Virtual Switching Extension (VSX)

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Virtual Switching Extension (VSX)

Agenda

1. Introduction
2. Basic Solution Details / Configuration
3. VSX & Loops
4. VSX & LACP Edge
5. VSX Active Gateway
6. VSX Enhancements
7. Q&A
Introduction
# Aruba Airheads

## Introduction

Aruba OS Configuration Guides / Webinars

### ArubaOS-CX 10.04 Virtual Switching Extension (VSX) Guide

6400, 8320, 8325, 8400 Switch Series

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### VSX Configuration Best Practices for Aruba CX 6400, 8320, 8325, 8400

AOS-CX VERSION 10.4

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## 2020

<table>
<thead>
<tr>
<th>Art</th>
<th>Webinar-Name</th>
<th>Datum</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Practice</td>
<td>VSX für Profis</td>
<td>02.06.2020</td>
<td>zur Anmeldung</td>
</tr>
<tr>
<td>Best Practice</td>
<td>VSX Grundlagen</td>
<td>19.05.2020</td>
<td>zur Anmeldung</td>
</tr>
</tbody>
</table>
What is VSX
Overview

- „Virtual Switching E Xtension“
  - Virtual = Software
  - Switching != Routing
  - Extension != Available on all Switches

- Supported on:
  - Aruba 6400, 8320, 8325, 8400 Switch Series
  - Mix of different Switch Series is not possible
  - Mix of different codes is not possible (see later)

- Maximum of two devices
- Creates a virtual Layer-2 device
- Active-Active L2, L3, Unicast, Multicast
- Dual Control Plane / Dual Management Plane
Switch Virtualization Solutions
Comparison

HPE IRF, Aruba VSF, …

SYNC?
SYNC(*)

Aruba VSX, Distributed Trunking, …

(*) different levels of synchronization possible

Chassis 1
Management
Control
Routing
Ethernet Links
Shared

Chassis 2
Management
Control
Routing
Ethernet Links
Shared

Chassis 1
Management
Control
Routing
Ethernet Links

Chassis 2
Management
Control
Routing
Ethernet Links
Shared
Solution Details
Basic VSX Components
VSX Components

VSX Roles

Two VSX Roles

- Primary
  - VSX-dataplane-sync is automatically activated by VSX
  - VSX-config-sync automatically activated by VSX
  - Synchronises selected config changes to directly Secondary
  - Fully active API (CLI, REST, …)

- Secondary
  - VSX-dataplane-sync is automatically activated by VSX
  - VSX-config-sync not automatically activated by VSX
  - Receives config changes from Primary
  - Fully active API (CLI, REST, …)
VSX Components
Inter-Switch-Link (ISL)

Inter Switch Link (ISL)
- Directly connected (max. two Boxes)
- Circuits
  - Single
  - Aggregated circuit (recommended)
- Speed
  - 10Gbps or more
  - No mix of different speeds
- Standard ports
  - No additional encapsulation
  - QoS, ACL policies work
  - Counters / Statistics work
  - Works long distances
- Runs Aruba proprietary ISL Protocol
VSX Components
ISL Protocol

- Ethernet Frame exchange (Layer 2)
- ISLP Version dependent
  - Capabilities Sync
- OS Version independent
- Synchronizes states between VSX peers:
  - LACP states
  - MAC forwarding database
  - ARP/ND table
  - STP states
  - ...
- Synchronizes config between VSX peers
  - AAA, VLAN, SNMP, SSH, OSPF, BGP, ...
VSX Components
VSX Link-Aggregation

**VSX LAG = Multi-Chassis Link-Aggregation**

- Layer 2 only
- LAG Types:
  - Non-LACP / Static
  - LACP (recommended)
- All speeds supported
- No mix of different speeds, duplex, VLANs, … (LACP requirements)
- Single L2 peer from the outside
  - Single system mac
- Up to 4 links per chassis
- Local Links always preferred
VSX Components

VSX system-mac

- System MAC identifies the virtual L2 system
- System MAC has to be a unicast MAC
- System MAC recommended to be private MAC

2930F-1# `show lldp info remote-device`
LLDP Remote Devices Information

<table>
<thead>
<tr>
<th>LocalPort</th>
<th>ChassisId</th>
<th>PortId</th>
<th>PortDescr</th>
<th>SysName</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>94f128-1d0f00</td>
<td>1/1/1</td>
<td>1/1/1</td>
<td>8400-2</td>
</tr>
</tbody>
</table>

2930F-1# `show lacp peer`
LACP Peer Information.

System ID: e0071b-c2e940

<table>
<thead>
<tr>
<th>Local Port</th>
<th>Local Trunk</th>
<th>System ID</th>
<th>Oper Port</th>
<th>Oper Priority</th>
<th>Oper Key</th>
<th>LACP Mode</th>
<th>Tx Timer</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Trk1</td>
<td>000000-000000</td>
<td>1</td>
<td>1</td>
<td>11</td>
<td>Active</td>
<td>Slow</td>
</tr>
<tr>
<td>26</td>
<td>Trk1</td>
<td>020000-000101</td>
<td>1001</td>
<td>1</td>
<td>11</td>
<td>Active</td>
<td>Slow</td>
</tr>
</tbody>
</table>

VSX system-mac set to Primary VSX System-ID
system-mac = 00:00:00:00:01:01

System MAC identifies the virtual L2 system
System MAC has to be a unicast MAC
System MAC recommended to be private MAC
**VSX Components**

**VSX Keepalive**

- **Keepalive**
  - Identifies split brain situation
  - No direct link required
  - UDP based (default port 7678)
  - L3 Source / Destination Interface
    - Using ISL is NOT recommended
    - Using VSX LAG is not supported
    - Routed port recommended
    - IPv4 only
  - Any Speed
VSX Components
VSX Keepalive & ISLP Sync

Keepalive & ISLP Sync – Both systems UP

<table>
<thead>
<tr>
<th>ISL</th>
<th>Established</th>
<th>Init</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Sync</td>
<td>Normal Operation</td>
<td>Normal Operation No Protection</td>
</tr>
<tr>
<td>Out-of-Sync</td>
<td>Normal Operation</td>
<td>Split-Brain</td>
</tr>
<tr>
<td>In-Sync</td>
<td>VSX LAG DOWN</td>
<td>Both forwarding</td>
</tr>
</tbody>
</table>
VSX Components
VSX split recovery

### VSX Split recovery

<table>
<thead>
<tr>
<th>Failure Scenarios</th>
<th>Split-recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Off</td>
</tr>
<tr>
<td>Keepalive down. ISL up.</td>
<td>No impact. (but loss of split detection)</td>
</tr>
<tr>
<td>ISL down. Keepalive up.</td>
<td>Secondary VSX node tears down VSX LAG member ports</td>
</tr>
<tr>
<td>ISL down. Keepalive up.</td>
<td>Secondary VSX node tears down VSX LAG member ports.</td>
</tr>
<tr>
<td>Then, after sometime¹, keepalive down as well.</td>
<td>Secondary VSX LAGs stays down.</td>
</tr>
<tr>
<td>At the same time², ISL down and keepalive down.</td>
<td>All VSX LAG ports stay up.</td>
</tr>
<tr>
<td>Keepalive restore</td>
<td>Secondary VSX node tears down VSX LAG member ports</td>
</tr>
</tbody>
</table>

¹: enough time for split to be detected between ISL cut and keepalive down events (between 0sec and one hellotime).
²: ISL cut and keepalive down events are closed enough so there is no possibility to detect a split (like a power-off).
Configuration
Basic VSX Components
VSX Configuration
Prepare VSX LAG

AOSCX-1(config)# interface lag 1
AOSCX-1(config-lag-if)# no routing
AOSCX-1(config-lag-if)# lacp mode active
AOSCX-1(config-lag-if)# no shutdown
AOSCX-1(config-lag-if)# exit
AOSCX-1(config)# interface 1/1/1-1/1/2
AOSCX-1(config-if-<1/1/1-1/1/2>)# no routing
AOSCX-1(config-if-<1/1/1-1/1/2>)# lag 1
AOSCX-1(config-if-<1/1/1-1/1/2>)# no shutdown
AOSCX-1(config-if-<1/1/1-1/1/2>)# exit

AOSCX-2(config)# interface lag 1
AOSCX-2(config-lag-if)# no routing
AOSCX-2(config-lag-if)# lacp mode active
AOSCX-2(config-lag-if)# no shutdown
AOSCX-2(config-lag-if)# exit
AOSCX-2(config)# interface 1/1/1-1/1/2
AOSCX-2(config-if-<1/1/1-1/1/2>)# no routing
AOSCX-2(config-if-<1/1/1-1/1/2>)# lag 1
AOSCX-2(config-if-<1/1/1-1/1/2>)# no shutdown
AOSCX-2(config-if-<1/1/1-1/1/2>)# exit
**VSX Configuration**

**VSX Roles, VSX System MAC, VSX ISL**

```
AOSCX-1(config)# vsx
AOSCX-1(config-vsx)# role primary
AOSCX-1(config-vsx)# system-mac 02:00:00:01:00:01
AOSCX-1(config-vsx)# inter-switch-link lag 1
AOSCX-1(config-vsx)# exit

AOSCX-2(config)# vsx
AOSCX-2(config-vsx)# role secondary
AOSCX-2(config-vsx)# system-mac 02:00:00:01:00:01
AOSCX-2(config-vsx)# inter-switch-link lag 1
AOSCX-2(config-vsx)# exit
```

**Private MACs:**
- x2-xx-xx-xx-xx-xx
- x6-xx-xx-xx-xx-xx
- xA-xx-xx-xx-xx-xx
- xE-xx-xx-xx-xx-xx
VSX Configuration
Verify basic VSX setup - Primary

AOSCX-1# show vsx status
VSX Operational State
---------------------
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Local</th>
<th>Peer</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISL channel</td>
<td>In-Sync</td>
<td></td>
</tr>
<tr>
<td>ISL mgmt channel</td>
<td>operational</td>
<td></td>
</tr>
<tr>
<td>Config Sync Status</td>
<td>in-sync</td>
<td></td>
</tr>
<tr>
<td>NAE</td>
<td>peer_reachable</td>
<td></td>
</tr>
<tr>
<td>HTTPS Server</td>
<td>peer_reachable</td>
<td></td>
</tr>
<tr>
<td>ISL link</td>
<td>lag1</td>
<td>lag1</td>
</tr>
<tr>
<td>ISL version</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>System MAC</td>
<td>02:00:00:01:00:01</td>
<td>02:00:00:01:00:01</td>
</tr>
<tr>
<td>Platform</td>
<td>X86-64</td>
<td>X86-64</td>
</tr>
<tr>
<td>Software Version</td>
<td>Virtual.10.03.0020</td>
<td>Virtual.10.03.0020</td>
</tr>
<tr>
<td>Device Role</td>
<td>primary</td>
<td>secondary</td>
</tr>
</tbody>
</table>

1/1/1 1/1/2
(lag 1)
1/1/1 1/1/2
(lag 1)
VSX Configuration
Verify basic VSX setup - Secondary

AOSCX-2# `show vsx status`
VSX Operational State
---------------------
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Local</th>
<th>Peer</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISL channel          : In-Sync</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISL mgmt channel     : operational</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config Sync Status   : in-sync</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NAE                  : peer_reachable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTTPS Server         : peer_reachable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1/1/1
1/1/2 (lag 1)
1/1/1
1/1/2 (lag 1)
VSX Configuration
Tune VSX ISL

AOSCX(config-vsx)# `inter-switch-link dead-interval` ?
   <2-20> Set the dead time interval in seconds (Default: 20 seconds)

AOSCX(config-vsx)# `inter-switch-link hello-interval` ?
   <1-5> Set the hello time interval in seconds (Default: 1 second)

AOSCX(config-vsx)# `inter-switch-link hold-time` ?
   <0-3> Set the hold time interval in seconds (Default: 0 seconds)

AOSCX(config-vsx)# `inter-switch-link peer-detect-interval` ?
   <60-600> Set the peer detect interval in seconds (Default: 300 seconds)
VSX Configuration
VSX Keepalive in separate VRF

AOSCX-1(config)# vrf keepalive
AOSCX-1(config-vrf)# exit
AOSCX-1(config)# interface 1/1/3
AOSCX-1(config-if)# routing
AOSCX-1(config-if)# vrf attach keepalive
AOSCX-1(config-if)# ip address 192.168.1.0/31
AOSCX-1(config-if)# no shutdown
AOSCX-1(config-if)# exit
AOSCX-1(config)# vsx
AOSCX-1(config-vsx)# keepalive peer 192.168.1.1 source 192.168.1.0 vrf
keepalive

AOSCX-2(config)# vrf keepalive
AOSCX-2(config-vrf)# exit
AOSCX-2(config)# interface 1/1/3
AOSCX-2(config-if)# routing
AOSCX-2(config-if)# vrf attach keepalive
AOSCX-2(config-if)# ip address 192.168.1.1/31
AOSCX-2(config-if)# no shutdown
AOSCX-2(config-if)# exit
AOSCX-2(config)# vsx
AOSCX-2(config-vsx)# keepalive peer 192.168.1.1 source 192.168.1.0 vrf
keepalive
### VSX Configuration

#### Verify VSX Keepalive

**AOSCX-1# show vsx brief**

- **ISL State**: In-Sync
- **Device State**: Peer-Established
- **Keepalive State**: Keepalive-Established
- **Device Role**: primary
- **Number of Multi-chassis LAG interfaces**: 0

**AOSCX-2# show vsx brief**

- **ISL State**: In-Sync
- **Device State**: Peer-Established
- **Keepalive State**: Keepalive-Established
- **Device Role**: secondary
- **Number of Multi-chassis LAG interfaces**: 0
VSX Configuration
Tune VSX Keepalive

AOSCX(config-vsx)# keepalive dead-interval ?
<2-20> Set the keepalive dead time interval in seconds (Default: 3 seconds)

AOSCX(config-vsx)# keepalive hello-interval ?
<1-5> Set the keepalive hello time interval in seconds (Default: 1 second)

AOSCX(config-vsx)# keepalive udp-port ?
<1024-65535> UDP port (Default: 7678)
VSX & Spanning-Tree-Protocol
Solution Details
VSX & Spanning-Tree-Protocol

VSX & Spanning-Tree-Protocol

- VSX works with
  - MSTP
  - RPVST
- Independent STP on both switches
- STP state part of ISLP sync
- External System-ID is VSX System-ID
- Internal System-ID is VSX system-id (+1 and -1)
- VSX „STP operational“ node owns BPDUs on VSX lag
- ISL is never blocked, part of STP calculation
- Global STP configuration must be the same (e.g. Name, Revision, VLAN Mapping, …)
VSX & Spanning-Tree-Protocol Limitation

VSX & MSTP Limitations

– VSX can be root or non-root
– Path Cost is not allowed on ISL port
– No Port Specific Configuration on ISL
– No Redundant Links parallel to the ISL
– Topology changes only accounted on Active Primary
– MSTP supported in VSX and non-VSX environments
– STP configuration on VSX LAGs must be the same

VSX & RPVSTP Limitation

– VSX can be root or non-root
– Path Cost is not allowed on ISL port
– No Port Specific Configuration on ISL
– No Redundant Links parallel to the ISL
– Topology changes only accounted on Active Primary
– RPVST supported in VSX and non-VSX environments
– STP configuration on VSX LAGs must be the same
VSX & Loop Protect
Solution Details & Configuration
VSX & Loop Protect – Best Practices

- Enable Loop Protect on both VSX switches
- Do not enable Loop-Protect on ISL
- Change of Loop-Protect Action requires disable/enable
- "do-not-disable" leads to log/trap every transmit interval
- Loop Protect CoPP is 4094 (10k max) (= Ports x VLAN)
VSX & Loop Protect
Configuration

AOSCX-1(config)# interface lag 1 multi-chassis
AOSCX-1(config-if-lag)# loop-protect
AOSCX-1(config-if-lag)# loop-protect vlan 1-2000
AOSCX-1(config-if-lag)# exit
AOSCX-1(config)# interface lag 2 multi-chassis
AOSCX-1(config-if-lag)# loop-protect
AOSCX-1(config-if-lag)# loop-protect vlan 1-2000
AOSCX-1(config-if-lag)# exit

AOSCX-2(config)# interface lag 1 multi-chassis
AOSCX-2(config-if-lag)# loop-protect
AOSCX-2(config-if-lag)# loop-protect vlan 1-2000
AOSCX-2(config-if-lag)# exit
AOSCX-2(config)# interface lag 2 multi-chassis
AOSCX-2(config-if-lag)# loop-protect
AOSCX-2(config-if-lag)# loop-protect vlan 1-2000
AOSCX-2(config-if-lag)# exit
VSX LACP Fallback (LACP Edge)
Solution Details
VSX LACP Fallback (LACP Edge)
Solution Details

VSX LACP Fallback
- Ports are individual LACP ports
- Both Individual Ports send out STP BPDUs
- After first LACP PDU ports become LACP active ports
- Enables
  - PXE Boot
  - Switch deployment
  - …
LACP Fallback
Configuration

AOSCX-1(config)# interface lag 1
AOSCX-1(config-lag-if)# lacp fallback

AOSCX-2(config)# interface lag 1
AOSCX-2(config-lag-if)# lacp fallback
**LACP Fallback**

**Troubleshooting – Before LACP**

AOSCX-1# show lacp interface

State abbreviations:
A - Active        P - Passive      F - Aggregable  I - Individual
S - Short-timeout L - Long-timeout N - InSync     O - OutofSync
C - Collecting    D - Distributing
X - State m/c expired        E - Default neighbor state

Actor details of all interfaces:

<table>
<thead>
<tr>
<th>Intf</th>
<th>Aggr Name</th>
<th>Port</th>
<th>Port Pri</th>
<th>State</th>
<th>System-ID</th>
<th>System Aggr Forwarding Pri</th>
<th>Key</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>lag101(mc)</td>
<td>1</td>
<td></td>
<td>IE</td>
<td>00:00:00:83:25:01</td>
<td>65534</td>
<td>101</td>
<td>up</td>
</tr>
</tbody>
</table>

Partner details of all interfaces:

<table>
<thead>
<tr>
<th>Intf</th>
<th>Aggr Name</th>
<th>Port</th>
<th>Port Pri</th>
<th>State</th>
<th>System-ID</th>
<th>System Aggr Pri</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>lag101(mc)</td>
<td>0</td>
<td></td>
<td>IE</td>
<td>65534</td>
<td>00:00:00:00:00:00</td>
<td>0</td>
</tr>
</tbody>
</table>
LACP Fallback
Troubleshooting – After LACP

AOSCX-1# show lacp interface

State abbreviations:
A - Active      P - Passive      F - Aggregable
S - Short-timeout L - Long-timeout N - InSync
C - Collecting  D - Distributing
X - State m/c expired    E - Default neighbor state

Actor details of all interfaces:

<table>
<thead>
<tr>
<th>Intf</th>
<th>Aggr Name</th>
<th>Port Id</th>
<th>Port Pri</th>
<th>State</th>
<th>System-ID</th>
<th>System Aggr</th>
<th>Forwarding Pri</th>
<th>Key</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>lag101(mc) 1</td>
<td>1</td>
<td>1</td>
<td>up</td>
<td>ALFNCD 00:00:00:83:25:01</td>
<td>65534</td>
<td>101</td>
<td>up</td>
<td></td>
</tr>
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<table>
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<th>Intf</th>
<th>Aggr Name</th>
<th>Port Id</th>
<th>Port Pri</th>
<th>State</th>
<th>System-ID</th>
<th>System Aggr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/1</td>
<td>lag101(mc) 0</td>
<td>65534</td>
<td></td>
<td>0</td>
<td>ALFNCD 00:00:00:00:00:00</td>
<td>0</td>
</tr>
</tbody>
</table>
VSX LACP Fallback (LACP Edge)
Switch Zero-Touch-Provisioning

Switch Zero-Touch-Provisioning
– Supports any brand of Switches
– Validated scenario:
  – All ports up
  – All ports in VLAN 1
– Loop-Prevention
  – MSTP
    – No Spanning-Tree and BPDU Forwarding on Naked Switch
    – Spanning-Tree enabled
  – RPVST
    – Not supported
  – Loop-Protect
    – Not supported
VSX Active-Gateway
Solution Details
Active-Gateway
Description

- Shared virtual IP address (VIP) and MAC address (VMAC)
- VIP/VMAC is First-Hop-Gateway for local VLANs
- No need for VRRP (and mutually exclusive)
- VIP/VMAC must be the same on both VSX switches
- Support for multiple VIPs and single VMAC per protocol
- Support for IPv4 and IPv6
Active-Gateway
Unicast traffic Load-Balancing

Active-Gateway Load-balancing
- During normal operation no ISL traffic
- Regardless of L2 or L3 (First Hop Routing)
VSX Active-Gateway
ARP Handling

ARP
- ARP is send with physical MAC on Ethernet
- ARP Reply contains VMAC/VIP
- Gratuitous ARP is send every 25 seconds for VMAC
  - ISL In-Sync: Only Primary sends GARP
  - ISL Out-of-Sync: Primary + Secondary sends GARP

<table>
<thead>
<tr>
<th>No.</th>
<th>Time</th>
<th>Source</th>
<th>Destination</th>
<th>Protocol</th>
<th>Length</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>34.423663</td>
<td>0a:00:0c:0d:0e:0f</td>
<td>Broadcast</td>
<td>ARP</td>
<td>68</td>
<td>Gratuitous ARP for 10.1.100.1 (Reply)</td>
</tr>
<tr>
<td>15</td>
<td>46.521331</td>
<td>HewlettP:47:53:e0</td>
<td>Broadcast</td>
<td>ARP</td>
<td>68</td>
<td>Gratuitous ARP for 10.1.100.2 (Reply)</td>
</tr>
<tr>
<td>16</td>
<td>53.919524</td>
<td>HewlettP:ca:fc:d4</td>
<td>Broadcast</td>
<td>ARP</td>
<td>68</td>
<td>Gratuitous ARP for 10.1.100.3 (Reply)</td>
</tr>
<tr>
<td>19</td>
<td>61.059186</td>
<td>0a:00:0c:0d:0e:0f</td>
<td>Broadcast</td>
<td>ARP</td>
<td>68</td>
<td>Gratuitous ARP for 10.1.100.1 (Reply)</td>
</tr>
<tr>
<td>20</td>
<td>67.138330</td>
<td>HewlettP:47:53:e0</td>
<td>Broadcast</td>
<td>ARP</td>
<td>68</td>
<td>Gratuitous ARP for 10.1.100.2 (Reply)</td>
</tr>
<tr>
<td>21</td>
<td>80.451917</td>
<td>HewlettP:ca:fc:d4</td>
<td>Broadcast</td>
<td>ARP</td>
<td>68</td>
<td>Gratuitous ARP for 10.1.100.3 (Reply)</td>
</tr>
</tbody>
</table>
VSX Configuration
VSX Active Gateway Configuration

AOSCX-1(config)# vlan 100
AOSCX-1(config-vlan-100)# description users
AOSCX-1(config-vlan-100)# exit
AOSCX-1(config)# interface vlan 100
AOSCX-1(config-if-vlan)# ip address 10.1.100.2/24
AOSCX-1(config-if-vlan)# active-gateway ip mac 0a:0b:0c:0d:0e:0f
AOSCX-1(config-if-vlan)# active-gateway ip 10.1.100.1

AOSCX-2(config)# vlan 100
AOSCX-2(config-vlan-100)# description users
AOSCX-2(config-vlan-100)# exit
AOSCX-2(config)# interface vlan 100
AOSCX-2(config-if-vlan)# ip address 10.1.100.3/24
AOSCX-2(config-if-vlan)# active-gateway ip mac 0a:0b:0c:0d:0e:0f
AOSCX-2(config-if-vlan)# active-gateway ip 10.1.100.1
VSX Active-Gateway DHCP Relay
Solution Details
VSX Active-Gateway DHCP Relay

- Primary Node relays DHCP to upstream Server
- Secondary Node relays DHCP packets to Primary Node
- Secondary takes over Primary role in case of failure
- Upstream servers receive single request
- Clients receive single offer
Active-Gateway

DHCP relay backup

Outbound traffic

<table>
<thead>
<tr>
<th>Source IP</th>
<th>Destination IP</th>
<th>Protocol</th>
<th>Source Port</th>
<th>Destination Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0.111.50</td>
<td>10.0.111.50</td>
<td>TCP</td>
<td>68</td>
<td>67</td>
</tr>
<tr>
<td>10.0.111.50</td>
<td>10.0.111.50</td>
<td>UDP</td>
<td>68</td>
<td>67</td>
</tr>
</tbody>
</table>

DHCP server configuration:

- **AOS-CX Agg-1**: 832x / 8400
- **AOS-CX Agg-2**: 832x / 8400

Primary DHCP server:

- **AOS-CX Core-1**: 832x / 8400
- **AOS-CX Core-2**: 832x / 8400

Secondary DHCP server:

- **Access SW1**: AOS-CX Agg-1
- **Access SW2**: AOS-CX Agg-2
Active-Gateway
DHCP relay backup – Primary failure
VSX Enhancements
Solution Details
## VSX Enhancements Summary

<table>
<thead>
<tr>
<th>Feature</th>
<th>10.1</th>
<th>10.2</th>
<th>10.3</th>
<th>10.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSX + Spanning-tree (MSTP or RPVST+)</td>
<td>No</td>
<td>MSTP only</td>
<td>MSTP / RPVST+</td>
<td></td>
</tr>
<tr>
<td>Multicast Active-Active</td>
<td>No</td>
<td>Yes: Dual-DR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX static LAG</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX manual system-mac</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX split-recovery</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX LACP fallback</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVRP (Multiple VLAN Registration Protocol)</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX active-gateway and VRRP</td>
<td>No</td>
<td>Yes: Global co-existence, mutually exclusive per SVI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX active-gateway multinetting</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LACP graceful shutdown (during VSX live upgrade)</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSPF and BGP graceful shutdown (during VSX live upgrade)</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX with BGP EVPN VXLAN</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keepalive over OOBM</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DHCP relay (active on primary, standby on secondary)</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DHCP server and lease synchronization within VSX</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gratuitous ARP on active-gateway (sent by primary)</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX Live Upgrade orchestration from CLI</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX Live Upgrade orchestration from WebUI</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX-sync (pseudo single management plane)</td>
<td>VLANs, ACLs, Class, Policy + feature-group tags</td>
<td>VLAN range sync + new feature-group tags + new feature-group tags (ospf, bgp, evpn, vrrp…)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSX linkup delay optimization</td>
<td>No</td>
<td>Partial</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
VSX Config Sync
Solution Details
VSX Config Sync

- Enabled with VSX Sync
- VSX sync is only set on primary
- Per default no configuration is synced
- Each config feature has to be enabled manually
- Dependencies are not resolved
- Failed synchronisations:
  - are indicated on CLI
  - no automatic action is taken
  - changes to secondary are buffered
VSX Live-Update
Solution Details
VSX update-software command

```bash
vsx update-software <remote-url> [vrf <vrf-name>]
```

- This command, ran from the primary node, downloads new software from TFTP server and, after successfully verification, install the software to the alternate image of both VSX Primary and Secondary systems.
- Post download, it reboots them in sequence:
  - send a notification to the VSX Secondary switch to reboot first
  - monitor for the Secondary switch to come back in steady state.
  - reboot primary.
- In the event of a failure that causes the Secondary switch to not boot-up, the Primary will abort the firmware update operation and stay up.
- If a switch has booted with the primary image then it will install the software to Secondary image.
- When the Secondary VSX switch is rebooting, the Primary is actively forwarding traffic.
- Before the Primary goes for a reboot, the Secondary is up and forwarding traffic.
- It can be aborted at any point using Control+C or Control+Z
Questions ?
percy.jahn@hpe.com