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ACI Troubleshooting

VMware vDS VMM Integration

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cisco Live!
Barcelona | January 27-31, 2020

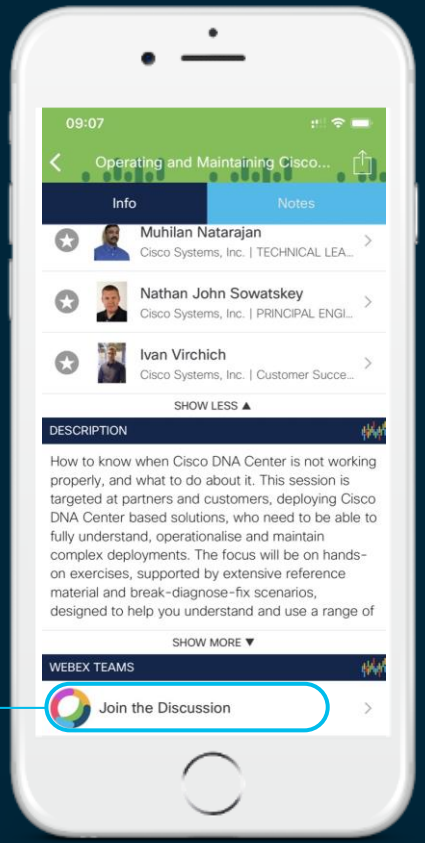
Cisco Webex Teams

Questions?

Use Cisco Webex Teams to chat with the speaker after the session

How

1. Find this session in the Cisco Events Mobile App
2. Click “Join the Discussion”
3. Install Webex Teams or go directly to the team space
4. Enter messages/questions in the team space



Agenda

- Introduction
- APIC to vCenter Connectivity
- Host Discovery
- Policy Download and Verification

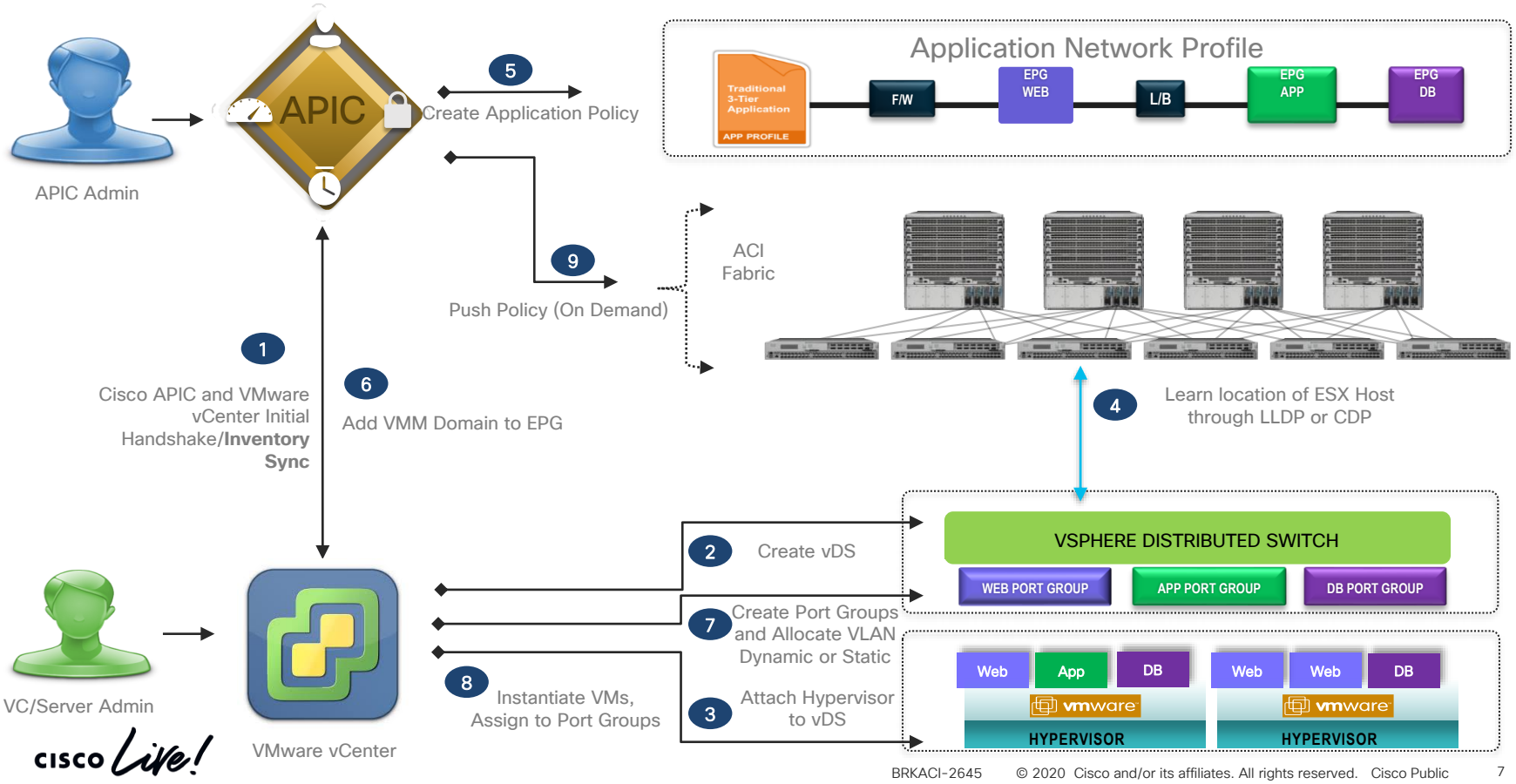
Acronyms/Definitions

Reference Slide Icon ➔ 

Acronyms	Definitions	Acronyms	Definitions
ACI	Application Centric Infrastructure	fvIfConn	MO Object for VLAN Mapping to EPG and Port
AEP	Attachable Entity Profile	fvRsStPathAtt	MO Object for Static EPG Policy to Port
API	Application Programming Interface	LLDP	Link Layer Discovery Protocol
APIC	Application Policy Infrastructure Controller	UCS	Unified Computing System
CDP	Cisco Discovery Protocol	UFN	Unmanaged Fabric Node
DNS	Domain Name System	VC	Virtual Center
vDS	vSphere Distributed Switch	VM	Virtual Machine
EPG	Endpoint Group	VMM	Virtual Machine Manager
fabricLooseNode	MO Object for Blade Switch	VMNIC	Physical NIC on Host
FI	Fabric Interconnect (Blade Switch for UCS B Series Servers)	VNIC	Virtual NIC (for VM)
fvAttEntityPathAtt	MO Object for EPG Deployment to AEP		
fvDyPathAtt	MO Object for Dynamic EPG Policy to Port		

Introduction

Cisco ACI Hypervisor Integration



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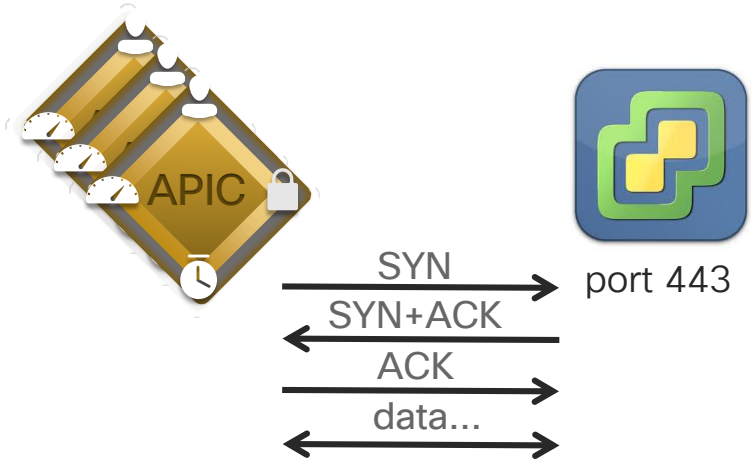
APIC to vCenter Connectivity

APIC to vCenter Connection

Network Connection



Important Notes:

- APIC Initiates Handshake and Login with VC on Port 443 via OOB or In-Band depending on preference.
- APIC connects to VC using a user account to pull the inventory, receive events, and push config
- Only 1 APIC Active Per VMM Domain
- Connection is handed to new APIC in case previous owner goes unavailable.

What If the connection is broken?

- vDS and/or Port Groups Will not be pushed
- Inventory Sync will Fail
- Events from VC will be missed on APIC

APIC to vCenter Connection

Troubleshooting - Faults

Virtual Networking > VMM Domains > VMWare > Policy > Faults

Affected Object: comp/prov-VMware/ctrlr-[CiscoLive]-VC

Description: Fault delegate: Connection to VMM controller: 172.18.118.140 with name VC in datacenter jristain in domain: CiscoLive is failing repeatedly with error: []. Please verify network connectivity of VMM controller 172.18.118.140 and check VMM controller user credentials are valid.

Type: Communications

Hmmm, are my permissions correct?

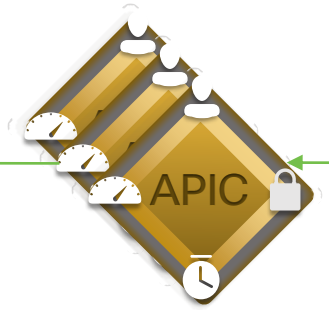
Severity: major
Last Transition: 2019-02-19T17:28:33.205-05:00
Lifecycle: Soaking
Affected Object: comp/prov-VMware/ctrlr-[CiscoLive]-VC
Description: Fault delegate: Connection to VMM controller: 172.18.118.140 with name VC in datacenter jristain in domain: CiscoLive is failing repeatedly with error: []. Please verify network connectivity of VMM controller 172.18.118.140 and check VMM controller user credentials are valid.
Type: Communications
Cause: connect-failed
Change Set: operSt (Old: online, New: offline), remoteOperIssues (Old: partial-inv, New:), usr (Old: aciadmin@vsphere.local, New: acibroken@vsphere.local)
Created: 2019-02-19T17:28:33.205-05:00
Code: F0130
Number of Occurrences: 1
Original Severity:
Previous Severity:
Highest Severity: major

F0130

APIC to vCenter Connection

User Credentials

- Alarms
- Distributed switch
- dvPort group
- Folder
- Network
- Host
  - Configuration
    - Advanced settings
    - Network configuration
  - Local operations
    - Reconfigure virtual machine
- Virtual machine
  - Configuration
    - Modify device settings
    - Settings



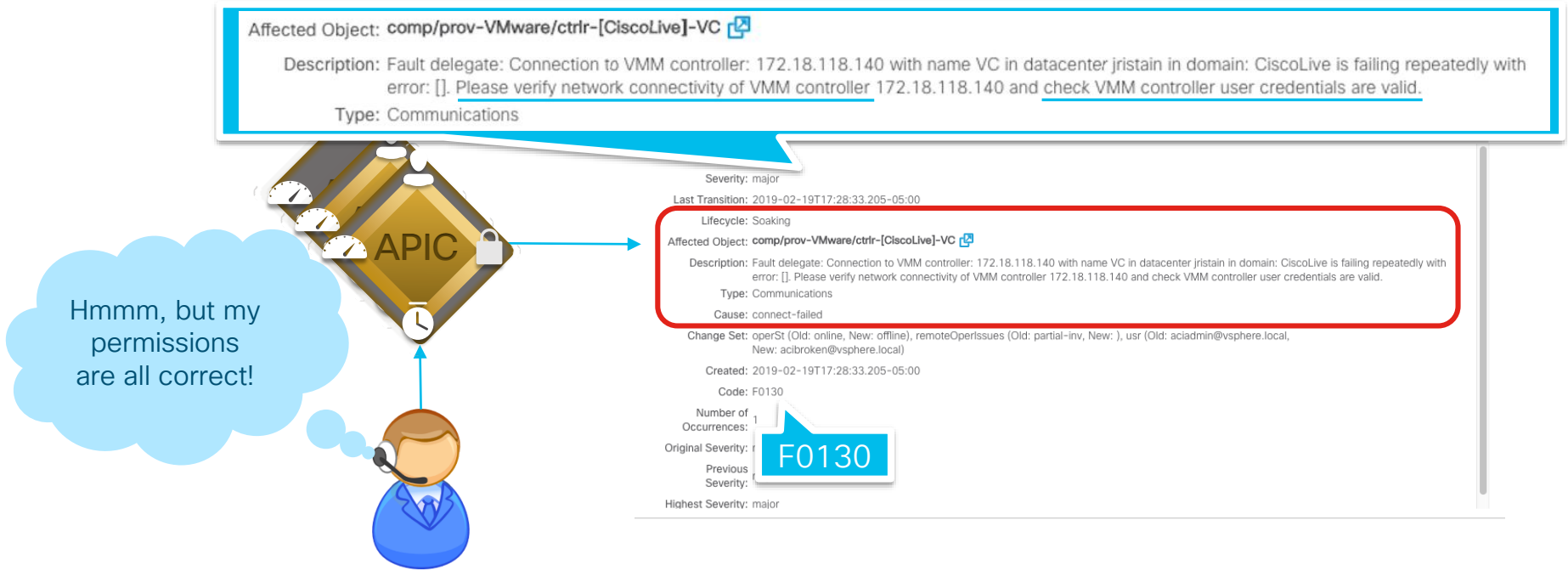
APIC needs access to the VMware API for the following:

- Inventory Sync
- vDS/Port Group Creation
- Event Subscriptions

APIC to vCenter Connection

Troubleshooting - Faults

Virtual Networking > VMM Domains > VMWare > Policy > Faults



APIC to vCenter Connection

Troubleshooting – Find Shard Leader

1 Find Shard Leader
NXOS CLI on Any APIC

3.1(2)+

```
apic1# show vmware domain name CiscoLive
. . .
Domain Name          : CiscoLive
Virtual Switch Mode : VMware Distributed Switch
. . .
vCenters:
Faults:(Critical, Major, Minor, Warning)
 vCenter          Status    ESXs    VMs    Faults
 --------------   -------   -----   ----   -------
 172.18.118.140   online    3       11     0,0,0,0
. . .
APIC Owner:
 Controller     APIC       Ownership
 ------------   --------   ---------------
 VC             apic1      Leader
 VC             apic2      NonLeader
 VC             apic3      NonLeader
. . .
```

OR

1 Find Shard Leader
Check MO file for each APIC

Any Version

```
apic1# bash
admin@apic1:> cat /debug/apic1/vmmmgr/comp/prov-VMware/
ctrlr-[CiscoLive]-VC/info/mo
CtrlrDn                 : comp/prov-VMware/ctrlr-[Ciscolive]-VC
CurrentRole             : Leader
OperState               : 0
MainConnectionStatus    : Connected
EventConnectionStatus   : Connected
DropEventStatus         : False
TaskMapLoggingStatus    : False
SharedEventLog          : False
MaxWorkerQueueSize      : 300
CurrentWorkerQueueSize  : 0
RcvdEventCount          : 4
EventCollectorId        : 0
                        : No more pending events
EventCollectorId        : 1
                        : No more pending events
UnprocessedEventCount   : 0
PendingTasksCount       : 0
```

APIC to vCenter Connection

Shard Leader Verification

2 Check DNS

```
apic1# nslookup ciscolive-vcenter
Server:       10.11.12.13
Address:      10.11.12.13#53

Name:  ciscolive-vcenter.cisco.com
Address: 172.18.118.140
```

3 Check Route Table

```
apic1# bash
admin@apic1:~> route
Kernel IP routing table
Destination  Gateway      Genmask         Flags Metric Ref  Use Iface
default      192.168.4.1  0.0.0.0         UG    16     0      0 oobmgmt
10.0.0.0     10.0.0.30    255.255.0.0     UG    0      0      0 bond0.3091
10.0.0.30    0.0.0.0      255.255.255.255 UH    0      0      0 bond0.3091
```

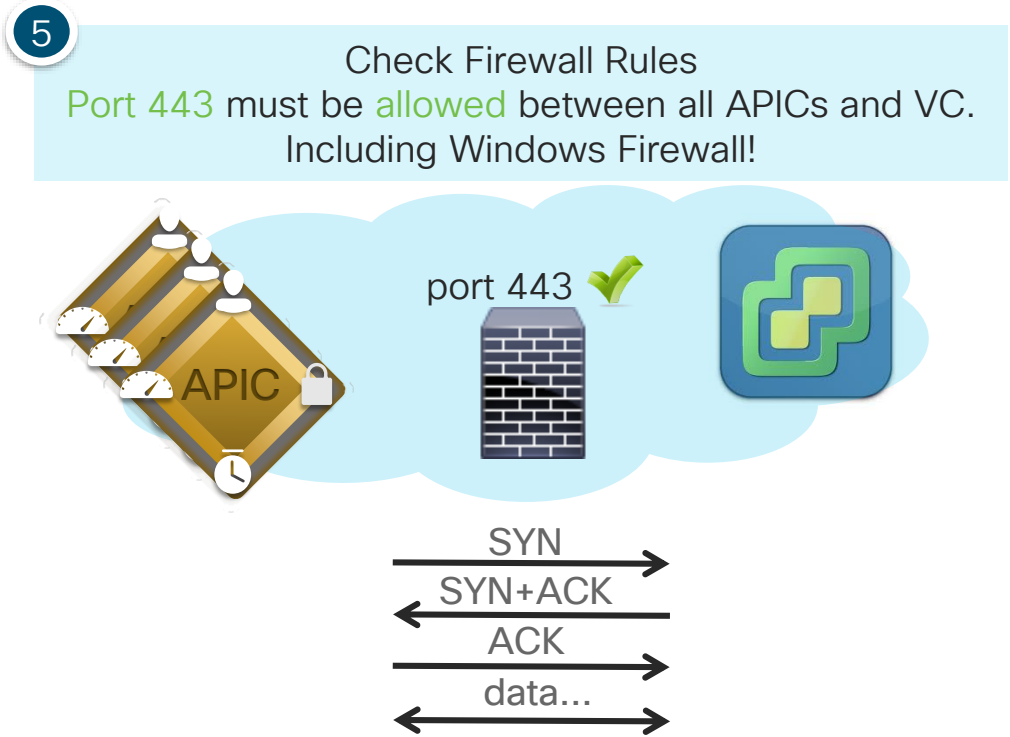
4 Verify IP Connectivity

```
apic1# ping 172.18.118.140
PING 172.18.118.140 (172.18.118.140) 56(84) bytes of data.
64 bytes from 172.18.118.140: icmp_seq=1 ttl=61 time=0.512 ms
64 bytes from 172.18.118.140: icmp_seq=2 ttl=61 time=0.660 ms
64 bytes from 172.18.118.140: icmp_seq=3 ttl=61 time=0.624 ms

--- 172.18.118.140 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
rtt min/avg/max/mdev = 0.512/0.598/0.660/0.069 ms
```

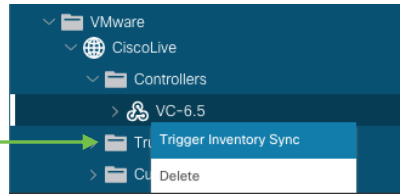
APIC to vCenter Connection

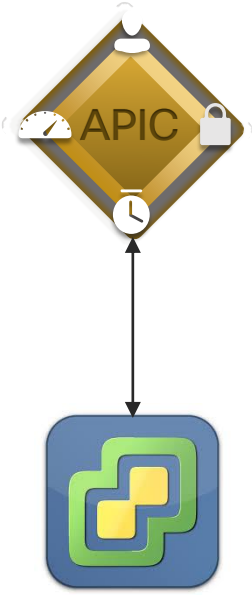
Troubleshooting - Connectivity



APIC Inventory Synchronization

- APIC Synchronizes with VC every 24 hours.
  - Can also be triggered manually
    Virtual Networking > VMM Domains > VMWare > Domain > Controller



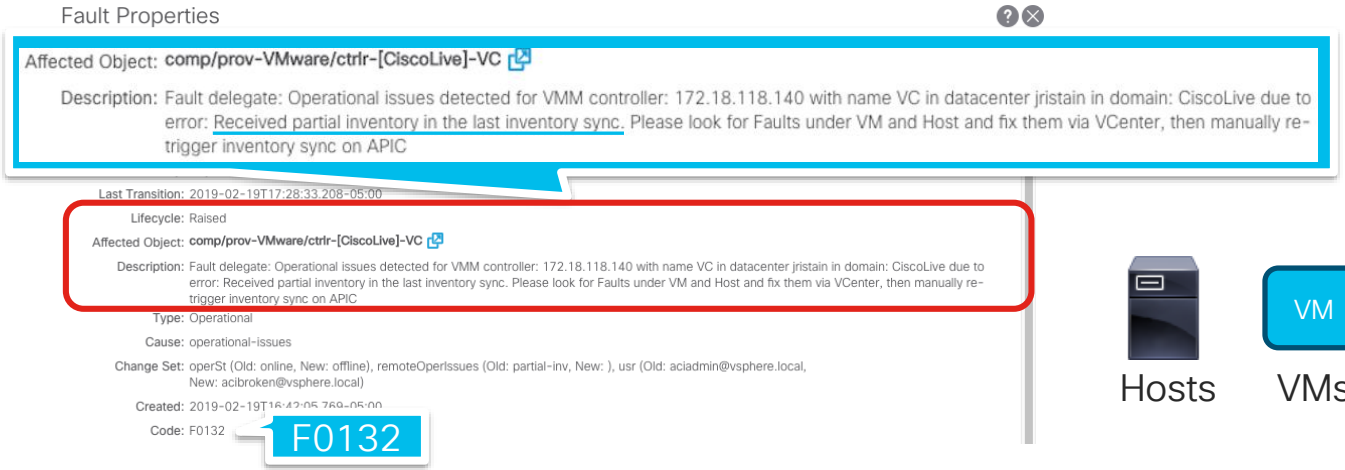


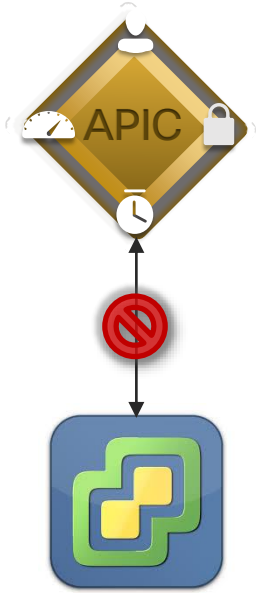
- Purpose is to ensure we have full knowledge of VC state for correct programming
- **Hosts and VM's** determine where policy can be pushed
- **Port Groups and Network Settings** are checked for consistency between APIC and VC
- **Attribute Tags** and **Folders** can be used as a MicroSegmentation Match Parameter

APIC Inventory Synchronization

What If It Fails???

- New Config may be missing in vCenter
- Dynamic Policy Download to Leafs may stop working!
- Fault is Raised





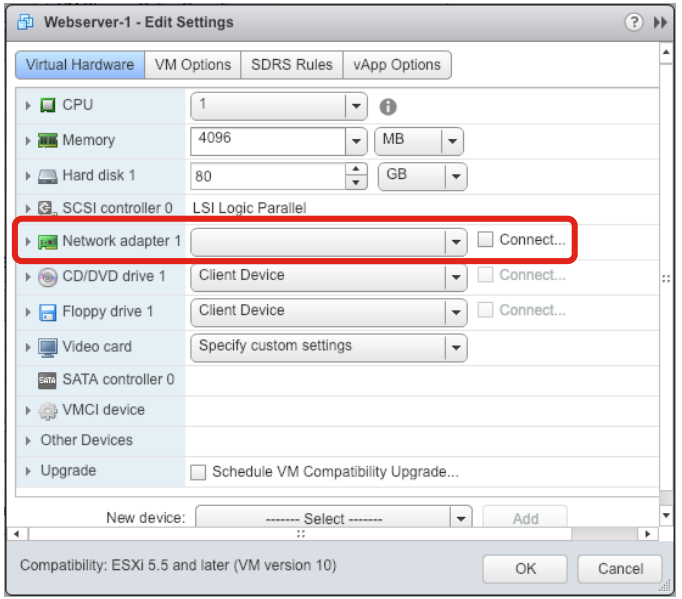
APIC Inventory Synchronization

Common Failure Scenarios

VMs with Invalid Backings

Problem:

- If a VM is moved from one VC to another, and the old port group is not present on the new VC, the VM will have an **“Invalid Backing”**
- This causes **Inventory Sync to Fail** because the network information cannot be retrieved!



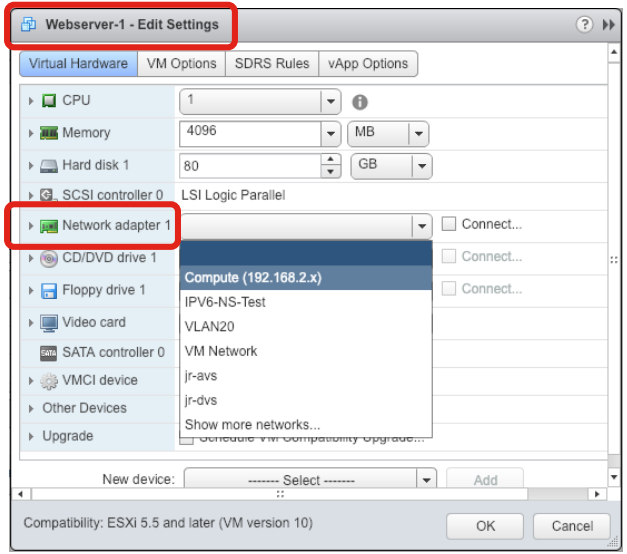
APIC Inventory Synchronization

Common Failure Scenarios

VMs with Invalid Backings

Fix – Prior to 3.2(4) Release

1. Tail VMM Log on Shard Leader
2. Manually Trigger Inventory Sync
3. Find VM(s) and assign valid network




```
apic1# bash
admin@apic1:~> cd /var/log/dme/log
admin@apic1:log> tail -f svc_ifc_vmmmgr.bin.log | egrep -i "Inventory pull|failed to update"
6348||19-02-19 16:39:55.782-05:00||ifc_vmmmgr||WARN||||CiscoLive: VC: 0x563e3b4e4a10: Failed to update VnicCfg Webserver-1:Network adapter 1
6348||19-02-19 16:39:55.899-05:00||ifc_vmmmgr||INFO||||CiscoLive: VC: 0x563e3b4e4a10: getHvHealthProvider | starting inventory pull...
6348||19-02-19 16:39:55.904-05:00||ifc_vmmmgr||DBG4||fn=[startInventoryPull]||CiscoLive: VC: 0x563e3b4e4a10: Inventory pull is Partial.
```

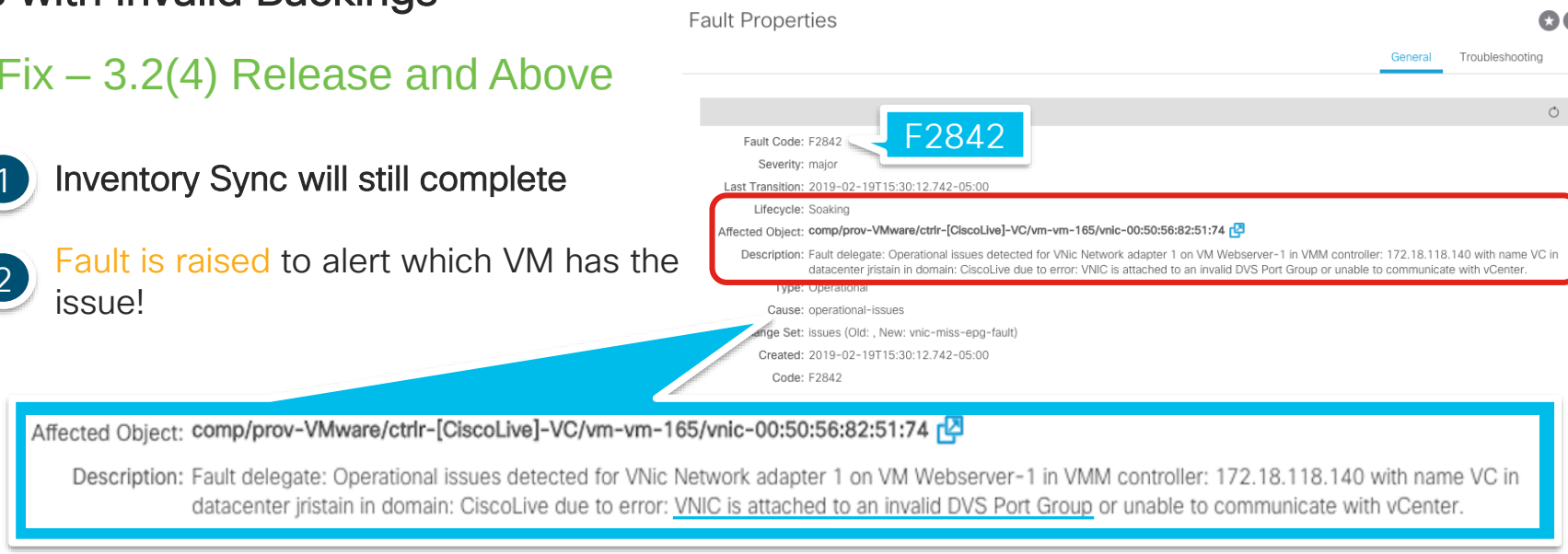
APIC Inventory Synchronization

Common Failure Scenarios

VMs with Invalid Backings

Fix – 3.2(4) Release and Above

1. Inventory Sync will still complete
2. Fault is raised to alert which VM has the issue!



APIC Inventory Synchronization

Common Failure Scenarios

Unable to Retrieve Tag or Folder Inventory

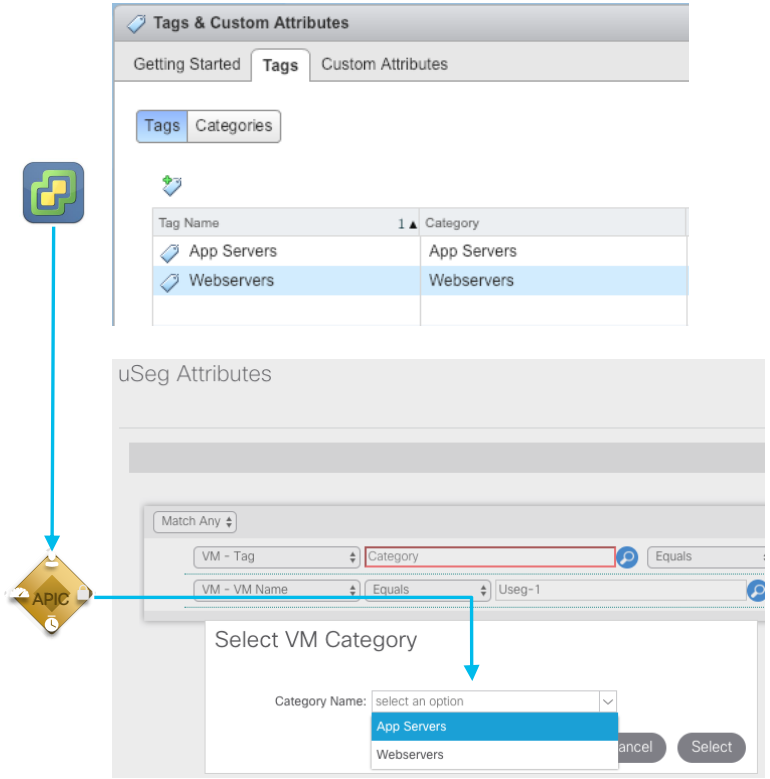
Problem:

- Starting in VC 6.0, VMware introduced attribute tags. Starting in Version 2.3, APIC can use Tags as a match parameter for USEG.
  Starting in Version 3.2, APIC can use Folders as a match parameter for USEG.

- Inventory can fail if **there is a large number of tags or folders.**

Supported Numbers:

VC Version	# of Tags
6.0	500
6.5	1000



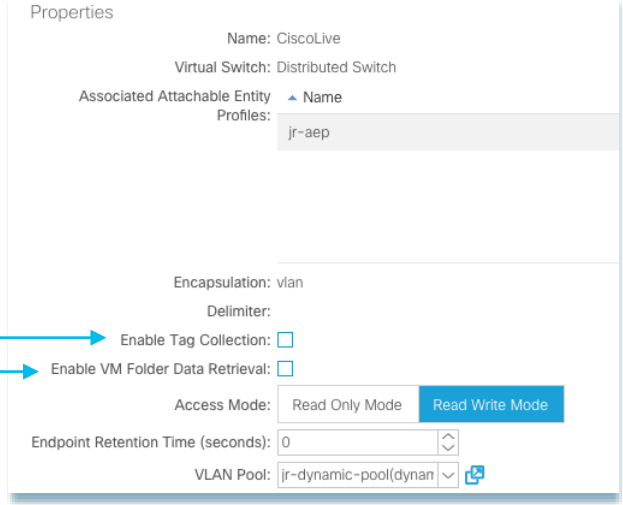
APIC Inventory Synchronization

Common Failure Scenarios

Unable to Retrieve Tag or Folder Inventory

Fix – 3.2(7)+

1. Tagging can be **toggled on VMM Domain**
2. Folder Collection can be **toggled on VMM Domain**
3. Folder Collection **Optimizations available in 4.2**



Virtual Networking > VMM Domains > VMWare > Policy

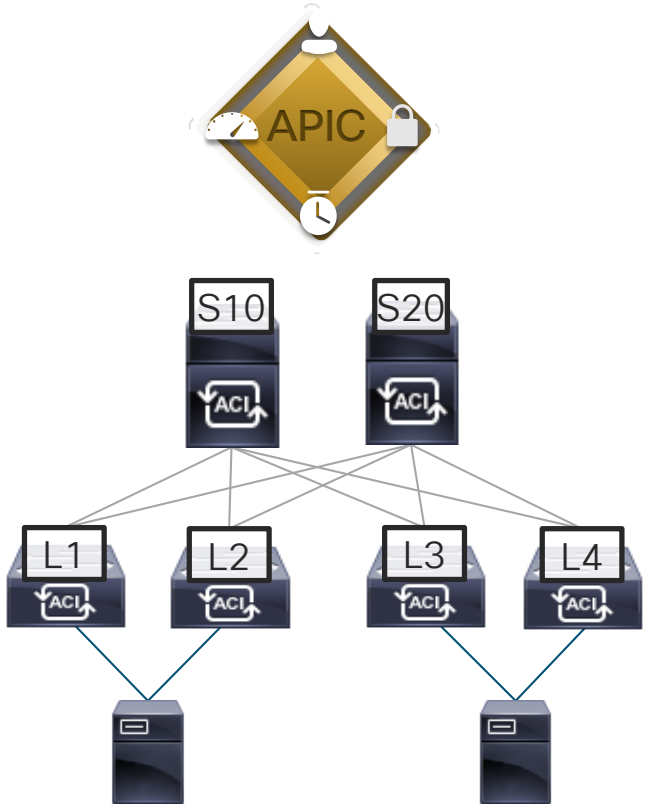
```
admin@apic1:~> moquery -c compCtrlr -f "comp.Ctrlr.domName==\"CiscoLive\"" | egrep “Tag|Folder”
enableTag             : no
enableVmFolder        : no
vsphereTag            : yes
```

Host Discovery

Host Discovery

Why is it needed?

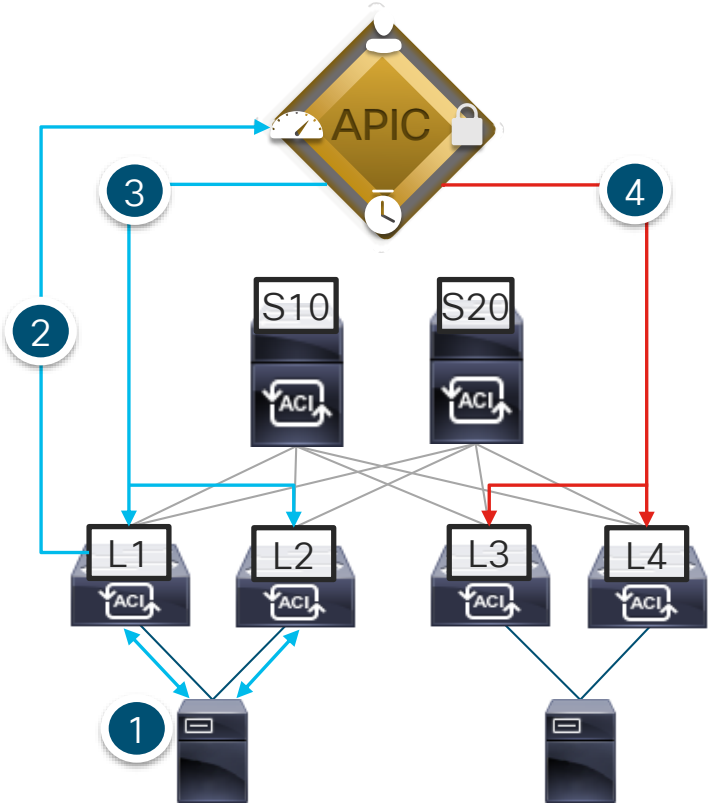
- APIC Will learn the location of the hosts via LLDP or CDP Adjacency
- This information is used to **push policy dynamically** to the leafs as resources attach
- **Saves TCAM and VLAN port count** when resources are not needed.
- If Adjacency is missing, Dynamic Policy will not be pushed



Host Discovery

How Do We Think it Works?

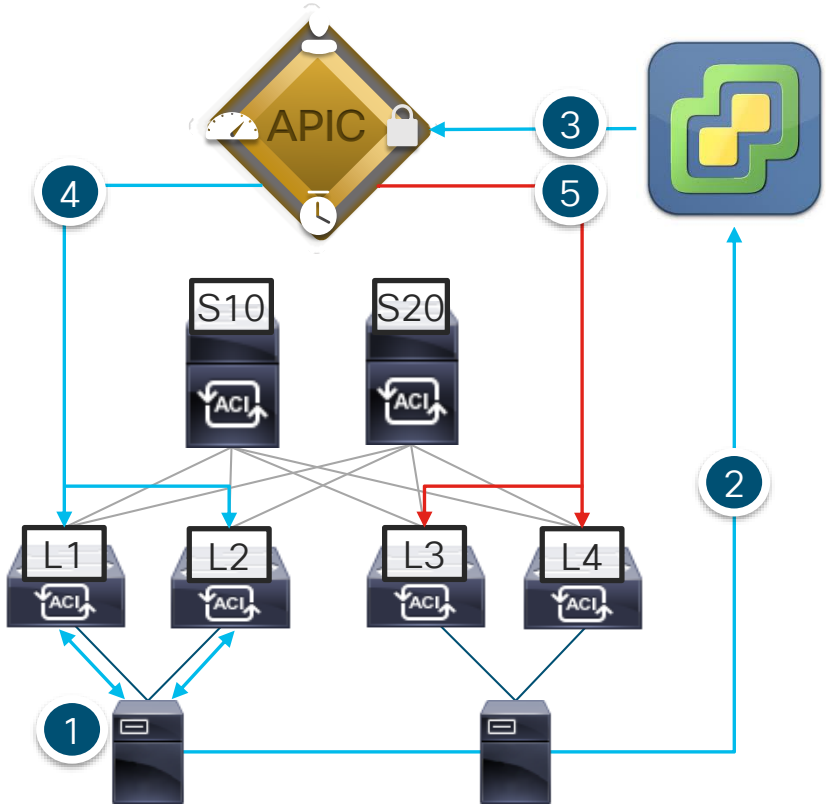
1. LLDP or CDP is exchanged between Hosts and Leaf switches?
2. Leafs tell APIC the ports in which hosts are connected as long as traffic is received?
3. APIC pushes Policy to Leaf/Port?
4. If LLDP or CDP stops, APIC can remove policy?



Host Discovery

How it Actually Works!

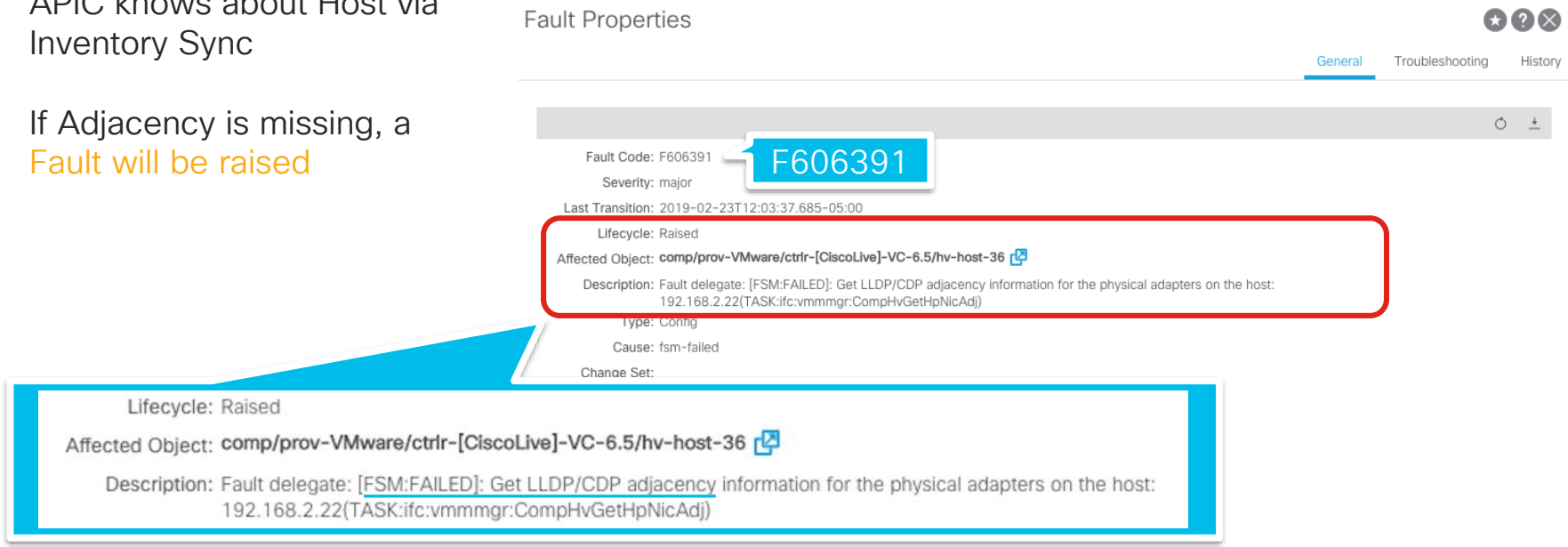
1. LLDP or CDP is exchanged between Hosts and Leaf switches
2. Hosts Report Adjacency Info to VC
3. vCenter Notifies APIC of Adjacency Info
4. APIC pushed Policy to Leaf/Port
5. If vCenter Adjacency info is lost, APIC can remove policy



Host Discovery
Troubleshooting – Faults

Virtual Networking > VMM Domains > VMWare > Policy > Faults

- APIC knows about Host via Inventory Sync
- If Adjacency is missing, a Fault will be raised

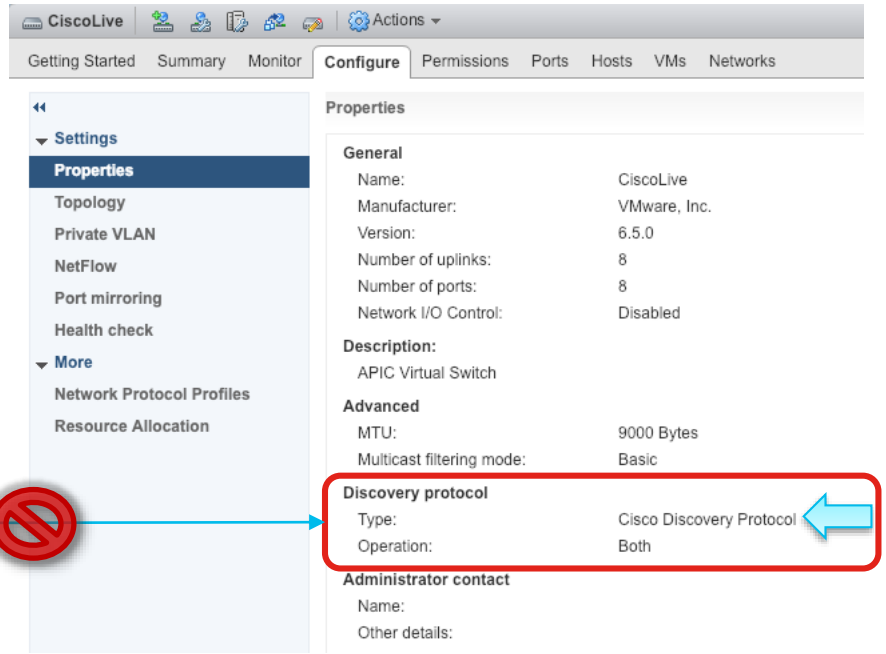


Host Discovery
Troubleshooting – VC Config

Discovery Protocol Mismatch

- vCenter Can only operate in one discovery mode: LLDP *or* CDP
- vCenter Setting **Needs to Match** what is being sent by Leaf

Networking > vDS > Configure

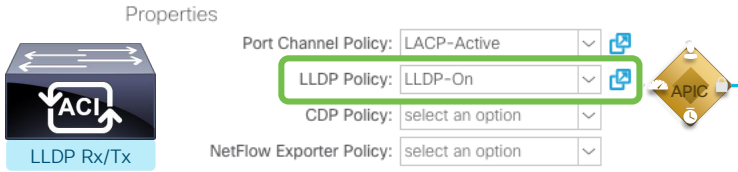


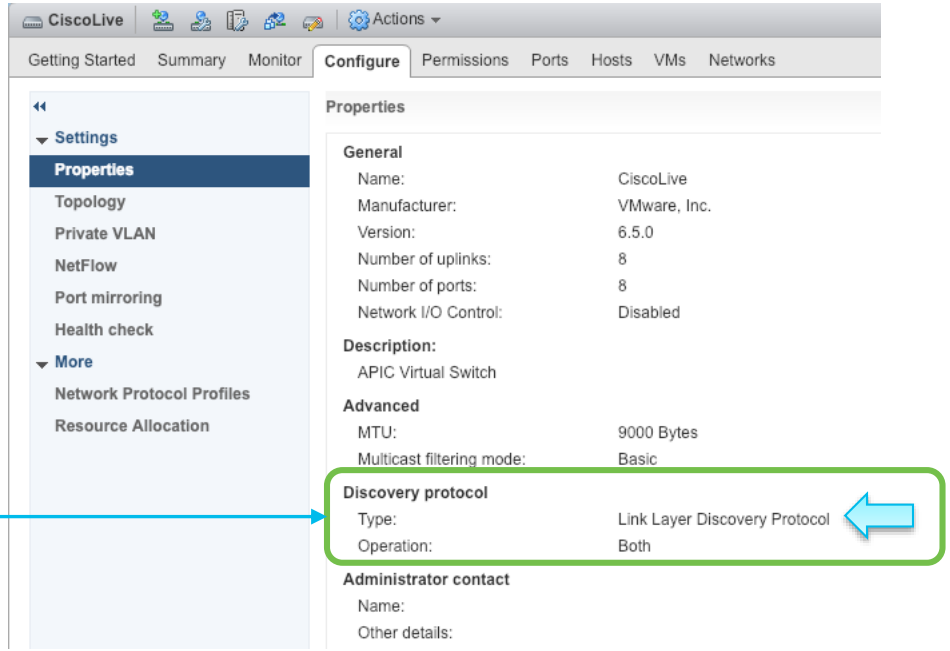
Host Discovery
Troubleshooting – VC Config

Networking > vDS > Configure

Fix Discovery Protocol Mismatch!

- APIC can push vDS Global config to VC to **ensure consistency**
- This includes Discovery Protocol, Port-Channel Config, Netflow, etc
- Done via "Vswitch Policy"
  LLDP Takes Precedence over CDP





Virtual Networking > VMM Domains > VMWare > Policy > Vswitch Policy

Host Discovery

General Troubleshooting

1 Check ACI Access Policies

Fabric > Access Policies > Interface Policies

Associate Policy to Interface Policy Group

Properties

Name: LLDP-On

Description: optional

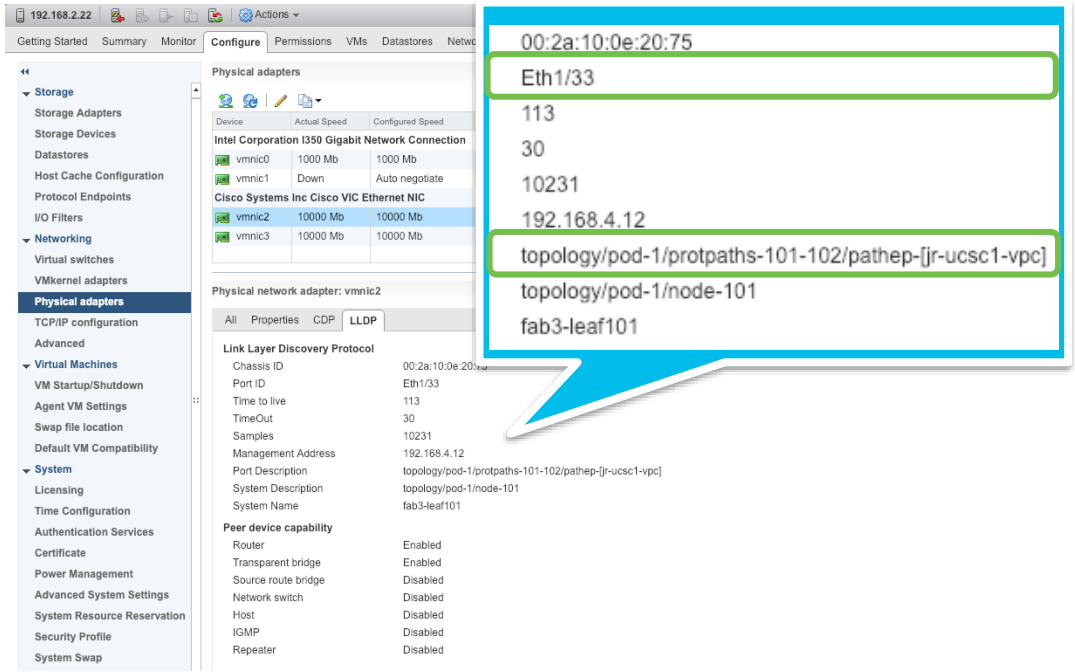
Alias:

Receive State: Disabled Enabled

Transmit State: Disabled Enabled

2 Check Host Adjacency Info

Host > Configure > Physical Adapters



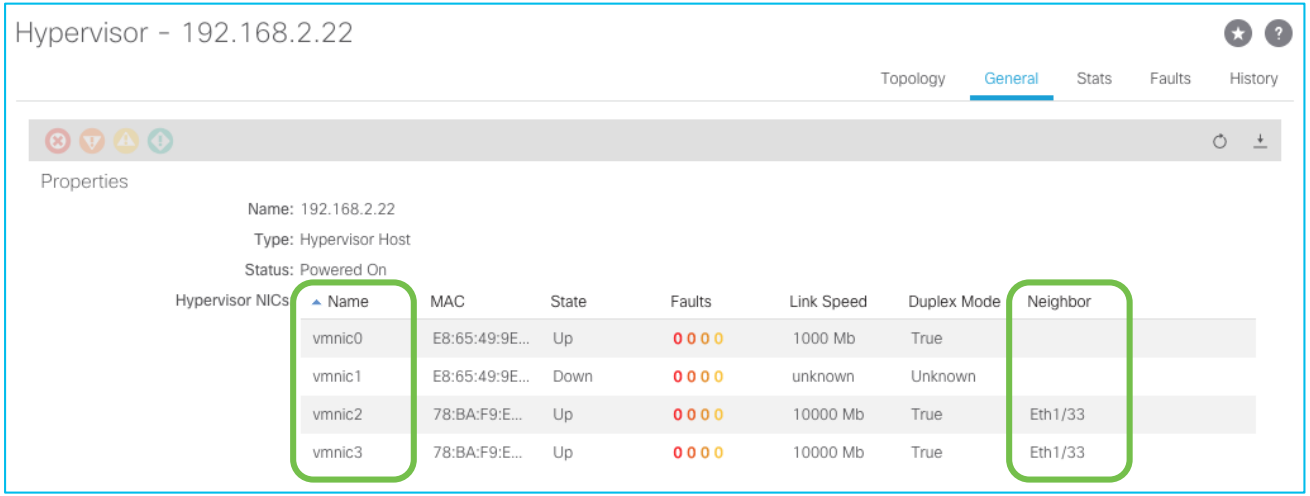
Host Discovery

General Troubleshooting

3

Verify Adjacency in APIC

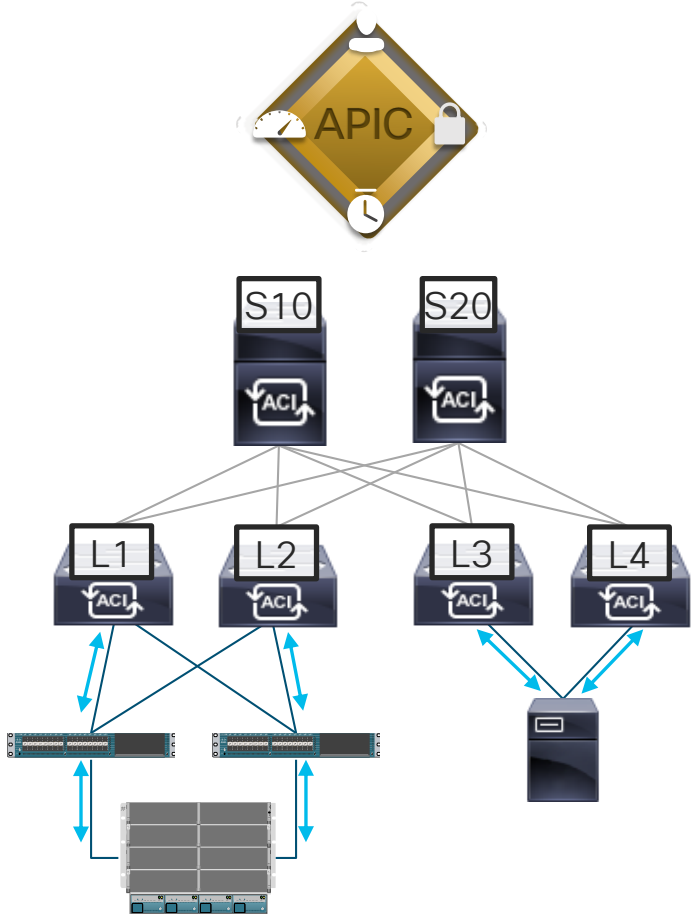
Virtual Networking > VMM Domains > VMWare > Policy > Controller > Hypervisor > General



Host Discovery

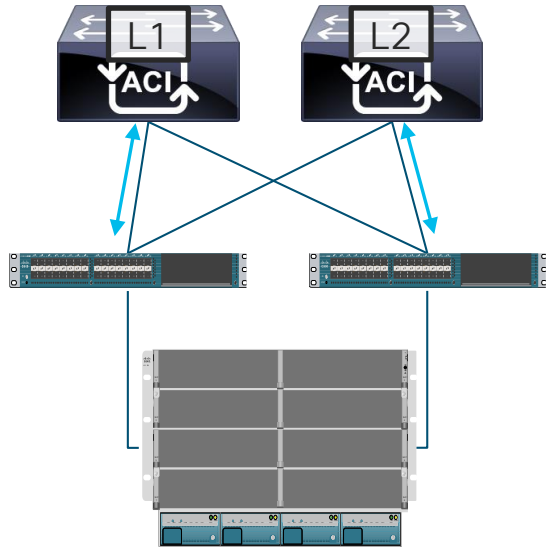
What About Blade Switches?

- Blade Switches may be an LLDP or CDP **termination point**
- Leaf switches may see LLDP or CDP from Blade Switch and not actual host
- APIC will get Host LLDP or CDP Info from VC but it will show **Blade Switch Adjacency**
- APIC needs a way to **“stitch”** the connection between **Blade Switch** and **End Host** so it can deploy Config to Blade Switch Ports



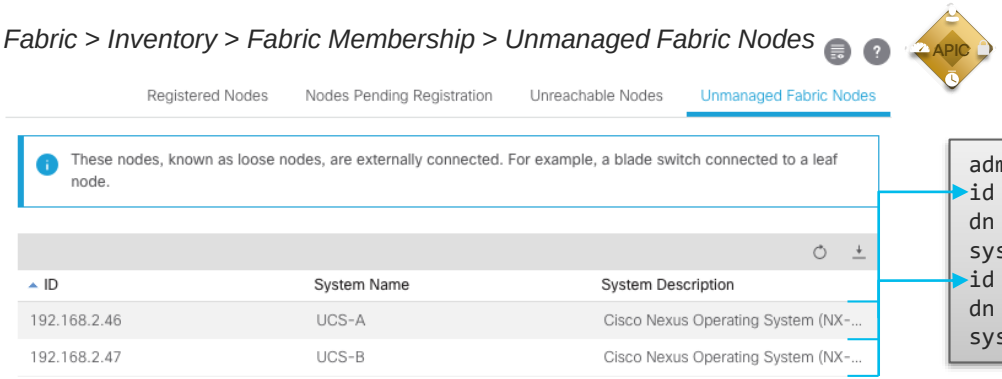
Host Discovery

Blade Switch = Unmanaged Fabric Node



- **Unmanaged Fabric Nodes(UFN)** are Discovered and Created Dynamically via LLDP or CDP
- Classname is called **“fabricLooseNode”**
- If UFN is not seen in APIC, Dynamic Policy cannot be pushed!

Fabric > Inventory > Fabric Membership > Unmanaged Fabric Nodes




```
admin@apic1:~> moquery -c fabricLooseNode | egrep "id|dn|sysName"
id            : 192.168.2.46
dn            : topology/lsnode-192.168.2.46
sysName       : UCS-A
id            : 192.168.2.47
dn            : topology/lsnode-192.168.2.47
sysName       : UCS-B
```

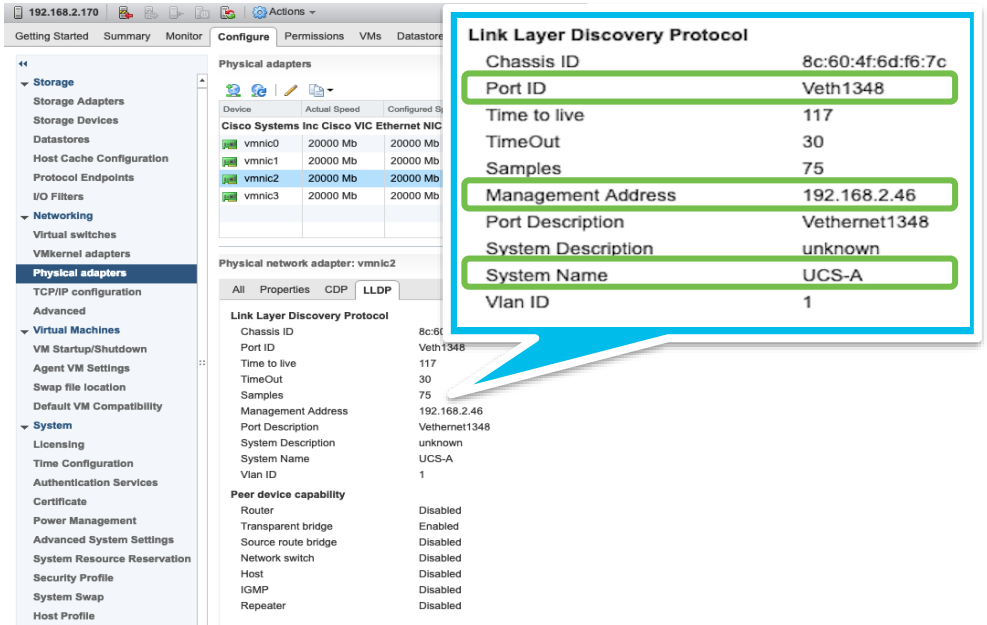
Host Discovery

Blade Switch Troubleshooting

Fabric > Inventory > Fabric Membership > Unmanaged Fabric Nodes

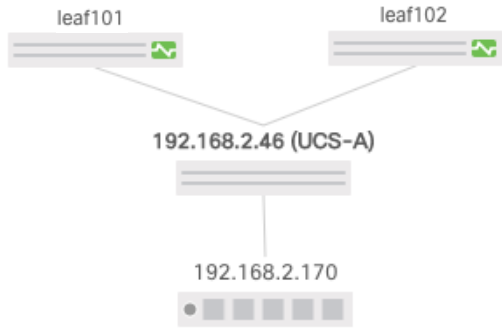
1 Check Host Adjacency Info

Host > Configure > Physical Adapters



2 Double Click Unmanaged Fabric Node

Ensure Topology is Built to Host!



Host Discovery

Blade Switch Common Issues

1

CDP/LLDP Not Enabled

CDP/LLDP Must be sent from Blade Switch to Leafs and Downlink Hosts

For UCS, this is done via network Control Policy on vNIC

2

Changing MGMT IP Breaks Connectivity

VC will see new MGMT IP in Adjacency, but will not update APIC

Trigger Manual Inventory Sync to Fix

3

VMM VLANS Not Added to Blade Switch

APIC Cannot Program Third Party Blade Switch.

UCSM Integration available in 4.1(1) release.

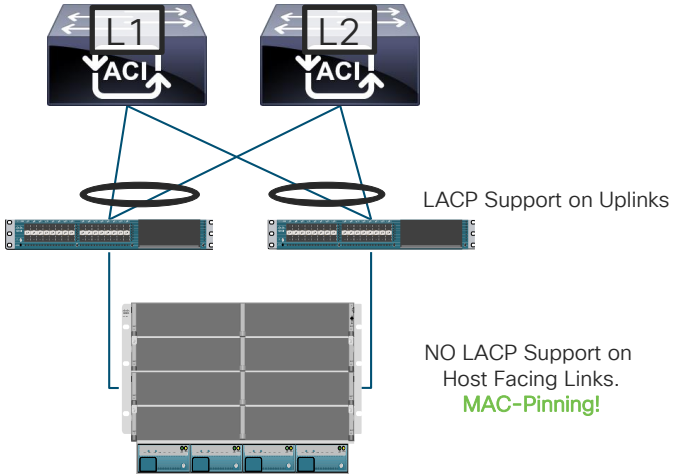
VLANs must be configured and trunked to uplinks/hosts

4

Intermittent Traffic Loss

Traffic loss seen with IP Hash Load Balancing

UCSB FI's cannot run LACP and form a vPC down to the blades. Route based on originating virtual port/Physical NIC load must be used (MAC-Pinning ACI vSwitch Policy).



Host Discovery

Troubleshooting – LLDP/CDP Traffic on Leaf

1 Check LLDP on Interface


```
leaf101# show lldp interface ethernet 1/33
Interface Information:
Enable (tx/rx/dcbx): Y/Y/N  Port Mac address: 00:2a:10:0e:20:75
```

2 Check Counters on Interface

```
leaf101# show lldp traffic interface ethernet 1/33
LLDP interface traffic statistics:

    Total frames transmitted: 2887
    Total entries aged: 0
    Total frames received: 2887
    Total frames received in error: 0
    Total frames discarded: 0
    Total unrecognized TLVs: 0
```

1 Check CDP on Interface


```
leaf101# show cdp interface ethernet 1/33
Ethernet1/33 is
    CDP enabled on interface
    Refresh time is 60 seconds
    Hold time is 180 seconds
```

2 Check Counters on Interface

```
leaf101# show cdp traffic interface ethernet 1/33
----------------------------------------
Traffic statistics for Ethernet1/33
Input Statistics:
    Total Packets: 100
    ...
Output Statistics:
    Total Packets: 100
    ...
```

Host Discovery

Troubleshooting – LLDP/CDP Traffic on Host

1 Check LLDP Receive on Interface


```
[root@esx1:~] pktcap-uw --uplink vmnic2 --ethtype 0x88cc
16:02:08.816915[1] Captured at EtherswitchDispath point, TSO not
enabled, Checksum not offloaded and not verified, length 352.
       Segment[0] ---- 9018 bytes:
       0x0000:  0180 c200 000e 002a 100e 2075 88cc 0207
       0x0010:  0400 2a10 0e20 7504 0807 4574 6831 2f33
       ...
```

2 Check LLDP Transmit on Interface

```
[root@esx1:~] pktcap-uw --uplink vmnic2 --ethtype 0x88cc --dir 1
16:02:08.816915[1] Captured at EtherswitchDispath point, TSO not
enabled, Checksum not offloaded and not verified, length 352.
       Segment[0] ---- 140 bytes:
       0x0000:  0180 c200 000e 0050 5657 a0c3 88cc 0207
       0x0010:  0676 6d6e 6963 3204 0703 0050 5657 a0c3
       ...
```

1 Check CDP Receive on Interface


```
[root@esx1:~] pktcap-uw --uplink vmnic2 --ethtype 0x2000
16:02:08.816915[1] Captured at EtherswitchDispath point, TSO not
enabled, Checksum not offloaded and not verified, length 352.
       Segment[0] ---- 9018 bytes:
       0x0000:  0100 0ccc cccc 002a 100e 2075 0123 aaaa
       0x0010:  0300 000c 2000 02b4 a86d 0001 001d 6661
       ...
```

2 Check CDP Transmit on Interface

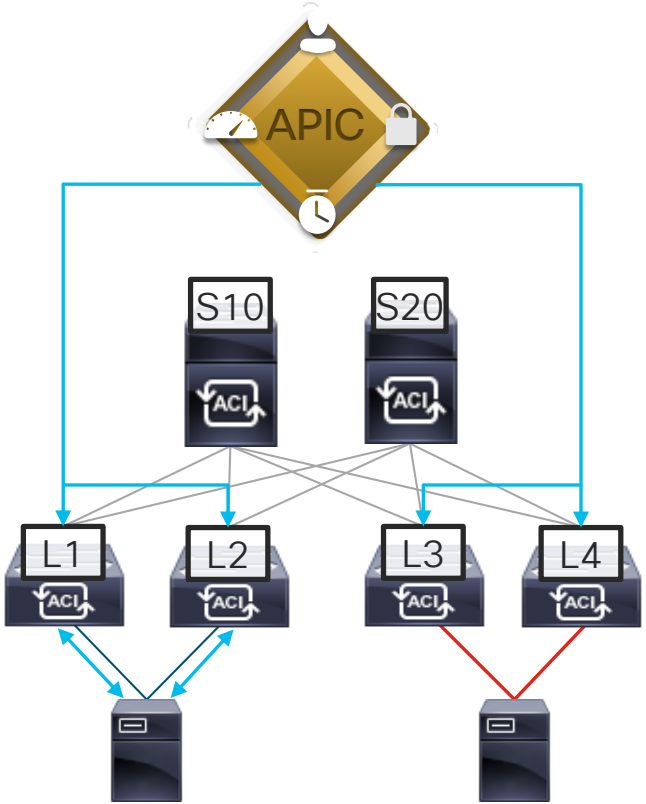
```
[root@esx1:~] pktcap-uw --uplink vmnic2 --ethtype 0x2000 --dir 1
16:02:08.816915[1] Captured at EtherswitchDispath point, TSO not
enabled, Checksum not offloaded and not verified, length 352.
       Segment[0] ---- 169 bytes:
       0x0000:  0100 0ccc cccc 0050 5657 a0c3 009b aaaa
       0x0010:  0300 000c 2000 02b4 3047 0001 0015 6a72
       ...
```

Policy Download and Verification

Policy Download and Verification

When is Policy Pushed?

- APIC Provides Flexibility in deciding where/when to push/pull VLANs and Contracts to the Leafs
- Behavior is defined when the VMM Domain is mapped to the EPG via the **Resolution and Deployment Immediacy**
- Behavior is per EPG and not Global to VMM Domain



Policy Download and Verification

When is Policy Pushed?

Resolution Immediacy

- Determines when Contracts/VLANs should be Downloaded to the Leafs

On-Demand

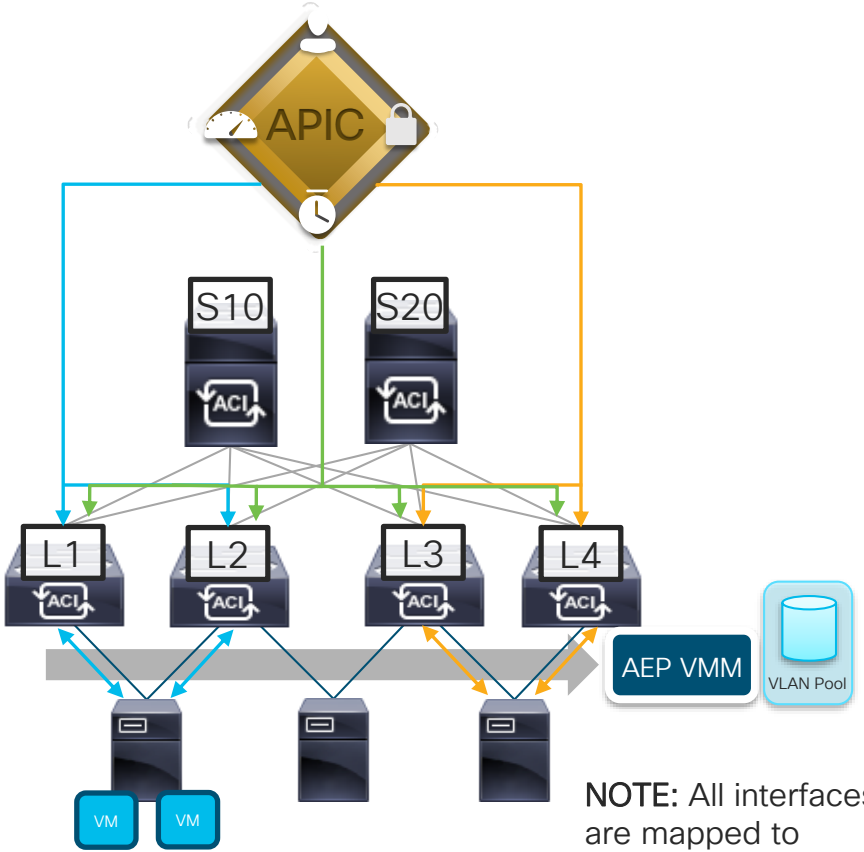
- Policy is pushed when a **VM is added to the Port-Group**, and the VM is on a **host with a valid LLDP/CDP Adjacency**

Immediate

- Policy is pushed when LLDP/CDP adjacency is detected from Host

Pre-Provision

- Policy is pushed to all ports/leafs tied to the AEP independent of Adjacency



NOTE: All interfaces are mapped to **correct AEP!**

Policy Download and Verification

When is Policy Pushed?

Deployment Immediacy

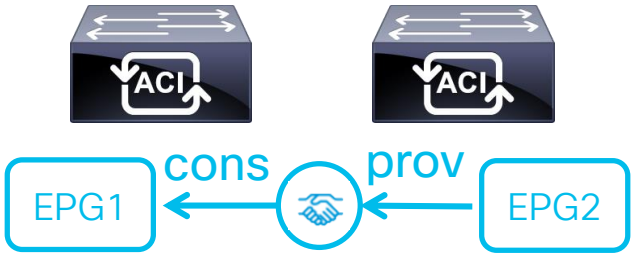
- Determines when Contracts Are Installed in Leaf TCAM

On-Demand

- Contract is installed when first packet is received by VM.

Immediate

- Contract is installed when policy is first downloaded to leaf.



Policy Download and Verification

Pre-Provision Use Cases

1 Management VMK Ports

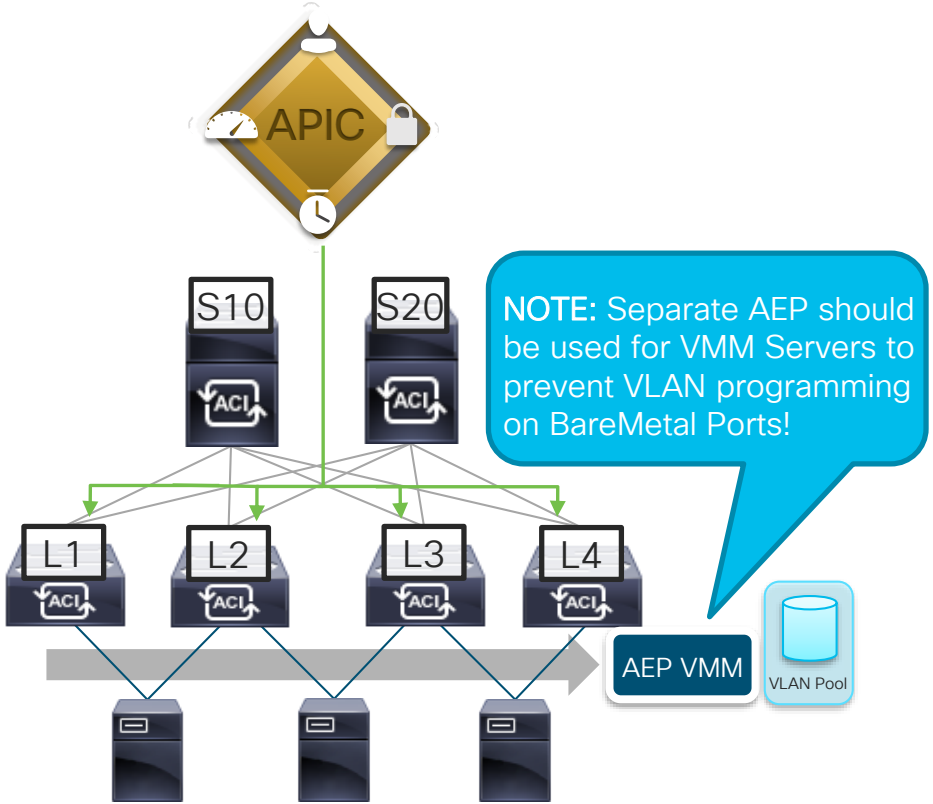
If Host management is on APIC vDS, networking needs to be in place statically so host can talk to VC. Otherwise APIC can't learn about adjacency to push the management policy. (Chicken and the Egg)

2 Maintenance

During maintenance, where links or adjacencies may flap, pre-provision can improve convergence since policy is always present on port

3 Troubleshooting

If Dynamic Policy is not working, you can enable pre-provision to see if policy is pushed. From there you can troubleshoot Dynamic Policy Download.



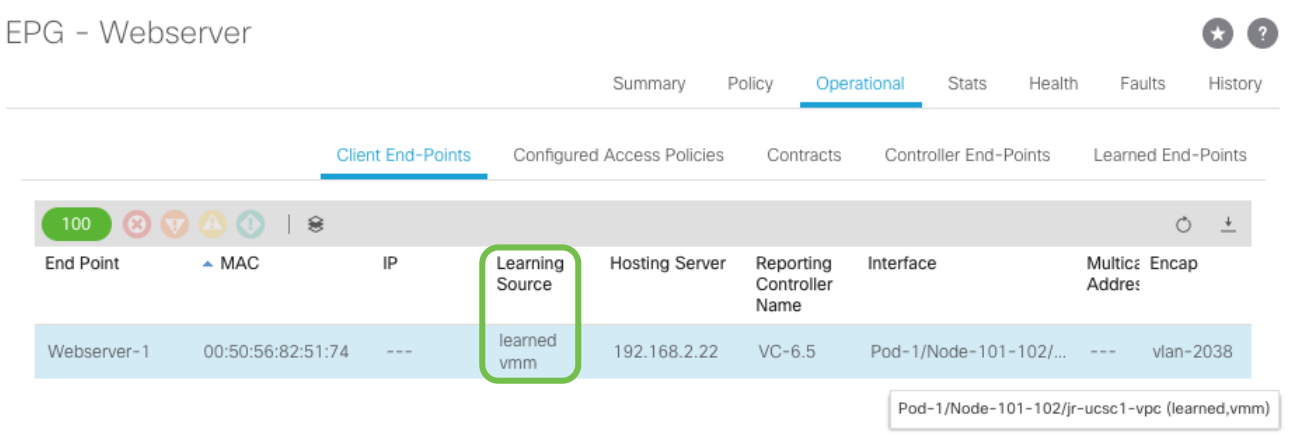
Policy Download and Verification
On Demand Troubleshooting

- Learning Source flagged as “learned” means VM has sent data to leaf.
- Deployment Immediacy On Demand is pushed when VM is marked as “learned”.

Tenants > Tenant > App Profile > EPG > Operational > Client End-Points

What if Endpoint doesn’t have “learned” flag?

1. Check Faults on VMM Domain
2. Check Faults on EPG
3. Ensure VM is sending Traffic
4. VLAN are configured on Blade Switch (if applicable)



Policy Download and Verification

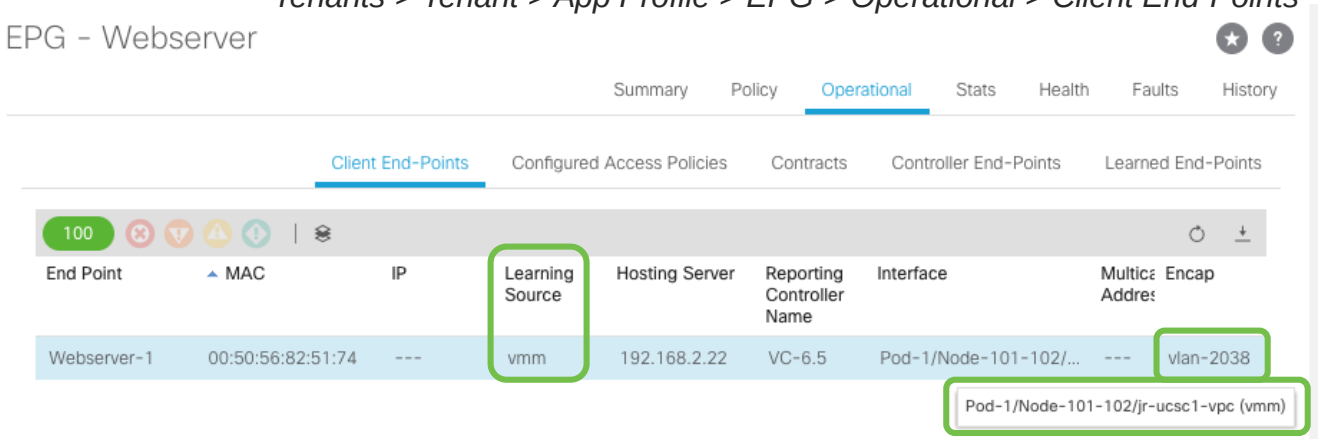
On Demand Troubleshooting

- Learning Source flagged as “vmm” means VC notified APIC that VM has been placed in Port Group
  and
  Host where VM lives has a valid LLDP/CDP Adjacency
- Resolution Immediacy is pushed to leafs when VM is marked as “vmm” learned.

What if Endpoint doesn’t have “vmm” flag?

1. Check Faults on VMM Domain
2. Check Faults on EPG
3. Check VNIC on VM for correct Port Group Mapping

Tenants > Tenant > App Profile > EPG > Operational > Client End-Points



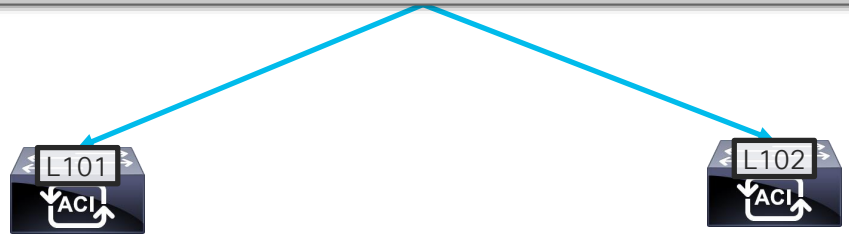
Policy Download and Verification

On Demand Path Deployment

- VMM Learn in EPG triggers “Dynamic Path”: fvDyPathAtt Object pushed to leaf where Host attaches.
- VLAN is mapped to interfaces using connection object: fvIfConn
- If Object is Missing: Ensure EP is learnt as “vmm” in EPG and Adjacency is seen in APIC!

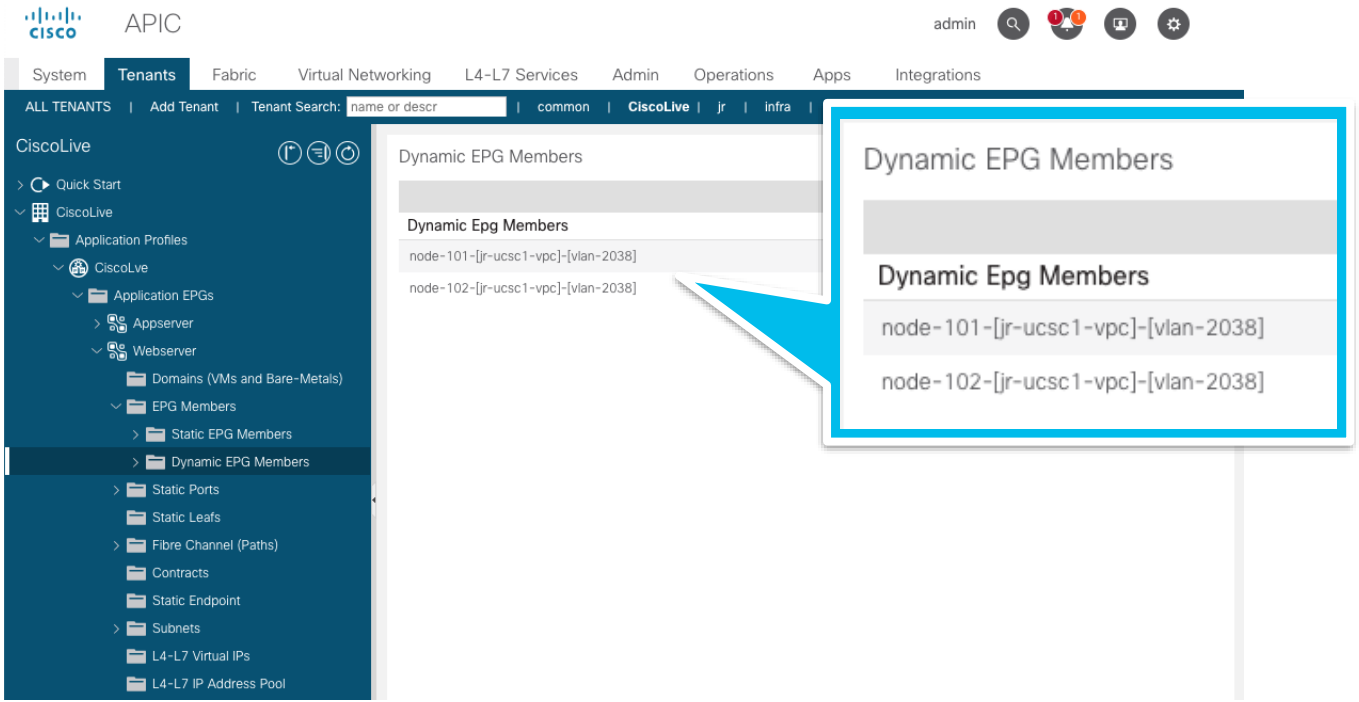
```
admin@apic1:~> moquery -c fvDyPathAtt | grep Webserver
dn    : uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/dyatt-[topology/pod-1/protpaths-101-102/pathep-[jr-ucsc1-vpc]]
dn    : uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/dyatt-[topology/pod-1/protpaths-101-102/pathep-[jr-ucsc1-vpc]]
```


```
admin@apic1:~> moquery -c fvIfConn | grep Webserver
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/dyatt-[topology/pod-1/protpaths-101-102/pathep-[jr-ucsc1-vpc]]/conndef/conn-[vlan-2038]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/dyatt-[topology/pod-1/protpaths-101-102/pathep-[jr-ucsc1-vpc]]/conndef/conn-[vlan-2038]
```



Policy Download and Verification

Path Deployment – UI Verification



Tenants > Tenant > App Profile > EPG > EPG Members > Dynamic EPG Members

Policy Download and Verification

Immediate Path Deployment

- Same Validation as On Demand, But **fvDyPathAtt** is pushed to all leafs/ports with Valid Adjacency.
- For Blade Switch, fvDyPathAtt is associated to fabricLooseNode
- **If Object is Missing**: Ensure Adjacency is seen in APIC!

```
admin@apic1:~> moquery -c fvDyPathAtt | grep Webserver
dn    : uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/dyatt-[topology/pod-1/node-101/sys/lsnode-192.168.2.46]
dn    : uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/dyatt-[topology/pod-1/node-102/sys/lsnode-192.168.2.46]
dn    : uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/dyatt-[topology/pod-1/node-101/sys/lsnode-192.168.2.47]
dn    : uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/dyatt-[topology/pod-1/node-102/sys/lsnode-192.168.2.47]
dn    : uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/dyatt-[topology/pod-1/protpaths-101-102/pathep-[jr-ucsc1-vpc]]
dn    : uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/dyatt-[topology/pod-1/protpaths-101-102/pathep-[jr-ucsc1-vpc]]
```


```
admin@apic1:~> moquery -c fvIfConn | grep Webserver
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/dyatt-[topology/pod-1/node-101/sys/lsnode-192.168.2.46]/conndef/conn-[vlan-2038]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/dyatt-[topology/pod-1/node-102/sys/lsnode-192.168.2.46]/conndef/conn-[vlan-2038]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/dyatt-[topology/pod-1/node-101/sys/lsnode-192.168.2.47]/conndef/conn-[vlan-2038]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/dyatt-[topology/pod-1/node-102/sys/lsnode-192.168.2.47]/conndef/conn-[vlan-2038]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/dyatt-[topology/pod-1/protpaths-101-102/pathep-[jr-ucsc1-vpc]]/conndef/conn-[vlan-2038]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/dyatt-[topology/pod-1/protpaths-101-102/pathep-[jr-ucsc1-vpc]]/conndef/conn-[vlan-2038]
```

Policy Download and Verification

Pre-Provision Path Deployment

- Pre-Provision is the same as pushing static path, but to every leaf/interface tied to AEP
- Path and VLAN Deployment get pushed using fvAttEntityPathAtt Object
- **If Object is Missing**: Ensure Interface is tied to AEP for VMM Domain

```
admin@apic1:~> moquery -c fvAttEntityPathAtt | grep Webserver
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/attEntitypathatt-[CiscoLive]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/attEntitypathatt-[CiscoLive]
```

```
admin@apic1:~> moquery -c fvRsStPathAtt | grep Webserver
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/attEntitypathatt-[CiscoLive]/rsstPathAtt-[sys/conng/path-[po1]]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/attEntitypathatt-[CiscoLive]/rsstPathAtt-[sys/conng/path-[po2]]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/attEntitypathatt-[CiscoLive]/rsstPathAtt-[sys/conng/path-[po3]]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/attEntitypathatt-[CiscoLive]/rsstPathAtt-[sys/conng/path-[po1]]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/attEntitypathatt-[CiscoLive]/rsstPathAtt-[sys/conng/path-[po2]]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/attEntitypathatt-[CiscoLive]/rsstPathAtt-[sys/conng/path-[po3]]
```

```
admin@apic1:~> moquery -c fvIfConn | grep Webserver
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-101/attEntitypathatt-[CiscoLive]/conndef/conn-[vlan-2038]
dn: uni/epp/fv-[uni/tn-CiscoLive/ap-CiscoLive/epg-Webserver]/node-102/attEntitypathatt-[CiscoLive]/conndef/conn-[vlan-2038]
```

Policy Download and Verification

When is Policy Removed?

Prior to Version 3.0

On-Demand

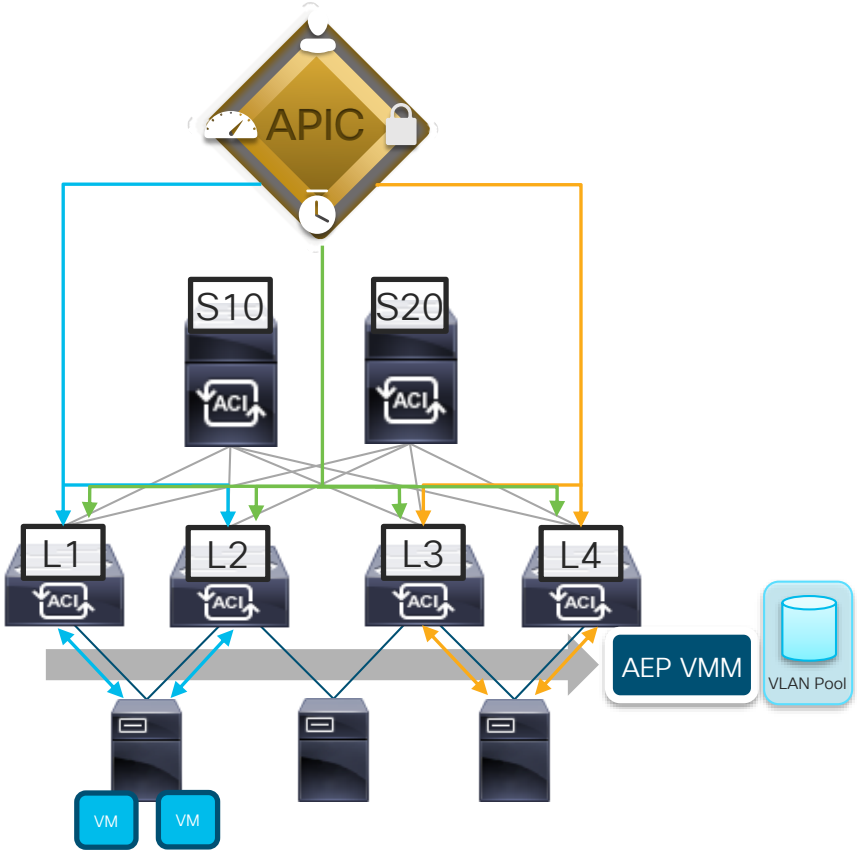
1. If No VM's exist in EPG
   OR
   LLDP/CDP goes away from host
2. If interface is removed from AEP

Immediate

1. If LLDP/CDP is removed From Host
2. If interface is removed from AEP

Pre-Provision

1. If VMM Domain is Removed From EPG
2. If interface is removed from AEP



Policy Download and Verification

When is Policy Removed from Interface?

Version 3.0 and Higher

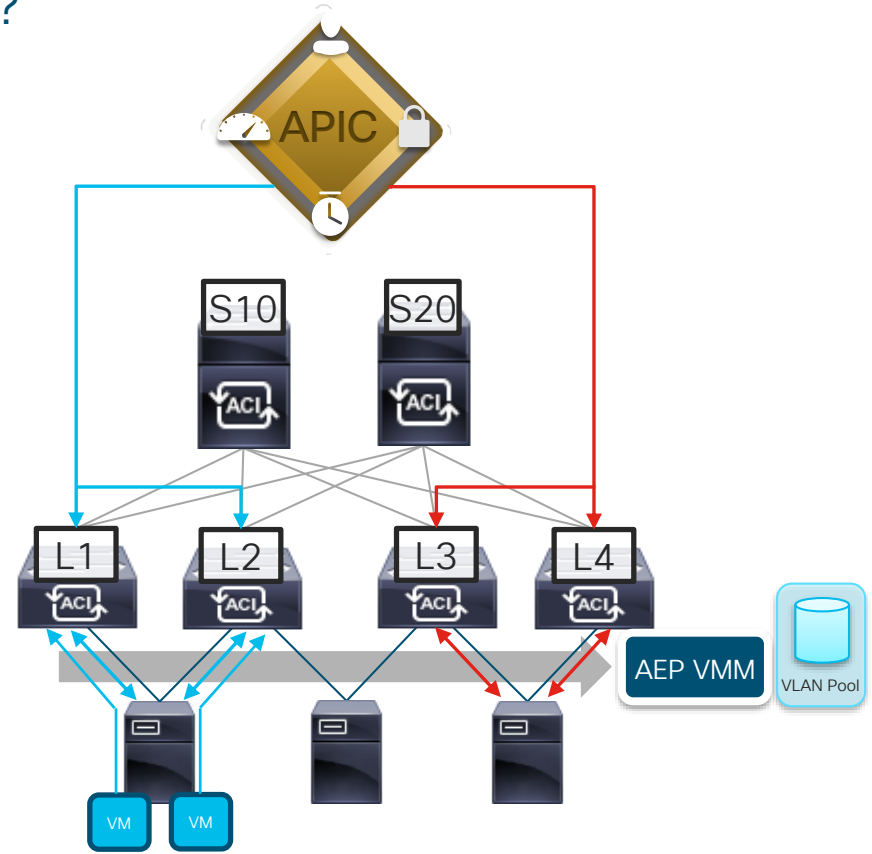
On-Demand and Immediate

1. If No VM's exist in VMWare PortGroup
   AND
   LLDP/CDP goes away from host
   AND
   VM Traffic Stops and Ages Out

2. If Interface is Removed From AEP

Pre-Provision

1. Behavior is the same



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