1.2: icmp_seq=3 ttl=64 time=1.50 ms
108 bytes from 1.1.1.2: icmp_seq=4 ttl=64 time=1.41 ms
108 bytes from 1.1.1.2: icmp_seq=5 ttl=64 time=1.64 ms

--- 1.1.1.2 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4004ms
rtt min/avg/max/mdev = 1.409/1.829/2.409/0.397 ms

Core# sho ip ospf neighbors
VRF : default                          Process : 1
=====================================================

Total Number of Neighbors : 2

Neighbor ID      Priority  State             Nbr Address       Interface
-------------------------------------------------------------------------
1.1.1.1          n/a       FULL              192.168.3.0        1/1/1
1.1.1.2          n/a       FULL              192.168.3.2        1/1/2
```

DC-Core-SwitchA#

```
ping 1.1.1.2
PING 1.1.1.2 (1.1.1.2) 100(128) bytes of data.
108 bytes from 1.1.1.2: icmp_seq=1 ttl=64 time=4.56 ms
108 bytes from 1.1.1.2: icmp_seq=2 ttl=64 time=2.19 ms
108 bytes from 1.1.1.2: icmp_seq=3 ttl=64 time=2.70 ms
108 bytes from 1.1.1.2: icmp_seq=4 ttl=64 time=2.05 ms
108 bytes from 1.1.1.2: icmp_seq=5 ttl=64 time=2.18 ms

ping 1.1.1.3
PING 1.1.1.3 (1.1.1.3) 100(128) bytes of data.
108 bytes from 1.1.1.3: icmp_seq=1 ttl=64 time=2.53 ms
108 bytes from 1.1.1.3: icmp_seq=2 ttl=64 time=1.58 ms
108 bytes from 1.1.1.3: icmp_seq=3 ttl=64 time=2.84 ms
108 bytes from 1.1.1.3: icmp_seq=4 ttl=64 time=1.80 ms
108 bytes from 1.1.1.3: icmp_seq=5 ttl=64 time=2.21 ms
```

```
--- 1.1.1.3 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 1.580/2.192/2.843/0.461 ms

sho ip ospf neighbors
VRF : default                           Process : 1
================================================

Total Number of Neighbors : 2

Neighbor ID      Priority  State             Nbr Address       Interface
-------------------------------------------------------------------------
1.1.1.3          n/a       FULL              192.168.3.1        1/1/6
1.1.1.2          n/a       FULL              1.1.200.2          vlan200
```

DC-Core-SwitchB#

```
DC-Core-SwitchB(config)# ping 1.1.1.1
PING 1.1.1.1 (1.1.1.1) 100(128) bytes of data.
108 bytes from 1.1.1.1: icmp_seq=1 ttl=64 time=2.84 ms
108 bytes from 1.1.1.1: icmp_seq=2 ttl=64 time=1.74 ms
108 bytes from 1.1.1.1: icmp_seq=3 ttl=64 time=2.36 ms
108 bytes from 1.1.1.1: icmp_seq=4 ttl=64 time=1.76 ms
108 bytes from 1.1.1.1: icmp_seq=5 ttl=64 time=2.27 ms

--- 1.1.1.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 1.738/2.193/2.841/0.412 ms

DC-Core-SwitchB(config)# ping 1.1.1.3
PING 1.1.1.3 (1.1.1.3) 100(128) bytes of data.
108 bytes from 1.1.1.3: icmp_seq=1 ttl=64 time=2.01 ms
108 bytes from 1.1.1.3: icmp_seq=2 ttl=64 time=2.16 ms
108 bytes from 1.1.1.3: icmp_seq=3 ttl=64 time=3.27 ms
108 bytes from 1.1.1.3: icmp_seq=4 ttl=64 time=2.10 ms
108 bytes from 1.1.1.3: icmp_seq=5 ttl=64 time=2.53 ms

--- 1.1.1.3 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4004ms
rtt min/avg/max/mdev = 2.010/2.412/3.270/0.463 ms


DC-Core-SwitchB(config)# show ip ospf neighbors
VRF : default                           Process : 1
================================================

Total Number of Neighbors : 2

Neighbor ID      Priority  State             Nbr Address       Interface
-------------------------------------------------------------------------
1.1.1.3          n/a       FULL              192.168.3.3        1/1/6
1.1.1.1          n/a       FULL              1.1.200.1          vlan200
```

HostA#

```
ping 1.1.1.3
PING 1.1.1.3 (1.1.1.3) 100(128) bytes of data.
108 bytes from 1.1.1.3: icmp_seq=1 ttl=63 time=3.19 ms
```

```
108 bytes from 1.1.1.3: icmp_seq=2 ttl=63 time=2.69 ms
108 bytes from 1.1.1.3: icmp_seq=3 ttl=63 time=3.22 ms
108 bytes from 1.1.1.3: icmp_seq=4 ttl=63 time=3.09 ms
108 bytes from 1.1.1.3: icmp_seq=5 ttl=63 time=3.30 ms

--- 1.1.1.3 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 2.691/3.099/3.302/0.214 ms
```

```
HostB#
ping 1.1.1.3
PING 1.1.1.3 (1.1.1.3) 100(128) bytes of data.
108 bytes from 1.1.1.3: icmp_seq=1 ttl=63 time=3.89 ms
108 bytes from 1.1.1.3: icmp_seq=2 ttl=63 time=3.08 ms
108 bytes from 1.1.1.3: icmp_seq=3 ttl=63 time=3.19 ms
108 bytes from 1.1.1.3: icmp_seq=4 ttl=63 time=3.91 ms
108 bytes from 1.1.1.3: icmp_seq=5 ttl=63 time=3.71 ms

--- 1.1.1.3 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4004ms
rtt min/avg/max/mdev = 3.078/3.555/3.905/0.351 ms
```

Appendix – Complete Configurations

Core

```
Core# sho run
Current configuration:
!
!Version ArubaOS-CX Virtual.10.07.0010
!export-password: default
hostname Core
user admin group administrators password ciphertext AQBapRHfzMsPKAk4v0V613PaTAbC4o8t
96rIPfPPtnzOlCvBYgAAAMNts+PFcxXUdAtBuPnz7x5EMC3CmbeamM0lKo/BJaH3yL5uTs+1h2V5FtomeZP8
jGq0ftRpMYSO6yW72AxqrOmqvfPaTCNzS3cZTAygOyL3KXoyDMFx395Sk3U8oHFMPurG
led locator on
ntp server pool.ntp.org minpoll 4 maxpoll 4 iburst
ntp enable
!
!
!
!
!
!
ssh server vrf mgmt
vlan 1
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/1
    no shutdown
    description To DC-Core-SwitchA
```

```
    ip mtu 9198
    ip address 192.168.3.1/31
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
    ip ospf cost 1000
    ip ospf network point-to-point
interface 1/1/2
    no shutdown
    description To DC-Core-SwitchB
    ip mtu 9198
    ip address 192.168.3.3/31
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
    ip ospf cost 1000
    ip ospf network point-to-point
interface loopback 0
    ip address 1.1.1.3/32
    ip ospf 1 area 0.0.0.0
!
!
!
!
!
router ospf 1
    router-id 1.1.1.3
    max-metric router-lsa on-startup
    passive-interface default
    graceful-restart restart-interval 300
    trap-enable
    area 0.0.0.0
https-server vrf mgmt
```

DC-Core-SwitchA

```
DC-Core-SwitchA# sho run
Current configuration:
!
!Version ArubaOS-CX Virtual.10.07.0010
!export-password: default
hostname DC-Core-SwitchA
user admin group administrators password ciphertext AQBapVPM4SHSLKL4RgeuwJ6iTzyKG3Xr
62UbkM6Rm2T/5ravYgAAAP7jVtEZytdoVmk5A752r+bou1hyZa48EeAYn3HnRkW21SNvgAbuw+Sqi+u70te1
LwiOsPvqFagle/eaOEsGf91bXI7zsTcxolNXp3wop5dtefMJBp3kWc71PNcKvJySC3kS
led locator on
vrf KA
ntp server pool.ntp.org minpoll 4 maxpoll 4 iburst
ntp enable
!
!
!
!
!
!
ssh server vrf mgmt
vlan 1
vlan 10
    vsx-sync
    description VLAN 10
vlan 30
    vsx-sync
```

```
    description VLAN 30
vlan 200
    vsx-sync
    description TRANSIT-VLAN
interface mgmt
    no shutdown
    ip dhcp
interface lag 1 multi-chassis
    no shutdown
    description To Host-A
    no routing
    vlan trunk native 1
    vlan trunk allowed 10
    lacp mode active
interface lag 2 multi-chassis
    no shutdown
    description To Host-B
    no routing
    vlan trunk native 1
    vlan trunk allowed 30
    lacp mode active
interface lag 256
    no shutdown
    description ISL Links
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    lacp mode active
interface 1/1/1
    no shutdown
    mtu 9100
    description To Host-A
    lag 1
interface 1/1/2
    no shutdown
    mtu 9100
    description To Host-B
    lag 2
interface 1/1/6
    no shutdown
    description To Core
    ip mtu 9198
    ip address 192.168.3.0/31
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
    ip ospf cost 1000
    ip ospf network point-to-point
interface 1/1/7
    no shutdown
    vrf attach KA
    description KA Interface
    ip address 192.168.0.0/31
interface 1/1/8
    no shutdown
    mtu 9198
    description ISL Physical Links
    lag 256
interface 1/1/9
    no shutdown
    mtu 9198
```

```
    description ISL Physical Links
    lag 256
interface loopback 0
    ip address 1.1.1.1/32
    ip ospf 1 area 0.0.0.0
interface vlan 10
    vsx-sync active-gateways
    description VLAN 10 Interface
    ip mtu 9100
    ip address 10.1.10.250/24
    active-gateway ip mac 10:01:00:00:01:00
    active-gateway ip 10.1.10.254
    ip ospf 1 area 0.0.0.0
interface vlan 30
    vsx-sync active-gateways
    description VLAN 30 Interface
    ip address 10.1.30.250/24
    active-gateway ip mac 30:01:00:00:01:00
    active-gateway ip 10.1.30.254
    ip ospf 1 area 0.0.0.0
interface vlan 200
    ip mtu 9100
    ip address 1.1.200.1/30
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
    ip ospf cost 50
    ip ospf network point-to-point
vsx
    system-mac 02:01:00:00:01:00
    inter-switch-link lag 256
    role primary
    keepalive peer 192.168.0.1 source 192.168.0.0 vrf KA
    vsx-sync vsx-global
!
!
!
!
!
router ospf 1
    router-id 1.1.1.1
    max-metric router-lsa on-startup
    passive-interface default
    graceful-restart restart-interval 300
    trap-enable
    area 0.0.0.0
https-server vrf mgmt
```

DC-Core-SwitchB

```
DC-Core-SwitchB(config)# sho run
Current configuration:
!
!Version ArubaOS-CX Virtual.10.07.0010
!export-password: default
hostname DC-Core-SwitchB
user admin group administrators password ciphertext AQBapTaB2JiehVGJNbWsCEN0LkufPp2E
sbrTJOthv7D12JyfYgAAAG7xySFol4D4i9oH9KsAbuyAQyuNRlBoSrw29VWSRhgZFArbBzr1I9BCYRTRbCMe
GdAM6/BmclHhOBxTxosjZ2TCjsmX2NhlCu6jpWnuOPplG+Nxje22Z5AqA35TYKSkOKYH
```

```
led locator on
vrf KA
ntp server pool.ntp.org minpoll 4 maxpoll 4 iburst
ntp enable
!
!
!
!
!
!
ssh server vrf mgmt
vlan 1
vlan 10
    vsx-sync
    description VLAN 10
vlan 30
    vsx-sync
    description VLAN 30
vlan 200
    vsx-sync
    description TRANSIT-VLAN
interface mgmt
    no shutdown
    ip dhcp
interface lag 1 multi-chassis
    no shutdown
    description To Host-A
    no routing
    vlan trunk native 1
    vlan trunk allowed 10
    lacp mode active
interface lag 2 multi-chassis
    no shutdown
    description To Host-B
    no routing
    vlan trunk native 1
    vlan trunk allowed 30
    lacp mode active
interface lag 256
    no shutdown
    description ISL Trunk
    no routing
    vlan trunk native 1
    vlan trunk allowed all
    lacp mode active
interface 1/1/1
    no shutdown
    mtu 9100
    description To Host-A
    lag 1
interface 1/1/2
    no shutdown
    mtu 9100
    description To Host-B
    lag 2
interface 1/1/6
    no shutdown
    description To Core
    ip mtu 9198
    ip address 192.168.3.2/31
```

```
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
    ip ospf cost 1000
    ip ospf network point-to-point
interface 1/1/7
    no shutdown
    vrf attach KA
    description KA Interface
    ip address 192.168.0.1/31
interface 1/1/8
    no shutdown
    mtu 9198
    description ISL Physical Links
    lag 256
interface 1/1/9
    no shutdown
    mtu 9198
    description ISL Physical Links
    lag 256
interface loopback 0
    ip address 1.1.1.2/32
    ip ospf 1 area 0.0.0.0
interface vlan 10
    vsx-sync active-gateways
    description VLAN 10 Interface
    ip address 10.1.10.251/24
    active-gateway ip mac 10:01:00:00:01:00
    active-gateway ip 10.1.10.254
    ip ospf 1 area 0.0.0.0
interface vlan 30
    vsx-sync active-gateways
    description VLAN 30 Interface
    ip address 10.1.30.251/24
    active-gateway ip mac 30:01:00:00:01:00
    active-gateway ip 10.1.30.254
    ip ospf 1 area 0.0.0.0
interface vlan 200
    ip mtu 9100
    ip address 1.1.200.2/30
    ip ospf 1 area 0.0.0.0
    no ip ospf passive
    ip ospf cost 50
    ip ospf network point-to-point
vsx
    system-mac 02:01:00:00:01:00
    inter-switch-link lag 256
    role secondary
    keepalive peer 192.168.0.0 source 192.168.0.1 vrf KA
    vsx-sync vsx-global

!
!
!
!
!
router ospf 1
    router-id 1.1.1.2
    max-metric router-lsa on-startup
    passive-interface default
    graceful-restart restart-interval 300
```

```
    trap-enable
    area 0.0.0.0
https-server vrf mgmt
```

Host-A

```
HostA# sho run
Current configuration:
!
!Version ArubaOS-CX Virtual.10.07.0010
!export-password: default
hostname HostA
user admin group administrators password ciphertext AQBapV+/FoudFpWwMMzK0Z3e6Ru5Wy2N
nE/lAggAwKknQz5xYgAAAGgW2qlPJ+rOsTc8AJN4E3sJo9z82R+grCuBts3M9Gi4wxmH37MKvpPxHzCpyJK7
n1qlot6GqgOQWZaTvgz8vrKVvsgZqbGhU4z0OUvd4B0kql+AktWwDOWVqo2cZsAgVJ9e
led locator on
ntp server pool.ntp.org minpoll 4 maxpoll 4 iburst
ntp enable
!
!
!
!
!
!
ssh server vrf mgmt
vlan 1
vlan 10
    description VLAN-10-Host-A
interface mgmt
    no shutdown
    ip dhcp
interface lag 1
    no shutdown
    description Host-A to DC-Collapsed-Core-Switch-A-B 1/1/1
    no routing
    vlan trunk native 1
    vlan trunk allowed 10
    lacp mode active
interface 1/1/1
    no shutdown
    mtu 9100
    description To DC-Collapsed-Core-Switch-A
    lag 1
interface 1/1/2
    no shutdown
    mtu 9100
    description To DC-Collapsed-Core-Switch-B
    lag 1
interface vlan 10
    ip address 10.1.10.1/24
ip route 0.0.0.0/0 10.1.10.254

!
!
!
!
!
https-server vrf mgmt
```

Host-B

```
Host-B# sho run
Current configuration:
!
!Version ArubaOS-CX Virtual.10.07.0010
!export-password: default
hostname Host-B
user admin group administrators password ciphertext AQBapaMiYBEtCzJ6uBeQmacgJaqJCGLL
CWRSlxr2PT4oSnPbYgAAAJCKEbAveqfAntMKeSROKdrsJetuw4N+heI9i4vZ5m+eT1nJFqPYlIJ3gmPLn/11
y8ETt8i4/YSDGkY7aQUvn47rhI75QhuqxF8ugS7Wj92j1foHK9r1oFnl0q1rbnLxkf+t
led locator on
ntp server pool.ntp.org minpoll 4 maxpoll 4 iburst
ntp enable
!
!
!
!
!
!
ssh server vrf mgmt
vlan 1
vlan 30
    description VLAN-30-Host-B
interface mgmt
    no shutdown
    ip dhcp
interface lag 2
    no shutdown
    description Host-B to DC-Core-SwitchA-B 1/1/2
    no routing
    vlan trunk native 1
    vlan trunk allowed 30
    lacp mode active
interface 1/1/1
    no shutdown
    mtu 9100
    description To DC-Core-Switch-A
    lag 2
interface 1/1/2
    no shutdown
    mtu 9100
    description To DC-Core-Switch-B
    lag 2
interface vlan 30
    ip address 10.1.30.1/24
ip route 0.0.0.0/0 10.1.30.254
!
!
!
!
https-server vrf mgmt
```