Troubleshoot ACI Management and Core Services - In-band and Out-of-band Management

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Introduction

This document describes steps to troubleshoot ACI out-of-band (OOB) and in-band (INB) management.

Background Information

The material from this document was extracted from the <u>Troubleshooting Cisco Application Centric</u> <u>Infrastructure, Second Edition book</u> specifically the **Management and Core Services - In-band and out-of-band Management** chapter.

In-band and out-of-band management

ACI fabric nodes have two options for management connectivity; out-of-band (OOB), which governs the dedicated physical management port on the back of the device, or in-band (INB), which is provisioned using a specific EPG/BD/VRF in the management tenant with a degree of configurable parameters. There's an OOB EPG present in the management ('mgmt') tenant, but it's there by default and can't be modified. It only allows configuration of Provided OOB Contracts. On the APIC, the OOB interface is observed in the 'ifconfig' command output as 'oobmgmt' and

the in-band interface will be represented by the 'bond.x' interface, where is the encap VLAN configured for the in-band EPG.

```
apic1# ifconfig oobmgmt
oobmgmt: flags=4163<UP, BROADCAST, RUNNING, MULTICAST> mtu 1500
       inet 192.168.4.20 netmask 255.255.255.0 broadcast 192.168.4.255
       inet6 fe80::7269:5aff:feca:2986 prefixlen 64 scopeid 0x20
       ether 70:69:5a:ca:29:86 txqueuelen 1000 (Ethernet)
       RX packets 495815 bytes 852703636 (813.2 MiB)
       RX errors 0 dropped 0 overruns 0 frame 0
       TX packets 432927 bytes 110333594 (105.2 MiB)
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
apic1# ifconfig bond0.300
bond0.300: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1496
       inet 10.30.30.254 netmask 255.255.255.0 broadcast 10.30.30.255
       inet6 fe80::25d:73ff:fec1:8d9e prefixlen 64 scopeid 0x20
       ether 00:5d:73:c1:8d:9e txqueuelen 1000 (Ethernet)
       RX packets 545 bytes 25298 (24.7 KiB)
       RX errors 0 dropped 0 overruns 0 frame 0
       TX packets 6996 bytes 535314 (522.7 KiB)
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

On the leaf, the OOB interface is seen as 'eth0' in the 'ifconfig' command output and the INB is seen as a dedicated SVI. The user can view the interface with 'ifconfig' or with 'show ip interface vrf mgmt:' where is the name selected for the in-band VRF.

```
leaf101# show interface mgmt 0
mgmt0 is up
admin state is up,
 Hardware: GigabitEthernet, address: 00fc.baa8.2760 (bia 00fc.baa8.2760)
 Internet Address is 192.168.4.23/24
 MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec
 reliability 255/255, txload 1/255, rxload 1/255
 Encapsulation ARPA, medium is broadcast
 Port mode is routed
 full-duplex, 1000 Mb/s
 Beacon is turned off
 Auto-Negotiation is turned on
 Input flow-control is off, output flow-control is off
 Auto-mdix is turned off
 EtherType is 0x0000
 30 seconds input rate 3664 bits/sec, 4 packets/sec
 30 seconds output rate 4192 bits/sec, 4 packets/sec
 Rx
   14114 input packets 8580 unicast packets 5058 multicast packets
   476 broadcast packets 2494768 bytes
 Τx
    9701 output packets 9686 unicast packets 8 multicast packets
    7 broadcast packets 1648081 bytes
```

leaf101# show ip interface vrf mgmt:inb

IP Interface Status for VRF "mgmt:inb-vrf"
vlan16, Interface status: protocol-up/link-up/admin-up, iod: 4, mode: pervasive
IP address: 10.30.30.1, IP subnet: 10.30.30.0/24
secondary IP address: 10.30.30.3, IP subnet: 10.30.30.0/24
IP broadcast address: 255.255.255

The **'show ip interface vrf mgmt:'** will show the in-band management BD subnet IP as the secondary IP address; this is expected output.

On spine switches the in-band management IP address is added as a dedicated loopback interface in the 'mgmt:' VRF. This implementation is thus different from the in-band management IP implementation on leaf switches. Observe the **'show ip int vrf mgmt:'** command output below on a spine switch

```
spine201# show ip interface vrf mgmt:inb
    IP Interface Status for VRF "mgmt:inb"
    lo10, Interface status: protocol-up/link-up/admin-up, iod: 98, mode: pervasive
    IP address: 10.30.30.12, IP subnet: 10.30.30.12/32
    IP broadcast address: 255.255.255
    IP primary address route-preference: 0, tag: 0
```

Under the System Settings, there is a setting to select either the in-band or out-of-band connectivity preference for the APICs.

Only the traffic sent from the APIC will use the management preference selected in the 'APIC Connectivity Preferences'. The APIC can still receive traffic on either in-band or out-of-band, assuming either is configured. APIC uses the following forwarding logic:

- Packets that come in an interface and go out that same interface.
- Packets sourced from the APIC, destined to a directly connected network, go out the directly connected interface.
- Packets sourced from the APIC, destined to a remote network, prefer in-band or out-of-band based on the APIC Connectivity Preferences.

APIC Connectivity Preferences



APIC routing table with OOB selected. Observe the metric value of 16 for the oobmgmt interface which is lower than the bond0.300 in-band management interface metric of 32. Meaning the oobmgmt out-of-band management interface will be used for outgoing management traffic.

pic1# bash											
dmin@apic1:~> route -n											
Kernel IP routir	ng table										
Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface				
0.0.0.0	192.168.4.1	0.0.0.0	UG	16	0	0	oobmgmt				
0.0.0.0	10.30.30.1	0.0.0.0	UG	32	0	0	bond0.300				

APIC routing table with in-band selected. Observe the bond0.300 in-band management interface's metric if 8 which is now lower than the oobmgmt interface metric of 16. Meaning the bond0.300 in-band management interface will be used for outgoing management traffic.

admin@apic1:~> 1	route -n						
Kernel IP routir	ng table						
Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
0.0.0.0	10.30.30.1	0.0.0.0	UG	8	0	0	bond0.300
0.0.0.0	192.168.4.1	0.0.0.0	UG	16	0	0	oobmgmt

The leaf and spine node management preferences are not affected by this setting. These connectivity preferences are selected under the protocol policies. Below is an example for NTP.

cisco	APIC										admin	٩	C	•	\$)
System	Tenants	Fabric	Virtua	al Networking	L4-L7 Se	ervices	Admin	Operatio	ons	Apps	Integr	ations				
Inve	ntory Fat	oric Policies	Access	Policies												
Policies		Ð	\odot	Providers -	NTP Serve	r 10.48.3	37.151									0
C Quick SI	lart		^							Policy	Oper	ational	Fau	Its	Hist	ory
> Pods				0.00							-				3	44
> Switche	S				0									0	<u>+</u>	*-
> Modules				Properties	10.4.1.1	10 10 07 1										
> interface	15		-1	Host Nar	Description:	10.48.37.1	151									
V Policies					Description.											
V Pod																
	ate and Time				Preferred:											
~ =	Policy Date Ti	mePolicy		Minimum	Polling Interval:	4										
	NTP Serve	er 10.48.37.151		Maximum	Polling Interval:	6										
> =	Policy default				Keys:											+
> 🚞 S	NMP					🔺 Key										
> 🚞 M	lanagement Ac	cess							No ite	ms have bee	n found.					
≓ IS	IS Policy defau	II.							Select Acti	ons to create	a new item	L.				
> 🚞 Swite	ah															
> 🚞 Inter	ace															
> 🚞 Glob	al															
> 🚞 Moni	toring															
> 🚞 Troul	bleshooting			Mar	agement EPG:	select an	option	\sim								
> 🚞 Geol	ocation					default	(Out-of-Ba	nd)								
> 🚞 Mace	sec					mgmt/d	efault									
> 🚞 Analy	ytics					inb_mgr	mt (In-Band	1)		Sho	w Usage					
🚞 Tena	nt Quota					mgmt/de	efault			5110	n osage					

If in-band is selected under the APIC Connectivity Preferences, but then out-of-band is selected under the protocol, which interface with the protocol packet use?

- The APIC Connectivity Preference will always take precedence over the protocol selection on the APIC.
- The leaf nodes are the opposite, they only reference the selection under the protocol.

Scenario: Unable to reach management network

If the user is unable to reach the management network, it may be due to a number of different issues, but they can always use the same methodology to isolate the issue. The assumption in this scenario is that the user cannot reach any devices in the management network from behind their L3Out.

- Verify the APIC connectivity preference. This is outlined in figure 'APIC Connectivity Preferences', and the options are OOB or in-band.
- Depending on which preference is selected, verify the configuration is correct, the interfaces are up, the default gateway is reachable via the selected interface, and there are no drops on the path of the packet.

Do not forget to check for faults in each section of configuration in the GUI. However, some configuration mistakes can manifest in unexpected states, but a fault may be generated in another section than the one the user would initially consider.

Out-of-Band Management Access



Out-of-band configuration verification

For out-of-band configuration, there are four folders to verify under a special tenant called 'mgmt':

- Node Management Addresses.
- Node Management EPGs.
- Out-of-band Contracts (under Contracts).
- External Network Instance Profiles.

Node Management Addresses can either be assigned statically or from a pool. Below is an example of static address assignment. Verify that the type out-of-band IP addresses are assigned and that the default gateway is correct.

Static Node Management Addresses GUI verification

cisco	APIC						ad	min 🔇 🤇	•	۵
System	Tenants	Fabric Virtual	Networking L4-L7	Services Admi	in Operatio	ons App	os Integratio	ons		
ALL TENANT	rs Add Ten	ant Tenant Search:	name or descr	common infr	a mgmt	Ecommerce				
mgmt		00	Static Node Man	agement Address	es					00
> 🕩 Quick S	Start								Ó	+ %-
✓ ₩ mgmt > ➡ Appl	lication Profiles		 Node ID 	Name	Туре	EPG	IPV4 Address	IPV4 Gateway	IPV6 Address	IPV6 Gateway
> 🚞 Netv	working		pod-1/node-1	bdsol-aci37-apic1	Out-Of-Band	default	10.48.176.57/24	10.48.176.1		
> 🚞 IP A	ddress Pools		pod-1/node-101	S1P1-Leaf101	Out-Of-Band	default	10.48.176.70/24	10.48.176.1		::
> 🚞 Cont	tracts		pod-1/node-102	S1P1-Leaf102	Out-Of-Band	default	10.48.176.71/24	10.48.176.1		
	cies		pod-1/node-2	bdsol-aci37-apic2	Out-Of-Band	default	10.48.176.58/24	10.48.176.1		
> Serv	ie Management El	PGs	pod-1/node-201	S1P1-Spine201	Out-Of-Band	default	10.48.176.74/24	10.48.176.1		
> 🚞 Exte	ernal Management	Network Instance Profil	pod-1/node-202	S1P1-Spine202	Out-Of-Band	default	10.48.176.75/24	10.48.176.1		
🗸 🖿 Node	e Management A	ddresses	pod-1/node-301	S1P2-Leaf301	Out-Of-Band	default	10.48.176.72/24	10.48.176.1		
🖿 s	Static Node Mana	gement Addresses	pod-1/node-302	S1P2-Leaf302	Out-Of-Band	default	10.48.176.73/24	10.48.176.1		
≓ d	default		pod-1/node-401	S1P2-Spine401	Out-Of-Band	default	10.48.176.76/24	10.48.176.1		::
> 🚞 Man	aged Node Conn	ectivity Groups	pod-1/node-402	S1P2-Spine402	Out-Of-Band	default	10.48.176.77/24	10.48.176.1		
			pod-2/node-3	bdsol-aci37-apic3	Out-Of-Band	default	10.48.176.59/24	10.48.176.1		

The out-of-band EPG should be present under the Node Management EPGs folder.

Out-of-band EPG - default

cisco APIC					admin	0 🕐		٢
System Tenants Fabric Virtual 1	Networking L4-L7 Service	s Admin	Operations	Apps Integ	rations			
ALL TENANTS Add Tenant Tenant Search:	name or descr I comr	non mgmt	infra E	commerce				
mgmt (È 雪) ⊘ > C+ Quick Start	Out-of-Band EPG - defa	ult						00
✓ I mgmt					P	olicy Fa	ults	History
> 🖿 Application Profiles	8 👽 🛆 🕦							0 +
> 🧮 Networking	Properties							
P Address Pools E Contracts	Name: de Tags: en	fault er tags separated by o	comma	~				Î
> Policies	Configuration Issues:							- 11
	Configuration State: ap	plied						- 11
 In-Band EPG - inb. momt 	QoS Class: U	nspecified	~					- 11
Out-of-Band EPG - default	Provided Out-of-Band							
> 🚞 External Management Network Instance Profil	Contracts:	OB Contract	Tenant	Type	OoS Class	State		+
> 🚞 Node Management Addresses		OB-default	mamt	oobbrc-008-default	Linspecified	forme	ad	- 11
> Managed Node Connectivity Groups		Job Gordan	gint	Sobort Sob deladit	onopoundu	Iom		- 11
								- 11
	٢							>
					Show Usage	Reset	s	ubmit

The contracts which govern which management services are provided from the out-of-band EPG are special contracts that are configured in the out-of-band contracts folder.

Out-of-band contract

cisco	APIC									admin	٩	()		٥	
System	Tenants	Fabric	Virtual N	letworking	L4-L7 Service	s Admin	Operati	ons Ap	ops Integ	rations					
ALL TENANT	rs Add Te	nant Ter	nant Search:	ame or descr	comr	non i mgmt	l infra	Ecommerc	:0						
mgmt		(060	Contract	Subject - OOB	-default								0	?
> C► Quick S ∨ ⊞ mgmt	Start										Policy	Fau	lts	History	
> 🖿 Appl	lication Profiles											Gen	eral	Label	
> 💼 Netv > 💼 IP Ar	working ddress Pools			8 👽									Ο.	<u>+</u> %-	
V 🖿 Cont	tracts			Property	Name: O)B-default									
> 🔤 S > 🚞 T	faboos				Description:	ptional									
> 🖬 Ir	mported			Rev	verse Filter Ports: 🗹										
	Dut-Of-Band Co	ntracts			Filters:									+	
~ 🗖	OOB-default				Ν	lame	Te	nant	Stat	e		Action			
	🚞 OOB-defa	ult			0	lefault	C	ommon	form	ned		Permit			
> 🚞 Polic	cies														
> 🚞 Serv	vices														
> 🚞 Node	e Management I	EPGs													
Exter	rnal Managemer	nt Network In	stance Profil												
> 🖬 Nodi	e Management / aged Node Con	nectivity Grou	ips							Show Usage					

Next, verify the External Management Network Instance Profile is created and that the correct outof-band contract is configured as the 'Consumed Out-Of-Band Contract'.

External Management Network Instance Profile

cisc	APIC					admin	٩	0	•	0	(
Syste	em Tenants Fabric	Virtual Networking L4-L7 Servi	ces Admin	Operation	ns Apps Inte	grations					
ALL TE	ENANTS I Add Tenant I Tenant	Search: name or descr I co	ommon I infra	i mgmti i	Ecommerce						
mgmt	\mathbb{O}	External Management	Network Insta	nce Profile -	default					0	
	Quick Start	•								•	U
~ 🎹 m	ngmt						Policy	Fau	ilts	Histo	ry
> E	Application Profiles	8000								Ó	+
> 🖬	Networking	Properties									
> 🖻	IP Address Pools	Name:	default								^
> 🖿	Contracts	Tags:			~						
> E	Policies	Configuration Issues:	enter tags separated	by comma							
>	Services	Configuration State:	applied								
> 🖬	Node Management EPGs	QoS Class:	Unspecified	~							
~ 🖿	External Management Network Instan	ce Profil Consumed Out-of-Band								т н	-
	≓ default	Contracts:	Out-of-Band	Tenant	Туре	A QoS C	lass	State	Э		
> =	Node Management Addresses		Contract								
> E	Managed Node Connectivity Groups		OOB-default	mgmt	oobbrc-OOB-default	Unspecif	hed	form	ied		
											~
					She	ow Usage					

The next items to verify are the interface state and cabling, and then the connectivity to the gateway.

• To check if the oobmgmt interface is up, enter 'ifconfig oobmgmt' on the APIC CLI. Verify that

the interface flags are 'UP' and 'RUNNING', that the correct IP address is configured, and that packets are increasing in the RX and TX counters. If any checks are missing, then verify the correct cables are being used and that they are connected to the correct physical management ports on the APIC. The management ports will be labelled Eth1-1 and Eth1-2 and recent hardware have oobmgmt stickers to indicate the out-of-band interface. For more information about the physical out-of-band mgmt ports on the back of an APIC, please refer to the section "Initial fabric setup" in chapter "Fabric discovery".

apic1# ifconfig oobmgmt

oobmgmt: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500 inet 192.168.4.20 netmask 255.255.255.0 broadcast 192.168.4.255 inet6 fe80::7269:5aff:feca:2986 prefixlen 64 scopeid 0x20 ether 70:69:5a:ca:29:86 txqueuelen 1000 (Ethernet) RX packets 295605 bytes 766226440 (730.7 MiB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 253310 bytes 38954978 (37.1 MiB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

• To check the network connectivity through the OOB, use ping to test the path of the packet through the out-of-band network.

apic1# ping 192.168.4.1
PING 192.168.4.1 (192.168.4.1) 56(84) bytes of data.
64 bytes from 192.168.4.1: icmp_seq=1 ttl=255 time=0.409 ms
64 bytes from 192.168.4.1: icmp_seq=2 ttl=255 time=0.393 ms
64 bytes from 192.168.4.1: icmp_seq=3 ttl=255 time=0.354 ms

Using traceroute in the bash shell on the APIC, trace the connectivity to the end user. If the traceroute is incomplete, login to this device (if accessible) and ping the oobmgmt interface and ping the host. Depending on which direction fails, troubleshoot the issue as a traditional networking problem.

Traceroute works by sending UDP packets with an increasing TTL, starting with 1. If a router receives the packet with TTL 1 and needs to route it, it drops the frame and sends back an ICMP unreachable message to the sender. Each hop is sent 3 UDP packets at the current TTL, and asterisks represent attempts where an ICMP unreachable / TTL Exceeded packet was not received. These 3 asterisk blocks are expected in most networks as some routing devices have ICMP unreachable / TTL Exceeded messages disabled, so when they receive TTL 1 packets that they need to route, they simply drop the packet and do not send the message back to the sender.

```
apic1# bash
admin@apic1:~> traceroute 10.55.0.16
traceroute to 10.55.0.16 (10.55.0.16), 30 hops max, 60 byte packets
1 192.168.4.1 (192.168.4.1) 0.368 ms 0.355 ms 0.396 ms
2 * * *
3 * * *
4 10.0.255.221 (10.0.255.221) 6.419 ms 10.0.255.225 (10.0.255.225) 6.447 ms *
5 * * *
6 * * *
```

The leaf switches have access to the tcpdump command, which can be used to verify which packets are traversing the oobmgmt interface. The example below captures on 'eth0', which is the oobmgmt interface used on the leaf and spine switches, and uses '-n' option for tcpdump to give the IP addresses used instead of the DNS names, and then filtering specifically for NTP packets (UDP port 123). Recall that in the previous example the leaf is polling NTP server 172.18.108.14. Below, the user can verify that NTP packets are being transmitted via the out-of-band interface and also that the leaf is receiving a response from the server.

fab1-leaf101# tcpdump -n -i eth0 dst port 123 tcpdump: verbose output suppressed, use -v or -vv for full protocol decode listening on eth0, link-type EN10MB (Ethernet), capture size 65535 bytes 16:49:01.431624 IP 192.168.4.23.123 > 172.18.108.14.123: NTPv4, Client, length 48 16:49:01.440303 IP 172.18.108.14.123 > 192.168.4.23.123: NTPv4, Server, length 48

The in-band management configuration requires specific considerations for Layer 2 or Layer 3 deployments. This example will only cover the Layer 3 deployment and troubleshooting.

In-band management configuration



Verify that there is a BD in the mgmt tenant with a subnet from which in-band node mgmt addresses will be allocated to the fabric nodes for in-band connectivity, and make sure that the L3Out is associated under the in-band management BD.

Bridge Domain Subnet which will act as the in-band management gateway

cisco	APIC											а	dmin	٩	0	•	٢	
System	Tenants	Fabric	Virtual	Networking	L4-L7 Ser	vices Ad	dmin	Operation	ns A	pps Ir	tegrations	6						
ALL TENANT	TS Add Ten	ant Ter	ant Search:	name or descr		common	mgmt	infra	Ecommerc	e								
mgmt > ()► Quick S ~ III mgmt	Start	0	00	Bridge D	omain - inb			Summa	ry P	olicyC	perational	State	s I	Health	Fau	ilts	Q Histor	0 y
> 🖿 App	lication Profiles								_	Gener	al L3 (Configura	tions	Adv	anced/	Troubles	shootin	a
🗠 🚞 Neti	working									Gene		ooningara	uono		anocaj			9
E	Bridge Domains			100	$\otimes \odot \odot \circ$												0	+
~@) inb DHCP Relay Subnets	Labels		Propert	es ational Value for	Unicast Routir Unicast Routir	ng: 🗹 ng: true	00.50.10.57										î
	📥 10.30.30	0.1/24			Custo	m MAC Addre	ss. 00:22	(BU.F8.19.FF										
	D Proxy S	ubnets			Virtu	ai MAC Addre	ss. Not G	onngurea										
> 🖿 🛚	VRFs					Subne	15,		C		Deimana ID		Man	10	0	have Ca	- +	1
> 🚞 🗄	External Bridged N	letworks		1			Addr	ess	Scope		Primary IP	Address	Virtual	IP	SL	ibnet Col	ntrol	
	_3Outs						10.3	0.30.1/24	Advert	tised Externall	y False		False					
	inbmgmt_I3out																	
	ddraea Daala				_													
	itrants				Ass	sociated L3 Ou	ts:										e +	1
> E Polic	nies						▲ L3	Out										
> 🖿 Sen	vices						inbm	igmt_l3out										
> 🖿 Nod	e Management El	PGs																
V 🖿 Exte	ernal Management	Network In	stance Pr	<													>	Č.,
= 0	default																	
> 🚞 Nod	le Management A	ddresses										Show	Usage					
s 🖿 Man	aged Node Conn	ectivity Grou	ins.															

Verify an in-band node management EPG is present. As per screenshot below, the in-band EPG names are denoted in the GUI with the prefix 'inb-'. Verify the in-band EPG encap VLAN is associated correctly with a VLAN pool.

The encapsulation VLAN configured in the in-band management EPG needs to be allowed by Access Policies: 'inb mgmt EPG encap VLAN > VLAN Pool > Domain > AEP > Interface Policy Group > Leaf Interface Profile > Switch Profile'. If the supporting access policies are not configured, a fault with code F0467 will be raised as per below screenshot.

Fault F0467 - inb EPG

ID:	8589935303
)escription:	Fault delegate: Configuration failed for uni/tn-mgmt/mgmtp-default/inb-inbmgmt due to Invalid VLAN Configuration, debug message: i vlan-300STP Segment Id not present for Encap. Either the EpG is not associated with a domain or the domain does not have this vlan a
Severity:	minor
ted Object:	uni/tn-mgmt/mgmtp-default/inb-inbmgmt [2
jated From:	topology/pod-1/node-101/local/svc-policyelem-id-0/uni/epp/inb-[uni/tn-mgmt/mgmtp-default/inb-inbmgmt]/nwissues
Created:	2019-10-03T02:23:04.637+00:00
Code:	F0467
Type:	Config
Cause:	configuration-failed
hange Set:	
Action:	deletion
Domain:	Tenant
Life Cycle:	
t Occurred:	1
ient Status:	false

Verify that the bridge domain is the same as the one created above for the in-band subnet. Lastly, verify that there is a Provided Contract configured on the in-band management EPG, which is consumed by the external EPG.

cisco	APIC						ac	dmin Q	C? 🖸	٢	
System	Tenants Fat	oric Virtual N	etworking L4-L7 Service	ces Adr	nin Operatio	ns Apps	s Integrations				
ALL TENAN	NTS Add Tenant	Tenant Search: n	ame or descr I co	mmon in	ifra mgmt	Ecommerce					
mgmt		00	In-Band EPG - inb_mg	gmt						0	0
> C► Quick ~ III mgmt	Start						Policy Stats	Health	Faults	Histor	y
> 🚞 Ap	plication Profiles									Polic	y
	address Pools		100 8 00 4 0							0	+
> 🚍 Co	intracts		Properties								
> 🚞 Po	licies		Name:	inb_mgmt							î
⇒ 🚞 Se	rvices		Tays.	enter tags separa	ated by comma						
V 🖿 No	de Management EPGs		Encap:	vlan-300 e.o. vlan-1							
Ē	In-Band EPG - inb_mgr	nt	Configuration Issues:								
	Out-of-Band EPG - def	ault	Configuration State:	applied							
	ternal Management Netv	vork Instance Prohl	Class ID:	32770							
> 🖿 Ma	inaged Node Connectivit	ly Groups	QOS Class.	Unspecified	× 1						
			Bridge Domain.	inb	× C	7					
			Provided Contracts:	ing.						+	
				Name	Tenant	Туре	QoS Class	Match Type	State		
				default	common	Contract	Unspecified	AtleastOne	formed		
							Show U	Jsage Rd			, D

In-band EPG

External EPG Instance Profile

cisco	APIC					admin	0 😋	•
System	Tenants Fabric	Virtual Networking	L4-L7 Services	Admin Operatio	ons Apps	Integrations		
ALL TENANT	TS Add Tenant Tenan	t Search: name or desc	l commo	n i infra mgmt i	Ecommerce			
mgmt	Ē	(I) (I) Externa	I EPG Instance Pro	file - Inband-Out				0.6
Quick S	Start	Ê		Policy	Operational	Stats	Health Fau	Its History
> 🖿 App	lication Profiles				General C	ontracts	Subject Labels	EPG Labels
→ 🖬 Netv	working 3ridge Domains	< Pr	ovided Contracts	Consumed Contracts	Contract Interfac	es Taboo	Contracts I	nherited Contra)
> 🖿 🛛	/RFs							0 🗊 +
	External Bridged Networks	Name	Ten	ant Typ	be	QoS Class	State	6
- 🖿 L	.3Outs	default	com	rmon Cor	ntract	Unspecified	forme	d
~ 4	inbmgmt_l3out							
	😑 Logical Node Profiles	4						
	🗁 External EPGs							
	Inband-Out							
	Route map for import and	export						
> 🚍 🕻	Dot1Q Tunnels							
> 🚞 IP A	ddress Pools							
> 🚞 Con	tracts							
> 🚞 Polic	cies							
🗦 🚞 Serv	vices							
> 🚞 Nod	le Management EPGs							
> 🚞 Exte	ernal Management Network Insta	nce Pr						

Similar to out-of-band, fabric node in-band mgmt IP addresses can be statically assigned or dynamically assigned from a pre-selected range. Verify the addresses applied for type in-band match the previous BD subnet that was configured. Also verify that the default gateway is correct.

Static Node Management Addresses

cisco	APIC						(4	admin Q	9 💿	0
System	Tenants	Fabric Virtual N	etworking L4-L7	Services Adm	n Operatio	ns Apps	Integration	IS		
ALL TENAN	ITS Add Ten	ant Tenant Search:	ame or descr	common mg	mt infra	Ecommerce				
mgmt		00	Static Node Man	agement Address	es					00
> C Quick	Start								Ō.	<u>+ %-</u>
mgmt	plication Profiles		 Node ID 	Name	Туре	EPG	IPV4 Address	IPV4 Gateway	IPV6 Address	IPV6 Gateway
> 🚞 Net	tworking		pod-1/node-1	bdsol-aci37-apic1	Out-Of-Band	default	10.48.176.57/24	10.48.176.1		
> 🚞 IP 4	Address Pools		pod-1/node-101	S1P1-Leaf101	In-Band	inb_mg	10.30.30.101/24	10.30.30.1		
> 🚞 Cor	ntracts		pod-1/node-101	S1P1-Leaf101	Out-Of-Band	default	10.48.176.70/24	10.48.176.1		
> Pol	licies		pod-1/node-102	S1P1-Leaf102	Out-Of-Band	default	10.48.176.71/24	10.48.176.1		
Ser	rvices de Management FE	XGe	pod-1/node-2	bdsol-aci37-apic2	Out-Of-Band	default	10.48.176.58/24	10.48.176.1		
> Ext	ternal Management	Network Instance Profil	pod-1/node-201	S1P1-Spine201	Out-Of-Band	default	10.48.176.74/24	10.48.176.1		
V 🗖 Nor	de Management Ad	ddresses	pod-1/node-202	S1P1-Spine202	Out-Of-Band	default	10.48.176.75/24	10.48.176.1		
-	Static Node Manag	gement Addresses	pod-1/node-301	S1P2-Leaf301	Out-Of-Band	default	10.48.176.72/24	10.48.176.1		
F	default		pod-1/node-302	S1P2-Leaf302	Out-Of-Band	default	10.48.176.73/24	10.48.176.1		
🔿 🚞 Mai	naged Node Conne	ectivity Groups	pod-1/node-401	S1P2-Spine401	Out-Of-Band	default	10.48.176.76/24	10.48.176.1		
			pod-1/node-402	S1P2-Spine402	Out-Of-Band	default	10.48.176.77/24	10.48.176.1		
			pod-2/node-3	bdsol-aci37-apic3	Out-Of-Band	default	10.48.176.59/24	10.48.176.1		

If everything has been configured correctly, and there are no faults in any above-mentioned section, the next step is to ping between the switches and/or APICs to verify that in-band connectivity is working correctly inside ACI.

The spine nodes will not respond to ping on the in-band as they use loopback interfaces for connectivity which do not respond to ARP.

The in-band interface used on the leaf switches is kpm_inb. Using a similar tcpdump capture, verify the packet is egressing the in-band CPU interface.

fab2-leaf101# tcpdump -n -i kpm_inb dst port 123

tcpdump: verbose output suppressed, use -v or -vv for full protocol decode listening on kpm_inb, link-type EN10MB (Ethernet), capture size 65535 bytes 16:46:50.431647 IP 10.30.30.3.123 > 172.18.108.14.123: NTPv4, Client, length 48 16:47:19.431650 IP 10.30.30.3.123 > 172.18.108.15.123: NTPv4, Client, length 48 Verify that the SVI used for in-band is 'protocol-up/link-up/admin-up'.

fabl-leaf101# show ip interface vrf mgmt:inb-vrf IP Interface Status for VRF "mgmt:inb-vrf"

vlan16, Interface status: protocol-up/link-up/admin-up, iod: 4, mode: pervasive IP address: 10.30.30.1, IP subnet: 10.30.30.0/24 secondary IP address: 10.30.30.3, IP subnet: 10.30.30.0/24 IP broadcast address: 255.255.255.255 IP primary address route-preference: 0, tag: 0