

# Intent Based Networking - ACI Elite Track

## THE ACI ELITE SERIES

The ACI Elite Series is a series of expert-led 4-hour deep-dive sessions with hands-on lab practice. We cover different topics each week, so you can choose the ones that apply to you.

## WHO SHOULD ATTEND

This ACI Elite Series will provide value for anyone deploying or operating an ACI fabric. However some topics will be more relevant to specific audiences

- Sessions 1, 7, 8, 9, 10, 12, 13, and 14 are more focused for Architects or Engineers doing design work
- Sessions 2, 3, 4, 5, 6, and 11 are more focused for operations teams

## FEATURES

- Live Instructor-led virtual training with hands-on lab practice
- Deep-dive into ACI through 14 self contained, 4-hour sessions
- Runs weekly
- No prior ACI knowledge needed
- For people that need real-world training on ACI
- First class instructors

## BENEFITS

- Easy to consume 4-hour chunks allow the student to digest contents and ask questions each week
- Modular approach allows students to consume the topics more relevant to their job function and deployment
- Driven by real world scenarios and requirements
- Delivered by an expert on the topic
- After attending this class you will have the required knowledge to deploy and operate an ACI fabric

## LEARNING OBJECTIVES

- Describe ACI components and policy model
- Explain ACI packet forwarding
- Describe ACI fabric configuration
- Describe ACI logical constructs
- Explain how ACI uses contracts to allow for secure communication between endpoints
- Explain how ACI connects to other switched and routed networks
- Explain how to troubleshoot an ACI fabric
- Describe Multi-site and Multi-pod solutions, and how they fit in a multi-DC/multi-cloud design

## Session 1 ACI Overview

### Lecture

- What is ACI
- ACI's benefits
- Overview of Switch and APIC models APIC Architecture Fabric bring up process
- ACI Object Model
- ACI MGMT
  - > RBAC
  - > Syslog
  - > SNMP
  - > Upgrade Process
  - > BGP Policy

### Labs

- Instructor demo GUI Overview
- Instructor demo Intro to cli
- Creating Users and assign Permissions Software Upgrades
- Syslog, SNMP and config rollbacks

### Audience

Architects or Engineers doing design work

### Duration

4 hours

## Session 2 Fabric Forwarding

### Lecture

- VxLan refresher
- Understanding Bridge Domains
  - > Bridge Domain as a layer 2 boundary
  - > Difference between Vlans and Bridge Domains
  - > Bridge Domain configuration knobs
    - + Limit Learning to IP subnet
  - > Encapsulation and multicast group
- Coop
  - > Oracles and Citizens
  - > Endpoint tables
  - > Lookup process
- Layer2 and Layer3forwarding
  - > ARP handling packet walk
  - > L2 packet walk
  - > L3 packet walk
  - > BUM traffic packet walk
  - > VxLan Encapsulations
    - + Intro to Fd\_Vlans and BD\_Vlans
    - + VRF encapsulation
  - > EP move and bounce entries
  - > Rogue endpoint detection
  - > Silent hosts
  - > Endpoint table vs Mac and Routing Table

### Labs

- Intro to endpoint reachability troubleshooting
  - > Understanding show endpoint command
  - > Validate coop entries (GUI and CLI)
  - > Using Iping, Elam and Friage (App not CLI)

### Audience

Operations teams

### Duration

4 hours

## Session 3 Fabric Configuration Part 1

### Lecture

Overview of interface configurations

- > Physical and VMM domains overview
  - + Deployment immediacy (VMM)
  - + Resolution immediacy (VMM)
- > VLAN Pools
  - + Static and Dynamic Pools
  - + Base encap value
- > AEPs
  - + Used as a way to tie VLANs to an Interface
  - + Used to define EPG membership
- > Policy Groups
- > Interface Profiles

Overview of switch configurations

- > VPC in ACI
- > Switch Profiles

VLANs in the ACI world

- > PI, HW, Access Encap, BD and FD
- > Physical Domain, AEP and VLAN Pool relationship to FD\_VLAN and VxLAN encap

### Labs

Create a physical Domain to connect endpoints to the ACI Fabric

- > Create VLAN Pool and AEP
- Create a VMM domain to connect endpoints to the ACI fabric
- > Create VLAN Pool and AEP
  - > Create VMM integration
- Create VPCs explicit protection groups Create Interface Profiles and Policy Groups Create Switch Profiles
- Understanding the output
- > Show VLAN brief
  - > Show VLAN extended
  - > Show system internal eltmc info VLAN brief (vsh\_lc shell)

### Audience

Operations teams

### Duration

4 hours

## Session 4 Fabric Configuration Part 2

### Lecture

Overview of interface configurations

- > Physical and VMM domains overview
  - + Deployment immediacy (VMM)
  - + Resolution immediacy (VMM)
- > VLAN Pools
  - + Static and Dynamic Pools
  - + Base encap value
- > AEPs
  - + Used as a way to tie VLANs to an Interface
  - + Used to define EPG membership
- > Policy Groups
- > Interface Profiles

Overview of switch configurations

- > VPC in ACI
- > Switch Profiles

VLANs in the ACI world

- > PI, HW, Access Encap, BD and FD
- > Physical Domain, AEP and VLAN Pool relationship to FD\_VLAN and VxLAN encap

### Labs

Create a physical Domain to connect endpoints to the ACI Fabric

- > Create VLAN Pool and AEP
- Create a VMM domain to connect endpoints to the ACI fabric
- > Create VLAN Pool and AEP
  - > Create VMM integration
- Create VPCs explicit protection groups Create Interface Profiles and Policy Groups Create Switch Profiles
- Understanding the output
- > Show VLAN brief
  - > Show VLAN extended
  - > Show system internal eltmc info VLAN brief (vsh\_lc shell)

### Audience

Operations teams

### Duration

4 hours

## Session 5 ACI Logical Constructs Part 1

### Lecture

- Tenants
- VRFs
- Bridge Domains
- Application Profiles
- EPGs and Endpoint Security Groups
  - > VMM and Physical Domains
- Intro to Contracts

### Labs

- Create a tenant
- Create an Application Profile
- Create a set of EPGs and establish L2 and L3 connectivity between endpoints
  - > Create required BDs, EPGs and Contracts

### Audience

Operations teams

### Duration

4 hours

## Session 6 ACI Logical Constructs Part 2

### Lecture

- Tenants
- VRFs
- Bridge Domains
- Application Profiles
- EPGs and Endpoint Security Groups
  - > VMM and Physical Domains
- Intro to Contracts

### Labs

- Create a tenant
- Create an Application Profile
- Create a set of EPGs and establish L2 and L3 connectivity between endpoints
  - > Create required BDs, EPGs and Contracts

### Audience

Operations teams

### Duration

4 hours

## Session 7 Contracts

### Lecture

Contract Scope

Subjects

Filters

- > Directives (Log and Policy Compression)

Verifying L2 and L3 permit and denies from the GUI Subject

Labels

- > Apply both ways and reverse filter ports

EPG Labels Deny

Contracts

- > Taboo Contracts
- > Regular contracts with Deny Filter

VRF Enforced and Unenforced

Preferred Group

VZ\_ANY

Consumed contract interfaces (Intro to leaking)

### Labs

- > Enable EPG to EPG communication using Subject Labels and EPG Labels
- > Enable EPG to EPG communication using Preferred Group and VZ\_Any VRF options
- > Block specific traffic using Taboo contracts and deny filters

### Audience

Architects or Engineers doing design work

### Duration

4 hours

## Session 8 External Connectivity Part 1

### Lecture

Layer 2 Connectivity

- > Understanding L2Outs
- > Understanding VLANs on ACI
- > Understanding EPG extensions
- > Unicast Routing option on Bridge Domain for migration
- > Dual homing Layer 2 connectivity

Layer 3 Connectivity

- > L3Out Building Blocks
- > Single L3Outs with Multiple Node Profiles vs Multiple L3Outs with single Node Profile
- + Traffic Shaping and traffic flow

Layer 3 VPC

- > Special configuration for HA L4-L7 Devices

Understanding Subnet options for Ext-EPG

Advertising routes

- > Mapping L3Out to Bridge Domain
- > Using Route Maps

Shared L3Outs

- > VRF Leaking overview and verification
- > Shared L3Out on Common Tenant
- > Shared L3Out on different tenants

Transit Routing

### Labs

- > Create a L2Out and consume a GW outside of ACI
- > Replicate the config using an EPG extension
- > Create a local L3Out
- > Create a Shared L3Out
- > Advertise routes not owned by ACI
- > Configure an L3out to be preferred over other L3Outs

### Audience

Architects or Engineers doing design work

### Duration

4 hours

## Session 9 External Connectivity Part 2

### Lecture

#### Layer 2 Connectivity

- > Understanding L2Outs
- > Understanding VLANs on ACI
- > Understanding EPG extensions
- > Unicast Routing option on Bridge Domain for migration
- > Dual homing Layer 2 connectivity

#### Layer 3 Connectivity

- > L3Out Building Blocks
- > Single L3Outs with Multiple Node Profiles vs Multiple L3Outs with single Node Profile
- + Traffic Shaping and traffic flow

#### Layer 3 VPC

- > Special configuration for HA L4-L7 Devices

#### Understanding Subnet options for Ext-EPG

#### Advertising routes

- > Mapping L3Out to Bridge Domain
- > Using Route Maps

#### Shared L3Outs

- > VRF Leaking overview and verification
- > Shared L3Out on Common Tenant
- > Shared L3Out on different tenants

#### Transit Routing

### Labs

- > Create a L2Out and consume a GW outside of ACI
- > Replicate the config using an EPG extension
- > Create a local L3Out
- > Create a Shared L3Out
- > Advertise routes not owned by ACI
- > Configure an L3out to be preferred over other L3Outs

### Audience

Architects or Engineers doing design work

### Duration

4 hours

## Session 10 Deployment Models and DevOps

### Lecture

#### Naming Convention

#### App Centric and Network Centric

- > EPG to Bridge Domain to VLAN and Subnet relationship
- > Generic VLAN/Subnet to App Driven VLAN/Subnet

#### Whitelisting, Blacklisting, and Graylisting

#### Benefits and Drawbacks

#### Intro to Automation

- > Moquery
- > API inspector and postman
- > Python
- + Cobra SDK

### Labs

- > Recreating our lab topology thru Python and Postman

### Audience

Architects or Engineers doing design work

### Duration

4 hours

## Session 11 Advanced Troubleshooting

### Lecture

- Different CLI shells
- Common troubleshooting commands Structure to
- ACI troubleshooting
- Elam and fTriage CLI
- Understanding how to use show zoning rule
- Common faults and mistakes
  - > L3Out debugging in the ACI world

### Labs

- > Use the discussed tools to troubleshoot connectivity issues between endpoints connected to the ACI fabric and end-points connected via L3Out

### Audience

Operations teams

### Duration

4 hours

## Session 12 Multi-site and Multi-pod Part 1

### Lecture

- Active/Active, HA, Metro, and DR
  - > What it means
  - > How to choose the correct fit based on business requirements
- Multi-pod
  - > Components
  - > Requirements
  - > Fabric forwarding between Pods
- Multi-site
  - > Components
  - > Requirements
  - > Fabric forwarding between sites
  - > Stretched vs non-stretched
  - > Understanding Schema
  - > Intersite L3Outs
  - > Azure and AWS

### Labs

- Verifying a Multi-pod deployment
- Deploying Tenants using MSO
  - > Configure App Profile and EPGs from MSO
  - > Create Local and Stretched Bridge Domains

### Audience

Architects or Engineers doing design work

### Duration

4 hours

## Session 13 Multi-site and Multi-pod Part 2

### Lecture

Active/Active, HA, Metro, and DR

- > What it means
- > How to choose the correct fit based on business requirements

Multi-pod

- > Components
- > Requirements
- > Fabric forwarding between Pods

Multi-site

- > Components
- > Requirements
- > Fabric forwarding between sites
- > Stretched vs non-stretched
- > Understanding Schema
- > Intersite L3Outs
- > Azure and AWS

### Labs

Verifying a Multi-pod deployment

Deploying Tenants using MSO

- > Configure App Profile and EPGs from MSO
- > Create Local and Stretched Bridge Domains

### Audience

Architects or Engineers doing design work

### Duration

4 hours

## Session 14 Design and Migration Considerations

### Lecture

Integrating ACI to legacy environments Migration

Steps

Migration considerations

FW Considerations

- > Where do we place the GWs?
- > Designing based on Zones
- > To Service Graph or not to Service Graph
- > DMZ inside of ACI vs DMZ outside
- > Understanding inbound and outbound traffic flow for multi DC solutions
- > Multi-cloud considerations

LB considerations

- > Single or Multi-hop
- > GSLB/GTM requirements for multi DC solutions

### Labs

- > Create a DMZ structure inside of ACI connecting to FWs and LBs
- > Test Connectivity from the outside world

### Audience

Architects or Engineers doing design work

### Duration

4 hours