

**Document Classification**

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ASML

ACI Health Check - EID

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Document Summary

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About this Document

Purpose

This document outlines the findings from an architectural and health assessment of the ASML EID fabric. Details and recommendations are described throughout the document, and recommendations are summarized at the end.

Audience

This report is intended for the ASML engineering, architecture, and leadership responsible for ACI design and operational health.

Scope

This review covers only the EID fabric. The review includes configuration and design review, scalability, and overall network health. Additional recommendations may be added to future health checks, as well as adjustments to the included recommendations based on Cisco Services customer insights. At the same time, the assessment and recommendations in this document have been written in a way where the guidance should continue to be relevant for the foreseeable changes.

Assumptions

Related Documents

Summary of Recommendations

The following table summarizes and prioritizes the recommendations in this document. Priorities are determined through a combination of risk and ease/risk of implementing the recommended change.

**Note** that these priorities are based on automated analysis of the EID fabric and Cisco knowledge of the environment; however, they may vary significantly between companies, and between fabrics in the same company. These are guidelines to be discussed and prioritized by ASML to determine what’s best for this environment.

|  |
| --- |
| Recommendation |
| **High** |
| Not all Leaf switches are dual homed to Spines. Ensure all Leaf switches are dual homed. |
| Duplicate subnets are configured to the external EPGs behind different L3outs, this can cause indeterministic behavior when applying contracts to these external EPGs. |
| On 40 switches the MCP limits have been surpassed, keep track of this and resolve as soon as possible. |
| Many vPC interfaces are currently individual or suspended. Ensure these vPCs are restored before performing upgrades. |
| **Medium** |
| Enable Domain Validation. |
| Ensure all member switches of vPC pairs are in different upgrade groups. |
| Start Life Cycle Management process for 93180YC-EX and 93108TC-EX. |
| Many links are overloaded, consider adding bandwidth or move workloads. |
| Replace the expired certificate. |
| There are many invalid configurations present. Remove these to improve stability. |
| Many duplicate subnets are configured on BD’s and/or EPGs. Remove these duplicates. |
| **Low** |
| Enable Digital Optical Monitoring (DOM). |
| Re-enable remote endpoint learning. |
| Several overlapping vlan blocks exist. This can cause issues when duplicate vlans from different domains are assigned to the same EPG. |
| Start Life Cycle Management process for 93180YC-FX, 93108TC-FX, 9364C and APIC-SERVER-L3. |

# Fabric Overview

The EID fabric is a multi-pod fabric with 9 pods. Multi-pod has some special consideration that were analyzed in this review and are covered later in this document.

## Hardware

The following hardware was found in EID:

|  |  |  |
| --- | --- | --- |
| Model | Role | Count |
| APIC-SERVER-L3 | Controller | 7 |
| N9K-C9364C | Spine | 16 |
| N9K-C9364C-GX | Spine | 2 |
| N9K-C93180YC-FX | Leaf | 106 |
| N9K-C9336C-FX2 | Leaf | 46 |
| N9K-C93240YC-FX2 | Leaf | 2 |
| N9K-C93180YC-EX | Leaf | 34 |
| N9K-C93108TC-FX | Leaf | 32 |
| N9K-C93108TC-EX | Leaf | 2 |

## Firmware

The lowest version of firmware found in EID is 5.2(8e). Note that the fabric was reviewed for multiple versions of firmware, malformed version strings, etc.

|  |
| --- |
| Lowest Version |
| 5.2(8e) |

## Tenant overview

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Tenant | VRFs | BDs | EPGs | L3outs | Contracts |
| common | 2 | 1 | 0 | 1 | 1 |
| eid-dc-tenant1 | 100 | 1470 | 1504 | 119 | 134 |
| infra | 2 | 2 | 2 | 1 | 0 |
| mgmt | 2 | 1 | 0 | 0 | 0 |

Bridge Domain overview

|  |  |
| --- | --- |
| BD Configuration | Count |
| Total | 1470 |
| **Layer2** | |
| L2 Total | 451 |
| L2 Hardware Proxy | 1 |
| L2 Flooding | 450 |
| **Layer3** | |
| L3 Total | 1019 |
| L3 Hardware Proxy | 1019 |
| L3 Flooding | 0 |
| **Specific Configurations** | |
| L3 No Subnet | 0 |
| L3 Limit IP Learning to Subnet | 0 |

Fault Summary

|  |  |
| --- | --- |
| Severity | Count |
| Critical | 1363 |
| Major | 1765 |
| Warning | 383 |
| Minor | 1286 |

# Findings

This section outlines findings where action or further assessment is recommended. Details about risk, change process, and further references are included.

## Operational Health

Switch Node Bootflash Space

Overview

ACI switch image files are transfered to switch nodes during an upgrade. It is important to ensure that enough space is available in /bootflash on each switch for image files so that upgrades can complete successfully. If /bootflash is more than 50% utilized, it is recommended to remove unnecessary files from that directory to ensure adequate space is available

Additional information regarding /bootflash utilization can be found in the Pre-Upgrade Checklists chapter of the [Cisco APIC Installation and ACI Upgrade and Downgrade Guide](https://www.cisco.com/c/en/us/td/docs/dcn/aci/apic/all/apic-installation-aci-upgrade-downgrade/Cisco-APIC-Installation-ACI-Upgrade-Downgrade-Guide/m-pre-upgrade-checklists.html).

Finding

One or more switch nodes were found to have greater than 50% utilization on /bootflash. It is recommended to remove unnecessary files from /bootflash to ensure adequate space is available for upgrades.

|  |  |
| --- | --- |
| Node | Bootflash Utilization |
| topology/pod-8/node-818/sys/eqptcapacity/fspartition-bootflash | 51% |

High-Risk Faults

"High risk" faults are a select list of faults that have been observed to result in higher than average impact across a wide range of customer environments. **Note** that this is not an exhaustive list of impactful faults.

Finding

The following high-risk faults were found in the reviewed fabric:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Code | DN | Sev | Ack? | Description |
| F0467 | topology/pod-1/node-101/local/svc-policyelem-id-0/uni/epp/rtd-[uni/tn-eid-dc-tenant1/out-l3out-bgp\_net\_centric\_tenants\_app\_centric/instP-extepg-rteidf68\_subnets\_01]/nwissues/fault-F0467 | minor | no | Configuration failed for uni/tn-eid-dc-tenant1/out-l3out-bgp\_net\_centric\_tenants\_app\_centric/instP-extepg-rteidf68\_subnets\_01 due to Prefix Entry Already Used in Another EPG, debug message: prefix-entry-already-in-use: Prefix entry sys/ctx-[vxlan-3047426]/pfx-[172.28.9.0/25] is in use ; subnet with the same network address; |
| F0467 | topology/pod-1/node-101/local/svc-policyelem-id-0/uni/epp/rtd-[uni/tn-eid-dc-tenant1/out-l3out-ospf\_t08\_dc\_core/instP-extepg-rteidf68\_subnets\_01]/nwissues/fault-F0467 | minor | no | Configuration failed for uni/tn-eid-dc-tenant1/out-l3out-ospf\_t08\_dc\_core/instP-extepg-rteidf68\_subnets\_01 due to Prefix Entry Already Used in Another EPG, debug message: prefix-entry-already-in-use: Prefix entry sys/ctx-[vxlan-2752512]/pfx-[172.21.57.128/25] is in use; |
| F0467 | topology/pod-1/node-102/local/svc-policyelem-id-0/uni/epp/rtd-[uni/tn-eid-dc-tenant1/out-l3out-bgp\_net\_centric\_tenants\_app\_centric/instP-extepg-rteidf68\_subnets\_01]/nwissues/fault-F0467 | minor | no | Configuration failed for uni/tn-eid-dc-tenant1/out-l3out-bgp\_net\_centric\_tenants\_app\_centric/instP-extepg-rteidf68\_subnets\_01 due to Prefix Entry Already Used in Another EPG, debug message: prefix-entry-already-in-use: Prefix entry sys/ctx-[vxlan-3047426]/pfx-[172.28.9.0/25] is in use ; subnet with the same network address; |
| F0467 | topology/pod-1/node-102/local/svc-policyelem-id-0/uni/epp/rtd-[uni/tn-eid-dc-tenant1/out-l3out-ospf\_t08\_dc\_core/instP-extepg-rteidf68\_subnets\_01]/nwissues/fault-F0467 | minor | no | Configuration failed for uni/tn-eid-dc-tenant1/out-l3out-ospf\_t08\_dc\_core/instP-extepg-rteidf68\_subnets\_01 due to Prefix Entry Already Used in Another EPG, debug message: prefix-entry-already-in-use: Prefix entry sys/ctx-[vxlan-2752512]/pfx-[172.21.57.128/25] is in use; |

FN72464 - Nexus 9300 Switches Can Experience Memory Failures

Overview

A limited number of Dual In-line Memory Modules (DIMMs) shipped from Cisco are impacted by a known deviation in the memory supplier's manufacturing process. This deviation can result in a higher rate of failure.

Most DIMMs with this manufacturing deviation will exhibit persistent correctable memory errors. If left untreated, the DIMMs can eventually encounter an uncorrectable memory event. If encountered during runtime, uncorrectable errors will cause an unexpected switch reset.

Various DIMM Reliability, Availability, and Serviceability (RAS) features or even operating system features can mask the extent of these correctable errors. It is recommended to check your DIMMs for exposure

More details can be found in the [field notice](https://www.cisco.com/c/en/us/support/docs/field-notices/724/fn72464.html) on cisco.com.

Finding

The following devices are *potentially* exposed to this issue. **Note** that to identify exact risk additional action will need to be taken, i.e. validate the serial number in the online [Serial Number Validation Tool](https://snvui.cisco.com/snv/FN72464).

|  |  |
| --- | --- |
| Model | Potentially Impacted Device |
| APIC-SERVER-L3 | topology/pod-1/node-1 |
| topology/pod-1/node-5 |
| topology/pod-2/node-2 |
| topology/pod-3/node-3 |
| topology/pod-4/node-4 |
| topology/pod-5/node-6 |
| topology/pod-6/node-7 |
| N9K-C93180YC-FX | topology/pod-1/node-101 |
| topology/pod-1/node-102 |
| topology/pod-1/node-103 |
| topology/pod-1/node-104 |
| topology/pod-1/node-105 |
| topology/pod-1/node-106 |
| topology/pod-1/node-109 |
| topology/pod-1/node-110 |
| topology/pod-1/node-111 |
| topology/pod-1/node-112 |
| topology/pod-1/node-113 |
| topology/pod-1/node-114 |
| topology/pod-1/node-115 |
| topology/pod-1/node-116 |
| topology/pod-1/node-117 |
| topology/pod-1/node-118 |
| topology/pod-1/node-119 |
| topology/pod-1/node-120 |
| topology/pod-1/node-129 |
| topology/pod-1/node-130 |
| topology/pod-1/node-131 |
| topology/pod-1/node-132 |
| topology/pod-1/node-133 |
| topology/pod-1/node-134 |
| topology/pod-1/node-135 |
| topology/pod-1/node-136 |
| topology/pod-1/node-139 |
| topology/pod-1/node-140 |
| topology/pod-2/node-209 |
| topology/pod-2/node-210 |
| topology/pod-2/node-211 |
| topology/pod-2/node-212 |
| topology/pod-2/node-213 |
| topology/pod-2/node-214 |
| topology/pod-2/node-217 |
| topology/pod-2/node-218 |
| topology/pod-2/node-219 |
| topology/pod-2/node-220 |
| topology/pod-2/node-227 |
| topology/pod-2/node-228 |
| topology/pod-5/node-503 |
| topology/pod-5/node-504 |
| topology/pod-5/node-505 |
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| topology/pod-5/node-531 |
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| topology/pod-6/node-621 |
| topology/pod-6/node-622 |
| topology/pod-6/node-625 |
| topology/pod-6/node-626 |
| topology/pod-6/node-627 |
| topology/pod-6/node-628 |
| topology/pod-6/node-629 |
| topology/pod-6/node-630 |
| topology/pod-6/node-637 |
| topology/pod-6/node-638 |
| topology/pod-7/node-701 |
| topology/pod-7/node-702 |
| topology/pod-7/node-705 |
| topology/pod-7/node-706 |
| topology/pod-7/node-707 |
| topology/pod-7/node-708 |
| topology/pod-7/node-709 |
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| topology/pod-7/node-711 |
| topology/pod-7/node-712 |
| topology/pod-7/node-713 |
| topology/pod-7/node-714 |
| topology/pod-7/node-717 |
| topology/pod-7/node-718 |
| topology/pod-7/node-719 |
| topology/pod-7/node-720 |
| topology/pod-8/node-805 |
| topology/pod-8/node-806 |
| topology/pod-8/node-811 |
| topology/pod-8/node-812 |
| topology/pod-8/node-817 |
| topology/pod-8/node-818 |
| topology/pod-8/node-819 |
| topology/pod-8/node-820 |
| topology/pod-8/node-821 |
| topology/pod-8/node-822 |

Overlapping VLANs

Overview

In ACI, VNIDs are assigned based on VLAN + VLAN pool ID. The same VLAN ID in different VLANs is provided a different VNID. Ports using the same VLAN from different pools will experience traffic loss in certain L2 dynamics, e.g. the two legs of a vPC, or BPDU forwarding for spanning tree.

Additionally, if an EPG has multiple domains with the same VLAN provided by different pools, the VLAN used is nondeterministic. Because of this a working environment can start experiencing problems on a reload.

Note, that this analysis *only* checks for overlapping VLANs associated with the same AEP.

Finding

Overlapping VLANs can result in traffic loss over a subset of L2 topologies and non-deterministic behavior on reload.

It's generally recommended to avoid assigning the same VLAN from different pools to multiple physical domains.

Change impact will vary significantly depending on the scope of the current configuration and if VNID assignment is currently deterministic.

The following VLANs are overlapping. Note that these do not immediately indicate an active problem on this fabric. An overlapping VLAN indicates a potential problem, that once configured in the same EPG can result in traffic loss.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Domain A | Domain B | VLAN Pool A | VLAN Pool B | VLAN Blocks |
| uni/phys-phydom-dc\_physical | uni/phys-phydom-ltm | uni/infra/vlanns-[vlp-dc\_physical]-static | uni/infra/vlanns-[vlp-ltm]-static | 1362-1362  1363-1363  1364-1364  1365-1365  1366-1366  1367-1367  1368-1368  1369-1369  1370-1370  1371-1371  1372-1372  1373-1373  1374-1374  1375-1375  1376-1376  1377-1377  1378-1378  1379-1379  1380-1380  1381-1381  1382-1382  1383-1383  1384-1384  1385-1385  1386-1386  1387-1387  1388-1388  1389-1389  1390-1390  1391-1391  1392-1392  1393-1393  1394-1394  1395-1395  1396-1396  1397-1397  1398-1398  1399-1399  1400-1400  1401-1401  1402-1402  1403-1403  1405-1405  1406-1406  1407-1407  1408-1408  1409-1409  1410-1410  1411-1411  1412-1412  1413-1413  1414-1414  1415-1415  1416-1416  1417-1417  1418-1418  1419-1419  1420-1420  1421-1421  1422-1422  1423-1423  1424-1424  1425-1425  1426-1426  1427-1427  1428-1428  1429-1429  1430-1430  1431-1431  1432-1432  1433-1433  1434-1434  1435-1435  1645-1645  1646-1646  1647-1647  1648-1648  1649-1649  1650-1650  1651-1651  1652-1652  1653-1653  1654-1654  1655-1655  1656-1656  1657-1657  1658-1658  1659-1659  1660-1660  1661-1661  1662-1662  1663-1663  1664-1664  1665-1665  1666-1666  1667-1667  1668-1668  1669-1669  1670-1670  1671-1671  1672-1672  1673-1673  1674-1674  1675-1675  1676-1676  1677-1677  1678-1678  1680-1680  1681-1681  1682-1682  1683-1683 |

## Best Practices

Backup to Remote Location

Overview

The ACI Fabric configuration should be backed up to the remote location periodically, in case an engineer needs to restore the fabric. With ACI, all components of the ACI Fabric are treated as one entity (leafs, spines, APIC controllers). The ACI Fabric configuration, while made up of different managed objects, is combined into one tar/gz zip file, which greatly improves the configuration backup and restore process.

* This section checks that the ACI Fabric backup is configured to backup to an external destination.
* Please refers to [Creating a Backup for Your APIC Cluster](https://www.cisco.com/c/dam/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/aci-guide-creating-backup-for-apic-cluster.pdf) for detailed information about the process of creating a backup configuration to a remote location.

Finding

There are export configuration policies **without** a remote location.

* eid\_aci\_fabric\_daily\_backup
* temp-EID-ACI-backup-July

Recommendation

* Follow the instructions in the linked reference article to create backup configuration policy with an external destination.

Digital Optical Monitoring (DOM)

Overview

Digital Optical Monitoring (DOM) is an industry standard that provides additional monitoring for optical connections beyond simple up/down. It monitors optic-specific state, e.g. send and receive power, which can protect against situations like impending failure and degraded connectivity.

More details are available in the [DOM section](https://www.cisco.com/c/en/us/td/docs/switches/datacenter/aci/apic/sw/4-x/troubleshooting/Cisco-APIC-Troubleshooting-Guide-401/b_APIC_Troubleshooting_4x_chapter_0110.html#id_37684) of the ACI Troubleshooting Guide.

Finding

Digital Optical Monitoring (DOM) is **not** enabled on all interfaces. The following devices do not have DOM enabled:

536, 127, 1801, 108, 401, 312, 406, 606, 807, 102, 212, 816, 136, 318, 518, 301, 412, 225, 315, 408, 502, 119, 211, 707, 813, 111, 214, 531, 532, 607, 635, 715, 131, 527, 115, 820, 901, 418, 708, 515, 634, 117, 207, 615, 638, 503, 609, 403, 616, 216, 402, 330, 1702, 1602, 217, 523, 416, 604, 636, 1902, 311, 1401, 1601, 625, 722, 110, 307, 516, 223, 1502, 712, 140, 218, 602, 112, 209, 617, 702, 329, 603, 309, 519, 524, 802, 811, 821, 205, 1302, 405, 716, 139, 324, 317, 1701, 331, 121, 221, 1201, 608, 128, 138, 513, 530, 109, 511, 415, 534, 132, 1202, 711, 407, 1501, 411, 510, 514, 704, 206, 224, 703, 103, 701, 529, 637, 815, 316, 1402, 619, 627, 106, 118, 504, 506, 623, 713, 310, 314, 201, 215, 517, 705, 806, 114, 137, 526, 808, 219, 308, 611, 818, 213, 417, 404, 101, 129, 620, 714, 535, 605, 612, 410, 533, 505, 614, 622, 710, 803, 135, 208, 520, 133, 227, 525, 528, 632, 812, 222, 414, 539, 801, 804, 1101, 323, 228, 814, 817, 1901, 220, 226, 501, 618, 628, 319, 409, 512, 717, 130, 1301, 152, 720, 805, 116, 151, 621, 633, 721, 107, 113, 320, 610, 613, 624, 631, 706, 104, 122, 718, 819, 540, 1102, 202, 629, 1802, 210, 509, 601, 709, 822, 902, 105, 134, 413, 626, 719, 810, 120, 302, 630, 809, 313, 332

Without DOM the fabric will not have access to L1 optical data that can be useful for troubleshooting. It's therefore recommended to enable DOM on all interfaces. Enabling DOM on optics that do not support DOM will have no impact.

DOM can be configured at **Fabric > Fabric Policies > Policies > Monitoring > Fabric Node Controls > default**

No impact is expected from this change.

Domain Validation

Overview

Domain Validation prevents a misconfiguration where static ports are deployed in an EPG without a domain also configured. Without this feature a VLAN can be configured in an EPG without a domain and the VLAN will be deployed with no validation. If a domain is later associated to this domain, VLANs will be validated against the domain's associated VLAN pool, and invalid VLANs will be removed from hardware.

With Domain Validation enabled, static ports are prevented from being deployed until a domain is configured.

More detail about this feature is available in the [ACI Design Guide](https://www.cisco.com/c/en/us/td/docs/dcn/whitepapers/cisco-application-centric-infrastructure-design-guide.html).

Finding

Domain validation is **not** enabled.

Domain Validation protects against a misconfiguration that can result in unexpected traffic loss. It's recommended to consider enabling Enable Domain Validation

**CAUTION:**

Please be aware of the following considerations:

Domain Validation cannot be turned off once it has been enabled, even through backup restore or downgrade. Previous snapshots or backups will not work.

Additionally, if EPGs currently exist with static path bindings and no domain association, these port bindings will stop working with this feature is enabled. Fault F0468 will be raised for invalid path assignments. These will need to be corrected prior to enabling Domain Validation by associating a domain with the required VLANs.

Domain Validation can be configured at **System > System Settings > Fabric-Wide Settings > Enforce Domain Validation**

Mis-Cabling Protocol (MCP) – Interface Configuration

Overview

The mis-cabling protocol (MCP) was designed to handle misconfigurations not detected by Link Layer Discovery Protocol (LLDP) and Spanning Tree Protocol (STP). MCP sends out layer 2 hello packets. If these packets are received on another interface, the ports that form the loop will be disabled.

More details are [available on CCO](https://www.cisco.com/c/dam/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/aci-guide-using-mcp-mis-cabling-protocol.pdf).

Finding

MCP is **not** configured on all interfaces. The following interface profiles do not have MCP configured:

|  |
| --- |
| Disabled Device |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle151\_152 |
| uni/infra/accportprof-intprof-sweidle151\_152 |
| uni/infra/accportprof-intprof-sweidle151\_152 |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle101\_102 |
| uni/infra/accportprof-intprof-sweidle101 |
| uni/infra/accportprof-intprof-sweidle102 |

Without MCP ACI is at risk of propagating bridging loop behavior due to STP failure or L1 problems. It's, therefore, recommended to configure MCP on all interfaces whenever feasible.

Enable MCP within the Interface Policy, at **Fabric > Access Policies > Policies > MCP Interface**.

**CAUTION:**

Please ensure your fabric is not running at scale exposed to [CSCvx37709](https://bst.cloudapps.cisco.com/bugsearch/bug/CSCvx37709) before considering enabling MCP.

MCP hellos are transmitted unencapsulated. An L2 misconfiguration can allow MCP hellos to "jump" from one VLAN to another, appearing as though an L2 loop is occurring, and resulting in err-disable. Because of this, it’s extremely important to ensure legacy environments are configured correctly, and specifically that an 802.1q header is applied to unencapsulated traffic.

Disable Remote EP Learning

Overview

Remote EP learning is when a leaf caches the remote location of an endpoint. This functionality isn't strictly necessary, as unknown remote destinations will be proxied to the spine, which will always maintain EP location in the COOP database.

There are several scenarios where remote endpoint learning on a border leaf can result in stale endpoints, and traffic loss. Details about these scenarios are available in the [Remote EP learning section](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-739989.html#_Toc529820938) of the ACI Endpoint Learning Whitepaper.

Finding

**Disable Remote EP Learning** is on.

Spine proxy can be avoided by turning this feature off. Note that this feature may have been previous recommended to be enabled; however, this is no longer required with newer hardware and code.

As a general best practice, Cisco recommends turning this feature back off to take advantage of remote EP learning from the border leaf.

Note that disabling this feature is a comparatively low priority recommendation. The impact of spine proxy at the border leaf is not expected to be a risk to the fabric.

This feature can be configured at **System > System Settings > Fabric Wide Settings > Disable Remote EP Learning**.

While enabled, unknown EPs will be proxied to the spine; however, no impact is expected from modifying this feature.

Fabric Topology

It's expected that each leaf is connected to more than one spine. This allows for spine-level redundancy, e.g. upgrades and other maintenance can be performed on a spine without impact.

Finding

Not all leaves are dual-homed. It's recommended to connect every leaf to at least two spines. The following table lists leaves that are single-homed.

|  |  |
| --- | --- |
| Leaf ID | Spine ID |
| 101 | 1101, 1102 |
| 102 | 1101, 1102 |
| 103 | 1101, 1102 |
| 104 | 1101, 1102 |
| 105 | 1101, 1102 |
| 106 | 1101, 1102 |
| 107 | 1101, 1102 |
| 108 | 1101, 1102 |
| 109 | 1101, 1102 |
| 110 | 1101, 1102 |
| 111 | 1101, 1102 |
| 112 | 1101, 1102 |
| 113 | 1101, 1102 |
| 114 | 1101, 1102 |
| 115 | 1101, 1102 |
| 116 | 1101, 1102 |
| 117 | 1101, 1102 |
| 118 | 1101, 1102 |
| 119 | 1101, 1102 |
| 120 | 1101, 1102 |
| 121 | 1101, 1102 |
| 122 | 1101, 1102 |
| 127 | 1101, 1102 |
| 128 | 1101, 1102 |
| 129 | 1101, 1102 |
| 130 | 1101, 1102 |
| 131 | 1101, 1102 |
| 132 | 1101, 1102 |
| 133 | 1101, 1102 |
| 134 | 1101, 1102 |
| 135 | 1101, 1102 |
| 136 | 1101, 1102 |
| 137 | 1101, 1102 |
| 138 | 1101, 1102 |
| 139 | 1101, 1102 |
| 140 | 1101, 1102 |
| 151 | 1101, 1102 |
| 152 | 1101, 1102 |
| 201 | 1201, 1202 |
| 202 | 1201, 1202 |
| 205 | 1201, 1202 |
| 206 | 1201, 1202 |
| 207 | 1201, 1202 |
| 208 | 1201, 1202 |
| 209 | 1201, 1202 |
| 210 | 1201, 1202 |
| 211 | 1202, 1201 |
| 212 | 1201, 1202 |
| 213 | 1201, 1202 |
| 214 | 1201, 1202 |
| 215 | 1201, 1202 |
| 216 | 1201, 1202 |
| 217 | 1201, 1202 |
| 218 | 1202, 1201 |
| 219 | 1201, 1202 |
| 220 | 1201, 1202 |
| 221 | 1201, 1202 |
| 222 | 1201, 1202 |
| 223 | 1201, 1202 |
| 224 | 1201, 1202 |
| 225 | 1201 |
| 226 | 1202 |
| 227 | 1202, 1201 |
| 228 | 1201, 1202 |
| 301 | 1301, 1302 |
| 302 | 1301, 1302 |
| 307 | 1301, 1302 |
| 308 | 1301, 1302 |
| 309 | 1301, 1302 |
| 310 | 1301, 1302 |
| 311 | 1301, 1302 |
| 312 | 1302, 1301 |
| 313 | 1301, 1302 |
| 314 | 1301, 1302 |
| 315 | 1301, 1302 |
| 316 | 1301, 1302 |
| 317 | 1301, 1302 |
| 318 | 1301, 1302 |
| 319 | 1301, 1302 |
| 320 | 1302, 1301 |
| 323 | 1302, 1301 |
| 324 | 1301, 1302 |
| 329 | 1302, 1301 |
| 330 | 1301, 1302 |
| 331 | 1301, 1302 |
| 332 | 1301, 1302 |
| 401 | 1401, 1402 |
| 402 | 1401, 1402 |
| 403 | 1401, 1402 |
| 404 | 1401, 1402 |
| 405 | 1401, 1402 |
| 406 | 1401, 1402 |
| 407 | 1401, 1402 |
| 408 | 1401, 1402 |
| 409 | 1401, 1402 |
| 410 | 1401, 1402 |
| 411 | 1401, 1402 |
| 412 | 1401, 1402 |
| 413 | 1401, 1402 |
| 414 | 1401, 1402 |
| 415 | 1402, 1401 |
| 416 | 1401, 1402 |
| 417 | 1401, 1402 |
| 418 | 1401, 1402 |
| 501 | 1501, 1502 |
| 502 | 1501, 1502 |
| 503 | 1501, 1502 |
| 504 | 1501, 1502 |
| 505 | 1501, 1502 |
| 506 | 1501, 1502 |
| 509 | 1501, 1502 |
| 510 | 1502, 1501 |
| 511 | 1501, 1502 |
| 512 | 1502, 1501 |
| 513 | 1501, 1502 |
| 514 | 1501, 1502 |
| 515 | 1501, 1502 |
| 516 | 1501, 1502 |
| 517 | 1501, 1502 |
| 518 | 1502, 1501 |
| 519 | 1501, 1502 |
| 520 | 1502, 1501 |
| 523 | 1501, 1502 |
| 524 | 1501, 1502 |
| 525 | 1501, 1502 |
| 526 | 1501, 1502 |
| 527 | 1501, 1502 |
| 528 | 1501, 1502 |
| 529 | 1501, 1502 |
| 530 | 1501, 1502 |
| 531 | 1501, 1502 |
| 532 | 1501, 1502 |
| 533 | 1501, 1502 |
| 534 | 1501, 1502 |
| 535 | 1501, 1502 |
| 536 | 1501, 1502 |
| 539 | 1501, 1502 |
| 540 | 1501, 1502 |
| 601 | 1601, 1602 |
| 602 | 1602, 1601 |
| 603 | 1602, 1601 |
| 604 | 1602, 1601 |
| 605 | 1601, 1602 |
| 606 | 1601, 1602 |
| 607 | 1601, 1602 |
| 608 | 1601, 1602 |
| 609 | 1601, 1602 |
| 610 | 1601, 1602 |
| 611 | 1601, 1602 |
| 612 | 1602, 1601 |
| 613 | 1601, 1602 |
| 614 | 1601, 1602 |
| 615 | 1601, 1602 |
| 616 | 1602, 1601 |
| 617 | 1601, 1602 |
| 618 | 1601, 1602 |
| 619 | 1601, 1602 |
| 620 | 1601, 1602 |
| 621 | 1601, 1602 |
| 622 | 1601, 1602 |
| 623 | 1601, 1602 |
| 624 | 1601, 1602 |
| 625 | 1601, 1602 |
| 626 | 1601, 1602 |
| 627 | 1601, 1602 |
| 628 | 1601, 1602 |
| 629 | 1601, 1602 |
| 630 | 1601, 1602 |
| 631 | 1601, 1602 |
| 632 | 1601, 1602 |
| 633 | 1601, 1602 |
| 634 | 1601, 1602 |
| 635 | 1601, 1602 |
| 636 | 1601, 1602 |
| 637 | 1601, 1602 |
| 638 | 1601, 1602 |
| 701 | 1701, 1702 |
| 702 | 1701, 1702 |
| 703 | 1702, 1701 |
| 704 | 1701, 1702 |
| 705 | 1701, 1702 |
| 706 | 1701, 1702 |
| 707 | 1701 |
| 708 | 1702 |
| 709 | 1701, 1702 |
| 710 | 1701, 1702 |
| 711 | 1702, 1701 |
| 712 | 1701, 1702 |
| 713 | 1701, 1702 |
| 714 | 1701, 1702 |
| 715 | 1701, 1702 |
| 716 | 1701, 1702 |
| 717 | 1701, 1702 |
| 718 | 1701, 1702 |
| 719 | 1701, 1702 |
| 720 | 1701, 1702 |
| 721 | 1701, 1702 |
| 722 | 1701, 1702 |
| 801 | 1801, 1802 |
| 802 | 1801, 1802 |
| 803 | 1801, 1802 |
| 804 | 1801, 1802 |
| 805 | 1801, 1802 |
| 806 | 1802, 1801 |
| 807 | 1801, 1802 |
| 808 | 1801, 1802 |
| 809 | 1801, 1802 |
| 810 | 1801, 1802 |
| 811 | 1801, 1802 |
| 812 | 1801, 1802 |
| 813 | 1801, 1802 |
| 814 | 1801, 1802 |
| 815 | 1801, 1802 |
| 816 | 1801, 1802 |
| 817 | 1801, 1802 |
| 818 | 1801, 1802 |
| 819 | 1801, 1802 |
| 820 | 1801, 1802 |
| 821 | 1801, 1802 |
| 822 | 1802, 1801 |
| 901 | 1901, 1902 |
| 902 | 1902, 1901 |

No impact is expected from dual-homing these devices.

Upgrade Groups

Overview

Upgrade groups should be designed to upgrade the fabric in stages defined by redundant infrastructure.

Finding

Note that the assessment performed in this section of the document does not indicate an immediate risk; however, upgrade groups should be configured correctly prior to an upgrade.

**Summary:**

|  |  |
| --- | --- |
| Risk | Impacted Nodes |
| VPC switch pairs are not in redundant upgrade groups | 819  820  901  902  821  822  623  624 |

VPCs are not in Redundant Upgrade Groups

VPCs are **not** in Redundant Upgrade Group, i.e., some VPC interfaces are in the same upgrade group.

Loss of both VPC switches during an upgrade will result in loss of connectivity for all hosts attached to this VPC pair. It's recommended to distribute VPC switches across different upgrade groups.

Upgrade Groups can be configured under **Admin > Firmware > Infrastructure > Nodes**

No impact is expected from upgrade group modification.

## Lifecycle

End of Life

As EoL devices pass critical milestones, they will no longer receive patches. After Last Day of Support (LDoS), EoL devices will no longer be supported by TAC.

Finding

The following EoL notices were identified. Please review these in conjunction with your lifecycle management strategy to ensure devices are replaced prior to critical milestones.

|  |  |  |  |
| --- | --- | --- | --- |
| Model | Announced | URL | Impacted Devices |
| APIC-SERVER-L3 | May 1, 2023 | [CCO Announcment](https://www.cisco.com/c/en/us/products/collateral/cloud-systems-management/application-policy-infrastructure-controller-apic/apic-m3-l3-se-node-g2-eol.html) | apiceid01  apiceid05  apiceid02  apiceid03  apiceid04  apiceid06  apiceid07 |
| N9K-C93108TC-EX | August 9, 2021 | [CCO Announcment](https://www.cisco.com/c/en/us/products/collateral/switches/nexus-9000-series-switches/n9k-c93180yc-c93108tc-ex-eol.html) | sweidle403  sweidle404 |
| N9K-C93108TC-FX | August 1, 2023 | [CCO Announcment](https://www.cisco.com/c/en/us/products/collateral/switches/nexus-9000-series-switches/nexus-c93180yc-fx-c93108tc-fx-fixed-switches-eol.html) | sweidle215  sweidle216  sweidle501  sweidle502  sweidle509  sweidle510  sweidle511  sweidle512  sweidle513  sweidle514  sweidle523  sweidle524  sweidle525  sweidle526  sweidle527  sweidle528  sweidle533  sweidle534  sweidle603  sweidle604  sweidle611  sweidle612  sweidle613  sweidle614  sweidle619  sweidle620  sweidle631  sweidle632  sweidle633  sweidle634  sweidle635  sweidle636 |
| N9K-C93180YC-EX | August 9, 2021 | [CCO Announcment](https://www.cisco.com/c/en/us/products/collateral/switches/nexus-9000-series-switches/n9k-c93180yc-c93108tc-ex-eol.html) | sweidle201  sweidle202  sweidle301  sweidle302  sweidle311  sweidle312  sweidle313  sweidle314  sweidle315  sweidle316  sweidle317  sweidle318  sweidle319  sweidle320  sweidle323  sweidle324  sweidle329  sweidle330  sweidle331  sweidle332  sweidle401  sweidle402  sweidle407  sweidle408  sweidle411  sweidle412  sweidle413  sweidle414  sweidle415  sweidle416  sweidle417  sweidle418  sweidle721  sweidle722 |
| N9K-C93180YC-FX | August 1, 2023 | [CCO Announcment](https://www.cisco.com/c/en/us/products/collateral/switches/nexus-9000-series-switches/nexus-c93180yc-fx-c93108tc-fx-fixed-switches-eol.html) | sweidle101  sweidle102  sweidle103  sweidle104  sweidle105  sweidle106  sweidle109  sweidle110  sweidle111  sweidle112  sweidle113  sweidle114  sweidle115  sweidle116  sweidle117  sweidle118  sweidle119  sweidle120  sweidle129  sweidle130  sweidle131  sweidle132  sweidle133  sweidle134  sweidle135  sweidle136  sweidle139  sweidle140  sweidle209  sweidle210  sweidle211  sweidle212  sweidle213  sweidle214  sweidle217  sweidle218  sweidle219  sweidle220  sweidle227  sweidle228  sweidle503  sweidle504  sweidle505  sweidle506  sweidle515  sweidle516  sweidle517  sweidle518  sweidle519  sweidle520  sweidle529  sweidle530  sweidle531  sweidle532  sweidle535  sweidle536  sweidle539  sweidle540  sweidle601  sweidle602  sweidle605  sweidle606  sweidle607  sweidle608  sweidle609  sweidle610  sweidle615  sweidle616  sweidle617  sweidle618  sweidle621  sweidle622  sweidle625  sweidle626  sweidle627  sweidle628  sweidle629  sweidle630  sweidle637  sweidle638  sweidle701  sweidle702  sweidle705  sweidle706  sweidle707  sweidle708  sweidle709  sweidle710  sweidle711  sweidle712  sweidle713  sweidle714  sweidle717  sweidle718  sweidle719  sweidle720  sweidle805  sweidle806  sweidle811  sweidle812  sweidle817  sweidle818  sweidle819  sweidle820  sweidle821  sweidle822 |
| N9K-C9364C | August 1, 2023 | [CCO Announcment](https://www.cisco.com/c/en/us/products/collateral/switches/nexus-9000-series-switches/nexus-9332c-9364c-fixed-spine-switch-eol.html) | sweidsp1101  sweidsp1102  sweidsp1201  sweidsp1202  sweidsp1301  sweidsp1302  sweidsp1401  sweidsp1402  sweidsp1501  sweidsp1502  sweidsp1601  sweidsp1602  sweidsp1701  sweidsp1702  sweidsp1801  sweidsp1802 |

# Fault Review

The following faults types were found in the EID fabric.

|  |  |  |  |
| --- | --- | --- | --- |
| Code | Count | Explanation | Recommendation |
| **Critical Faults** | | | |
| F0532 | 1354 | This fault occurs when a port is down and is in use for epg | 1. Check the port connectivity 2. Remove the configuration or administratively shut the port if the port is not in use 3. To remove the static port configuration from EPG go to Tenant->ApplicationProfile->ApplicationEPG->Static Ports and remove the affected port if not being used. 4. For mcp-loop-err-disable, this could be due to a loop in the network. Check the config to resolve any loops 5. For lacp suspended ports, check for following issues - 6. Check whether peer device supports lacp or not. 7. Enable LACP feature in peer device, if peer device requires explicit global configuration. 8. Check vlan range configured part of member interface and port-channel configurations matches. 9. Check whether peer physical interface is added to port-channel as member interface. 10. Check whether lacp is configured on member interface of peer device. 11. If peer switch is of Cisco's, issue "show lacp counters" and verify interfaces of peer device are sending LACP PDU. 12. Using the "show etherchannel summary"/"show port-channel summary" command, ensure that the port-channel shows the S (Layer-2) and U (in use) flags, and that both the interfaces appear in the ports column with the P (bundled) flag. 13. If peer switch or router is not manufactured by Cisco, Please contact customer support of peer device's manufacturer for not sending lacp or recommended configuration guidelines. 14. For reason of suspend(connected) port, check whether VPC domain is configured in GUI Fabric-> External Access/Access Policies ->Virtual Port Channel defaul to tie two switches part of VPC domain if intent is to make two switches part of VPC. 15. If the above actions did not resolve the issue, create a tech-support file and contact Cisco TAC. |
| F102304 | 25 | This fault is caused by "Ingress Link Utilization maximum value" statistical property crossing threshold level. |  |
| F3082 | 1 | This fault occurs when the SAML X.509 Certificate has expired. | 1. Update SAML X.509 Certificate by going to Admin->AAA->Authentication->SAML. |
| F98536 | 34 | This fault is caused by "Egress Link Utilization maximum value" statistical property crossing threshold level. |  |
| **Major Faults** | | | |
| F0518 | 2 | This fault occurs when vPC configuration on the peers is not consistent. |  |
| F0600 | 82 | This fault occurs when port has been suspended. |  |
| F1199 | 24 | This fault occurs when span source on a port goes to failed state |  |
| F1201 | 4 | This fault occurs when span destination goes to failed state |  |
| F1296 | 608 | This fault occurs when vpc interface goes down while peer interface is also down. |  |
| F1545 | 483 | This fault occurs when a significant number of packet drops are detected by a configured and enabled Atomic Counter |  |
| F1547 | 468 | This fault occurs when a significant number of excess packets are detected by a configured and enabled Atomic Counter |  |
| F2705 | 43 | This fault occurs when vpc interface goes down while peer interface is up. |  |
| F4006 | 4 | This fault occurs when there are specific configuration errors on a ucast tep IP. | 1. [Please delete and reconfigure ucast tep IP or routable subnet (fabricExtRoutablePodSubnet) so that ucast tep doesnt overlapping with the unreserved portion of any routable subnet configured. Please delete and reconfigure one of the duplicate ucast tep IPs configured. Please delete and reconfigure corresponding ucast tep IP or rl pool (fabricExtSetupP) so that they dont overlap. If the above action did not resolve the issue, create a tech-support file and contact Cisco TAC] |
| F4140 | 1 | This fault is raised when there are more than one APIC as owners for a dhcp pool | 1. [Collect a tech-support file and contact Cisco TAC.] |
| F4144 | 2 | This fault is raised when dhcp client and pool are not in sync with fnv data | 1. [Collect a tech-support file and contact Cisco TAC.] |
| F4269 | 40 | This fault occurs when mcp vlan reaches the max limit 2000 | 1. [Review the network topology and vlan configuration on the node and If the above action did not resolve the issue, generate the show tech-support file and contact Cisco TAC.] |
| F96760 | 1 | This fault is caused by "Egress Buffer Drop Packets rate" statistical property crossing threshold level. |  |
| **Warning Faults** | | | |
| F0546 | 186 | This fault occurs when a port goes down | 1. [Check the port connectivity Administratively shut the port if the port is not in use For mcp-loop-err-disable, this could be due to a loop in the network. Check the config to resolve any loops For bpdu-guard-err-disable, Check configuration of peer device connected to Top of Rack Switch where peer device is sending BPDU to Top of Rack switch's interface and interfaces were configured with BPDU guard makes interface to go into err-disabled as intended If the above action did not resolve the issue, create a tech-support file and contact Cisco TAC.] |
| F0967 | 5 | The object refers to an object that was not found. |  |
| F0974 | 6 | The object refers to an object that was not found. |  |
| F1101 | 1 | The object refers to an object that was not found. |  |
| F1103 | 2 | The object refers to an object that was not found. |  |
| F112128 | 6 | This fault is caused by "ingress drop packets rate" statistical property crossing threshold level. |  |
| F1186 | 13 | This fault is caused by a hardware programming failure |  |
| F1192 | 12 | This fault is caused by a hardware programming failure |  |
| F1350 | 5 | The object refers to an object that was not found. |  |
| F1351 | 5 | The object refers to an object that was not found. |  |
| F1557 | 2 | This fault is raised when the span policy failed to get deployed. |  |
| F1703 | 4 | The object refers to an object that was not found. |  |
| F2740 | 13 | This fault occurs when port speed is configured to an invalid/unsupported value |  |
| F3013 | 38 | This fault occurs when a IP endpoint turns rogue | 1. [Check endpoint connectivity Shutdown endpoint If the network connectivity is fine, generate the show tech-support file and contact Cisco TAC.] |
| F3014 | 44 | This fault occurs when a MAC endpoint turns rogue | 1. [Check endpoint connectivity Shutdown endpoint If the network connectivity is fine, generate the show tech-support file and contact Cisco TAC.] |
| **Minor Faults** | | | |
| F0467 | 468 | This fault occurs when an End Point Group / End Point Security Group is incompletely or incorrectly configured. | 1. [Look at the configuration for issues For bd-not-present, this could be a temporary issue when the bridge domain has not yet been deployed to the node. If the EPG is associated with the default bridge domain, check the Connectivity Instrumentation Policy For context-not-present, this could be a temporary issue while the VRF has not yet been deployed to the node. If the EPG is associated with the default VRF, check the Connectivity Instrumentation Policy under Networking / Protocol Policies in common tenant For vlan-capacity, check that the number of configured EPGs and bridge domains deployed on a node do not exceed the supported number For vxlan-capacity, check that the number of configured EPGs, bridge domains and VRFs deployed on a node do not exceed the supported number For invalid-path, check that the configured path exists and is valid. Following issues are possible: The path (i.e. port/port-channel/Attachable-Profile/Loose-Node) getting referred does not exist on the node. The domain associated with the EPG is not allowed to use the specified path. Check the Attachable Profile configuration associated with the domain. The path (i.e. port/port-channel/Attachable-Profile/Loose-Node) is deployed on FEX and is part of l2Out/l3Out. l2Out and l3Out are NOT supported on FEX. L3Dom associated with the L3out does not exist. Configure a valid L3 Domain and associate it with the L3Out For port-part-of-port-channel, the configured interface is already configured as a port channel member For port-configured-as-l3, the configured interface is already configured as L3 For port-configured-as-l2, the configured interface is referring to an interface that is already configured as L2 For port-configured-for-fex, the configured interface is already configured for attaching to a FEX For port-configured-for-apic, the configured interface is connected to a controller For port-channel-capacity, check that the number of configured port channels deployed on a node do not exceed the supported number For native-or-untagged-encap-failure, multiple encaps are configured as native or untagged on the same path. Check the configured mode type For multiple-external-encap, a bridge domain can be extended outside the fabric using only one external encap per node For multiple-ctx-configuration, an L3 interface can belong to only 1 VRF at a time For encap-already-in-use, another EPG is already configured using this encap For invalid-vlan : This EPG's encap may not be valid for the domain on which the EPG is configured Check Fabric -> Acccess Policies -> Switches -> Leaf Switches -> Profile -> has a leaf profile defined with required node where config is deployed. Check leaf-profile is associated with interface selector with target profile. Check whether Fabric -> Access Policies -> Interface -> Leaf Interfaces -> Profiles has interface profile configured with required port and associated to leaf interface policy group. Check configured leaf interface policy-group in Fabric -> Access Policies -> Interface -> Leaf Interfaces -> Policy Groups has ?Attached Entity Profile? configured. Attached Entity profile should have domain configured with vlan-pool contains deployed vlan. For insufficient vlan, check the sum of number of EPG and number of BD applied on switch which should not exceed the capapcity of ToR. Check scalability guide. For path-wiring-issues, the configured interface has wiring issues For router-id-conflict ensure that same router ID is used for node in the VRF. Also ensure that node specified under "Logical interface profile" has been added to "Logical node profile". For port configured as q-in-q tunnel originator/terminator, Configure Leaf Interface Profile with policy-group enabled with “L2 Interface policy” with edgeport turned-on. And also make sure to create Switch Association with Associated Interface Selector Profiles For further details, refer to the documentation for fv:NwIssues Verify the End Point Group configuration is correct and complete If the above action did not resolve the issue, create a tech-support file and contact Cisco TAC.] |
| F0469 | 328 | This fault occurs when there is one or more duplicate Subnets defined for BDs or/and AEpGs associated with the Ctx. | 1. [For duplicate-subnets-within-ctx issue: Find the Ctx that this BD is associated with and find all other BDs associated with the Ctx, Find all the AEpGs associated with BDs found in previous step, Verify that there is no single subnets configured for AEpGs and BDs associated with Ctx. For dhcp-policy-not-present issue: Check the Configuration and make sure that DHCP Pelay Profile consumed by BD is defined in Tenant. If the above action did not resolve the issue, create a tech-support file and contact Cisco TAC.] |
| F0603 | 120 | This fault occurs when port becomes operationally individual. |  |
| F0756 | 4 | This fault occurs when a configured target of a named relationship cannot be resolved. | 1. [Verify that the configuration for the named target is correct and complete, and that it exists Verify the configuration for the specific relationship is correct and complete. If the above actions did not resolve the issue, create a tech-support file and contact Cisco TAC.] |
| F0849 | 9 | This fault occurs when a infra selector (port selector, card selector, node selector etc.) is incorrectly configured. | 1. [Look at the configuration for issues For invalid-port, check the infra port selector, it should have only leaf host ports or fex host ports. Fabric ports are not allowed to be configured using infra port selector. For port-configured-for-apic, check the infra port selector and the associated policies. Port connected to the controller can be configured for limited policies. Its allowed to be associated with only infra::AccPortGrp. For invalid-card, check the infra card selector, its referring to a card which does not exist. Fault will clear once the card is added to the node. For further details, refer to the documentation for fabric:SelectorIssues Verify the infra selector configuration is correct and complete If the above action did not resolve the issue, create a tech-support file and contact Cisco TAC.] |
| F1298 | 18 | : This fault occurs when deliverying EPg policies to a node has failed |  |
| F1299 | 20 | This fault occurs when a selector level policy has been created, all policies in the corresponding policy group should be deployed on all fabric nodes in that selector level policy but those selector level policies have not been deployed to one or more fabric nodes. |  |
| F1394 | 4 | This fault occurs when a port is down and is in use for fabric |  |
| F1546 | 125 | This fault occurs when a small number of packet drops are detected by a configured and enabled Atomic Counter |  |
| F1548 | 140 | This fault occurs when a small number of excess packets are detected by a configured and enabled Atomic Counter |  |
| F1651 | 4 | This fault occurs when export operation for techsupport or core files did not succeed. |  |
| F2514 | 14 | This fault occurs when an out of service policy has been created, but those policies have not been deployed to one or more fabric nodes. | 1. [Verify that corresponding fabric node is ready to receive policies Verify that corresponding fabric node is part of the POD specified in the policy If the above actions did not resolve the issue, create a tech-support file and contact Cisco TAC.] |
| F325032 | 1 | This fault is caused by "Total L2 entries usage current value" statistical property crossing threshold level. |  |
| F4268 | 24 | This fault occurs when mcp vlan reaches the max limit 256 on the interface | 1. [Review the network topology and vlan configuration on the node and If the above action did not resolve the issue, generate the show tech-support file and contact Cisco TAC.] |

# Scale

## Overview

ACI scalability is tested as a single unit, i.e. the entire fabric is tested against multiple scale limits at the same time. This differs from some of the previous, non-ACI scale testing methodologies that would test a scale metric in isolation, e.g. add 100k OSPF routes to a switch and test against the switch in that state. This isolated testing methodology is called unit testing.

The risk associated with primarily relying on unit testing is that it's not very indicative of a real-world environment, and it's increasingly likely that issues related to multiple stressors might not be discovered.

Some ACI scale limits are hard limits, i.e., a firm limit in software or hardware that cannot be exceeded, and some are soft limits that are limits determined during testability. Whether a given limit is a hard or soft limit is not documented in the scalability guide. This is because a soft limit hasn't been tested over scale, and the behavior is unknown, and could lead to impact. For this reason, all of the scale limits should be treated as hard limits. If there's technical justification to scale over the documented limits, please discuss this with your Cisco team to determine the best approach.

The ACI Scalability Guides are available on CCO on the [APIC homepage](https://www.cisco.com/c/en/us/support/cloud-systems-management/application-policy-infrastructure-controller-apic/tsd-products-support-series-home.html), under the "Verified Scalability" section. **Note** that a new guide is not released for every code release--choose the latest guide for the closest code version *before* your release of code.

## Current Scale

Fabric-Wide Scale

|  |  |  |
| --- | --- | --- |
| Metric | Count | Limit |
| EPGs | 1506 | 15000 |
| BDs | 1474 | 15000 |
| VRFs | 106 | 3000 |
| Tenants | 4 | 3000 |
| Contracts | 135 | 10000 |
| Filters | 93 | 10000 |

Per-Device Managed Object Scale

Some scale limits in ACI are tested limits, and some are hard limits, e.g. TCAM slots. In either case, a fabric in excess of supported scale limits may be denied support until scale is reduced, and may result in unexpected behavior and/or failure.

The following table lists a subset of scale metrics for this fabric. **Note** that this is not a comprehensive review of *all* scale metrics. The [Scalability Guides](https://www.cisco.com/c/en/us/support/cloud-systems-management/application-policy-infrastructure-controller-apic/tsd-products-support-series-home.html) should serve as the final authority on ACI scalability metrics.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Node | EPGs | BDs | VRFs | TCAM | VLANs |
| sweidle101 | 173 of 3960 | 282 of 3500 | 99 of 800 | 1414 of 65536 | 456 of 3960 |
| sweidle102 | 173 of 3960 | 282 of 3500 | 99 of 800 | 1414 of 65536 | 456 of 3960 |
| sweidle103 | 1 of 3960 | 2 of 3500 | 4 of 800 | 36 of 65536 | 4 of 3960 |
| sweidle104 | 2 of 3960 | 3 of 3500 | 5 of 800 | 41 of 65536 | 6 of 3960 |
| sweidle105 | 1 of 3960 | 2 of 3500 | 4 of 800 | 38 of 65536 | 4 of 3960 |
| sweidle106 | 1 of 3960 | 2 of 3500 | 4 of 800 | 36 of 65536 | 4 of 3960 |
| sweidle107 | 114 of 3960 | 112 of 3500 | 27 of 800 | 305 of 65536 | 227 of 3960 |
| sweidle108 | 114 of 3960 | 112 of 3500 | 27 of 800 | 305 of 65536 | 227 of 3960 |
| sweidle109 | 112 of 3960 | 110 of 3500 | 26 of 800 | 306 of 65536 | 223 of 3960 |
| sweidle110 | 112 of 3960 | 110 of 3500 | 26 of 800 | 306 of 65536 | 223 of 3960 |
| sweidle111 | 7 of 3960 | 7 of 3500 | 6 of 800 | 48 of 65536 | 15 of 3960 |
| sweidle112 | 7 of 3960 | 7 of 3500 | 6 of 800 | 48 of 65536 | 15 of 3960 |
| sweidle113 | 110 of 3960 | 108 of 3500 | 24 of 800 | 253 of 65536 | 219 of 3960 |
| sweidle114 | 110 of 3960 | 108 of 3500 | 24 of 800 | 253 of 65536 | 219 of 3960 |
| sweidle115 | 110 of 3960 | 108 of 3500 | 24 of 800 | 228 of 65536 | 219 of 3960 |
| sweidle116 | 110 of 3960 | 108 of 3500 | 24 of 800 | 228 of 65536 | 219 of 3960 |
| sweidle117 | 13 of 3960 | 13 of 3500 | 6 of 800 | 54 of 65536 | 27 of 3960 |
| sweidle118 | 13 of 3960 | 13 of 3500 | 6 of 800 | 54 of 65536 | 27 of 3960 |
| sweidle119 | 110 of 3960 | 108 of 3500 | 22 of 800 | 222 of 65536 | 219 of 3960 |
| sweidle120 | 110 of 3960 | 108 of 3500 | 22 of 800 | 222 of 65536 | 219 of 3960 |
| sweidle121 | 24 of 3960 | 24 of 3500 | 13 of 800 | 97 of 65536 | 49 of 3960 |
| sweidle122 | 24 of 3960 | 24 of 3500 | 13 of 800 | 97 of 65536 | 49 of 3960 |
| sweidle127 | 123 of 3960 | 121 of 3500 | 27 of 800 | 257 of 65536 | 245 of 3960 |
| sweidle128 | 123 of 3960 | 121 of 3500 | 27 of 800 | 257 of 65536 | 245 of 3960 |
| sweidle129 | 109 of 3960 | 107 of 3500 | 25 of 800 | 233 of 65536 | 217 of 3960 |
| sweidle130 | 109 of 3960 | 107 of 3500 | 25 of 800 | 233 of 65536 | 217 of 3960 |
| sweidle131 | 107 of 3960 | 105 of 3500 | 24 of 800 | 227 of 65536 | 213 of 3960 |
| sweidle132 | 107 of 3960 | 105 of 3500 | 24 of 800 | 227 of 65536 | 213 of 3960 |
| sweidle133 | 117 of 3960 | 115 of 3500 | 24 of 800 | 237 of 65536 | 233 of 3960 |
| sweidle134 | 117 of 3960 | 115 of 3500 | 24 of 800 | 237 of 65536 | 233 of 3960 |
| sweidle135 | 7 of 3960 | 7 of 3500 | 8 of 800 | 62 of 65536 | 15 of 3960 |
| sweidle136 | 7 of 3960 | 7 of 3500 | 8 of 800 | 62 of 65536 | 15 of 3960 |
| sweidle137 | 117 of 3960 | 115 of 3500 | 27 of 800 | 333 of 65536 | 233 of 3960 |
| sweidle138 | 117 of 3960 | 115 of 3500 | 27 of 800 | 333 of 65536 | 233 of 3960 |
| sweidle139 | 107 of 3960 | 105 of 3500 | 23 of 800 | 223 of 65536 | 213 of 3960 |
| sweidle140 | 107 of 3960 | 105 of 3500 | 23 of 800 | 223 of 65536 | 213 of 3960 |
| sweidle151 | 3 of 3960 | 3 of 3500 | 6 of 800 | 53 of 65536 | 7 of 3960 |
| sweidle152 | 3 of 3960 | 3 of 3500 | 7 of 800 | 55 of 65536 | 7 of 3960 |
| sweidle201 | 43 of 3960 | 44 of 3500 | 7 of 800 | 88 of 65536 | 88 of 3960 |
| sweidle202 | 43 of 3960 | 44 of 3500 | 7 of 800 | 88 of 65536 | 88 of 3960 |
| sweidle205 | 23 of 3960 | 23 of 3500 | 6 of 800 | 64 of 65536 | 47 of 3960 |
| sweidle206 | 23 of 3960 | 23 of 3500 | 6 of 800 | 64 of 65536 | 47 of 3960 |
| sweidle207 | 36 of 3960 | 36 of 3500 | 8 of 800 | 87 of 65536 | 73 of 3960 |
| sweidle208 | 36 of 3960 | 36 of 3500 | 8 of 800 | 87 of 65536 | 73 of 3960 |
| sweidle209 | 106 of 3960 | 106 of 3500 | 27 of 800 | 250 of 65536 | 213 of 3960 |
| sweidle210 | 106 of 3960 | 106 of 3500 | 27 of 800 | 250 of 65536 | 213 of 3960 |
| sweidle211 | 7 of 3960 | 7 of 3500 | 9 of 800 | 62 of 65536 | 15 of 3960 |
| sweidle212 | 7 of 3960 | 7 of 3500 | 9 of 800 | 62 of 65536 | 15 of 3960 |
| sweidle213 | 5 of 3960 | 5 of 3500 | 7 of 800 | 52 of 65536 | 11 of 3960 |
| sweidle214 | 5 of 3960 | 5 of 3500 | 7 of 800 | 52 of 65536 | 11 of 3960 |
| sweidle215 | 2 of 3960 | 2 of 3500 | 5 of 800 | 41 of 65536 | 5 of 3960 |
| sweidle216 | 3 of 3960 | 3 of 3500 | 6 of 800 | 46 of 65536 | 7 of 3960 |
| sweidle217 | 16 of 3960 | 16 of 3500 | 10 of 800 | 90 of 65536 | 33 of 3960 |
| sweidle218 | 15 of 3960 | 15 of 3500 | 10 of 800 | 89 of 65536 | 31 of 3960 |
| sweidle219 | 7 of 3960 | 7 of 3500 | 8 of 800 | 65 of 65536 | 14 of 3960 |
| sweidle220 | 7 of 3960 | 7 of 3500 | 8 of 800 | 65 of 65536 | 14 of 3960 |
| sweidle221 | 569 of 3960 | 561 of 3500 | 72 of 800 | 1715 of 65536 | 1130 of 3960 |
| sweidle222 | 569 of 3960 | 561 of 3500 | 72 of 800 | 1715 of 65536 | 1130 of 3960 |
| sweidle223 | 30 of 3960 | 30 of 3500 | 7 of 800 | 73 of 65536 | 61 of 3960 |
| sweidle224 | 30 of 3960 | 30 of 3500 | 7 of 800 | 73 of 65536 | 61 of 3960 |
| sweidle225 | 35 of 3960 | 35 of 3500 | 12 of 800 | 104 of 65536 | 71 of 3960 |
| sweidle226 | 35 of 3960 | 35 of 3500 | 12 of 800 | 104 of 65536 | 71 of 3960 |
| sweidle227 | 6 of 3960 | 6 of 3500 | 7 of 800 | 51 of 65536 | 13 of 3960 |
| sweidle228 | 6 of 3960 | 6 of 3500 | 7 of 800 | 51 of 65536 | 13 of 3960 |
| sweidle301 | 13 of 3960 | 13 of 3500 | 6 of 800 | 54 of 65536 | 27 of 3960 |
| sweidle302 | 13 of 3960 | 13 of 3500 | 6 of 800 | 54 of 65536 | 27 of 3960 |
| sweidle307 | 31 of 3960 | 31 of 3500 | 20 of 800 | 132 of 65536 | 63 of 3960 |
| sweidle308 | 31 of 3960 | 31 of 3500 | 20 of 800 | 132 of 65536 | 63 of 3960 |
| sweidle309 | 12 of 3960 | 12 of 3500 | 8 of 800 | 65 of 65536 | 25 of 3960 |
| sweidle310 | 12 of 3960 | 12 of 3500 | 8 of 800 | 65 of 65536 | 25 of 3960 |
| sweidle311 | 438 of 3960 | 429 of 3500 | 73 of 800 | 991 of 65536 | 867 of 3960 |
| sweidle312 | 438 of 3960 | 429 of 3500 | 73 of 800 | 991 of 65536 | 867 of 3960 |
| sweidle313 | 14 of 3960 | 14 of 3500 | 10 of 800 | 75 of 65536 | 29 of 3960 |
| sweidle314 | 14 of 3960 | 14 of 3500 | 10 of 800 | 75 of 65536 | 29 of 3960 |
| sweidle315 | 14 of 3960 | 14 of 3500 | 11 of 800 | 77 of 65536 | 29 of 3960 |
| sweidle316 | 14 of 3960 | 14 of 3500 | 11 of 800 | 77 of 65536 | 29 of 3960 |
| sweidle317 | 14 of 3960 | 14 of 3500 | 12 of 800 | 81 of 65536 | 29 of 3960 |
| sweidle318 | 14 of 3960 | 14 of 3500 | 12 of 800 | 81 of 65536 | 29 of 3960 |
| sweidle319 | 4 of 3960 | 4 of 3500 | 6 of 800 | 45 of 65536 | 9 of 3960 |
| sweidle320 | 4 of 3960 | 4 of 3500 | 6 of 800 | 45 of 65536 | 9 of 3960 |
| sweidle323 | 7 of 3960 | 7 of 3500 | 7 of 800 | 52 of 65536 | 15 of 3960 |
| sweidle324 | 7 of 3960 | 7 of 3500 | 7 of 800 | 52 of 65536 | 15 of 3960 |
| sweidle329 | 11 of 3960 | 12 of 3500 | 8 of 800 | 64 of 65536 | 24 of 3960 |
| sweidle330 | 11 of 3960 | 12 of 3500 | 8 of 800 | 64 of 65536 | 24 of 3960 |
| sweidle331 | 121 of 3960 | 119 of 3500 | 26 of 800 | 257 of 65536 | 241 of 3960 |
| sweidle332 | 121 of 3960 | 119 of 3500 | 26 of 800 | 257 of 65536 | 241 of 3960 |
| sweidle401 | 52 of 3960 | 52 of 3500 | 8 of 800 | 103 of 65536 | 105 of 3960 |
| sweidle402 | 52 of 3960 | 52 of 3500 | 8 of 800 | 103 of 65536 | 105 of 3960 |
| sweidle403 | 30 of 3960 | 30 of 3500 | 7 of 800 | 79 of 65536 | 61 of 3960 |
| sweidle404 | 30 of 3960 | 30 of 3500 | 8 of 800 | 83 of 65536 | 61 of 3960 |
| sweidle405 | 17 of 3960 | 17 of 3500 | 9 of 800 | 74 of 65536 | 35 of 3960 |
| sweidle406 | 17 of 3960 | 17 of 3500 | 9 of 800 | 74 of 65536 | 35 of 3960 |
| sweidle407 | 541 of 3960 | 534 of 3500 | 73 of 800 | 1228 of 65536 | 1075 of 3960 |
| sweidle408 | 541 of 3960 | 534 of 3500 | 73 of 800 | 1228 of 65536 | 1075 of 3960 |
| sweidle409 | 6 of 3960 | 6 of 3500 | 5 of 800 | 45 of 65536 | 13 of 3960 |
| sweidle410 | 6 of 3960 | 6 of 3500 | 5 of 800 | 45 of 65536 | 13 of 3960 |
| sweidle411 | 36 of 3960 | 36 of 3500 | 12 of 800 | 105 of 65536 | 73 of 3960 |
| sweidle412 | 36 of 3960 | 36 of 3500 | 12 of 800 | 105 of 65536 | 73 of 3960 |
| sweidle413 | 11 of 3960 | 12 of 3500 | 8 of 800 | 64 of 65536 | 24 of 3960 |
| sweidle414 | 11 of 3960 | 12 of 3500 | 8 of 800 | 64 of 65536 | 24 of 3960 |
| sweidle415 | 396 of 3960 | 392 of 3500 | 73 of 800 | 912 of 65536 | 788 of 3960 |
| sweidle416 | 396 of 3960 | 392 of 3500 | 73 of 800 | 912 of 65536 | 788 of 3960 |
| sweidle417 | 41 of 3960 | 41 of 3500 | 7 of 800 | 86 of 65536 | 83 of 3960 |
| sweidle418 | 41 of 3960 | 41 of 3500 | 7 of 800 | 86 of 65536 | 83 of 3960 |
| sweidle501 | 10 of 3960 | 10 of 3500 | 8 of 800 | 63 of 65536 | 21 of 3960 |
| sweidle502 | 10 of 3960 | 10 of 3500 | 8 of 800 | 63 of 65536 | 21 of 3960 |
| sweidle503 | 23 of 3960 | 23 of 3500 | 8 of 800 | 72 of 65536 | 47 of 3960 |
| sweidle504 | 23 of 3960 | 23 of 3500 | 8 of 800 | 72 of 65536 | 47 of 3960 |
| sweidle505 | 247 of 3960 | 247 of 3500 | 59 of 800 | 504 of 65536 | 494 of 3960 |
| sweidle506 | 247 of 3960 | 247 of 3500 | 59 of 800 | 504 of 65536 | 494 of 3960 |
| sweidle509 | 4 of 3960 | 4 of 3500 | 6 of 800 | 45 of 65536 | 9 of 3960 |
| sweidle510 | 4 of 3960 | 4 of 3500 | 6 of 800 | 45 of 65536 | 9 of 3960 |
| sweidle511 | 4 of 3960 | 4 of 3500 | 6 of 800 | 45 of 65536 | 9 of 3960 |
| sweidle512 | 4 of 3960 | 4 of 3500 | 6 of 800 | 45 of 65536 | 9 of 3960 |
| sweidle513 | 22 of 3960 | 22 of 3500 | 11 of 800 | 83 of 65536 | 45 of 3960 |
| sweidle514 | 22 of 3960 | 22 of 3500 | 11 of 800 | 83 of 65536 | 45 of 3960 |
| sweidle515 | 120 of 3960 | 118 of 3500 | 24 of 800 | 240 of 65536 | 239 of 3960 |
| sweidle516 | 120 of 3960 | 118 of 3500 | 24 of 800 | 240 of 65536 | 239 of 3960 |
| sweidle517 | 112 of 3960 | 110 of 3500 | 24 of 800 | 232 of 65536 | 223 of 3960 |
| sweidle518 | 112 of 3960 | 110 of 3500 | 24 of 800 | 232 of 65536 | 223 of 3960 |
| sweidle519 | 15 of 3960 | 15 of 3500 | 14 of 800 | 104 of 65536 | 31 of 3960 |
| sweidle520 | 14 of 3960 | 14 of 3500 | 13 of 800 | 97 of 65536 | 29 of 3960 |
| sweidle523 | 33 of 3960 | 33 of 3500 | 19 of 800 | 137 of 65536 | 67 of 3960 |
| sweidle524 | 33 of 3960 | 33 of 3500 | 19 of 800 | 137 of 65536 | 67 of 3960 |
| sweidle525 | 15 of 3960 | 15 of 3500 | 12 of 800 | 84 of 65536 | 31 of 3960 |
| sweidle526 | 15 of 3960 | 15 of 3500 | 12 of 800 | 84 of 65536 | 31 of 3960 |
| sweidle527 | 5 of 3960 | 5 of 3500 | 7 of 800 | 52 of 65536 | 11 of 3960 |
| sweidle528 | 4 of 3960 | 4 of 3500 | 7 of 800 | 51 of 65536 | 9 of 3960 |
| sweidle529 | 44 of 3960 | 45 of 3500 | 31 of 800 | 198 of 65536 | 49 of 3960 |
| sweidle530 | 44 of 3960 | 45 of 3500 | 31 of 800 | 198 of 65536 | 49 of 3960 |
| sweidle531 | 14 of 3960 | 14 of 3500 | 8 of 800 | 67 of 65536 | 29 of 3960 |
| sweidle532 | 14 of 3960 | 14 of 3500 | 8 of 800 | 67 of 65536 | 29 of 3960 |
| sweidle533 | 8 of 3960 | 8 of 3500 | 7 of 800 | 53 of 65536 | 17 of 3960 |
| sweidle534 | 8 of 3960 | 8 of 3500 | 7 of 800 | 53 of 65536 | 17 of 3960 |
| sweidle535 | 122 of 3960 | 120 of 3500 | 23 of 800 | 261 of 65536 | 243 of 3960 |
| sweidle536 | 122 of 3960 | 120 of 3500 | 23 of 800 | 261 of 65536 | 243 of 3960 |
| sweidle539 | 1 of 3960 | 1 of 3500 | 4 of 800 | 36 of 65536 | 3 of 3960 |
| sweidle540 | 1 of 3960 | 1 of 3500 | 4 of 800 | 36 of 65536 | 3 of 3960 |
| sweidle601 | 19 of 3960 | 19 of 3500 | 13 of 800 | 92 of 65536 | 39 of 3960 |
| sweidle602 | 19 of 3960 | 19 of 3500 | 13 of 800 | 92 of 65536 | 39 of 3960 |
| sweidle603 | 30 of 3960 | 30 of 3500 | 20 of 800 | 127 of 65536 | 61 of 3960 |
| sweidle604 | 30 of 3960 | 30 of 3500 | 20 of 800 | 127 of 65536 | 61 of 3960 |
| sweidle605 | 115 of 3960 | 113 of 3500 | 24 of 800 | 233 of 65536 | 229 of 3960 |
| sweidle606 | 115 of 3960 | 113 of 3500 | 24 of 800 | 233 of 65536 | 229 of 3960 |
| sweidle607 | 64 of 3960 | 64 of 3500 | 37 of 800 | 233 of 65536 | 129 of 3960 |
| sweidle608 | 64 of 3960 | 64 of 3500 | 37 of 800 | 233 of 65536 | 129 of 3960 |
| sweidle609 | 80 of 3960 | 81 of 3500 | 48 of 800 | 333 of 65536 | 162 of 3960 |
| sweidle610 | 80 of 3960 | 81 of 3500 | 48 of 800 | 333 of 65536 | 162 of 3960 |
| sweidle611 | 24 of 3960 | 24 of 3500 | 12 of 800 | 89 of 65536 | 49 of 3960 |
| sweidle612 | 24 of 3960 | 24 of 3500 | 12 of 800 | 89 of 65536 | 49 of 3960 |
| sweidle613 | 9 of 3960 | 9 of 3500 | 5 of 800 | 131 of 65536 | 19 of 3960 |
| sweidle614 | 9 of 3960 | 9 of 3500 | 5 of 800 | 103 of 65536 | 19 of 3960 |
| sweidle615 | 150 of 3960 | 148 of 3500 | 31 of 800 | 321 of 65536 | 268 of 3960 |
| sweidle616 | 150 of 3960 | 148 of 3500 | 31 of 800 | 321 of 65536 | 268 of 3960 |
| sweidle617 | 123 of 3960 | 121 of 3500 | 26 of 800 | 251 of 65536 | 245 of 3960 |
| sweidle618 | 123 of 3960 | 121 of 3500 | 26 of 800 | 251 of 65536 | 245 of 3960 |
| sweidle619 | 27 of 3960 | 27 of 3500 | 17 of 800 | 112 of 65536 | 55 of 3960 |
| sweidle620 | 27 of 3960 | 27 of 3500 | 17 of 800 | 112 of 65536 | 55 of 3960 |
| sweidle621 | 40 of 3960 | 40 of 3500 | 30 of 800 | 181 of 65536 | 81 of 3960 |
| sweidle622 | 40 of 3960 | 40 of 3500 | 30 of 800 | 181 of 65536 | 81 of 3960 |
| sweidle623 | 2 of 3960 | 2 of 3500 | 6 of 800 | 43 of 65536 | 5 of 3960 |
| sweidle624 | 2 of 3960 | 2 of 3500 | 6 of 800 | 43 of 65536 | 5 of 3960 |
| sweidle625 | 139 of 3960 | 139 of 3500 | 49 of 800 | 358 of 65536 | 279 of 3960 |
| sweidle626 | 137 of 3960 | 137 of 3500 | 49 of 800 | 356 of 65536 | 275 of 3960 |
| sweidle627 | 7 of 3960 | 7 of 3500 | 9 of 800 | 64 of 65536 | 15 of 3960 |
| sweidle628 | 7 of 3960 | 7 of 3500 | 9 of 800 | 64 of 65536 | 15 of 3960 |
| sweidle629 | 117 of 3960 | 115 of 3500 | 26 of 800 | 253 of 65536 | 233 of 3960 |
| sweidle630 | 117 of 3960 | 115 of 3500 | 26 of 800 | 253 of 65536 | 233 of 3960 |
| sweidle631 | 1 of 3960 | 1 of 3500 | 4 of 800 | 50 of 65536 | 3 of 3960 |
| sweidle632 | 1 of 3960 | 1 of 3500 | 4 of 800 | 50 of 65536 | 3 of 3960 |
| sweidle633 | 35 of 3960 | 35 of 3500 | 21 of 800 | 136 of 65536 | 71 of 3960 |
| sweidle634 | 35 of 3960 | 35 of 3500 | 21 of 800 | 136 of 65536 | 71 of 3960 |
| sweidle635 | 6 of 3960 | 6 of 3500 | 8 of 800 | 57 of 65536 | 13 of 3960 |
| sweidle636 | 6 of 3960 | 6 of 3500 | 8 of 800 | 57 of 65536 | 13 of 3960 |
| sweidle637 | 57 of 3960 | 57 of 3500 | 28 of 800 | 192 of 65536 | 113 of 3960 |
| sweidle638 | 57 of 3960 | 57 of 3500 | 27 of 800 | 188 of 65536 | 113 of 3960 |
| sweidle701 | 115 of 3960 | 113 of 3500 | 26 of 800 | 251 of 65536 | 229 of 3960 |
| sweidle702 | 115 of 3960 | 113 of 3500 | 26 of 800 | 251 of 65536 | 229 of 3960 |
| sweidle703 | 118 of 3960 | 116 of 3500 | 28 of 800 | 266 of 65536 | 235 of 3960 |
| sweidle704 | 118 of 3960 | 116 of 3500 | 28 of 800 | 266 of 65536 | 235 of 3960 |
| sweidle705 | 106 of 3960 | 104 of 3500 | 23 of 800 | 220 of 65536 | 211 of 3960 |
| sweidle706 | 106 of 3960 | 104 of 3500 | 23 of 800 | 220 of 65536 | 211 of 3960 |
| sweidle707 | 105 of 3960 | 103 of 3500 | 22 of 800 | 217 of 65536 | 209 of 3960 |
| sweidle708 | 105 of 3960 | 103 of 3500 | 22 of 800 | 217 of 65536 | 209 of 3960 |
| sweidle709 | 109 of 3960 | 107 of 3500 | 22 of 800 | 221 of 65536 | 217 of 3960 |
| sweidle710 | 109 of 3960 | 107 of 3500 | 22 of 800 | 221 of 65536 | 217 of 3960 |
| sweidle711 | 111 of 3960 | 109 of 3500 | 27 of 800 | 251 of 65536 | 221 of 3960 |
| sweidle712 | 111 of 3960 | 109 of 3500 | 27 of 800 | 251 of 65536 | 221 of 3960 |
| sweidle713 | 118 of 3960 | 116 of 3500 | 28 of 800 | 262 of 65536 | 235 of 3960 |
| sweidle714 | 118 of 3960 | 116 of 3500 | 28 of 800 | 262 of 65536 | 235 of 3960 |
| sweidle715 | 117 of 3960 | 115 of 3500 | 27 of 800 | 257 of 65536 | 233 of 3960 |
| sweidle716 | 117 of 3960 | 115 of 3500 | 27 of 800 | 257 of 65536 | 233 of 3960 |
| sweidle717 | 139 of 3960 | 137 of 3500 | 29 of 800 | 311 of 65536 | 277 of 3960 |
| sweidle718 | 139 of 3960 | 137 of 3500 | 29 of 800 | 311 of 65536 | 277 of 3960 |
| sweidle719 | 123 of 3960 | 121 of 3500 | 29 of 800 | 271 of 65536 | 245 of 3960 |
| sweidle720 | 123 of 3960 | 121 of 3500 | 29 of 800 | 271 of 65536 | 245 of 3960 |
| sweidle721 | 117 of 3960 | 115 of 3500 | 26 of 800 | 335 of 65536 | 233 of 3960 |
| sweidle722 | 117 of 3960 | 115 of 3500 | 26 of 800 | 335 of 65536 | 233 of 3960 |
| sweidle801 | 29 of 3960 | 29 of 3500 | 7 of 800 | 74 of 65536 | 59 of 3960 |
| sweidle802 | 29 of 3960 | 29 of 3500 | 7 of 800 | 74 of 65536 | 59 of 3960 |
| sweidle803 | 463 of 3960 | 454 of 3500 | 71 of 800 | 837 of 65536 | 918 of 3960 |
| sweidle804 | 463 of 3960 | 454 of 3500 | 71 of 800 | 837 of 65536 | 918 of 3960 |
| sweidle805 | 117 of 3960 | 117 of 3500 | 25 of 800 | 267 of 65536 | 235 of 3960 |
| sweidle806 | 117 of 3960 | 117 of 3500 | 25 of 800 | 267 of 65536 | 235 of 3960 |
| sweidle807 | 125 of 3960 | 125 of 3500 | 27 of 800 | 274 of 65536 | 251 of 3960 |
| sweidle808 | 125 of 3960 | 125 of 3500 | 27 of 800 | 274 of 65536 | 251 of 3960 |
| sweidle809 | 121 of 3960 | 119 of 3500 | 28 of 800 | 265 of 65536 | 241 of 3960 |
| sweidle810 | 121 of 3960 | 119 of 3500 | 28 of 800 | 265 of 65536 | 241 of 3960 |
| sweidle811 | 114 of 3960 | 112 of 3500 | 25 of 800 | 246 of 65536 | 227 of 3960 |
| sweidle812 | 114 of 3960 | 112 of 3500 | 25 of 800 | 246 of 65536 | 227 of 3960 |
| sweidle813 | 450 of 3960 | 441 of 3500 | 74 of 800 | 752 of 65536 | 891 of 3960 |
| sweidle814 | 450 of 3960 | 441 of 3500 | 74 of 800 | 752 of 65536 | 891 of 3960 |
| sweidle815 | 46 of 3960 | 46 of 3500 | 7 of 800 | 91 of 65536 | 93 of 3960 |
| sweidle816 | 46 of 3960 | 46 of 3500 | 7 of 800 | 91 of 65536 | 93 of 3960 |
| sweidle817 | 130 of 3960 | 130 of 3500 | 26 of 800 | 275 of 65536 | 261 of 3960 |
| sweidle818 | 130 of 3960 | 130 of 3500 | 26 of 800 | 275 of 65536 | 261 of 3960 |
| sweidle819 | 2 of 3960 | 2 of 3500 | 5 of 800 | 39 of 65536 | 5 of 3960 |
| sweidle820 | 2 of 3960 | 2 of 3500 | 5 of 800 | 39 of 65536 | 5 of 3960 |
| sweidle821 | 3 of 3960 | 3 of 3500 | 6 of 800 | 46 of 65536 | 7 of 3960 |
| sweidle822 | 3 of 3960 | 3 of 3500 | 6 of 800 | 46 of 65536 | 7 of 3960 |
| sweidle901 | 42 of 3960 | 42 of 3500 | 9 of 800 | 95 of 65536 | 85 of 3960 |
| sweidle902 | 42 of 3960 | 42 of 3500 | 9 of 800 | 95 of 65536 | 85 of 3960 |

Per-Device Endpoint Scale

|  |  |  |
| --- | --- | --- |
| Node | L2 Total | L3 Total |
| sweidle101 | 1419 of 24576 | 4770 of 24576 |
| sweidle102 | 1419 of 24576 | 4770 of 24576 |
| sweidle103 | 29 of 24576 | 57 of 24576 |
| sweidle104 | 32 of 24576 | 59 of 24576 |
| sweidle105 | 4 of 24576 | 3 of 24576 |
| sweidle106 | 5 of 24576 | 3 of 24576 |
| sweidle107 | 4399 of 24576 | 2944 of 24576 |
| sweidle108 | 4405 of 24576 | 2952 of 24576 |
| sweidle109 | 3895 of 24576 | 3397 of 24576 |
| sweidle110 | 3894 of 24576 | 3403 of 24576 |
| sweidle111 | 479 of 24576 | 433 of 24576 |
| sweidle112 | 478 of 24576 | 434 of 24576 |
| sweidle113 | 4404 of 24576 | 8239 of 24576 |
| sweidle114 | 4397 of 24576 | 8225 of 24576 |
| sweidle115 | 4130 of 24576 | 3621 of 24576 |
| sweidle116 | 4129 of 24576 | 3618 of 24576 |
| sweidle117 | 773 of 24576 | 748 of 24576 |
| sweidle118 | 775 of 24576 | 748 of 24576 |
| sweidle119 | 4102 of 24576 | 3891 of 24576 |
| sweidle120 | 4098 of 24576 | 3889 of 24576 |
| sweidle121 | 667 of 24576 | 2695 of 24576 |
| sweidle122 | 666 of 24576 | 2696 of 24576 |
| sweidle127 | 4365 of 24576 | 3367 of 24576 |
| sweidle128 | 4360 of 24576 | 3364 of 24576 |
| sweidle129 | 4046 of 24576 | 7407 of 24576 |
| sweidle130 | 4053 of 24576 | 7407 of 24576 |
| sweidle131 | 3951 of 24576 | 4269 of 24576 |
| sweidle132 | 3955 of 24576 | 4269 of 24576 |
| sweidle133 | 4664 of 24576 | 4202 of 24576 |
| sweidle134 | 4663 of 24576 | 4185 of 24576 |
| sweidle135 | 506 of 24576 | 4572 of 24576 |
| sweidle136 | 504 of 24576 | 4573 of 24576 |
| sweidle137 | 3906 of 24576 | 3855 of 24576 |
| sweidle138 | 3906 of 24576 | 3855 of 24576 |
| sweidle139 | 4554 of 24576 | 5579 of 24576 |
| sweidle140 | 4559 of 24576 | 5581 of 24576 |
| sweidle151 | 9 of 24576 | 6 of 24576 |
| sweidle152 | 9 of 24576 | 6 of 24576 |
| sweidle201 | 973 of 24576 | 732 of 24576 |
| sweidle202 | 971 of 24576 | 732 of 24576 |
| sweidle205 | 4150 of 24576 | 2018 of 24576 |
| sweidle206 | 4147 of 24576 | 2021 of 24576 |
| sweidle207 | 4398 of 24576 | 2832 of 24576 |
| sweidle208 | 4389 of 24576 | 2805 of 24576 |
| sweidle209 | 3734 of 24576 | 3723 of 24576 |
| sweidle210 | 3736 of 24576 | 3714 of 24576 |
| sweidle211 | 246 of 24576 | 197 of 24576 |
| sweidle212 | 247 of 24576 | 197 of 24576 |
| sweidle213 | 166 of 24576 | 82 of 24576 |
| sweidle214 | 166 of 24576 | 82 of 24576 |
| sweidle215 | 20 of 24576 | 49 of 24576 |
| sweidle216 | 22 of 24576 | 50 of 24576 |
| sweidle217 | 429 of 24576 | 385 of 24576 |
| sweidle218 | 393 of 24576 | 383 of 24576 |
| sweidle219 | 268 of 24576 | 23 of 24576 |
| sweidle220 | 268 of 24576 | 25 of 24576 |
| sweidle221 | 6744 of 24576 | 7796 of 24576 |
| sweidle222 | 6727 of 24576 | 7798 of 24576 |
| sweidle223 | 966 of 24576 | 709 of 24576 |
| sweidle224 | 966 of 24576 | 709 of 24576 |
| sweidle225 | 2803 of 24576 | 197 of 24576 |
| sweidle226 | 2806 of 24576 | 196 of 24576 |
| sweidle227 | 159 of 24576 | 37 of 24576 |
| sweidle228 | 159 of 24576 | 37 of 24576 |
| sweidle301 | 664 of 24576 | 622 of 24576 |
| sweidle302 | 663 of 24576 | 621 of 24576 |
| sweidle307 | 776 of 24576 | 991 of 24576 |
| sweidle308 | 778 of 24576 | 993 of 24576 |
| sweidle309 | 294 of 24576 | 199 of 24576 |
| sweidle310 | 294 of 24576 | 199 of 24576 |
| sweidle311 | 6108 of 24576 | 8655 of 24576 |
| sweidle312 | 6111 of 24576 | 8654 of 24576 |
| sweidle313 | 903 of 24576 | 229 of 24576 |
| sweidle314 | 903 of 24576 | 229 of 24576 |
| sweidle315 | 767 of 24576 | 83 of 24576 |
| sweidle316 | 766 of 24576 | 83 of 24576 |
| sweidle317 | 767 of 24576 | 347 of 24576 |
| sweidle318 | 769 of 24576 | 347 of 24576 |
| sweidle319 | 198 of 24576 | 145 of 24576 |
| sweidle320 | 198 of 24576 | 145 of 24576 |
| sweidle323 | 421 of 24576 | 294 of 24576 |
| sweidle324 | 421 of 24576 | 294 of 24576 |
| sweidle329 | 288 of 24576 | 186 of 24576 |
| sweidle330 | 289 of 24576 | 186 of 24576 |
| sweidle331 | 3673 of 24576 | 3175 of 24576 |
| sweidle332 | 3674 of 24576 | 3168 of 24576 |
| sweidle401 | 291 of 24576 | 262 of 24576 |
| sweidle402 | 291 of 24576 | 262 of 24576 |
| sweidle403 | 120 of 24576 | 145 of 24576 |
| sweidle404 | 125 of 24576 | 189 of 24576 |
| sweidle405 | 330 of 24576 | 261 of 24576 |
| sweidle406 | 330 of 24576 | 261 of 24576 |
| sweidle407 | 5493 of 24576 | 7012 of 24576 |
| sweidle408 | 5487 of 24576 | 7012 of 24576 |
| sweidle409 | 1368 of 24576 | 377 of 24576 |
| sweidle410 | 1368 of 24576 | 377 of 24576 |
| sweidle411 | 514 of 24576 | 345 of 24576 |
| sweidle412 | 514 of 24576 | 345 of 24576 |
| sweidle413 | 282 of 24576 | 139 of 24576 |
| sweidle414 | 283 of 24576 | 139 of 24576 |
| sweidle415 | 6372 of 24576 | 7346 of 24576 |
| sweidle416 | 6369 of 24576 | 7346 of 24576 |
| sweidle417 | 964 of 24576 | 632 of 24576 |
| sweidle418 | 961 of 24576 | 632 of 24576 |
| sweidle501 | 321 of 24576 | 171 of 24576 |
| sweidle502 | 316 of 24576 | 171 of 24576 |
| sweidle503 | 229 of 24576 | 38 of 24576 |
| sweidle504 | 229 of 24576 | 38 of 24576 |
| sweidle505 | 2023 of 24576 | 2448 of 24576 |
| sweidle506 | 2029 of 24576 | 2448 of 24576 |
| sweidle509 | 31 of 24576 | 96 of 24576 |
| sweidle510 | 31 of 24576 | 95 of 24576 |
| sweidle511 | 28 of 24576 | 95 of 24576 |
| sweidle512 | 28 of 24576 | 94 of 24576 |
| sweidle513 | 191 of 24576 | 498 of 24576 |
| sweidle514 | 191 of 24576 | 498 of 24576 |
| sweidle515 | 3661 of 24576 | 3274 of 24576 |
| sweidle516 | 3666 of 24576 | 3274 of 24576 |
| sweidle517 | 3765 of 24576 | 3153 of 24576 |
| sweidle518 | 3766 of 24576 | 3171 of 24576 |
| sweidle519 | 278 of 24576 | 153 of 24576 |
| sweidle520 | 266 of 24576 | 145 of 24576 |
| sweidle523 | 866 of 24576 | 1095 of 24576 |
| sweidle524 | 845 of 24576 | 1053 of 24576 |
| sweidle525 | 118 of 24576 | 166 of 24576 |
| sweidle526 | 117 of 24576 | 166 of 24576 |
| sweidle527 | 151 of 24576 | 198 of 24576 |
| sweidle528 | 127 of 24576 | 196 of 24576 |
| sweidle529 | 1021 of 24576 | 942 of 24576 |
| sweidle530 | 1022 of 24576 | 941 of 24576 |
| sweidle531 | 55 of 24576 | 33 of 24576 |
| sweidle532 | 55 of 24576 | 33 of 24576 |
| sweidle533 | 68 of 24576 | 115 of 24576 |
| sweidle534 | 67 of 24576 | 115 of 24576 |
| sweidle535 | 4143 of 24576 | 3741 of 24576 |
| sweidle536 | 4148 of 24576 | 3742 of 24576 |
| sweidle539 | 38 of 24576 | 51 of 24576 |
| sweidle540 | 38 of 24576 | 51 of 24576 |
| sweidle601 | 347 of 24576 | 743 of 24576 |
| sweidle602 | 346 of 24576 | 748 of 24576 |
| sweidle603 | 828 of 24576 | 944 of 24576 |
| sweidle604 | 827 of 24576 | 944 of 24576 |
| sweidle605 | 3739 of 24576 | 4114 of 24576 |
| sweidle606 | 3738 of 24576 | 4109 of 24576 |
| sweidle607 | 3271 of 24576 | 3186 of 24576 |
| sweidle608 | 3279 of 24576 | 3190 of 24576 |
| sweidle609 | 2072 of 24576 | 10341 of 24576 |
| sweidle610 | 2076 of 24576 | 10337 of 24576 |
| sweidle611 | 213 of 24576 | 509 of 24576 |
| sweidle612 | 213 of 24576 | 509 of 24576 |
| sweidle613 | 59 of 24576 | 151 of 24576 |
| sweidle614 | 86 of 24576 | 95 of 24576 |
| sweidle615 | 4369 of 24576 | 4340 of 24576 |
| sweidle616 | 4373 of 24576 | 4340 of 24576 |
| sweidle617 | 3893 of 24576 | 3188 of 24576 |
| sweidle618 | 3886 of 24576 | 3185 of 24576 |
| sweidle619 | 772 of 24576 | 926 of 24576 |
| sweidle620 | 772 of 24576 | 926 of 24576 |
| sweidle621 | 441 of 24576 | 551 of 24576 |
| sweidle622 | 439 of 24576 | 552 of 24576 |
| sweidle623 | 68 of 24576 | 4 of 24576 |
| sweidle624 | 68 of 24576 | 4 of 24576 |
| sweidle625 | 2736 of 24576 | 2802 of 24576 |
| sweidle626 | 2733 of 24576 | 2798 of 24576 |
| sweidle627 | 105 of 24576 | 144 of 24576 |
| sweidle628 | 105 of 24576 | 144 of 24576 |
| sweidle629 | 3538 of 24576 | 2973 of 24576 |
| sweidle630 | 3534 of 24576 | 2970 of 24576 |
| sweidle631 | 2 of 24576 | 9 of 24576 |
| sweidle632 | 2 of 24576 | 9 of 24576 |
| sweidle633 | 869 of 24576 | 1059 of 24576 |
| sweidle634 | 869 of 24576 | 1059 of 24576 |
| sweidle635 | 94 of 24576 | 101 of 24576 |
| sweidle636 | 94 of 24576 | 101 of 24576 |
| sweidle637 | 1364 of 24576 | 1430 of 24576 |
| sweidle638 | 1360 of 24576 | 1371 of 24576 |
| sweidle701 | 4360 of 24576 | 4163 of 24576 |
| sweidle702 | 4360 of 24576 | 4163 of 24576 |
| sweidle703 | 3950 of 24576 | 2987 of 24576 |
| sweidle704 | 3951 of 24576 | 2994 of 24576 |
| sweidle705 | 3947 of 24576 | 3529 of 24576 |
| sweidle706 | 3945 of 24576 | 3530 of 24576 |
| sweidle707 | 4857 of 24576 | 4601 of 24576 |
| sweidle708 | 4864 of 24576 | 4602 of 24576 |
| sweidle709 | 4658 of 24576 | 9035 of 24576 |
| sweidle710 | 4666 of 24576 | 9044 of 24576 |
| sweidle711 | 3941 of 24576 | 3551 of 24576 |
| sweidle712 | 3938 of 24576 | 3552 of 24576 |
| sweidle713 | 4457 of 24576 | 4051 of 24576 |
| sweidle714 | 4469 of 24576 | 4074 of 24576 |
| sweidle715 | 3805 of 24576 | 2844 of 24576 |
| sweidle716 | 3804 of 24576 | 2847 of 24576 |
| sweidle717 | 3803 of 24576 | 3355 of 24576 |
| sweidle718 | 3802 of 24576 | 3355 of 24576 |
| sweidle719 | 3988 of 24576 | 3656 of 24576 |
| sweidle720 | 3985 of 24576 | 3656 of 24576 |
| sweidle721 | 4403 of 24576 | 4133 of 24576 |
| sweidle722 | 4405 of 24576 | 4135 of 24576 |
| sweidle801 | 4181 of 24576 | 2224 of 24576 |
| sweidle802 | 4182 of 24576 | 2232 of 24576 |
| sweidle803 | 4700 of 24576 | 5391 of 24576 |
| sweidle804 | 4699 of 24576 | 5390 of 24576 |
| sweidle805 | 4300 of 24576 | 3865 of 24576 |
| sweidle806 | 4318 of 24576 | 3874 of 24576 |
| sweidle807 | 4088 of 24576 | 2047 of 24576 |
| sweidle808 | 4085 of 24576 | 2045 of 24576 |
| sweidle809 | 3813 of 24576 | 2156 of 24576 |
| sweidle810 | 3809 of 24576 | 2151 of 24576 |
| sweidle811 | 4159 of 24576 | 3930 of 24576 |
| sweidle812 | 4160 of 24576 | 3938 of 24576 |
| sweidle813 | 4516 of 24576 | 4881 of 24576 |
| sweidle814 | 4515 of 24576 | 4878 of 24576 |
| sweidle815 | 608 of 24576 | 358 of 24576 |
| sweidle816 | 610 of 24576 | 358 of 24576 |
| sweidle817 | 4465 of 24576 | 6682 of 24576 |
| sweidle818 | 4462 of 24576 | 6682 of 24576 |
| sweidle819 | 409 of 24576 | 335 of 24576 |
| sweidle820 | 408 of 24576 | 337 of 24576 |
| sweidle821 | 86 of 24576 | 32 of 24576 |
| sweidle822 | 86 of 24576 | 32 of 24576 |
| sweidle901 | 3976 of 24576 | 1259 of 24576 |
| sweidle902 | 3967 of 24576 | 1265 of 24576 |

Finding

No per-node scalability risks were identified. Note that only a subset of metrics were validated. Please review the scalability guide for the full list of scale limits.

# Other Checks Performed - Info Only

This section provides an overview of best practices and health checks performed where no risks were identified.

## Operational Health

Algosec App

Overview

The AlgoSec app provides policy-based security integration services using AlgoSec's security analytics.

The AlgoSec app may expose the fabric to [CSCvv12524](https://bst.cloudapps.cisco.com/bugsearch/bug/CSCvv12524/?rfs=iqvred). Before attempting any software upgrade of the ACI fabric the following applications from the ACI App Center **must** be deactivated/removed:

Finding

No AlgoSec apps are installed.

APIC Cluster Health

Overview

A "fully fit" state indicates the database and messaging between APICs is fully synchronizing.

Any state other than "fully fit" indicates data is **not** synchronizing between APICs. This could result in loss of configuration, issues with VMM integration, and various other issues. This is a high risk that should be dealt with immediately.

Finding

The APIC cluster is **fully fit**.

Configuration accepted with IP address mismatch for a given VLAN on the same node

Overview

[CSCvh02653](https://bst.cloudapps.cisco.com/bugsearch/bug/CSCvh02653) allows an invalid configuration with an IP address mismatch to be accepted by the APIC. L3Outs exposed to this issue are configured with two or more IP addresses for a given VLAN on the same node. This results in the last IP address programmed to be the active one while the other IP address is no longer present on the node.

Findings

Issue not identified.

Multiple Firmware Versions

Overview

Multiple versions of firmware are tested in ACI upgrade testing; however, this state is expected to run for a limited time, i.e. only during upgrades. Additionally, Cisco recommends no configuration changes in mixed-firmware state.

Finding

No firmware issues were identified.

FN72145 - SSD Failure After 3.2 Years

Overview

After approximately 3.2 years (28,224 accumulated Power On Hours (POH)), a memory buffer overrun condition occurs which triggers the firmware event in the SSD. This causes the drive to become unresponsive until the drive is power-cycled. No data loss will occur when the memory buffer overrun firmware event occurs. A power-cycle restores normal operation of the drive. The drive continues to operate normally for approximately six weeks (1008 additional accumulated power on hours), at which time the drive will become unresponsive again. Power-cycling the drive again will re-initiate the 1008 hour window.

More details can be found in the [field notice](https://www.cisco.com/c/en/us/support/docs/field-notices/721/fn72145.html) on cisco.com.

Finding

No devices exposed to FN72145.

Infra VLAN Consistency

The infra VLAN is used for internal fabric control traffic.

A mismatch in the infra VLAN may result in communication failure between APICs or between a subset of APICs and leaves or spines. It's recommended to correct the APIC with the wrong VLAN ID.

More information about Infrastructure VLAN can be found in the [Cisco ACI Getting Started Guide](https://www.cisco.com/c/en/us/td/docs/switches/datacenter/aci/apic/sw/4-x/getting-started/Cisco-APIC-Getting-Started-Guide-421/b-Cisco-APIC-Getting-Started-Guide-421_chapter_010.html) available on cisco.com.

Finding

The infra VLAN is consistent across controllers.

Multi-pod ISIS Metric

Overview

The default ISIS redistribution metric is **63**, which is the maximum configurable metric. When an inter-pod router (IPN) spine is removed from the fabric and then reintroduced a hold down timer is applied to prevent forwarding on the spine until ISIS has fully converged. During this time, the metric is set to the maximum available (63) to prevent forwarding. Unfortunately, this is the same value as the default metric, so traffic begins forwarding immediately, and traffic loss may occur. [CSCvd75131](https://bst.cloudapps.cisco.com/bugsearch/bug/CSCvd75131/?rfs=iqvred) was filed to address this issue.

CSCvd75131 is first addressed in 2.2(4f); however, even with CSCvd75131 in place, the fix for this issue still requires a manual configuration change. The fix in CSCvd75131 is to *enable* the ability to change the metric; however, the metric must be manually updated to a value that addresses the original issue.

Finding

The ISIS metric is set to 32 as per best-practice.

APIC Disk Utilization

Overview

It is recommended to ensure that the Disk Utilization of the mount points are below 75% capacity.

Additional information for disk utilization fault codes can be found at:

* [Fault Code: F1529](https://pubhub.devnetcloud.com/media/apic-mim-ref-501/docs/FAULT-F1529.html)
* [Fault Code: F1528](https://pubhub.devnetcloud.com/media/apic-mim-ref-501/docs/FAULT-F1528.html)
* [Fault Code: F1527](https://pubhub.devnetcloud.com/media/apic-mim-ref-501/docs/FAULT-F1527.html)

Finding

Disk utilization in all the APIC nodes is below 75% threshold.

SSD Faults

Overview

This section reviews faults related to known SSD issues. Impact of SSD failure varies from a best case that configuration cannot be saved, to a worst case of device failure.

Finding

No SSD-specific faults were identified.

## Potential Misconfiguration

Bridge Domain configurations

Overview

Bridge Domains in ACI have a number of configuration options to allow the administrator to tune the operation in various ways.

This section reviews Bridge Domain configurations for information purposes and to check for risks and best practices.

Please reference the [ACI Endpoint Learning Whitepaper](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-739989.html) for detailed information about the available configuration options and how to optimally apply them to your network requirements.

Finding

No configuration risks were identified.

## Best Practices

BFD on Fabric-Facing Interfaces

Overview

Internal fabric routing in ACI is performed by ISIS and BGP. Bi-directional Forwarding Detection (BFD) is a protocol that improves convergence of routing protocol in certain failure scenarios.

BFD does this by sending frequent (50ms by default) hellos between nodes, and triggering immediate failover on the loss of three hellos.

BFD is not configured on fabric facing interfaces. This is the recommended configuration.

Common Tenant Duplicate Names

Overview

Duplicate names can contribute to misconfiguration where an incorrect VRF, BD, contract, or filter are used. In some cases, e.g. filters, object relationships are defined by name-only, and which object is used is ambiguous.

This can result in misconfiguration, ambiguous configuration, or unexpected behavior due to the wrong object association.

More information about object naming can be found in the [Cisco ACI Object Naming and Numbering: Best Practices Guide](https://www.cisco.com/c/en/us/td/docs/switches/datacenter/aci/apic/sw/kb/b-Cisco-ACI-Naming-and-Numbering.html) on cisco.com.

Finding

No duplicate object names found.

COOP Strict Mode

Overview

COOP strict mode protects against certain exploits that take advantage of the spine accepting unauthenticated updates. Setting the COOP Group setting to Strict hashes updates using MD5. The MD5 keys are changed out every hour and redistributed to switches.

For this reason, strict mode is recommended as a general best practice.

Finding

COOP strict mode is configured, as per best practice.

Duplicate VLAN usage on EPGs

Overview

It is recommended to use a unique VLAN per EPG where possible as unintended flooding between EPGs can otherwise occur. When a VLAN is selected from a VLAN pool by an EPG, it is allocated a VXLAN identifier known as a fabric\_encap. The fabric\_encap is used to forward spanning-tree BPDUs within the ACI fabric for the given VLAN. Reusing the same VLAN from the same VLAN pool on multiple EPGs may cause unintended forwarding of this traffic due to reuse of the fabric\_encap VXLAN identifier.

In situations where the same VLAN ID must be used by multiple EPGs and this flooding behavior is not intended, ensure that the EPGs use separate VLAN pools to ensure unique fabric\_encap allocation. In such cases however, be careful to avoid an overlapping VLAN pool situation where an EPG is associated to two or more access policy domains (e.g., physical domains) with overlapping VLAN pools. For more information on potential overlapping VLAN pool issues, review the [Cisco Community page on overlapping VLAN pools](https://community.cisco.com/t5/data-center-and-cloud-documents/aci-common-migration-issue-overlapping-vlan-pools/ta-p/3362376).

Finding

No duplicate VLAN usage was found.

Encrypted Backups

Overview

ACI backups are **unencrypted** by default. In an unencrypted backup, only non-sensitive configuration data is backed up. In an encrypted backup, passwords are encrypted, and backed up in addition to the standard, unencrypted configuration.

[Encrypted Backups](https://www.cisco.com/c/en/us/td/docs/switches/datacenter/aci/apic/sw/4-x/aci-fundamentals/Cisco-ACI-Fundamentals-401/Cisco-ACI-Fundamentals-401_chapter_01011.html#concept_15E2D7F6CCF24A98A40CBCB9A8302B81)

Finding

Encrypted backups are configured as per best-practice.

Enforce Subnet Check

Overview

[The Enforce Subnet Check section](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-739989.html#_Toc529820939) of the Endpoint Learning whitepaper explains the global Enforce Subnet Check options in detail.

There are a few key differences between this and the BD-level "Limit IP Learning to Subnet" config:

1. This feature limits local learns in hardware. For local learns, it functions like "Limit IP Learning to Subnet" where addresses outside of the BD subnets will not be learned.
2. For remote learns, this feature will restrict IP learning at the VRF-level. This validates that a remotely learned IP belongs to a subnet within the source VRF.
3. Enforce Subnet Check is a single, global configuration option.

Finding

**Enforce Subnet Check** is enabled globally as per best practice.

EP Loop Protection

Overview

EP Loop Protection counts a move when a MAC address moves to another port and then back to its original port. It's therefore designed specifically to detect looping behavior. EP Loop Protection can be configured to err-disable the port or to raise a fault.

The default, BD-level loop protection will stop learning in the entire BD, potentially causing wide-spread impact.

Finding

EP Loop Protect is configured as per best practice for this fabric.

Fabric ID Check

Overview

It is best practice to set the ACI Fabric ID to the default value of "1" during the initial APIC setup script on all APICs in the fabric in most cases. At a minimum, the fabric ID should be a consistent value across all APICs if "1" is not used. Inconsistent fabric IDs may be propagated to fabric switches during node discovery and may result in forwarding inconsistencies. Additional information on fabric ID usage can be found in the [Cisco ACI Multi-Site Architecture White Paper](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-739609.html#Day0MultiSiteinfrastructureconfiguration).

Generally speaking, the fabric ID should only be changed from "1" if ACI GOLF is implemented and the GOLF routers are shared between different ACI fabrics with the same BGP ASN using auto-RT. The fabric ID in such cases serves as a unique identifier in VRF route targets to prevent unexpected cross-VRF route exhanges between fabrics.

Finding

All fabric nodes have a fabric ID of "1".

Ingress Policy Enforcement

Overview

Policy can either be enforced at the ingress or egress of the fabric. Software release 1.2 introduced a new policy enforcement model whereby security rules for all flows are enforced on the leaf node to which internal hosts are connected, rather than at the border leaf.

When the direction is set to **Egress**, the contract rules for an L3Out are deployed on both the border-leaf and non–border-leaf switches. In this situation, when there are many EPGs that need to talk to the L3Out, the TCAM resources for contracts on border leaf switches could be a bottle neck. This is because a border leaf deploys all contracts, while contracts on non–border leaf switches are typically distributed to multiple leaf switches. However, when set to **Ingress**, the contract rules are deployed only on non-border leaf switches; hence, this resolves the concern about TCAM resources for contracts on border leaf switches.

More information about Policy Control Enforcement Direction can be found in the [Cisco ACI L3Out Guide](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/guide-c07-743150.html) and the [ACI Fabric Endpoint Learning White Paper](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-739989.html), both available on cisco.com.

Finding

Ingress policy enforcement is configured on all VRFs.

IP Aging

Overview

By default, ACI only ages MAC address endpoints. For endpoints with multiple IP addresses assigned to the same MAC address, the IP addresses will not age separately. IP aging will apply the endpoint timer to IP addresses as well.

IP Aging is described in detail in the [IP aging section](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-739989.html#_Toc529820940) of the ACI Endpoint Learning Whitepaper.

Finding

**IP Aging** is enabled as per best practice.

L3out Redundancy

Overview

It's generally recommended to configure L3outs across at least two border leaves. This allows for upgrades and other maintenance activities to occur without impacting the L3 topology.

[ACI L3out Configuration Guide](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/guide-c07-743150.html)

Finding

All L3outs are redundant.

L3out Overlapping Subnets

Overview

ACI allows the same subnet to be used on an L3out and on a BD or EPG. This can lead to ambiguous forwarding behavior.

Finding

No overlapping subnets were identified.

MisCabling Protocol (MCP) - Global Configuration

Overview

The mis-cabling protocol (MCP) was designed to handle misconfigurations not detected by Link Layer Discovery Protocol (LLDP) and Spanning Tree Protocol (STP). MCP sends out layer 2 hello packets. If these packets are received on another interface, the ports that form the loop will be disabled.

More details are [available on CCO](https://www.cisco.com/c/dam/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/aci-guide-using-mcp-mis-cabling-protocol.pdf).

Finding

MCP is enabled globally as per best practice.

Please note that this health check is not currently checking for exposure to [CSCvx37709](https://bst.cloudapps.cisco.com/bugsearch/bug/CSCvx37709). Although, MCP is *generally* recommended, a scale configuration may put this fabric at risk of hitting this issue.

NTP Redundancy

Overview

Network Time Protocol (NTP) provides consistent, reliable time on the fabric. This is critical for a number of critical features, e.g. logging, authentication, encryption, atomic counters, etc.

More details of NTP configuration can be found in [this NTP configuration guide](https://www.cisco.com/c/en/us/support/docs/cloud-systems-management/application-policy-infrastructure-controller-apic/200128-Configuring-NTP-in-ACI-Fabric-Solution.html).

Finding

NTP is configured as per best practice.

Leaf and Spine Out-of-band Management

Overview

It is recommended to enable out-of-band addresses on all leaf and spine switches in the ACI fabric. Having out-of-band access is useful in the event direct access to the switches is needed and the normal management path via the APIC is disrupted. This check passes if either a valid IPv4 or IPv6 address is found.

Steps to configure out-of-band management and additional information can be found in the Management chapter of the Cisco APIC Basic Configuration Guide found on the [APIC homepage](https://www.cisco.com/c/en/us/support/cloud-systems-management/application-policy-infrastructure-controller-apic/tsd-products-support-series-home.html).

Finding

All nodes were found to have out-of-band IP addresses configured.

Port Tracking

Overview

The Port Tracking feature addresses a scenario where a leaf node may lose connectivity to the spine node and where hosts connected to the affected leaf node in an active / standby manner may not be aware of the failure for a period of time.

Finding

Port Tracking is enabled as per best practice.

Rogue EP Control

Overview

Rogue EP Control is a loop and misbehaving endpoint mechanism. It protects the fabric from issues like frequent flaps, loops, etc. As compared to the default BD-level loop protection, Rogue EP Control counts MAC and IP moves separately and only impacts the specific, misbehaving endpoints.

Detection criteria can be configured by using the following values:

* Rogue EP Detection interval: to specify the time in seconds to detect rogue endpoints. The default is 60 seconds. The supported range is 30 to 3600 seconds.
* Rogue EP Detection Multiplication Factor: The endpoint is declared rogue if the endpoint moves more than this number within the Rogue EP Detection interval. The default is 4. The supported range is 2 to 10.
* Hold Interval: the amount of time the endpoint is being handled as rogue and kept as the static endpoint. After this interval, the endpoint is deleted. The default is 1800 seconds (30 minutes). The supported range depends on the release. With ACI releases prior to ACI 5.2(3) the configurable range is 1800 to 3600. Starting with ACI 5.2(3) you can configure a minimum hold interval of 300 seconds (5 minutes).

More information about Rouge Endpoint Control can be found in the [Rogue Endpoint Control](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-739989.html#RogueEPControl) guide available on cisco.com.

**Note** that enabling Rogue EP Control automatically disables the BD-level loop prevention mechanism.

Finding

Rogue EP Control is currently on. This is configured as recommended for this fabric.

Route Reflector Redundancy

Overview

Route reflectors are used internally within ACI for MP-BGP route redistribution. This provides the critical service of ensuring L3out-learned routes are distributed between leaves.

Finding

All route reflectors are redundant, as per best practice.

vzAny

Overview

vzAny is a managed object within ACI that represents all EPGs within a VRF. This object can be used to provide or consume contracts, reducing TCAM utilization from every EPG to a single vzAny relationship.

Finding

No opportunities were identified to adopt vzAny.

## Configuration Cleanup

AEP associated with domain with invalid pool

Overview

Domains, AEP, and VLANs are mandatory to deploy an EPG on a specific port. The domain profile contains both the VLAN instance profile (VLAN pool) and the attachable Access Entity Profile (AEP), which are associated directly with application EPGs. The AEP deploys the associated application EPGs to all the ports to which it is attached, and automates the task of assigning VLANs.

* This section checks for any domains associated with an AEP with an invalid pool.
* Please reference the section "Creating Domains, Attach Entity Profiles, and VLANs to Deploy an EPG on a Specific Port" in [Cisco APIC Basic Configuration Guide, Release 5.2(x)](https://www.cisco.com/c/en/us/td/docs/dcn/aci/apic/5x/basic-configuration/cisco-apic-basic-configuration-guide-52x/m_tenants.html) for detailed information about the requirements and procedure to deploy EPG related to AEPs, Domains, and VLANs.

Finding

All domains associated with an AEP have valid VLAN pools, as per best-practice.

Bridge Domain VRF Associations

Overview

BDs require an explicit VRF configuration. Without this, the BD configuration is not valid and will not forward traffic.

Finding

All BDs are associated to VRFs.

Missing VLAN Pool on L2/L3/Physical Domain

Overview

In most cases, it is recommended that External Bridged (L2), External Routed (L3), and Physical Domains should be associated to a VLAN pool. Without a VLAN pool, VLAN allocation may fail and likely result in fault F0467 triggering on any associated L2Outs, L3Outs, or EPGs.

In the case of L3 Domains, a VLAN pool does not need to be associated if the L3Out(s) using the L3 Domain are only using routed or subinterfaces. Any L3 Domains identified in this check which meet this criteria can be disregarded. Additional information on L3Out encap usage can be found in the [ACI Fabric L3Out Guide](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/guide-c07-743150.html).

Finding

All access domains are associated to a VLAN pool.

# References

## Online references

* [ACI Best Practices Quick Summary](https://www.cisco.com/c/en/us/td/docs/dcn/whitepapers/cisco-aci-best-practices-quick-summary.html)
* [ACI Configuration Guides](https://www.cisco.com/c/en/us/support/cloud-systems-management/application-policy-infrastructure-controller-apic/tsd-products-support-series-home.html)
* [Fabric Endpoint Learning Whitepaper](https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-739989.html)
* [Scalability guides](https://www.cisco.com/c/en/us/support/cloud-systems-management/application-policy-infrastructure-controller-apic/tsd-products-support-series-home.html)
* [Fault reference guide](https://www.cisco.com/c/en/us/td/docs/switches/datacenter/aci/apic/sw/all/syslog/guide/b_ACI_System_Messages_Guide.html)

## Loop Detection

Frequent endpoint moves can increase CPU utilization and fill up logs, making troubleshooting more difficult. Additionally, rapid endpoint moves can be a symptom of a bridging loop, which can have catastrophic impact. ACI provides several features to protect the network from bridging loops. The following sections describe the behavior of these mechanisms to help illustrate the difference in functionality.

BD Level Tracking (EP dampening, move frequency)

**What types of moves are detected and counted?**

* **MAC move:** "move count" will be 1 + # of IP Addresses linked to this MAC address in the bridge domain, e.g. if the EP has a MAC address and three IP addresses, move count will be 4 on the first MAC move.
* **IP only move:** move not counted
* Only local moves are counted. MAC moves across leaf switches are not counted.

**Timer and Threshold**

* **Detection Time:** 1 sec (fixed)
* **Move count threshold:** 256 by default
* **BD hold interval:** 300s by default

**What happens when move count exceeds threshold within Detection Time?**

* BD learning is disabled for that BD
* EPs in that BD are **not** flushed
* BD learning will be enabled again after BD hold interval.

EP Loop Protection

**What move is detected?**

* **MAC move:** move count (loop count) will be 1 (see details below)
* **IP only move:** move not counted
* Move is counted only when MAC address moves back to its previous port
* Both local moves and moves across leaf switches are counted

**Timer and Threshold**

* **Detection time:** 60s by default
* **Move count threshold:** 4 by default
* Disabled by default

**What happens when move count exceeds threshold within the detection time?**

* BD Learning is disabled for that BD

**-- and/or --**

* Last learned port is err-disabled (epm-learn-err-disable)
* BD Learning will be enabled again after BD hold interval from BD level tracking
* Port err-disable will be recovered if error disabled recovery policy is configured (not configured by default)
* Port err-disable will be recovered by manual shut/no shut.
* EP will be deleted soon from leaf since learned port is disabled
* If EP flap is so rapid that previous port can learn EP again before EP is deleted from err-disabled port, both ports could be err-disabled.
* Above both err-disable situation should be avoided if BD learning disable is enabled as well as port disable.

Rogue EP Control

**What move is detected?**

* **MAC move:** move count will be 1
* **IP only move:** move count will be 1
* MAC moves and IP only moves are counted separately
* Both local moves and moves across leaf switches are counted

**Timer and Threshold**

* **Detection Time:** 60s by default
* **Move count threshold:** 4 by default
* **Rogue EP hold timer:** 1800s by default
* Disabled by default

**What happens when move count exceeds threshold within Detection Time?**

* EP is marked as Rogue.
* Move notification for Rogue EP is ignored
* Rogue EP will be deleted after hold interval

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