You make **possible**

Introduction to Automating ACI with Ansible

Thomas Renzy – Technical Leader
@ThomasRenzy

DEVNET-1797

Barcelona | January 27-31, 2020

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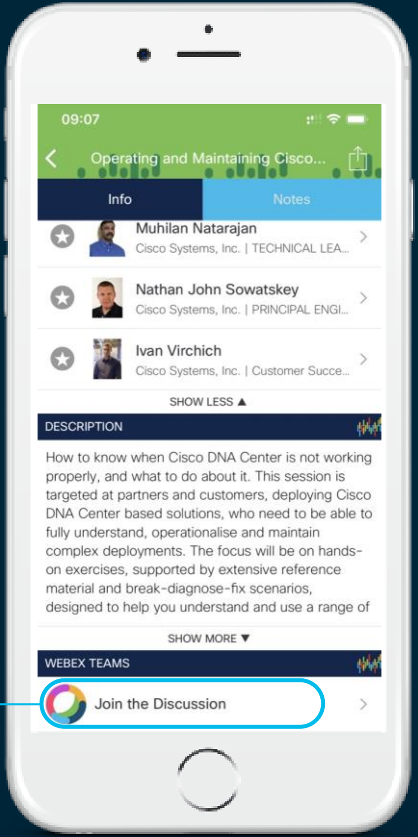

09:07
Operating and Maintaining Cisco...
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DESCRIPTION

How to know when Cisco DNA Center is not working properly, and what to do about it. This session is targeted at partners and customers, deploying Cisco DNA Center based solutions, who need to be able to fully understand, operationalise and maintain complex deployments. The focus will be on hands-on exercises, supported by extensive reference material and break-diagnose-fix scenarios, designed to help you understand and use a range of

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Agenda

- Introduction – What is Automation?
- Overview of Ansible
- Automating ACI with Playbooks
- ACI REST module

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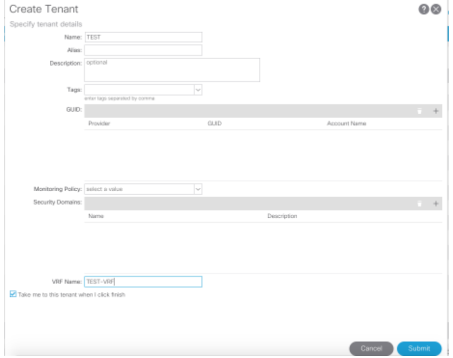
Introduction – What is Automation?

Why automation with ACI?

- GUI Point-and-click for configuration – one at a time
- Repetitive Tasks
- Does not scale when deploying large configurations



Create Tenant

Specify tenant details

Name: TEST

Alias:

Description: optional

Tags:

enter tags separated by comma

GUID:

Provider	GUID	Account Name

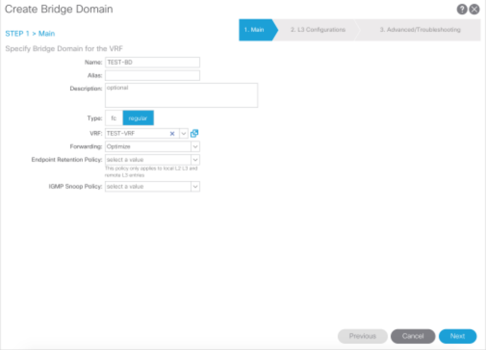
Monitoring Policy: select a value

Security Domains:

Name	Description

VRF Name: TEST-VRF

☑ Take me to this tenant when I click finish



Create Bridge Domain

STEP 1 > Main

Specify Bridge Domain for the VRF

Name: TEST-BD

Alias:

Description: optional

Type: fc [✓ regular]

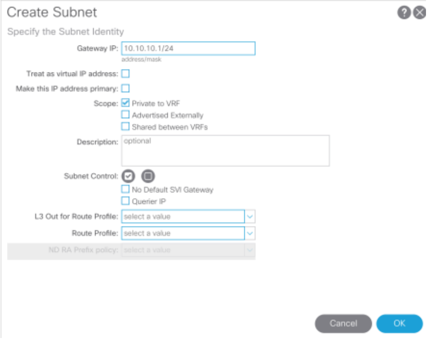
VRF: TEST-VRF

Forwarding: Optimize

Endpoint Retention Policy: select a value

This policy only applies to local L2 L3 and remote L3 entries

IGMP Snoop Policy: select a value



Create Subnet

Specify the Subnet Identity

Gateway IP: 10.10.10.1/24

address/mask

Treat as virtual IP address: □

Make this IP address primary: □

Scope: ☑ Private to VRF

□ Advertised Externally

□ Shared between VRFs

Description: optional

Subnet Control:

□ No Default SVI Gateway

□ Querier IP

L3 Out for Route Profile: select a value

Route Profile: select a value

ND RA Prefix policy: select a value

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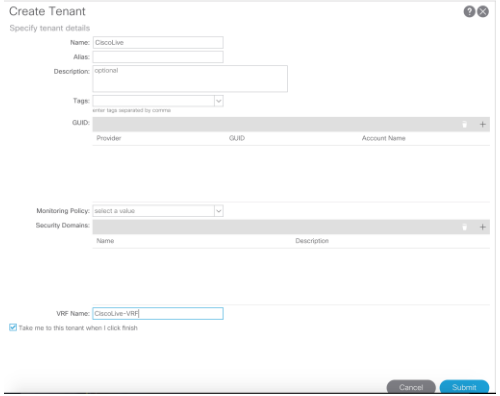
Deploy Three Tier Application – APIC GUI

Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive

Alias:

Description: optional

Tags:

enter tags separated by comma

GUID:

Provider	GUID	Account Name

Monitoring Policy: select a value

Security Domains:

Name	Description

VRF Name: CiscoLive-VRF

☑ Take me to this tenant when I click finish

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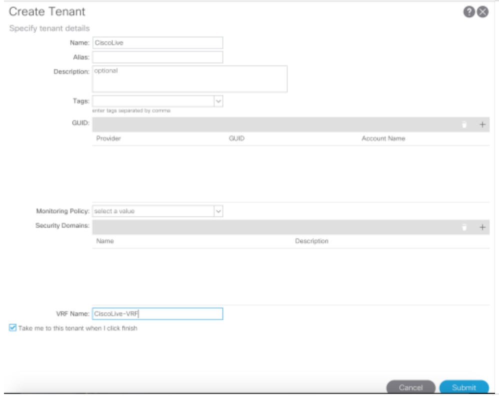
Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive

Alias:

Description: optional

Tags:

enter tags separated by comma

GUID:

Provider	GUID	Account Name

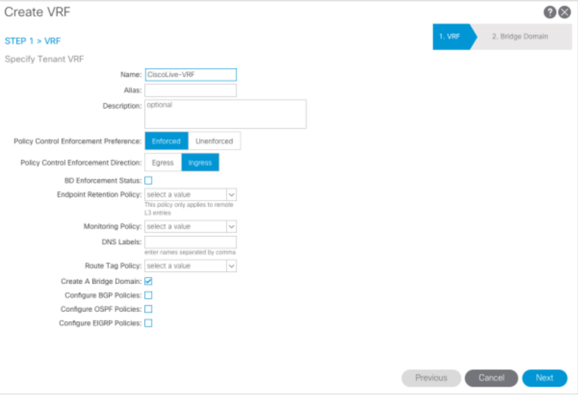
Monitoring Policy: select a value

Security Domains:

Name	Description

VRF Name: CiscoLive-VRF

☑ Take me to this tenant when I click finish



Create VRF

STEP 1 > VRF

Specify Tenant VRF

Name: CiscoLive-VRF

Alias:

Description: optional

Policy Control Enforcement Preference: [✓ Enforced] Unenforced

Policy Control Enforcement Direction: Egress [✓ Ingress]

BD Enforcement Status: □

Endpoint Retention Policy: select a value

This policy only applies to remote L3 entries

Monitoring Policy: select a value

DNS Labels:

enter names separated by comma

Route Tag Policy: select a value

Create A Bridge Domain: ☑

Configure BGP Policies: □

Configure OSPF Policies: □

Configure EIGRP Policies: □

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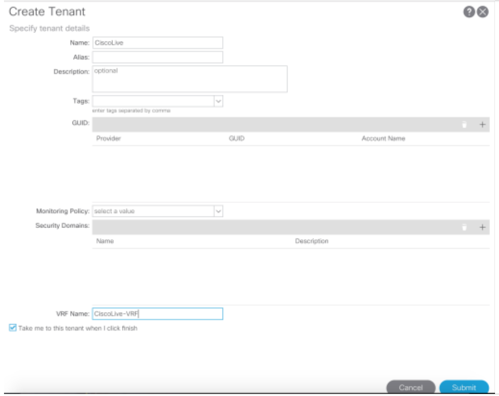
Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive

Alias:

Description: optional

Tags:

enter tags separated by comma

GUID:

Provider	GUID	Account Name

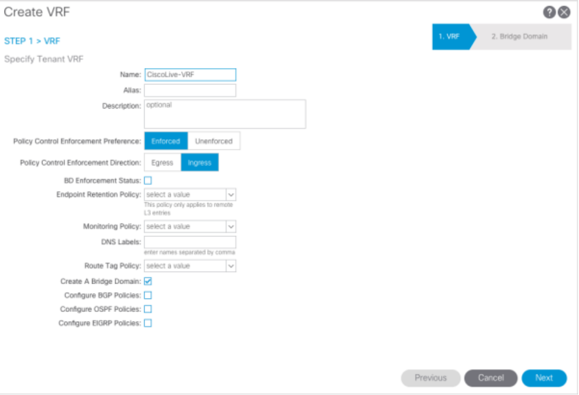
Monitoring Policy: select a value

Security Domains:

Name	Description

VRF Name: CiscoLive-VRF

☑ Take me to this tenant when I click finish



Create VRF

STEP 1 > VRF

Specify Tenant VRF

Name: CiscoLive-VRF

Alias:

Description: optional

Policy Control Enforcement Preference: [✓ Enforced] Unenforced

Policy Control Enforcement Direction: Egress [✓ Ingress]

BD Enforcement Status: □

Endpoint Retention Policy: select a value

This policy only applies to remote L3 entries

Monitoring Policy: select a value

DNS Labels:

enter names separated by comma

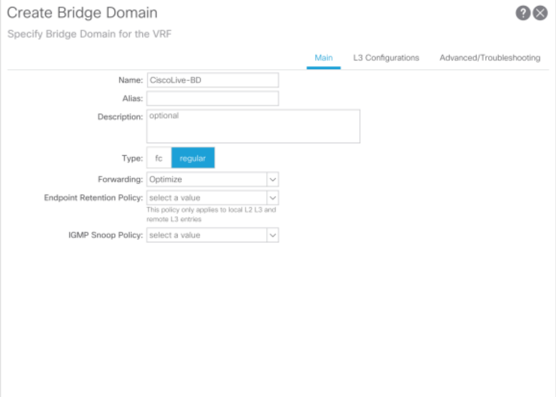
Route Tag Policy: select a value

Create A Bridge Domain: ☑

Configure BGP Policies: □

Configure OSPF Policies: □

Configure EIGRP Policies: □



Create Bridge Domain

Specify Bridge Domain for the VRF

Name: CiscoLive-BD

Alias:

Description: optional

Type: fc [✓ regular]

Forwarding: Optimize

Endpoint Retention Policy: select a value

This policy only applies to local L2 L3 and remote L3 entries

IGMP Snoop Policy: select a value

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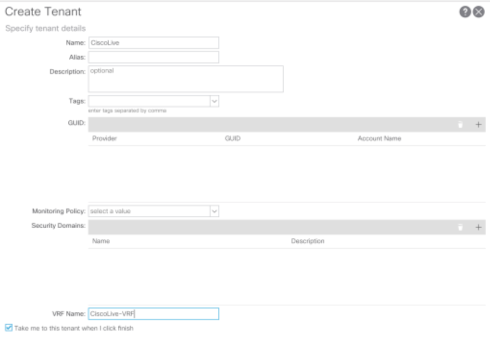
Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive

Alias:

Description: optional

Tags:

enter tags separated by comma

GUID:

Provider | GUID | Account Name

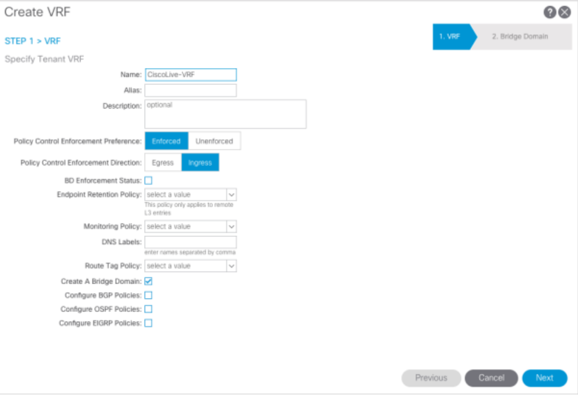
Monitoring Policy: select a value

Security Domains:

Name | Description

VRF Name: CiscoLive-VRF

☑ Take me to this tenant when I click finish



Create VRF

STEP 1 > VRF

Specify Tenant VRF

Name: CiscoLive-VRF

Alias:

Description: optional

Policy Control Enforcement Preference: [✓ Enforced] Unenforced

Policy Control Enforcement Direction: Egress [✓ Ingress]

BD Enforcement Status: □

Endpoint Retention Policy: select a value

This policy only applies to remote L3 entries

Monitoring Policy: select a value

DNS Labels:

enter names separated by comma

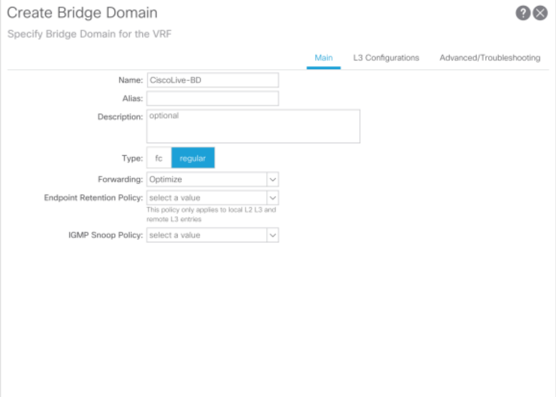
Route Tag Policy: select a value

Create A Bridge Domain: ☑

Configure BGP Policies: □

Configure OSPF Policies: □

Configure EIGRP Policies: □



Create Bridge Domain

Specify Bridge Domain for the VRF

Name: CiscoLive-BD

Alias:

Description: optional

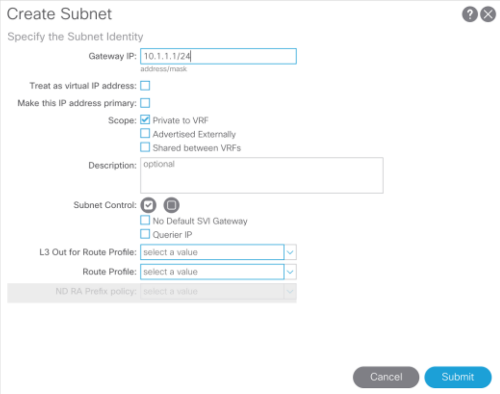
Type: fc [✓ regular]

Forwarding: Optimize

Endpoint Retention Policy: select a value

This policy only applies to local L2 L3 and remote L3 entries

IGMP Snoop Policy: select a value



Create Subnet

Specify the Subnet Identity

Gateway IP: 10.1.1.1/24

address/mask

Treat as virtual IP address: □

Make this IP address primary: □

Scope: ☑ Private to VRF

□ Advertised Externally

□ Shared between VRFs

Description: optional

Subnet Control:

□ No Default SVI Gateway

□ Querier IP

L3 Out for Route Profile: select a value

Route Profile: select a value

ND RA Prefix policy: select a value

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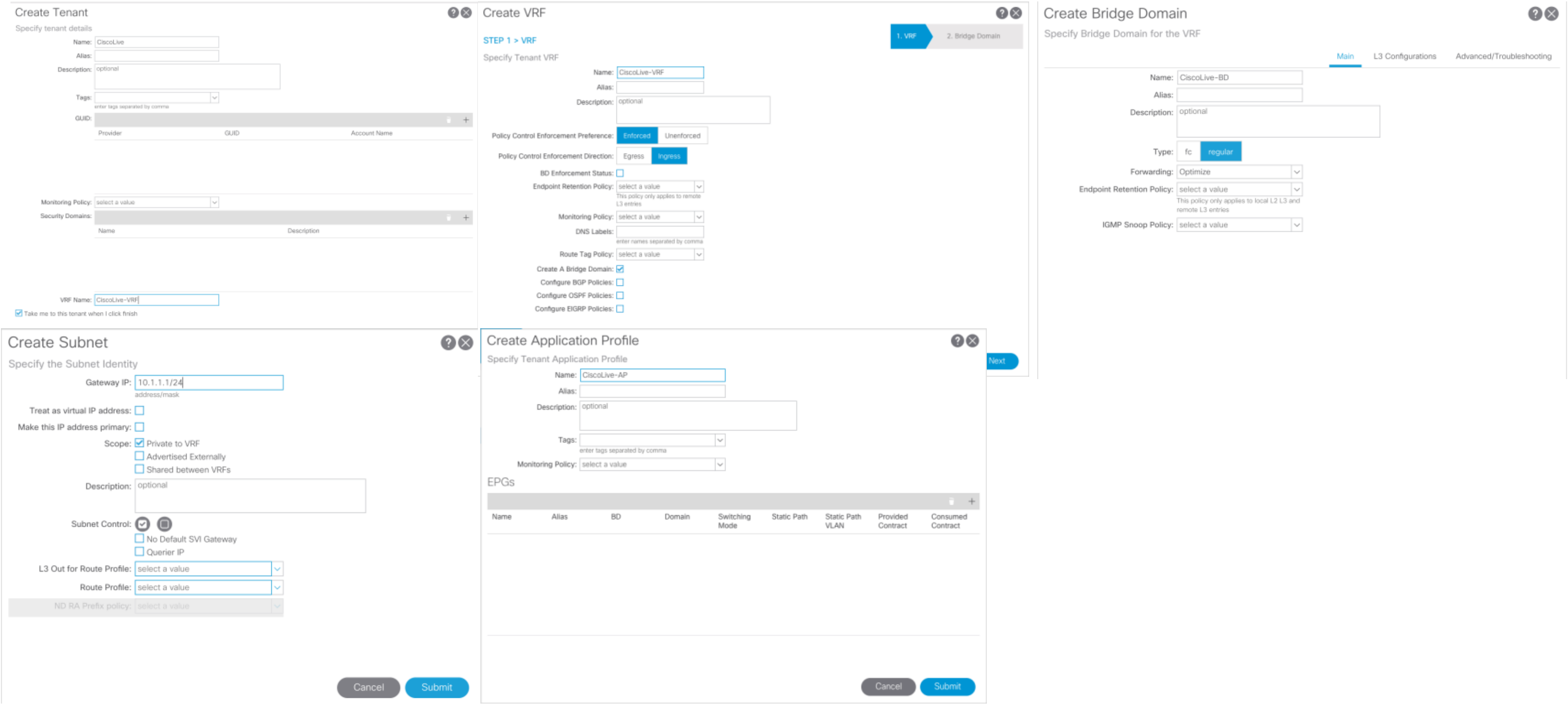
Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive

Alias:

Description: optional

Tags: (enter tags separated by comma)

GUID:

Provider	GUID	Account Name

Monitoring Policy: select a value

Security Domains:

Name	Description

VRF Name: CiscoLive-VRF

☑ Take me to this tenant when I click finish

Create VRF

STEP 1 > VRF

1. VRF → 2. Bridge Domain

Specify Tenant VRF

Name: CiscoLive-VRF

Alias:

Description: optional

Policy Control Enforcement Preference: [✓ Enforced] Unenforced

Policy Control Enforcement Direction: Egress [✓ Ingress]

BD Enforcement Status: □

Endpoint Retention Policy: select a value (This policy only applies to remote L3 entries)

Monitoring Policy: select a value

DNS Labels: (enter names separated by comma)

Route Tag Policy: select a value

Create A Bridge Domain: ☑

Configure BGP Policies: □

Configure OSPF Policies: □

Configure EIGRP Policies: □

Next

Create Bridge Domain

Specify Bridge Domain for the VRF

Main | L3 Configurations | Advanced/Troubleshooting

Name: CiscoLive-BD

Alias:

Description: optional

Type: fc [✓ regular]

Forwarding: Optimize

Endpoint Retention Policy: select a value (This policy only applies to local L2 L3 and remote L3 entries)

IGMP Snoop Policy: select a value

Create Subnet

Specify the Subnet Identity

Gateway IP: 10.1.1.1/24 (address/mask)

Treat as virtual IP address: □

Make this IP address primary: □

Scope: ☑ Private to VRF

□ Advertised Externally

□ Shared between VRFs

Description: optional

Subnet Control:

□ No Default SVI Gateway

□ Querier IP

L3 Out for Route Profile: select a value

Route Profile: select a value

ND RA Prefix policy: select a value

Cancel | Submit

Create Application Profile

Specify Tenant Application Profile

Name: CiscoLive-AP

Alias:

Description: optional

Tags: (enter tags separated by comma)

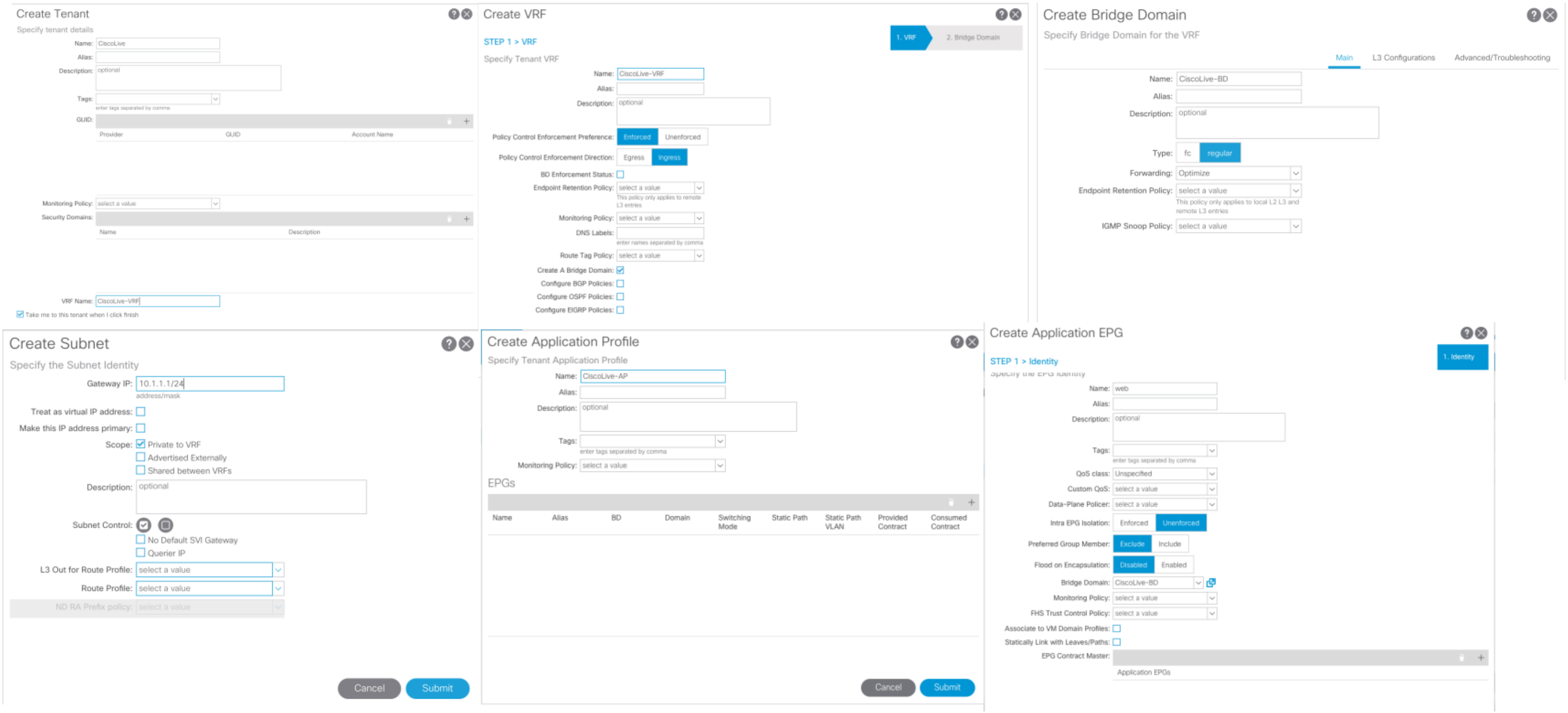
Monitoring Policy: select a value

EPGs

Name	Alias	BD	Domain	Switching Mode	Static Path	Static Path VLAN	Provided Contract	Consumed Contract

Cancel | Submit

Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive
Alias:
Description: optional
Tags: enter tags separated by comma
GUID:

Provider	GUID	Account Name

Monitoring Policy: select a value
Security Domains:

Name	Description

VRF Name: CiscoLive-VRF
☑ Take me to this tenant when I click finish

Create VRF

STEP 1 > VRF

1. VRF — 2. Bridge Domain

Specify Tenant VRF

Name: CiscoLive-VRF
Alias:
Description: optional
Policy Control Enforcement Preference: [✓ Enforced] Unenforced
Policy Control Enforcement Direction: Egress [✓ Ingress]
BD Enforcement Status: □
Endpoint Retention Policy: select a value
This policy only applies to remote L3 entries
Monitoring Policy: select a value
DNS Labels: enter names separated by comma
Route Tag Policy: select a value
Create A Bridge Domain: ☑
Configure BGP Policies: □
Configure OSPF Policies: □
Configure EIGRP Policies: □

Create Bridge Domain

Specify Bridge Domain for the VRF

Main | L3 Configurations | Advanced/Troubleshooting

Name: CiscoLive-BD
Alias:
Description: optional
Type: fc [✓ regular]
Forwarding: Optimize
Endpoint Retention Policy: select a value
This policy only applies to local L2 L3 and remote L3 entries
IGMP Snoop Policy: select a value

Create Subnet

Specify the Subnet Identity

Gateway IP: 10.1.1.1/24
address/mask
Treat as virtual IP address: □
Make this IP address primary: □
Scope: ☑ Private to VRF
□ Advertised Externally
□ Shared between VRFs
Description: optional
Subnet Control:
□ No Default SVI Gateway
□ Querier IP
L3 Out for Route Profile: select a value
Route Profile: select a value
ND RA Prefix policy: select a value

Cancel Submit

Create Application Profile

Specify Tenant Application Profile

Name: CiscoLive-AP
Alias:
Description: optional
Tags: enter tags separated by comma
Monitoring Policy: select a value

EPGs

Name	Alias	BD	Domain	Switching Mode	Static Path	Static Path VLAN	Provided Contract	Consumed Contract

Cancel Submit

Create Application EPG

STEP 1 > Identity

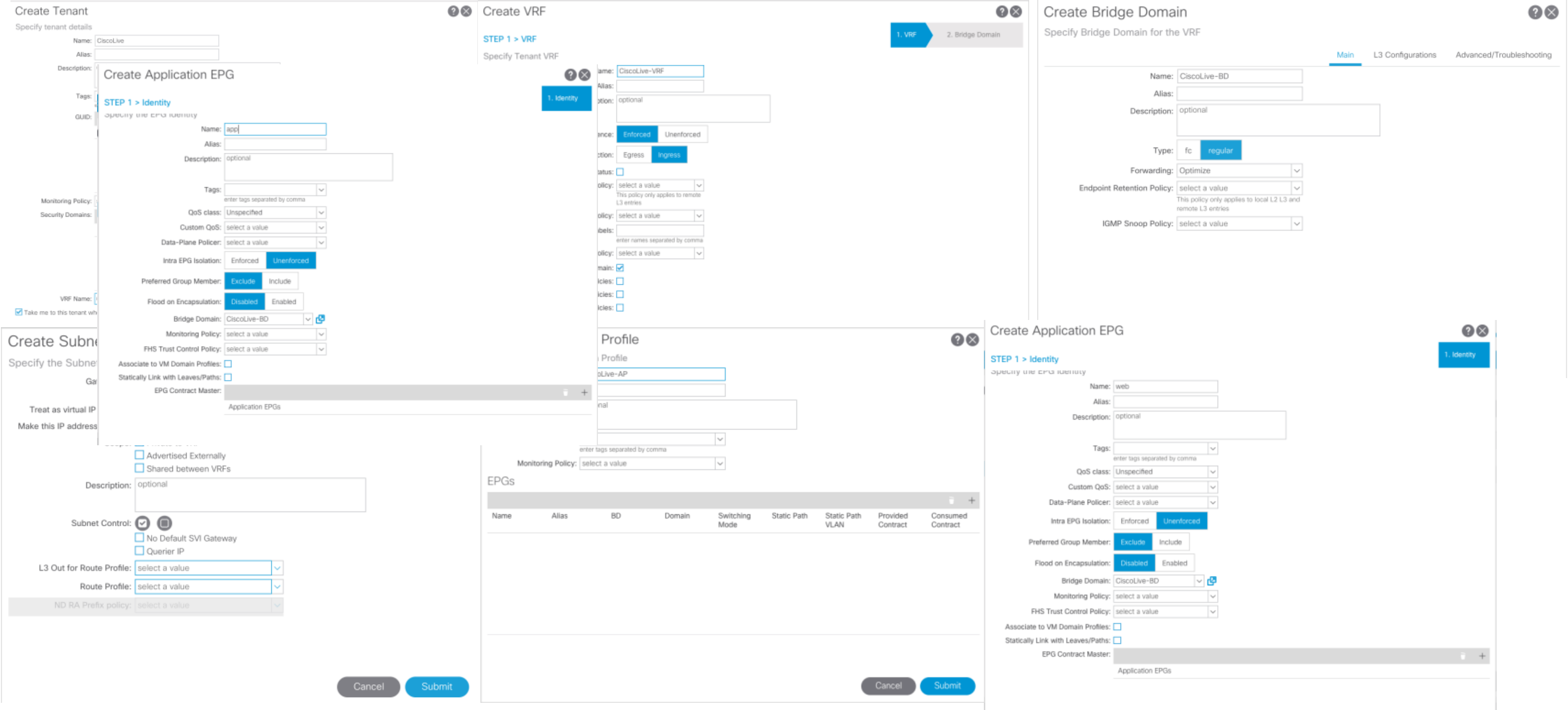
1. Identity

Specify the EPG Identity

Name: web
Alias:
Description: optional
Tags: enter tags separated by comma
QoS class: Unspecified
Custom QoS: select a value
Data-Plane Policer: select a value
Intra EPG Isolation: Enforced [✓ Unenforced]
Preferred Group Member: [✓ Exclude] Include
Flood on Encapsulation: [✓ Disabled] Enabled
Bridge Domain: CiscoLive-BD
Monitoring Policy: select a value
FHS Trust Control Policy: select a value
Associate to VM Domain Profiles: □
Statically Link with Leaves/Paths: □
EPG Contract Master:

Application EPGs

Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive

Alias:

Description:

Tags:

GUID:

Monitoring Policy:

Security Domains:

VRF Name:

☑ Take me to this tenant wh

Create VRF

STEP 1 > VRF

Specify Tenant VRF

1. VRF · 2. Bridge Domain

ame: CiscoLive-VRF

Alias:

ption: optional

ence: [✓ Enforced] Unenforced

ction: Egress [✓ Ingress]

tatus: □

olicy: select a value

This policy only applies to remote L3 entries

olicy: select a value

bels:

enter names separated by comma

olicy: select a value

main: ☑

icies: □

icies: □

icies: □

Create Bridge Domain

Specify Bridge Domain for the VRF

Main · L3 Configurations · Advanced/Troubleshooting

Name: CiscoLive-BD

Alias:

Description: optional

Type: fc [✓ regular]

Forwarding: Optimize

Endpoint Retention Policy: select a value

This policy only applies to local L2 L3 and remote L3 entries

IGMP Snoop Policy: select a value

Create Application EPG

STEP 1 > Identity

Specify the EPG identity

1. Identity

Name: app

Alias:

Description: optional

Tags:

enter tags separated by comma

QoS class: Unspecified

Custom QoS: select a value

Data-Plane Policer: select a value

Intra EPG Isolation: Enforced [✓ Unenforced]

Preferred Group Member: [✓ Exclude] Include

Flood on Encapsulation: [✓ Disabled] Enabled

Bridge Domain: CiscoLive-BD

Monitoring Policy: select a value

FHS Trust Control Policy: select a value

Associate to VM Domain Profiles: □

Statically Link with Leaves/Paths: □

EPG Contract Master:

Application EPGs

Create Subne

Specify the Subne

Ga

Treat as virtual IP

Make this IP address

□ Advertised Externally

□ Shared between VRFs

Description: optional

Subnet Control:

□ No Default SVI Gateway

□ Querier IP

L3 Out for Route Profile: select a value

Route Profile: select a value

ND RA Prefix policy: select a value

Cancel · Submit

Profile

Profile

oLive-AP

nal

enter tags separated by comma

Monitoring Policy: select a value

EPGs

Name	Alias	BD	Domain	Switching Mode	Static Path	Static Path VLAN	Provided Contract	Consumed Contract

Cancel · Submit

Create Application EPG

STEP 1 > Identity

Specify the EPG identity

1. Identity

Name: web

Alias:

Description: optional

Tags:

enter tags separated by comma

QoS class: Unspecified

Custom QoS: select a value

Data-Plane Policer: select a value

Intra EPG Isolation: Enforced [✓ Unenforced]

Preferred Group Member: [✓ Exclude] Include

Flood on Encapsulation: [✓ Disabled] Enabled

Bridge Domain: CiscoLive-BD

Monitoring Policy: select a value

FHS Trust Control Policy: select a value

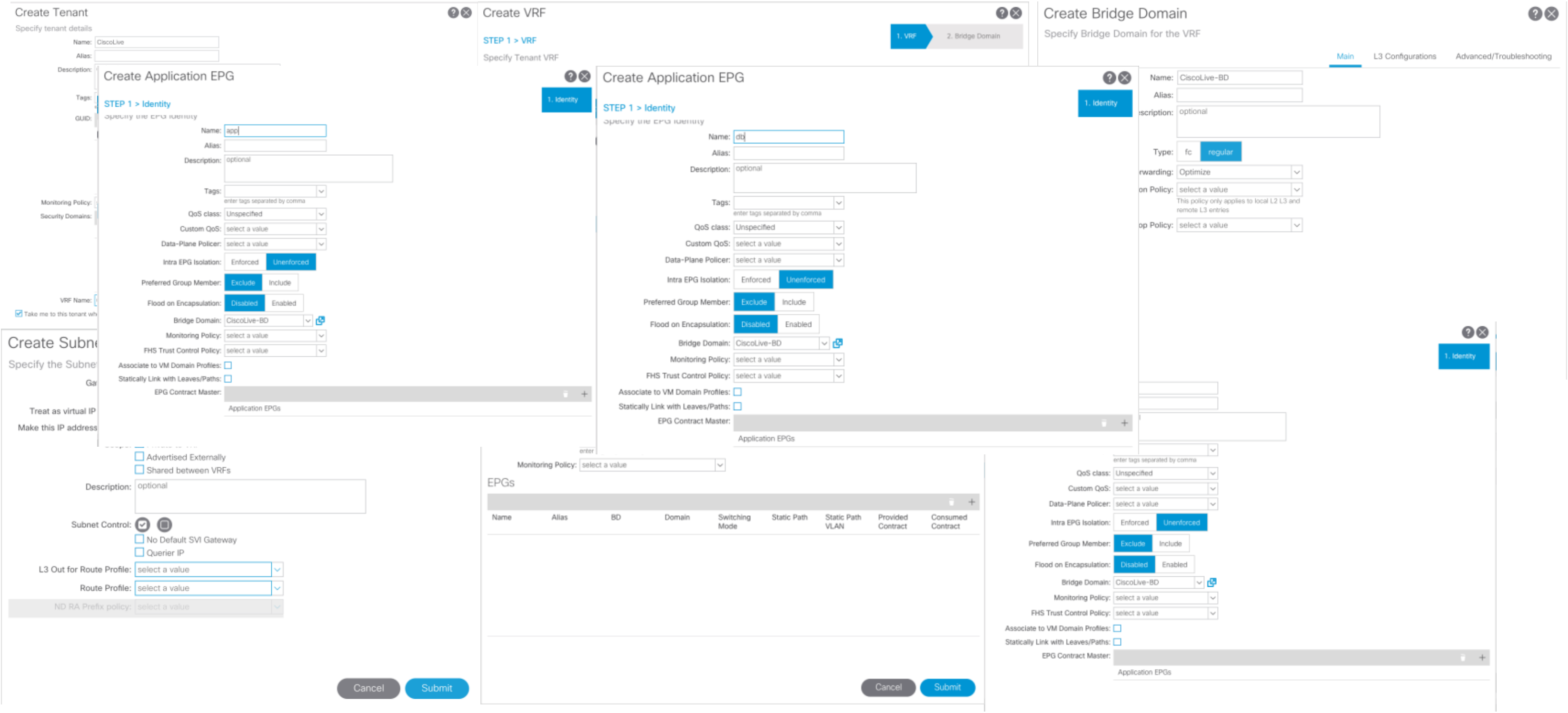
Associate to VM Domain Profiles: □

Statically Link with Leaves/Paths: □

EPG Contract Master:

Application EPGs

Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive

Alias:

Description:

Tags:

GUID:

Monitoring Policy:

Security Domains:

VRF Name:

☑ Take me to this tenant wh

Create VRF

STEP 1 > VRF

Specify Tenant VRF

1. VRF | 2. Bridge Domain

Create Bridge Domain

Specify Bridge Domain for the VRF

Main | L3 Configurations | Advanced/Troubleshooting

Name: CiscoLive-BD

Alias:

Description: optional

Type: fc | [✓ regular]

Forwarding: Optimize

Endpoint Retention Policy: select a value

This policy only applies to local L2 L3 and remote L3 entries

IGMP Snoop Policy: select a value

Create Application EPG

STEP 1 > Identity

Specify the EPG identity

1. Identity

Name: app

Alias:

Description: optional

Tags:

enter tags separated by comma

QoS class: Unspecified

Custom QoS: select a value

Data-Plane Policer: select a value

Intra EPG Isolation: Enforced | [✓ Unenforced]

Preferred Group Member: [✓ Exclude] | Include

Flood on Encapsulation: [✓ Disabled] | Enabled

Bridge Domain: CiscoLive-BD

Monitoring Policy: select a value

FHS Trust Control Policy: select a value

Associate to VM Domain Profiles: □

Statically Link with Leaves/Paths: □

EPG Contract Master:

Application EPGs

Create Application EPG

STEP 1 > Identity

Specify the EPG identity

1. Identity

Name: db

Alias:

Description: optional

Tags:

enter tags separated by comma

QoS class: Unspecified

Custom QoS: select a value

Data-Plane Policer: select a value

Intra EPG Isolation: Enforced | [✓ Unenforced]

Preferred Group Member: [✓ Exclude] | Include

Flood on Encapsulation: [✓ Disabled] | Enabled

Bridge Domain: CiscoLive-BD

Monitoring Policy: select a value

FHS Trust Control Policy: select a value

Associate to VM Domain Profiles: □

Statically Link with Leaves/Paths: □

EPG Contract Master:

Application EPGs

Create Subnet

Specify the Subnet

Gateway IP:

Treat as virtual IP

Make this IP address primary

□ Advertised Externally

□ Shared between VRFs

Description: optional

Subnet Control:

□ No Default SVI Gateway

□ Querier IP

L3 Out for Route Profile: select a value

Route Profile: select a value

ND RA Prefix policy: select a value

Cancel | Submit

Monitoring Policy: select a value

EPGs

Name	Alias	BD	Domain	Switching Mode	Static Path	Static Path VLAN	Provided Contract	Consumed Contract

Cancel | Submit

1. Identity

enter tags separated by comma

QoS class: Unspecified

Custom QoS: select a value

Data-Plane Policer: select a value

Intra EPG Isolation: Enforced | [✓ Unenforced]

Preferred Group Member: [✓ Exclude] | Include

Flood on Encapsulation: [✓ Disabled] | Enabled

Bridge Domain: CiscoLive-BD

Monitoring Policy: select a value

FHS Trust Control Policy: select a value

Associate to VM Domain Profiles: □

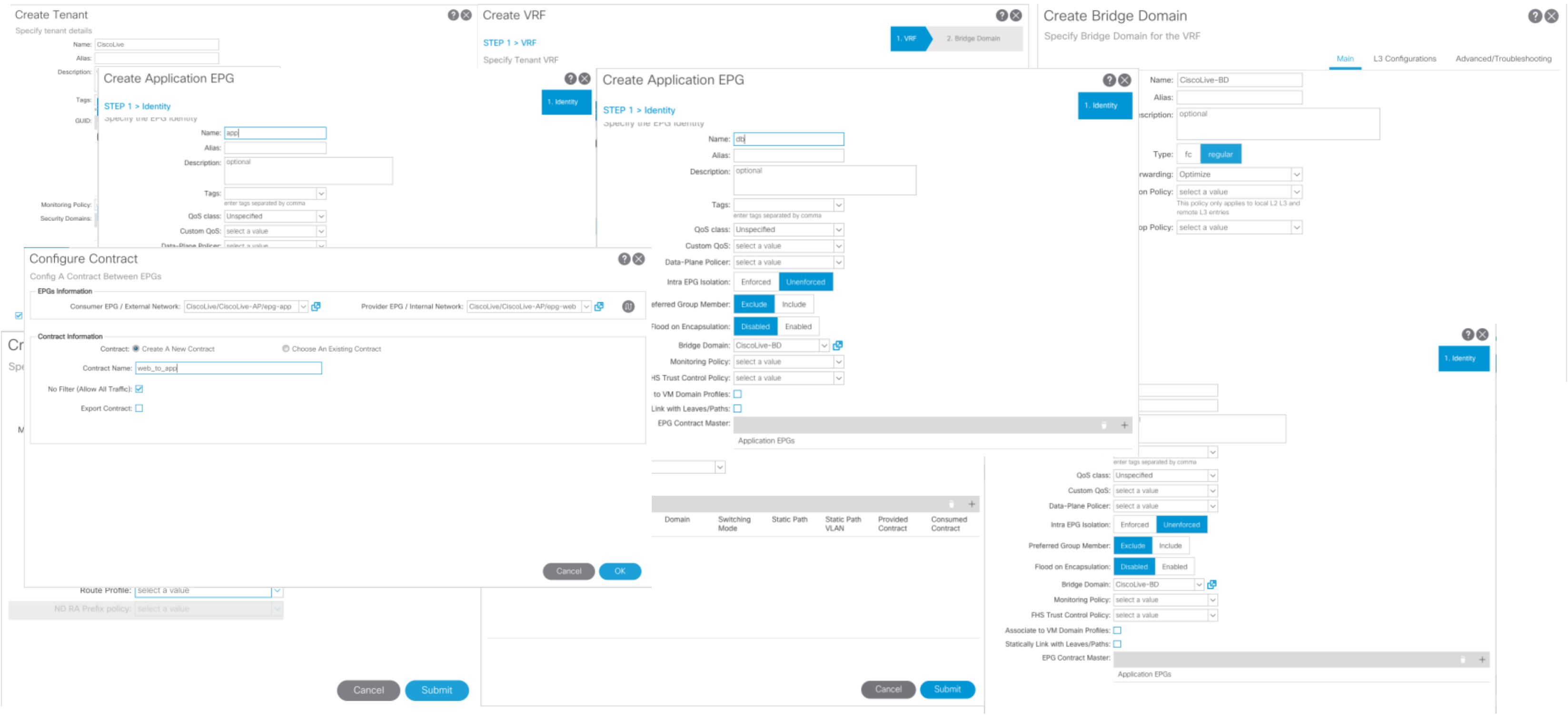
Statically Link with Leaves/Paths: □

EPG Contract Master:

Application EPGs

cisco Live!

Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive

Alias:

Description:

Tags:

GUID:

Monitoring Policy:

Security Domains:

Create VRF

STEP 1 > VRF

Specify Tenant VRF

Create Application EPG

STEP 1 > Identity

Specify the EPG Identity

Name: app

Alias:

Description: optional

Tags:

enter tags separated by comma

QoS class: Unspecified

Custom QoS: select a value

Data-Plane Policer: select a value

Create Application EPG

STEP 1 > Identity

Specify the EPG Identity

Name: db

Alias:

Description: optional

Tags:

enter tags separated by comma

QoS class: Unspecified

Custom QoS: select a value

Data-Plane Policer: select a value

Intra EPG Isolation: Enforced [✓ Unenforced]

eferred Group Member: [✓ Exclude] Include

Flood on Encapsulation: [✓ Disabled] Enabled

Bridge Domain: CiscoLive-BD

Monitoring Policy: select a value

HS Trust Control Policy: select a value

to VM Domain Profiles: □

Link with Leaves/Paths: □

EPG Contract Master:

Application EPGs

Create Bridge Domain

Specify Bridge Domain for the VRF

Name: CiscoLive-BD

Alias:

escription: optional

Type: fc [✓ regular]

rwarding: Optimize

on Policy: select a value

This policy only applies to local L2 L3 and remote L3 entries

op Policy: select a value

Configure Contract

Config A Contract Between EPGs

EPGs Information

Consumer EPG / External Network: CiscoLive/CiscoLive-AP/epg-app

Provider EPG / Internal Network: CiscoLive/CiscoLive-AP/epg-web

Contract Information

Contract: ● Create A New Contract ○ Choose An Existing Contract

Contract Name: web_to_app

No Filter (Allow All Traffic): ☑

Export Contract: □

Route Profile: select a value

ND RA Prefix policy: select a value

enter tags separated by comma

QoS class: Unspecified

Custom QoS: select a value

Data-Plane Policer: select a value

Intra EPG Isolation: Enforced [✓ Unenforced]

Preferred Group Member: [✓ Exclude] Include

Flood on Encapsulation: [✓ Disabled] Enabled

Bridge Domain: CiscoLive-BD

Monitoring Policy: select a value

FHS Trust Control Policy: select a value

Associate to VM Domain Profiles: □

Statically Link with Leaves/Paths: □

EPG Contract Master:

Application EPGs

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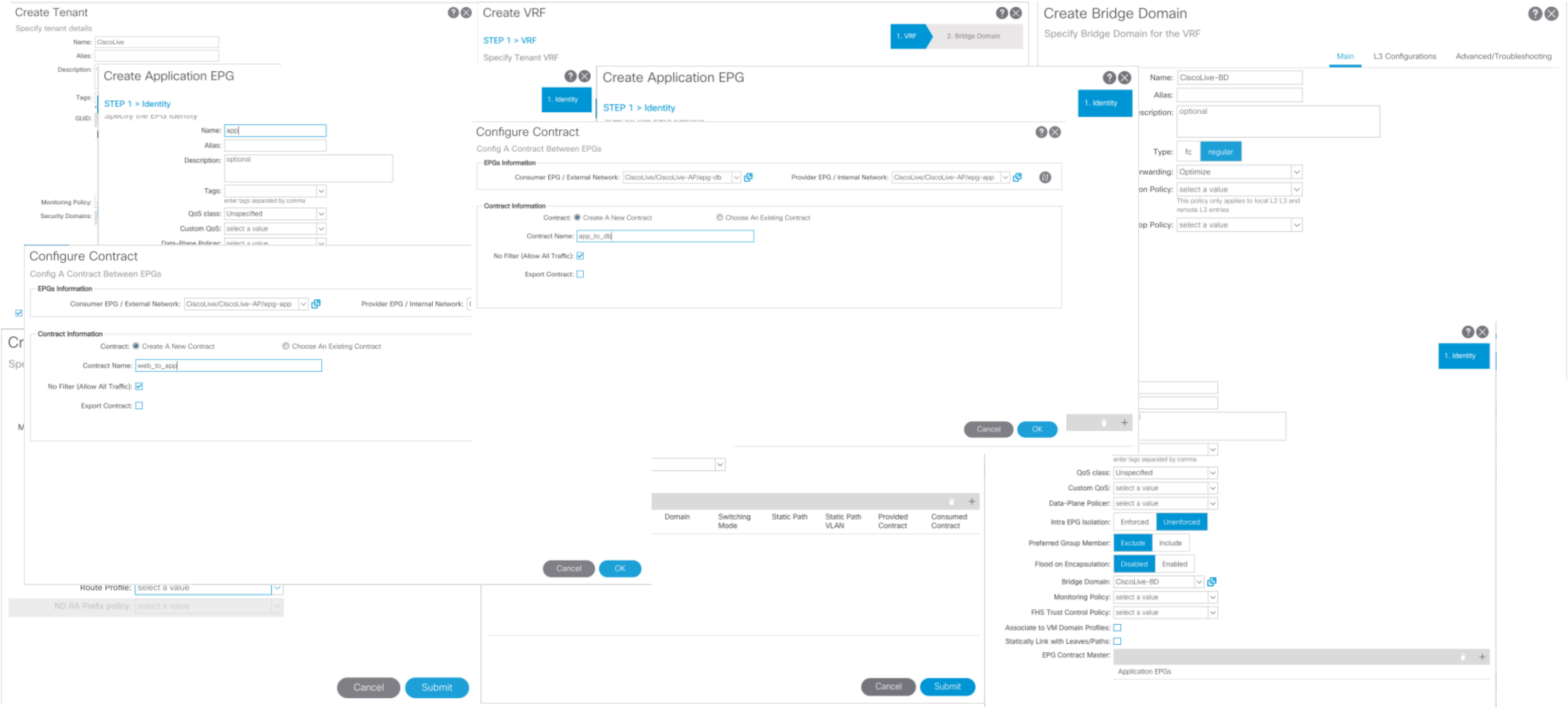
Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive

Alias:

Description:

Tags:

GUID:

Monitoring Policy:

Security Domains:

Route Profile: select a value

ND RA Prefix policy: select a value

Create VRF

STEP 1 > VRF

Specify Tenant VRF

1. VRF → 2. Bridge Domain

Create Bridge Domain

Specify Bridge Domain for the VRF

Main | L3 Configurations | Advanced/Troubleshooting

Name: CiscoLive-BD

Alias:

Description: optional

Type: fc [✓ regular]

Forwarding: Optimize

Policy: select a value

This policy only applies to local L2 L3 and remote L3 entries

Policy: select a value

Create Application EPG

STEP 1 > Identity

Specify the EPG identity

Name: app

Alias:

Description: optional

Tags: (enter tags separated by comma)

QoS class: Unspecified

Custom QoS: select a value

Data-Plane Policer: select a value

Configure Contract

Config A Contract Between EPGs

EPGs Information

Consumer EPG / External Network: CiscoLive/CiscoLive-AP/epg-app

Provider EPG / Internal Network:

Contract Information

Contract: ● Create A New Contract ○ Choose An Existing Contract

Contract Name: web_to_app

No Filter (Allow All Traffic): ☑

Export Contract: □

Configure Contract

Config A Contract Between EPGs

EPGs Information

Consumer EPG / External Network: CiscoLive/CiscoLive-AP/epg-db

Provider EPG / Internal Network: CiscoLive/CiscoLive-AP/epg-app

Contract Information

Contract: ● Create A New Contract ○ Choose An Existing Contract

Contract Name: app_to_db

No Filter (Allow All Traffic): ☑

Export Contract: □

Create Application EPG

STEP 1 > Identity

QoS class: Unspecified

Custom QoS: select a value

Data-Plane Policer: select a value

Intra EPG Isolation: Enforced [✓ Unenforced]

Preferred Group Member: [✓ Exclude] Include

Flood on Encapsulation: [✓ Disabled] Enabled

Bridge Domain: CiscoLive-BD

Monitoring Policy: select a value

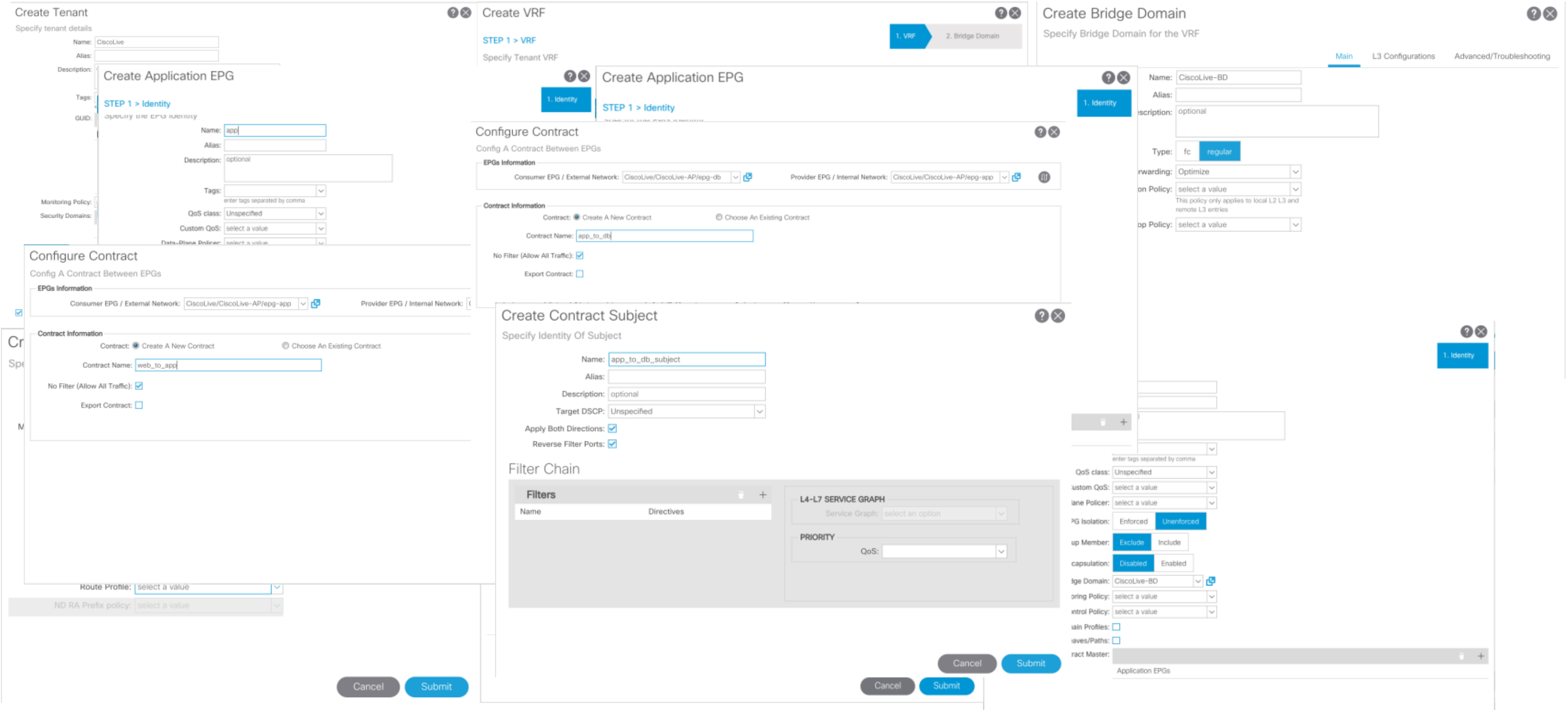
FHS Trust Control Policy: select a value

Associate to VM Domain Profiles: □

Statically Link with Leaves/Paths: □

EPG Contract Master:

Deploy Three Tier Application – APIC GUI



Create Tenant
Specify tenant details
Name: CiscoLive
Alias:
Description:
Tags:
GUID:
Monitoring Policy:
Security Domains:

Create VRF
STEP 1 > VRF
Specify Tenant VRF

Create Bridge Domain
Specify Bridge Domain for the VRF

Name: CiscoLive-BD
Alias:
scription: optional
Type: fc [✓ regular]
rwarding: Optimize
on Policy: select a value
This policy only applies to local L2 L3 and remote L3 entries
op Policy: select a value

Create Application EPG
STEP 1 > Identity
Specify the EPG identity
Name: app
Alias:
Description: optional
Tags:
enter tags separated by comma
QoS class: Unspecified
Custom QoS: select a value
Data-Plane Policer: select a value

Create Application EPG
STEP 1 > Identity

Configure Contract
Config A Contract Between EPGs
EPGs Information
Consumer EPG / External Network: CiscoLive/CiscoLive-AP/epg-app
Provider EPG / Internal Network:
Contract Information
Contract: ● Create A New Contract ○ Choose An Existing Contract
Contract Name: web_to_app
No Filter (Allow All Traffic): ☑
Export Contract: □

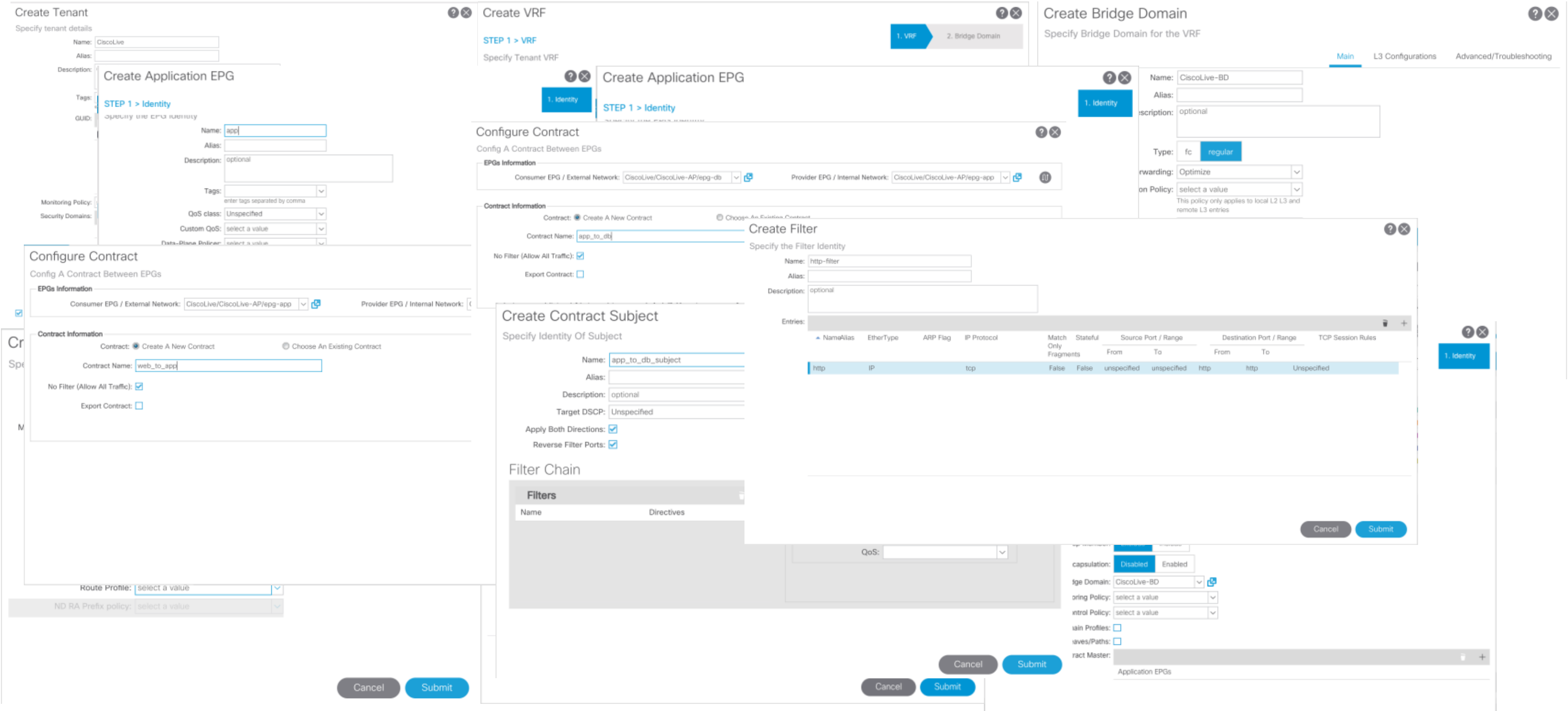
Configure Contract
Config A Contract Between EPGs
EPGs Information
Consumer EPG / External Network: CiscoLive/CiscoLive-AP/epg-db
Provider EPG / Internal Network: CiscoLive/CiscoLive-AP/epg-app
Contract Information
Contract: ● Create A New Contract ○ Choose An Existing Contract
Contract Name: app_to_db
No Filter (Allow All Traffic): ☑
Export Contract: □

Create Contract Subject
Specify Identity Of Subject
Name: app_to_db_subject
Alias:
Description: optional
Target DSCP: Unspecified
Apply Both Directions: ☑
Reverse Filter Ports: ☑
Filter Chain

enter tags separated by comma
QoS class: Unspecified
ustom QoS: select a value
lane Policer: select a value
'G Isolation: Enforced [✓ Unenforced]
up Member: [✓ Exclude] Include
capsulation: [✓ Disabled] Enabled
lge Domain: CiscoLive-BD
oring Policy: select a value
ntrol Policy: select a value
ain Profiles: □
aves/Paths: □
ract Master:
Application EPGs

Route Profile: select a value
ND RA Prefix policy: select a value

Deploy Three Tier Application – APIC GUI



Create Tenant
Specify tenant details
Name: CiscoLive
Alias:
Description:
Tags:
GUID:
Monitoring Policy:
Security Domains:

Create VRF
STEP 1 > VRF
Specify Tenant VRF
1. VRF | 2. Bridge Domain

Create Bridge Domain
Specify Bridge Domain for the VRF
Main | L3 Configurations | Advanced/Troubleshooting
Name: CiscoLive-BD
Alias:
Description: optional
Type: fc | regular
Forwarding: Optimize
Policy: select a value
This policy only applies to local L2 L3 and remote L3 entries

Create Application EPG
STEP 1 > Identity
Specify the EPG Identity
Name: app
Alias:
Description: optional
Tags: (enter tags separated by comma)
QoS class: Unspecified
Custom QoS: select a value
Data-Plane Policer: select a value

Create Application EPG
STEP 1 > Identity
1. Identity

Configure Contract
Config A Contract Between EPGs
EPGs Information
Consumer EPG / External Network: CiscoLive/CiscoLive-AP/epg-app
Provider EPG / Internal Network:
Contract Information
Contract: ● Create A New Contract ○ Choose An Existing Contract
Contract Name: web_to_app
No Filter (Allow All Traffic): ☑
Export Contract: □

Configure Contract
Config A Contract Between EPGs
EPGs Information
Consumer EPG / External Network: CiscoLive/CiscoLive-AP/epg-db
Provider EPG / Internal Network: CiscoLive/CiscoLive-AP/epg-app
Contract Information
Contract: ● Create A New Contract ○ Choose An Existing Contract
Contract Name: app_to_db
No Filter (Allow All Traffic): ☑
Export Contract: □

Create Contract Subject
Specify Identity Of Subject
Name: app_to_db_subject
Alias:
Description: optional
Target DSCP: Unspecified
Apply Both Directions: ☑
Reverse Filter Ports: ☑
Filter Chain
Filters
Name | Directives
QoS:

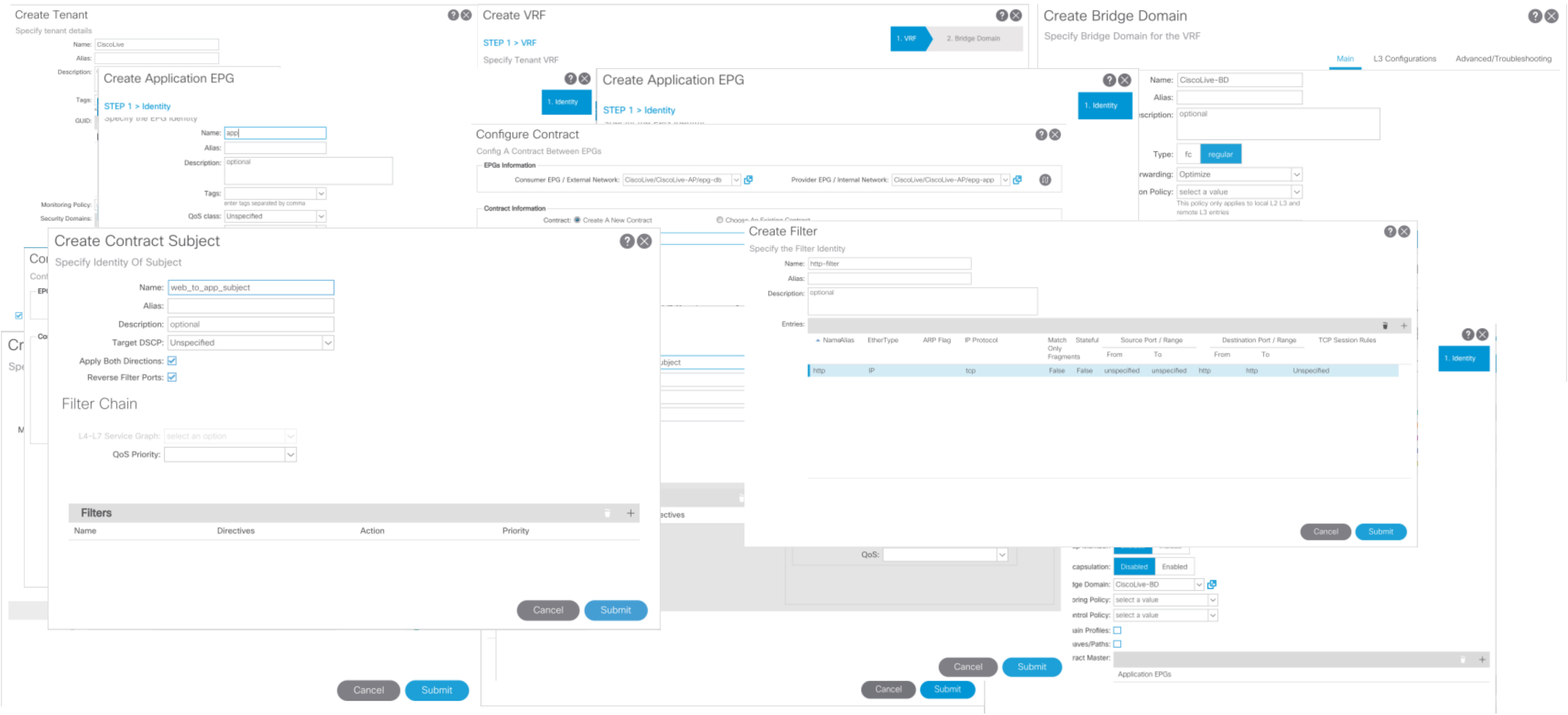
Create Filter
Specify the Filter Identity
Name: http-filter
Alias:
Description: optional
Entries:

NameAlias	EtherType	ARP Flag	IP Protocol	Match Only Fragments	Stateful	Source Port / Range		Destination Port / Range		TCP Session Rules
						From	To	From	To	
http	IP		tcp	False	False	unspecified	unspecified	http	http	Unspecified

Encapsulation: Disabled | Enabled
Bridge Domain: CiscoLive-BD
Monitoring Policy: select a value
Control Policy: select a value
Domain Profiles: □
Leaves/Paths: □
Contract Master:
Application EPGs

Route Profile: select a value
ND RA Prefix policy: select a value

Deploy Three Tier Application – APIC GUI



Create Tenant

Specify tenant details

Name: CiscoLive

Alias:

Description:

Tags:

GUID:

Monitoring Policy:

Security Domains:

Create VRF

STEP 1 > VRF

Specify Tenant VRF

1. VRF | 2. Bridge Domain

Create Bridge Domain

Specify Bridge Domain for the VRF

Main | L3 Configurations | Advanced/Troubleshooting

Name: CiscoLive-BD

Alias:

Description: optional

Type: fc | regular

Forwarding: Optimize

Policy: select a value

This policy only applies to local L2 L3 and remote L3 entries

Create Application EPG

STEP 1 > Identity

Specify the EPG Identity

Name: app

Alias:

Description: optional

Tags:

enter tags separated by comma

QoS class: Unspecified

Create Application EPG

STEP 1 > Identity

1. Identity

Encapsulation: Disabled | Enabled

Bridge Domain: CiscoLive-BD

Monitoring Policy: select a value

Control Policy: select a value

Domain Profiles: □

Leaves/Paths: □

Contract Master:

Application EPGs

Configure Contract

Config A Contract Between EPGs

EPGs Information

Consumer EPG / External Network: CiscoLive/CiscoLive-AP/epg-db

Provider EPG / Internal Network: CiscoLive/CiscoLive-AP/epg-app

Contract Information

Contract: ● Create A New Contract ○ Choose An Existing Contract

QoS:

Create Contract Subject

Specify Identity Of Subject

Name: web_to_app_subject

Alias:

Description: optional

Target DSCP: Unspecified

Apply Both Directions: ☑

Reverse Filter Ports: ☑

Filter Chain

L4-L7 Service Graph: select an option

QoS Priority:

Filters

Name	Directives	Action	Priority

Create Filter

Specify the Filter Identity

Name: http-filter

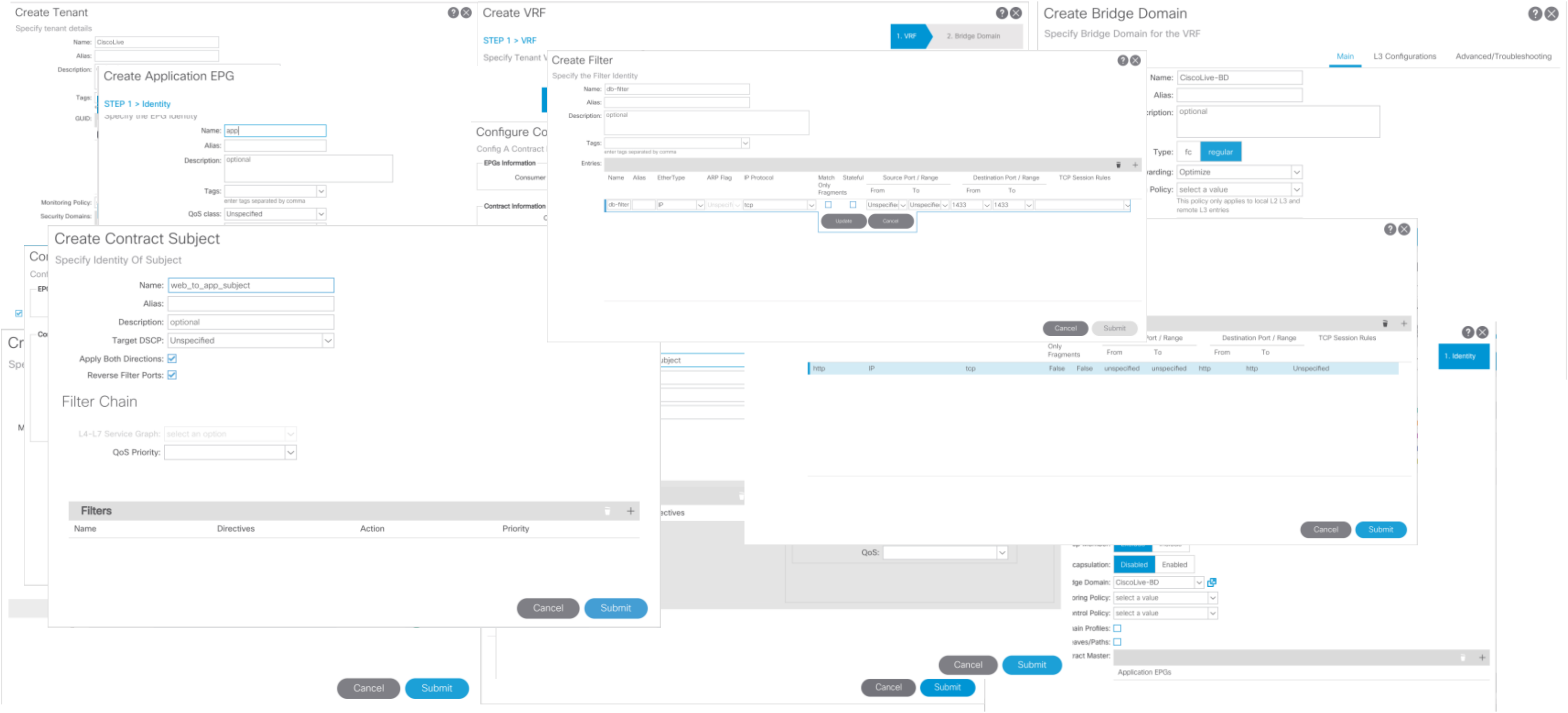
Alias:

Description: optional

Entries:

NameAlias	EtherType	ARP Flag	IP Protocol	Match Only Fragments	Stateful	Source Port / Range From	Source Port / Range To	Destination Port / Range From	Destination Port / Range To	TCP Session Rules
http	IP		tcp	False	False	unspecified	unspecified	http	http	Unspecified

Deploy Three Tier Application – APIC GUI



Create Tenant
Specify tenant details
Name: CiscoLive
Alias:
Description:
Tags:
GUID:
Monitoring Policy:
Security Domains:

Create Application EPG
STEP 1 > Identity
Specify the EPG Identity
Name: app
Alias:
Description: optional
Tags: enter tags separated by comma
QoS class: Unspecified

Create VRF
STEP 1 > VRF
Specify Tenant VRF
1. VRF · 2. Bridge Domain

Configure Contract
Config A Contract
EPGs Information
Consumer
Contract Information

Create Filter
Specify the Filter Identity
Name: db-filter
Alias:
Description: optional
Tags: enter tags separated by comma
Entries:

Name	Alias	EtherType	ARP Flag	IP Protocol	Match Only Fragments	Stateful	Source Port / Range From	Source Port / Range To	Destination Port / Range From	Destination Port / Range To	TCP Session Rules
db-filter		IP	Unspecified	tcp	□	□	Unspecified	Unspecified	1433	1433	

Update · Cancel

Cancel · Submit

Create Bridge Domain
Specify Bridge Domain for the VRF
Main · L3 Configurations · Advanced/Troubleshooting
Name: CiscoLive-BD
Alias:
Description: optional
Type: fc [regular]
Forwarding: Optimize
Policy: select a value
This policy only applies to local L2 L3 and remote L3 entries

					Match Only Fragments	Stateful	Source Port / Range From	Source Port / Range To	Destination Port / Range From	Destination Port / Range To	TCP Session Rules
http		IP		tcp	False	False	unspecified	unspecified	http	http	Unspecified

Cancel · Submit

1. Identity

Create Contract Subject
Specify Identity Of Subject
Name: web_to_app_subject
Alias:
Description: optional
Target DSCP: Unspecified
Apply Both Directions: ☑
Reverse Filter Ports: ☑

Filter Chain
L4-L7 Service Graph: select an option
QoS Priority:

Filters

Name	Directives	Action	Priority

Cancel · Submit

Subject
Directives
QoS:

Encapsulation: [✓ Disabled] Enabled
Bridge Domain: CiscoLive-BD
Monitoring Policy: select a value
Control Policy: select a value
Domain Profiles: □
Leaves/Paths: □
Contract Master:
Application EPGs

Cancel · Submit
Cancel · Submit
Cancel · Submit

Overview of Ansible

Inventory, Playbooks, and Modules

What is Ansible?

ANSIBLE

- Open Source
- Automation, Configuration & Orchestration
- Version 2.9
  - 2.7 & 2.8 Also supported
  - ACI support - 2.4
- Supported on UNIX/Linux
  - Windows subsystem for Linux
- Can manage different systems
  - ACI, IOS, NX-OS, IOS-XR

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What is Ansible?

- Agentless
  - Push Model
- Idempotent
- YAML based
  - Readable
- APIC REST API interface
  - Same as GUI
- Requires no special programming skills
  - Python is helpful

What makes up Ansible?

- Control Machine – Used to configure and push playbooks/plays to target systems
- Target Systems – Systems we want Ansible to control/automate
- Inventory files – Text based host files for target systems
  - INI or YAML based
- Playbook – Series of plays/automation tasks
  - Also YAML based
- Modules – reusable scripts that perform tasks in Ansible

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Example ACI Ansible Inventory

YAML inventory file

```yaml
all:
  hosts:
    Fabric1:
      inventory_hostname: 10.50.62.1
      username: admin
      password: cisco
    Fabric2:
      inventory_hostname: 10.51.92.1
      username: admin
      password: cisco
```

INI inventory file

```ini
[Fabric1]
la-apic1 username=admin password=cisco

[Fabric2]
ny-apic3 username=admin password=cisco
```

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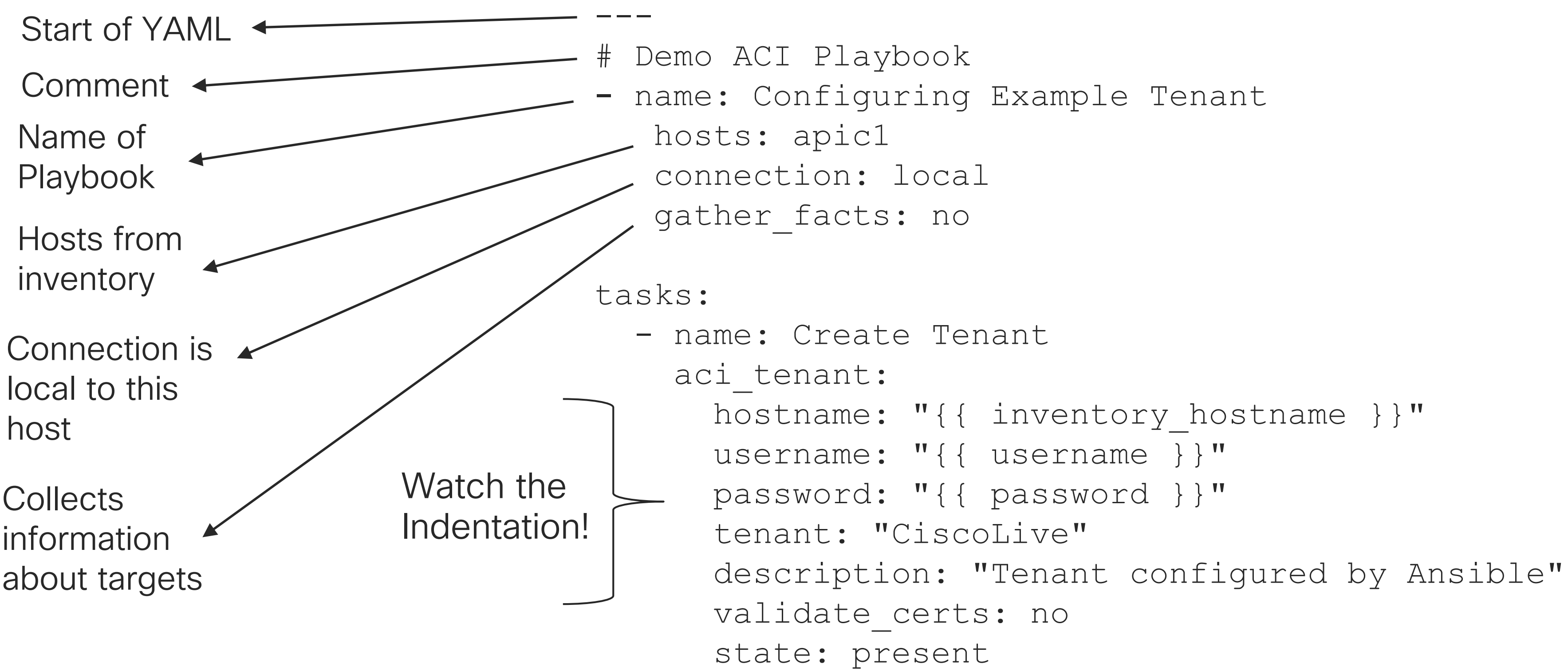
Ansible Playbooks Breakdown

- Contains a list of plays
  - Series of tasks to be performed on target systems
- Tasks are executed in order
- Built on YAML
- Proper Indentation is required
- "---" exists at the start of every playbook
- Apply specific roles to targets

Ansible Playbook breakdown



Start of YAML

Comment

Name of Playbook

Hosts from inventory

Connection is local to this host

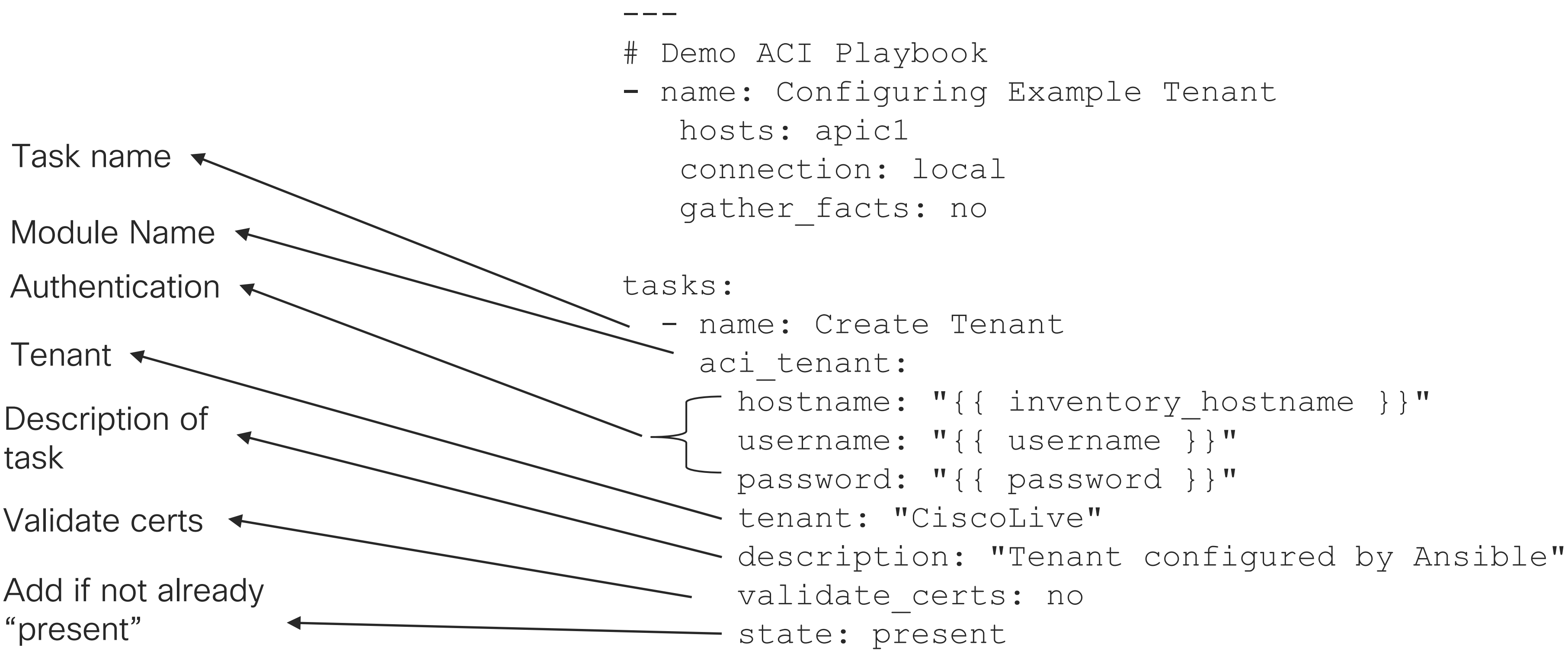
Collects information about targets

Watch the Indentation!

```
---
# Demo ACI Playbook
- name: Configuring Example Tenant
  hosts: apic1
  connection: local
  gather_facts: no

tasks:
  - name: Create Tenant
    aci_tenant:
      hostname: "{{ inventory_hostname }}"
      username: "{{ username }}"
      password: "{{ password }}"
      tenant: "CiscoLive"
      description: "Tenant configured by Ansible"
      validate_certs: no
      state: present
```

Ansible Playbook breakdown



```
---
# Demo ACI Playbook
- name: Configuring Example Tenant
  hosts: apic1
  connection: local
  gather_facts: no

tasks:
 - name: Create Tenant
  aci_tenant:
   hostname: "{{ inventory_hostname }}"
   username: "{{ username }}"
   password: "{{ password }}"
   tenant: "CiscoLive"
   description: "Tenant configured by Ansible"
   validate_certs: no
   state: present
```

Task name

Module Name

Authentication

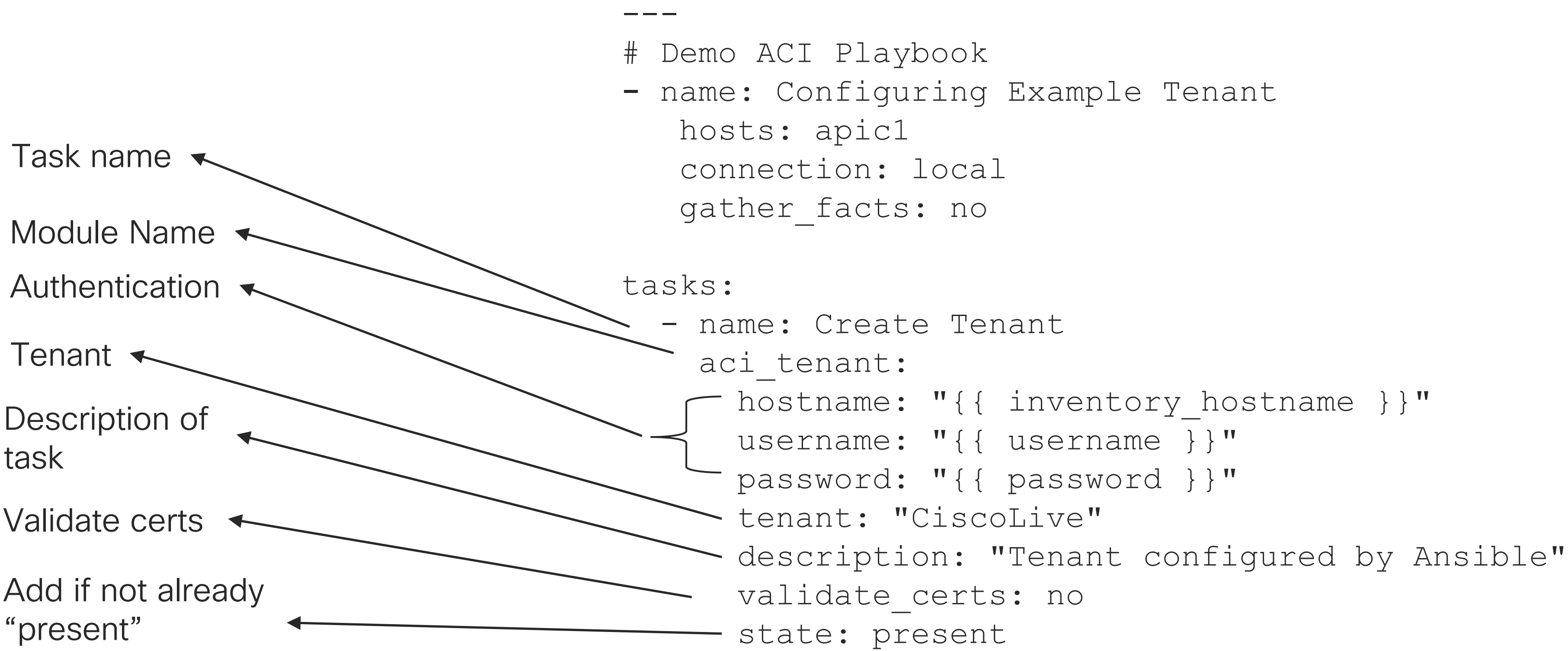
Tenant

Description of task

Validate certs

Add if not already “present”

Ansible Playbook breakdown



Task name

Module Name

Authentication

Tenant

Description of task

Validate certs

Add if not already “present”

```
---
# Demo ACI Playbook
- name: Configuring Example Tenant
  hosts: apic1
  connection: local
  gather_facts: no

tasks:
 - name: Create Tenant
   aci_tenant:
    hostname: "{{ inventory_hostname }}"
    username: "{{ username }}"
    password: "{{ password }}"
    tenant: "CiscoLive"
    description: "Tenant configured by Ansible"
    validate_certs: no
    state: present
```

Ansible ACI Modules

- Perform specific tasks (Create Tenant/VRF/BD)
- Already installed when you install Ansible
- Written in Python
  - Can develop your own modules
- 65+ ACI modules as of 2.9
  - 30+ Multisite Orchestrator Modules
- To see all Ansible Modules – `ansible-doc -l`
  - ACI specific ones – `ansible-doc -l | grep ^aci`

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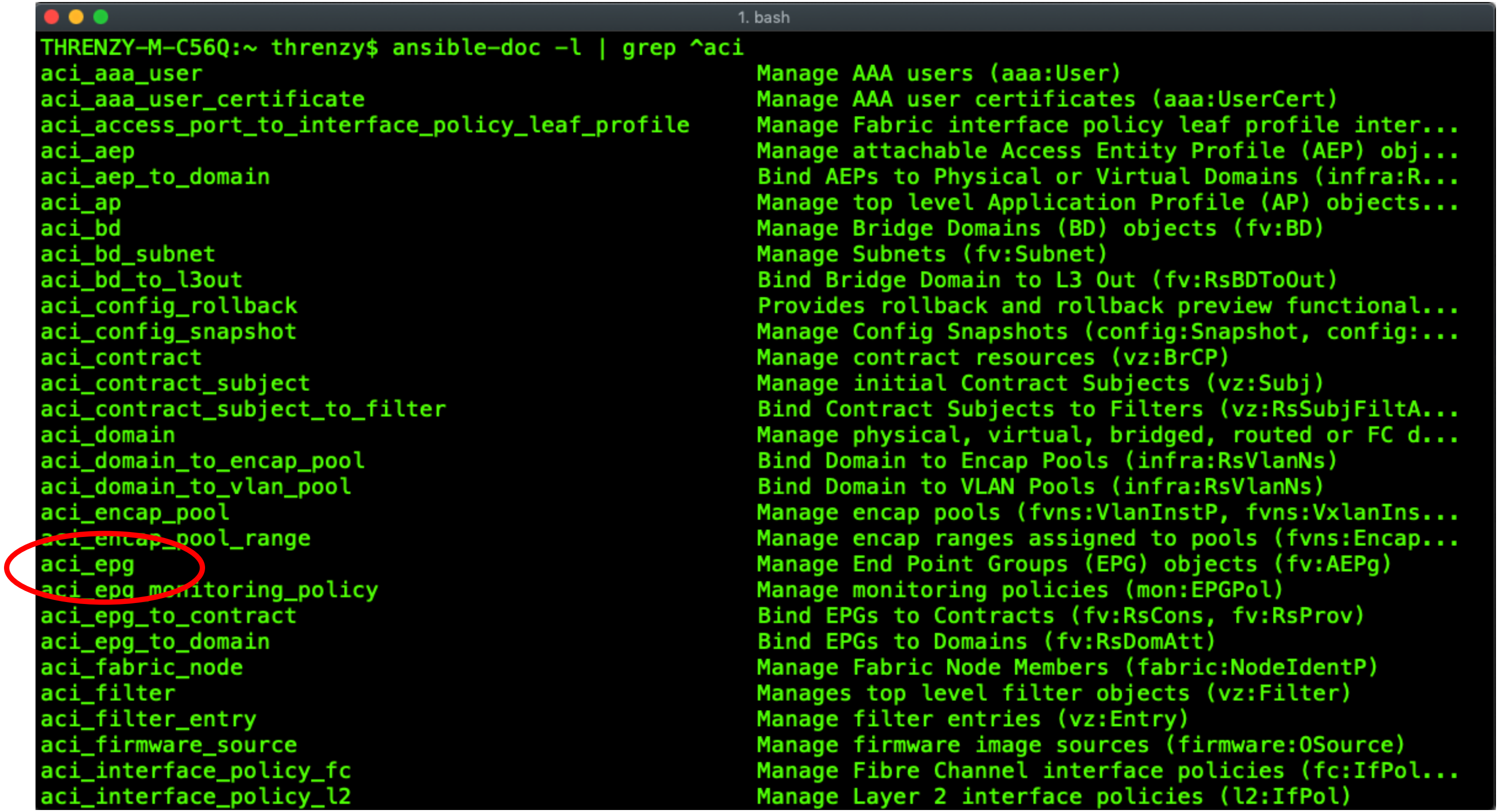
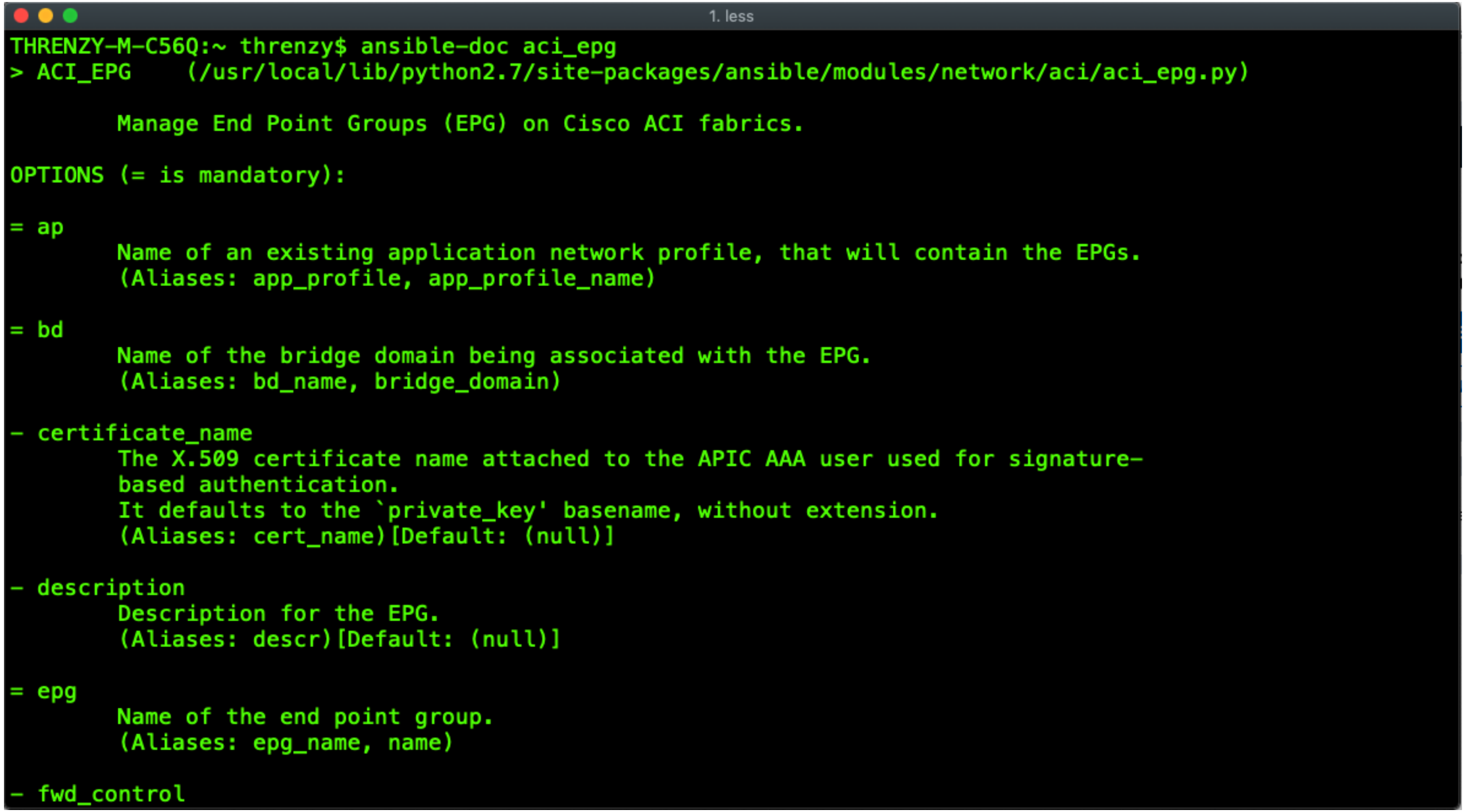
Ansible ACI Modules



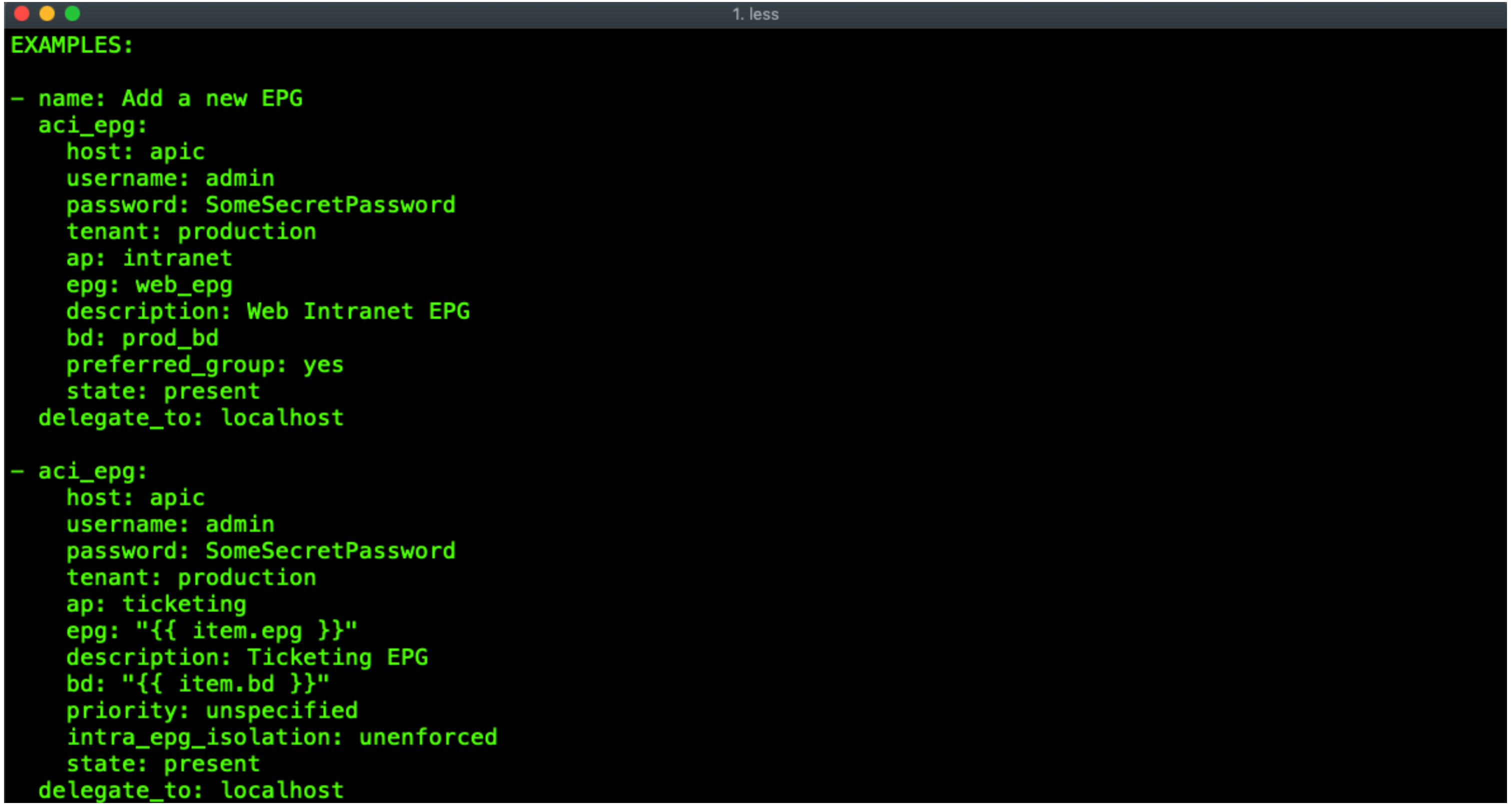
```
THRENZY-M-C56Q:~ threnzy$ ansible-doc -l | grep ^aci
aci_aaa_user                                         Manage AAA users (aaa:User)
aci_aaa_user_certificate                             Manage AAA user certificates (aaa:UserCert)
aci_access_port_to_interface_policy_leaf_profile     Manage Fabric interface policy leaf profile inter...
aci_aep                                              Manage attachable Access Entity Profile (AEP) obj...
aci_aep_to_domain                                    Bind AEPs to Physical or Virtual Domains (infra:R...
aci_ap                                               Manage top level Application Profile (AP) objects...
aci_bd                                               Manage Bridge Domains (BD) objects (fv:BD)
aci_bd_subnet                                        Manage Subnets (fv:Subnet)
aci_bd_to_l3out                                      Bind Bridge Domain to L3 Out (fv:RsBDToOut)
aci_config_rollback                                  Provides rollback and rollback preview functional...
aci_config_snapshot                                  Manage Config Snapshots (config:Snapshot, config:...
aci_contract                                         Manage contract resources (vz:BrCP)
aci_contract_subject                                 Manage initial Contract Subjects (vz:Subj)
aci_contract_subject_to_filter                       Bind Contract Subjects to Filters (vz:RsSubjFiltA...
aci_domain                                           Manage physical, virtual, bridged, routed or FC d...
aci_domain_to_encap_pool                             Bind Domain to Encap Pools (infra:RsVlanNs)
aci_domain_to_vlan_pool                              Bind Domain to VLAN Pools (infra:RsVlanNs)
aci_encap_pool                                       Manage encap pools (fvns:VlanInstP, fvns:VxlanIns...
aci_encap_pool_range                                 Manage encap ranges assigned to pools (fvns:Encap...
aci_epg                                              Manage End Point Groups (EPG) objects (fv:AEPg)
aci_epg_monitoring_policy                            Manage monitoring policies (mon:EPGPol)
aci_epg_to_contract                                  Bind EPGs to Contracts (fv:RsCons, fv:RsProv)
aci_epg_to_domain                                    Bind EPGs to Domains (fv:RsDomAtt)
aci_fabric_node                                      Manage Fabric Node Members (fabric:NodeIdentP)
aci_filter                                           Manages top level filter objects (vz:Filter)
aci_filter_entry                                     Manage filter entries (vz:Entry)
aci_firmware_source                                  Manage firmware image sources (firmware:OSource)
aci_interface_policy_fc                              Manage Fibre Channel interface policies (fc:IfPol...
aci_interface_policy_l2                              Manage Layer 2 interface policies (l2:IfPol)
```

Ansible ACI Modules



```
THRENZY-M-C56Q:~ threnzy$ ansible-doc aci_epg
> ACI_EPG    (/usr/local/lib/python2.7/site-packages/ansible/modules/network/aci/aci_epg.py)

        Manage End Point Groups (EPG) on Cisco ACI fabrics.

OPTIONS (= is mandatory):

= ap
        Name of an existing application network profile, that will contain the EPGs.
        (Aliases: app_profile, app_profile_name)

= bd
        Name of the bridge domain being associated with the EPG.
        (Aliases: bd_name, bridge_domain)

- certificate_name
        The X.509 certificate name attached to the APIC AAA user used for signature-
        based authentication.
        It defaults to the `private_key' basename, without extension.
        (Aliases: cert_name)[Default: (null)]

- description
        Description for the EPG.
        (Aliases: descr)[Default: (null)]

= epg
        Name of the end point group.
        (Aliases: epg_name, name)

- fwd_control
```

Ansible ACI Modules



```
EXAMPLES:

- name: Add a new EPG
  aci_epg:
    host: apic
    username: admin
    password: SomeSecretPassword
    tenant: production
    ap: intranet
    epg: web_epg
    description: Web Intranet EPG
    bd: prod_bd
    preferred_group: yes
    state: present
  delegate_to: localhost

- aci_epg:
    host: apic
    username: admin
    password: SomeSecretPassword
    tenant: production
    ap: ticketing
    epg: "{{ item.epg }}"
    description: Ticketing EPG
    bd: "{{ item.bd }}"
    priority: unspecified
    intra_epg_isolation: unenforced
    state: present
  delegate_to: localhost
```

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Automating ACI with Playbooks

Running an ACI Playbook

- Ansible command
  - Good for running single commands
  - **`ansible 10.15.20.101 --user=admin --ask-pass -a "uptime"`**
- Command to run our playbooks
  - **`ansible-playbook -i {inventory file} {Playbook file}`**
  - **`ansible-playbook -i hosts tenant.yml`**
- Check mode(--check)
  - Run through playbook without making changes
  - **`ansible-playbook -i hosts tenant.yml --check`**

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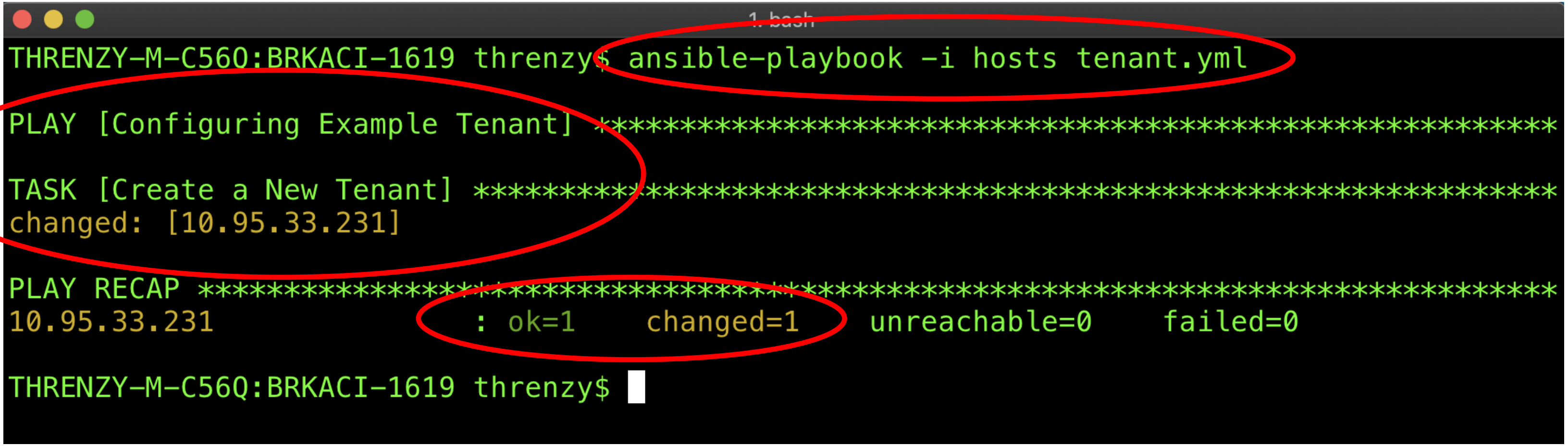
Running our Tenant Playbook



```
THRENZY-M-C56Q:BRKACI-1619 threnzy$ ansible-playbook -i hosts tenant.yml

PLAY [Configuring Example Tenant] ********************************************************

TASK [Create a New Tenant] ***************************************************************
changed: [10.95.33.231]

PLAY RECAP *******************************************************************************
10.95.33.231               : ok=1    changed=1    unreachable=0    failed=0

THRENZY-M-C56Q:BRKACI-1619 threnzy$ 
```

- Runs through each task.
- Let’s you know how many tasks were OK, changed or failed.
- To see more output use “-v”, “-vvv”, or “-vvvv”

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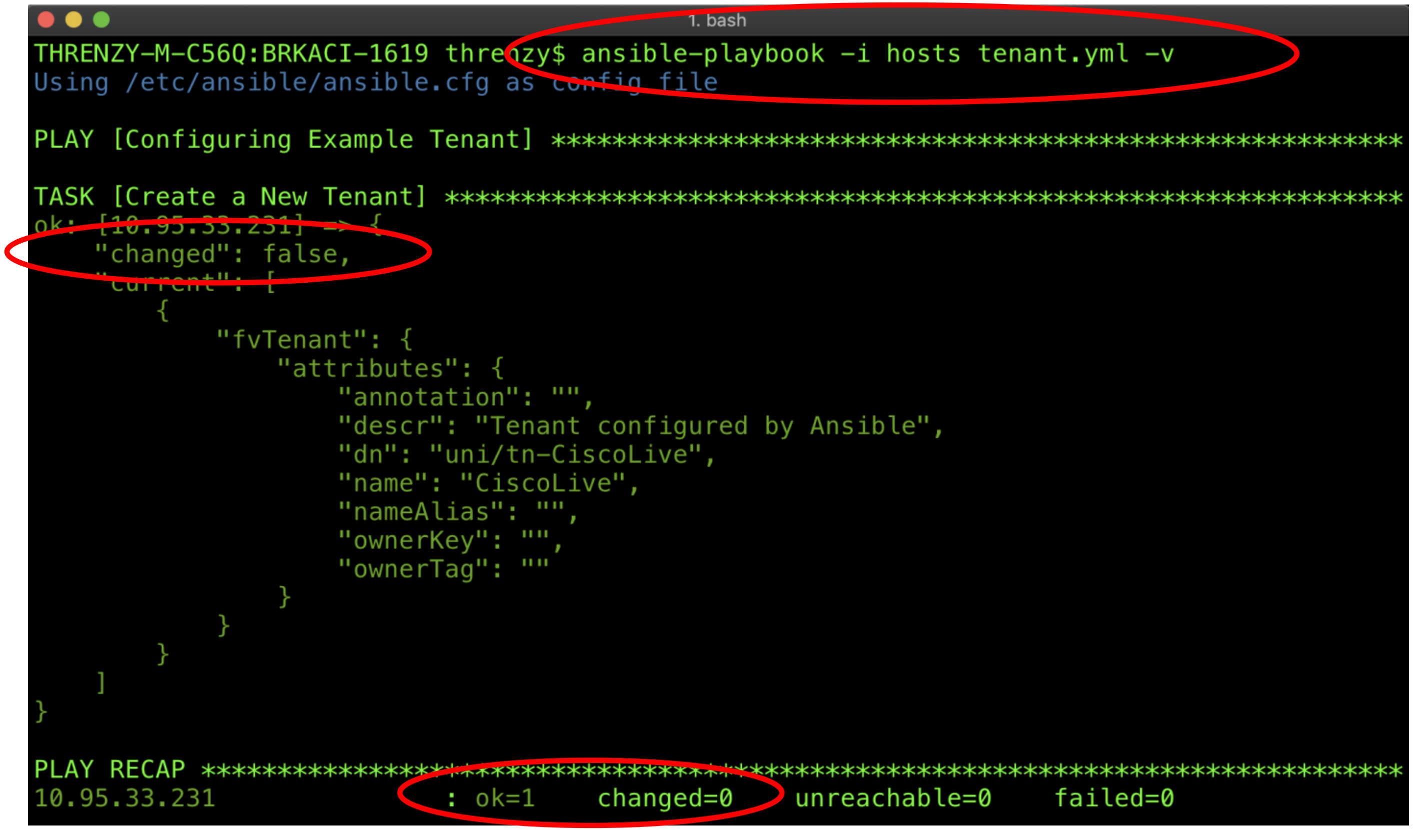
Tenant Playbook with verbose output



```
THRENZY-M-C56Q:BRKACI-1619 threnzy$ ansible-playbook -i hosts tenant.yml -v
Using /etc/ansible/ansible.cfg as config file

PLAY [Configuring Example Tenant] ********************************************************

TASK [Create a New Tenant] ***************************************************************
ok: [10.95.33.231] => {
    "changed": false,
    "current": [
        {
            "fvTenant": {
                "attributes": {
                    "annotation": "",
                    "descr": "Tenant configured by Ansible",
                    "dn": "uni/tn-CiscoLive",
                    "name": "CiscoLive",
                    "nameAlias": "",
                    "ownerKey": "",
                    "ownerTag": ""
                }
            }
        }
    ]
}

PLAY RECAP *******************************************************************************
10.95.33.231               : ok=1    changed=0    unreachable=0    failed=0
```

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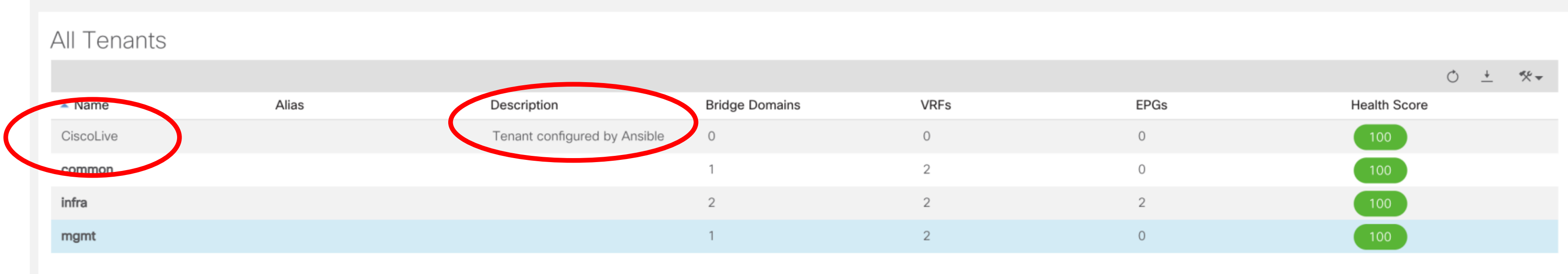
Verifying the APIC



All Tenants

Name	Alias	Description	Bridge Domains	VRFs	EPGs	Health Score
CiscoLive		Tenant configured by Ansible	0	0	0	100
common			1	2	0	100
infra			2	2	2	100
mgmt			1	2	0	100

More complex Playbook – A Three Tier Application

More complex ACI Playbooks

- Looked Simple Playbook with single tasks
  - Create a new Tenant
- What about larger tasks?
- Deployments at scale?
- Are there ACI tasks that we need to repeat?

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A Sample Three Tier Application in Ansible

- We want to do the following:
  - Create a new Tenant – Ansible
  - New VRF – ansible-VRF
  - New BD – ansible-BD
  - Application Profile – ansible-AP
  - 3 EPGs
    - Web, App, DB
- 2 Contracts (and associated subjects/filters)
    - web_to_app – Communication between Web EPG and App EPG on http (tcp 80)
    - app_to_db – Communication between App EPG and DB EPG on sql (tcp 1433)

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Variables in Three Tier Application

- Use of variables in Ansible
  - Can be used to substitute values in playbooks
  - Leverages jinja2 templating – “{{ Variable Value }}”
  - Defined in inventory, playbook, external
    - Variables have precedence

```
vars:
    mytenant: ciscolive
…
tenant: "{{ mytenant }}"
```

Loops (iteration) with loop

- Repeat a task multiple times
  - Suppose you need to create 3 or more EPGs
  - Tedious to write out 3 or more additional tasks
  - with_items: Also a method

```
aci_epg:
  …
  epg: "{{ item.epg }}"
loop:
  - epg: "{{ epg1 }}"
  - epg: "{{ epg2 }}"
  - epg: "{{ epg3 }}"
```

Modules used in Three-Tier Application

- aci_tenant
- aci_vrf
- aci_bd
- aci_bd_subnet
- aci_ap
- aci_epg
- aci_contract
- aci_filter
- aci_filter_entry
- aci_epg_to_contract
- aci_contract_subject
- aci_contract_subject_to_filter

Demo – Deploy a Three Tier Application

The Ansible ACI REST Module

Ansible ACI Modules, XML and JSON

- Ansible is a great solution to automate ACI tasks
- ACI modules can do *most* common configurations
- Lots modules as of 2.9
  - Modules added to every version
  - Modules aren’t 1-to-1 with all ACI features
- What if you are already using XML and JSON?

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ACI REST Module (aci_rest)

- Direct access and management to APIC REST API
- Can use JSON, XML, and even YAML
- Can POST, DELETE, GET
  - Similar to what you can do in POSTMAN
- Variables work with this as well
- Can grab GUI configurations through
  - API Inspector
  - Download JSON/XML configuration

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Example aci_rest module play

```
tasks:
 - name: Create Tenant with ACI Rest Module
    aci_rest:
        hostname: "{{ inventory_hostname }}"
        username: "{{ username }}"
        password: "{{ password }}"
        path: /api/mo/uni/tn-[Ansible-JSON].json
        method: post
        content: |
          {
             "fvTenant": {
               "attributes": {
                 "name": "Ansible-JSON",
                 "descr": "Configured by JSON/Ansible"
                             }
                         }
          }
        validate_certs: no
```

Configuration Examples with aci_rest

- Set my COOP policy to strict
  - Enables authenticated MD5 only
- End Point Loop Protection
  - Specified how frequent MAC moves are handled
- Global Enforce Subnet Check
  - Limit IP learning at the VRF level
- Currently no Ansible modules

COOP Policy with ACI REST module

```
path: /api/node/mo/uni/fabric/pol-default.json
        method: post
        content: |
          {
            "coopPol": {
              "attributes":{
                "type":"strict",
                "dn":"uni/fabric/pol-default"
                }
              }
            }
```

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Enforce Subnet Check with ACI REST module

```
path: /api/node/mo/uni/infra/settings.json
        method: post
        content: |
          {
            "infraSetPol": {
              "attributes": {
                "enforceSubnetCheck":"true",
                "dn":"uni/infra/settings"
                }
             }
           }
```

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End Point Loop Protection with ACI REST module

```
path: /api/node/mo/uni/infra/epLoopProtectP-default.json
        method: post
        content: |
          {
            "epLoopProtectP": {
              "attributes": {
                "action": "",
                "adminSt": "enabled",
                "loopDetectIntvl": "60",
                "loopDetectMult": "4",
                "dn":"uni/infra/epLoopProtectP-default"
              }
            }
          }
```

Demo – Configuration with aci_rest

Summary

Benefits of automating ACI with Ansible

- Automate repeatable tasks
- Saves time
- Ease of writing/reading inventory/playbooks
- No special programming skills needed
- Modules pre-built with most common tasks
- aci_rest module for leveraging JSON/XML
  - Can build tasks/plays not covered by a module

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References

Ansible Documentation

http://docs.ansible.com/

Ansible ACI Documentation

https://docs.ansible.com/ansible/devel/scenario_guides/guide_aci.html

Ansible ACI Modules

http://docs.ansible.com/ansible/devel/modules/list_of_network_modules.html#aci

Ansible Variables (and precedence)

https://docs.ansible.com/ansible/latest/user_guide/playbooks_variables.html

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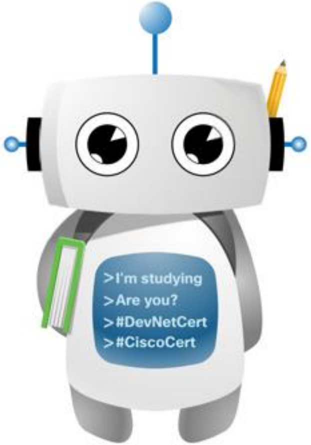

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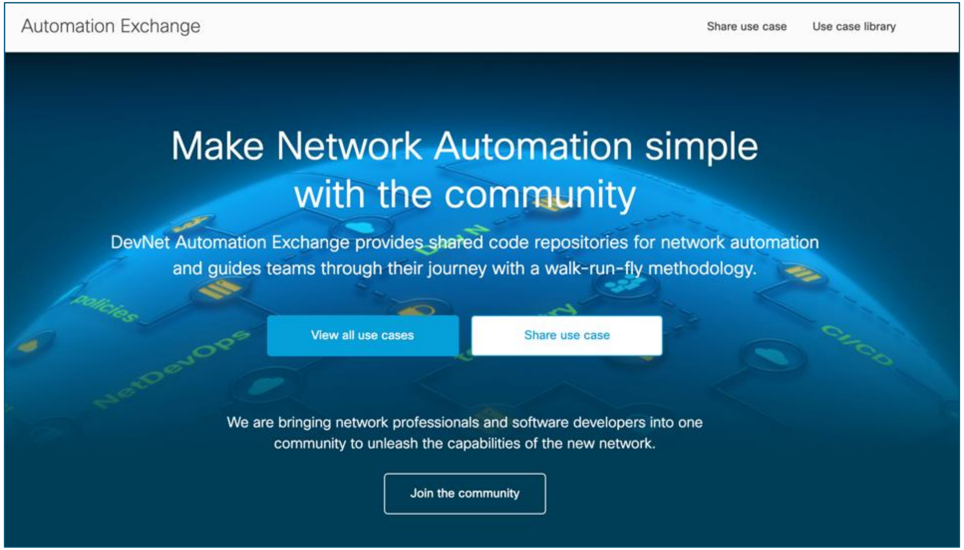

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