



# Cisco Network Assurance Engine

*Transforming Day 2 Operations from Reactive to Proactive*

John Ng – Director of Product Management

Usha Kodali – Sr. Product Manager

July 2019

Cisco DC Switching Marketing

# Agenda

- Business Update
- Product Positioning (NAE Differentiation)
- Feature Demo
- Ordering Simplification
- Product Roadmap

# Customer Traction Update



**2,700+**

**Leaf Assured**

**Fabrics Assured**

**150+**

**135,000+**

**Ports Assured**

**Active Customers**

**170+**

# Benefits of Cisco ACI and Cisco NAE

Cisco ACI



AUTOMATION & AGILITY

Cisco Network  
Assurance Engine



DAY 2 OPERATIONS  
REACTIVE TO PROACTIVE

Delivering Intent Based Networking in the Data Center

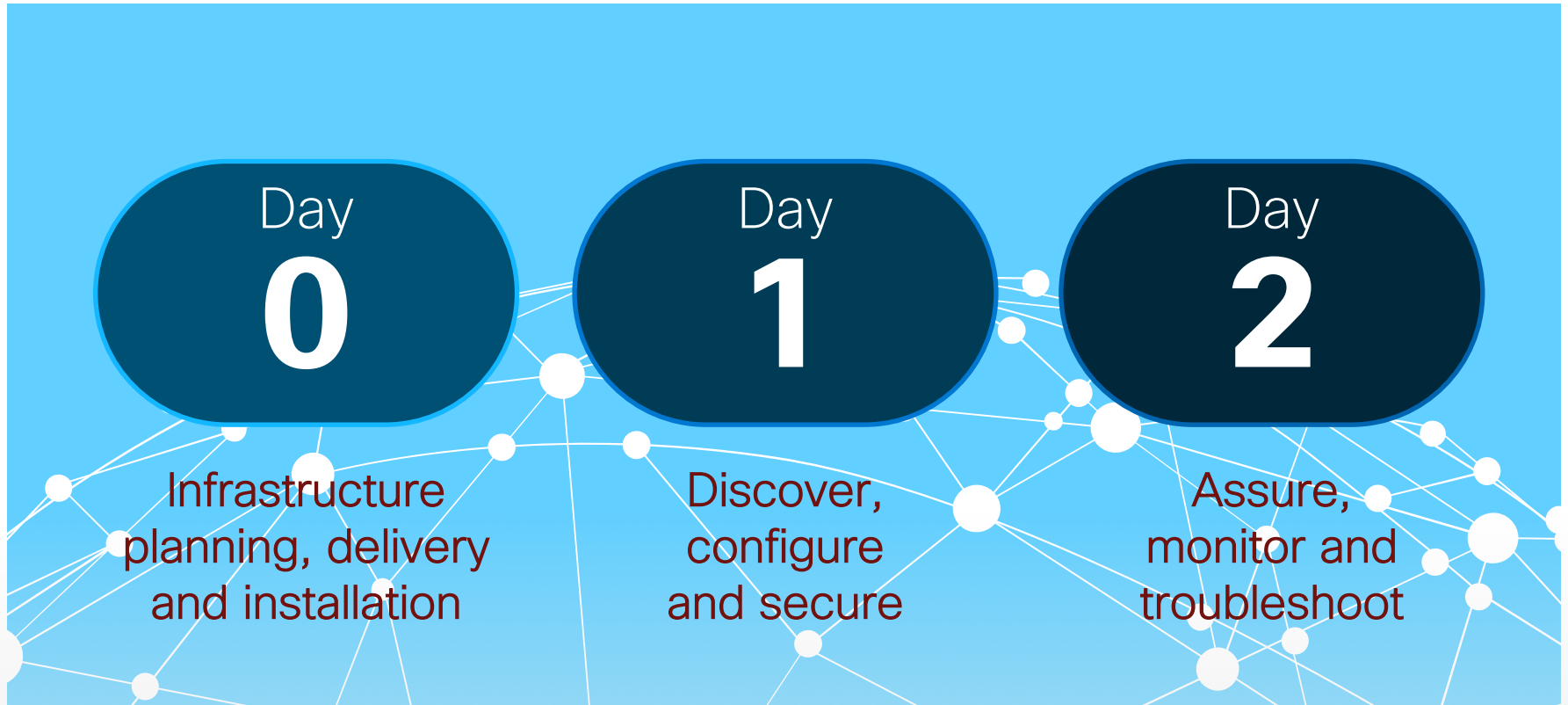
# Intent Assurance

The confidence that the  
infrastructure is doing what  
you intended it to do

Intent Encompasses Data Center Operations

Configs, Changes, Routing, VMs, Security, ... Compliance, Audits

# Managing the **Complete Lifecycle**



# Top Consumer of IT Time: 43% Troubleshooting



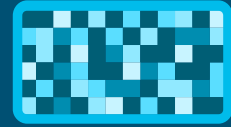
4x

Network operators spend more time collecting data than analyzing while troubleshooting



Replication challenge

Troubleshooting an issue can be impossible if IT can't replicate the issue or see the issue as is it happening real time



Slow resolution

Downtime is expense; unplanned downtime cost Fortune 1000 \$1.25-2.5B annually

# Problem: DC Paradigms Are Fundamentally Reactive

Intent Frequently Breaks ...

We Always React ...

Leaving Us With ...



Operational



Troubleshoot



Security



Scramble to fix it



Compliance



Fail audits



Change



Undo change

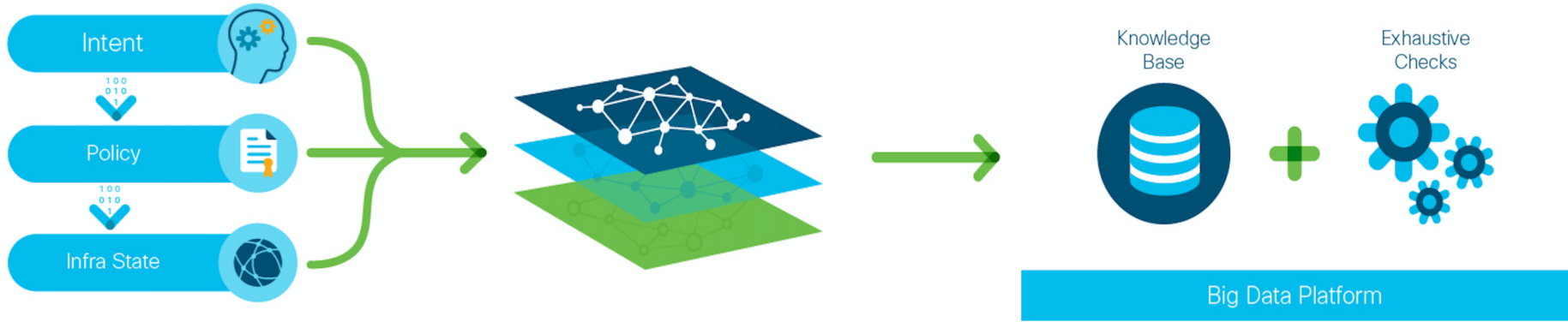
**An Inability to Assure Intent Proactively.**

We are always in a reactive break-fixed mode!





# Network Assurance Engine: How it Works



## Data Collection

Capture DC Wide Intent, Policy, Control/State across Forwarding & Security

## Formal Modeling of Network

Precise Formal Models that codify Cisco's 30+ Years of Networking and Cross Customer Domain Knowledge



## Continuous Analysis

Models verify that **Network operates per Intent** and accurately tell what is wrong, where, why, impact and how to fix



*ACI Expert in the NOC watching the state of fabric 24 hours a day x 365 days a year!*

# Verification Results Delivered via Smart Events

What ?

Severity	Event Category	Event Name
	Filter	Filter
	TENANT_FORWARDING	OVERLAPPING_SUBNETS_ACROSS_BDS_IN_VRF
	CHANGE_ANALYSIS	PERMIT_POLICY_SHADOWED_BY_DENY_POLICY

Who and Where ?

Impacted Bd Subnet	Subnet's Owner BD
 [5.1.32.101/24]	 testbddup3

Why ?

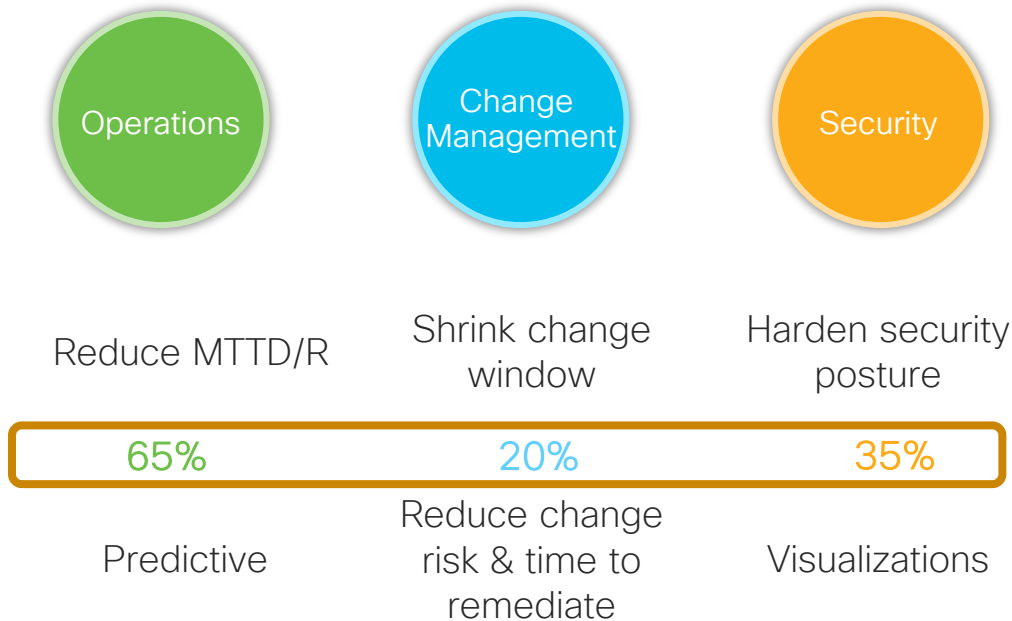
Failing Condition
Subnets defined under the BDs/EPGs are not unique.

How to fix ?

Suggested Next Steps
<ul style="list-style-type: none"><li>• For all the BDs/EPGs listed, determine the correct BD/EPG subnet.</li><li>• Configure unique subnets across BDs/EPGs in a VRF.</li></ul>

*Reduce Mean Time to Repair with **Precise Analysis and Remediation***

# NAE – Cisco IT Business Benefits



Cisco IT Testimonial : <http://cs.co/nae-Cisco-IT>



# NAE Operational Benefits

# Continuous Assurance Workflows

Is my network compliant with Governance Rules ?



Compliance analysis

Did something change in my network ?



Epoch Delta analysis

Can A talk to B ?



Connectivity Analysis

# Epoch Delta Analysis

## Correlated Ad hoc Analysis Workflow



Cisco Network Assurance Engine

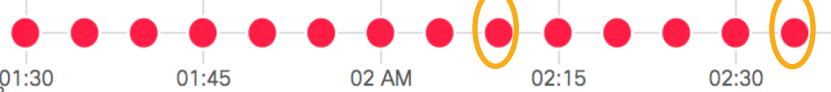
Dashboard

Epoch Analysis ▾

Change Management ▾



01:29 AM  
05/17/2018



Before /  
Baseline

After /  
Current

## 4 Qs, correlated answers...

- What changed?
- Who was impacted?
- Was it due to config changes?
- What happened as a result?

## Use Cases

- Change Management
- Root-cause analysis
- Migration
- Maintenance Upgrades
- Capacity Management

# Health Delta - Summary

## Change in the health of the Fabric

### Delta Analysis 1

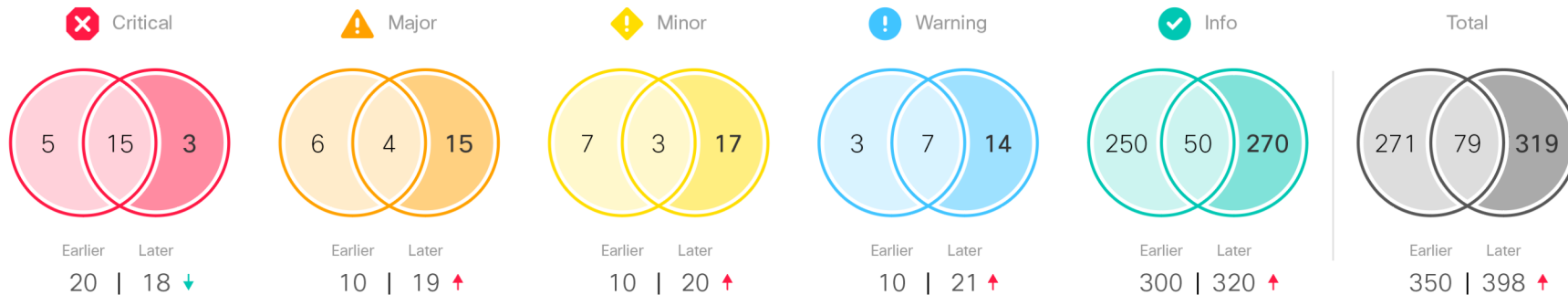
Earlier Epoch : 04/04/2018 1:46:30 PM PDT

Later Epoch : 04/05/2018 5:56:30 PM PDT

Time Range : 1 day 4:10:00

[Health Delta](#) | [Policy Delta](#)

#### Smart Event Count



# Epoch Delta Workflow – Policy Delta

Impact, Change, Operator

### Epoch Delta Analysis

Delta Analysis | Analysis Management

add\_delete\_modify\_ap

Earlier Epoch: 10/30/2018 9:26:46 PM PST | Later Epoch: 10/30/2018 9:31:47 PM PST | Time Range: 5min 1sec

[Health Delta](#) | [Policy Delta](#)

What got impacted? →

Details of impact, if any →

Search in changed policy objects

#### Changed Policy Objects

Tenants

- ▼ Tenant Coke (4)
  - ▼ AP foo (1)
    - ▼ EPG test (1)
      - uni/tn-coke/ap-foo/epg-test

EPG

- uni/tn-coke/ap-foo/epg-test

🔴 7	🟡 23	🟢 2
🔴 7654	🟡 23	🟢 2864
🔴 7	🟡 2367	🟢 2

BD-BDP1DJCommon128

- ▶ AP bar (1)
- ▶ Contract ABC (1)
- ▶ Tenant Pepsi (1)

Fabric

- ▶ Inventory
- ▶ Fabric Policies

Changed | Search in policy viewer

#### Policy Viewer

```
1 1 <?xml version="1.0" ?>
2 2 <polUni dn="uni" nameAlias="">
3 3 <dbgDebugP descr="" dn="uni/dbg" name="" nameAlias="">
4 4 <l2extDomP dn="uni/l2dom-navtestdom" name="navtestdom" nameAlias="" ownerKey="" ownerTag="">
5 5 <infraRsVlanNs dn="" tDn="uni/infra/vlanns-[navtest-
6 6 </l2extDomP>
7 7 vlan_] -static"/>
8 8 <l2extDomP>
9 9 <l2extDomP dn="uni/l2dom-epdemo" name="l2dom_epdemo" nameAlias="" ownerKey="" ownerTag="">
10 10 <infraRsVlanNs dn="" tDn="uni/infra/vlanns-[ep-
11 11 demo_vlan_pool] -static"/>
12 12 </l2extDomP>
13 13 <l2extDomP dn="uni/l2dom-l2DomP" name="l2DomP" nameAlias="" ownerKey="" ownerTag="">
14 14 <infraRsVlanNs dn="" tDn="uni/infra/vlanns-[Ext-vlans]-static"/>
15 15 </l2extDomP>
16 16 <l2extDomP>
17 17 <l2extDomP dn="uni/l2dom-l2DomP" name="l2DomP" nameAlias="" ownerKey="" ownerTag="">
18 18 <infraRsVlanNs dn="" tDn="uni/infra/vlanns-[Ext-vlans]-static"/>
19 19 <l2extDomP dn="uni/l2dom-global" name="l2dom_global" nameAlias="" ownerKey="" ownerTag="">
20 20 <infraRsVlanNs dn="" tDn="uni/infra/vlanns-[vlan_global]-static"/>
21 21 </l2extDomP>
22 22 </l2extDomP>
23 23 </l2extDomP>
24 24 <bbbUserEp descr="" dn="uni/userext" name="" nameAlias="" ownerKey="" ownerTag="" pwdStrengthCheck="no">
25 25
26 26
```

Search in audit log

#### Audit Log

04/04/2018

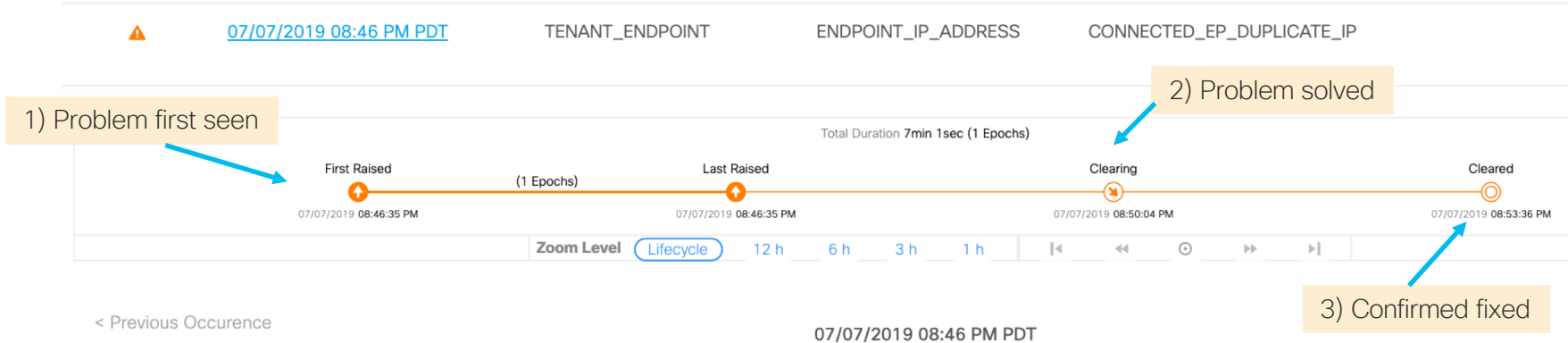
- 1:46:30 PM, Chandra RsBd added
- 1:46:30 PM, Chandra RsBd deleted
- 1:46:30 PM, Chandra RsBd added
- 1:46:30 PM, Chandra RsBd deleted
- 1:46:30 PM, Chandra RsBd modified
- 1:46:30 PM, Chandra RsBd modified
- 1:46:30 PM, Chandra RsBd deleted
- 1:46:30 PM, Chandra RsBd added
- 1:46:30 PM, Chandra RsBd modified

Who made the changes? →

What has changed? →



# Global Search Across Epoch and Event Life Cycle



Description	IP addresses are in use by Multiple MAC addresses within the same VRF.						
Impact	Multiple MACs sharing a single IP address will cause intermittent connectivity issues.						
Affected Objects Details	EP Type	Mac Address	IP Addresses	BD	BD's VRF	EPGs	EPG's Tenants
	Connected_Internal	AA:CC:B7:0A:DC:55 *	10.52.3.145	kube-pod-bd *	k8s *	unknownepg *	-

# Smart Events & Compliance Score for Compliance



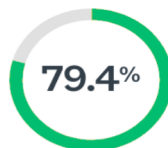
## COMPLIANCE VIOLATED SMART EVENT

- Identify non compliant policy
- Identify requirements violated
- Identify non-compliant EPGs

## COMPLIANCE SATISFIED SMART EVENT

- Identify compliant policy
- Identify requirements satisfied
- Identify compliant EPGs

## COMPLIANCE SCORE



# Compliance Analysis

## Continuous Compliance Verification

### NAE COMMUNICATION COMPLIANCE REQ

Entity A *must not talk to* Entity B

← Segmentation Compliance

Entity A *must talk to* Entity B on Y

← SLA Compliance

Entity A *must not talk to* Entity B on Z

← Traffic Restriction

Entity A *may talk to* Entity B only on Z

← Traffic Restriction

# APIC - Compliance Policy



APIC (FAB2)

admin



System **Tenants** Fabric Virtual Networking L4-L7 Services Admin Operations Apps Integrations

ALL TENANTS | Add Tenant | Tenant Search: name or descr | common | **NAE\_Compliance** | prj\_472286cbe80e491baf41f0483179348f | prj\_24a25726c9904d088cf425d240c622f6 | mso\_ansible

NAE\_Compliance



Quick Start

NAE\_Compliance

Application Profiles

CompliancesGood

Networking

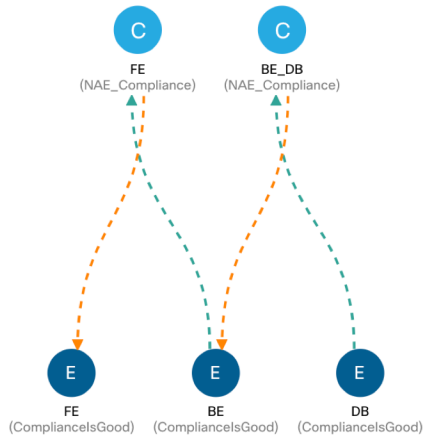
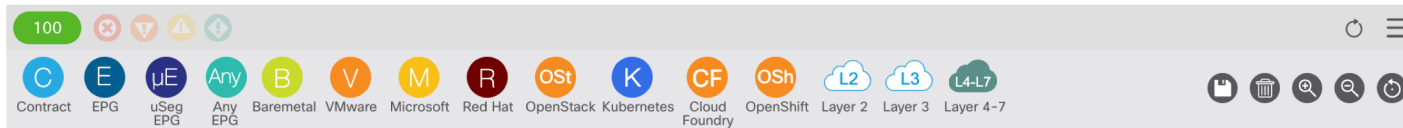
Contracts

Policies

Services

Application Profile - CompliancesGood

Summary **Topology** Policy Stats Health Faults History



### Relation Indicators

Configured  Operational

Show All  On Click

Provider	Green
Consumer	Orange
Intra EPG	Blue
Provider (from Master)	Purple
Consumer (From Master)	Dark Blue
Intra EPG (from Master)	Light Green
Master EPG	Yellow

# Policy Explorer - Connectivity Analysis

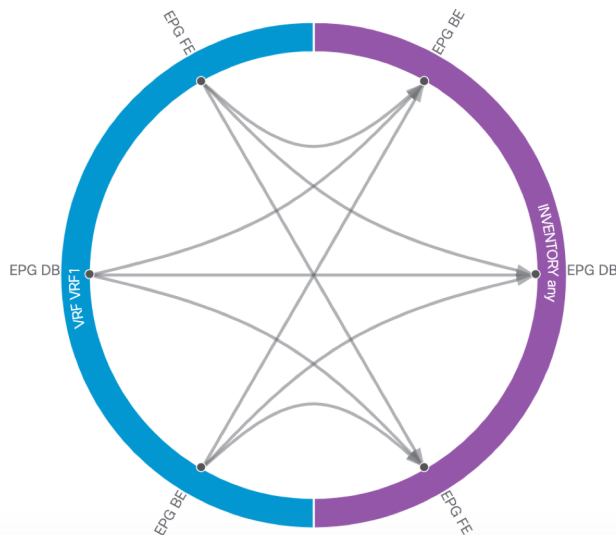
Which Entities Can Talk?

From EPG Search for DNs or names...

To EPG Search for DNs or names...

EPGs

Prefixes



## Use Cases

- Forwarding Communication Issues across entire fabric
- Visibility into Route Leakage
- Visibility into Fabric Communication with External Network
- Policy and Forwarding Inconsistencies

# Policy Explorer - Connectivity Analysis



Assurance Group ● Config-Compliance ▼ 🔍 ⚙️ A

Dashboard Change Management ▼ Epoch Delta ▼ TCAM Compliance ▼ Smart Events ▼ **Explore**

JUL  
07

8:50 PM

07/07/2019 06:30 06:45 07 PM 07:15 07:30 07:45 08 PM 08:15 08:30 08:45 08:50 09 PM 09:15 07/07/2019

↩️ Live Update Zoom Level All 1 m 1 w 1 d 12 h 6 h 1 h Custom ⏪ ⏩ ⏴ ⏵ ✖ Assurance control status

## Policy Explorer

Search

🔍 Can VRF:uni/tn-NAE\_Compliance/ctx-VRF1 talk to any ✕

- Allows you to use a Natural Query Language
- Quick and easy way to navigate to the issue





# Demo



# NAE Orderability Simplification



# ACI Premier License

- If a customer buys ACI Premier License then
  - They have already purchased Leaf for NAE (Entitled them for NIA/NIR)
- Then buy the Appliance license (below) depending on Leaf count for the fabric

CNAEL-ACI-SPARES (Below provide 3yrs or 5yrs subscription)		
Small Appliance form factor - Supports assurance of up to 50 Leafs per Fabric.	Medium Appliance form factor - Supports assurance of up to 100 Leafs per Fabric.	Large Appliance form factor - Supports assurance of up to 400 Leafs per Fabric.
CNAEL-VAL9-3Y-S	CNAEL-VAL9-3Y-M	CNAEL-VAL9-3Y-L
CNAEL-VAL9-5Y-S	CNAEL-VAL9-5Y-M	CNAEL-VAL9-5Y-L

NAE Appliance also available via: APIC-L2, APIC-L3, APIC-M2/M3 or APIC Clusters

# ACI Essentials or ACI Advantage License

CNAEL-ACI-SPARES (Below provide 3yrs or 5yrs subscription)		
Small Appliance form factor - Supports assurance of up to 50 Leafs per Fabric.	Medium Appliance form factor - Supports assurance of up to 100 Leafs per Fabric.	Large Appliance form factor - Supports assurance of up to 400 Leafs per Fabric.
CNAEL-VAL9-3Y-S	CNAEL-VAL9-3Y-M	CNAEL-VAL9-3Y-L
CNAEL-VAL9-5Y-S	CNAEL-VAL9-5Y-M	CNAEL-VAL9-5Y-L
CNAEL-LEAF-3Y-SD		
CNAEL-LEAF-5Y-SD		

NAE Appliance also available via: APIC-L2, APIC-L3, APIC-M2/M3 or APIC Clusters



# Using CNAEL-PID-SPARES

# Ordering using PID: CNAEL-ACI-SPARES



Cisco Commerce  
Estimates

Search All...

John Ng

- Catalog
- Estimates**
- Deals & Quotes
- Orders
- Services & Subscriptions
- Software

## I want to ...

- View Estimate Information
- Link to Opportunity
- Set Install/Service Location
- See Recommended Global Sales Kits
- Calculate Payment Options
- Security Subscriptions
- AS-Fixed
- Learning Credits

Export | Email | Share | Clone | Delete | Add Tag | Continue Shopping

ESTIMATE NAME Estimate\_BJ91813618ND (BJ91813618ND) Global Price List in US Dollars (USD)

ESTIMATE ID BJ91813618ND CREATED BY John Ng CREATED ON 05-May-2019

Set preferences for this estimate

Search by Sku , Program ID , Description and Product Family 1 Add Find Products & Solutions Actions

The product discounts are cascaded to subscription SKUs, but they may be eligible for lower discounts. To apply proper discount to subscriptions, please click "MORE" --> "Apply Discounts"

Remove Selected Lines More Manage Groups / Rearrange Lines

	Hardware, Software and Services	Estimated Lead Time	Unit List Price (USD)	Qty	Unit Net Price (USD)	Discount (%)	Extended Net Price (USD)
<input type="checkbox"/>	1.0 CNAEL-ACI-SPARES Cisco Network Assurance Engine Spares Valid as of 05-May-2019 11:41:11 PDT	10 days	0.00	1	0.00	0.00	0.00

Select Options | Validate | Add Note | More Actions

Add Subtotal

# NAE Appliance: CNAEL-VAPLK9-3Y-M

OPTION SELECTION: CNAEL-ACI-SPARES NAE PID Global Price List in US Dollars (USD)

---

**Configuration Summary** [View Full Summary](#)

Category	Qty	Extended List Price (USD)
Subscriptions		
Cisco Network Assurance Engine Small-Medium-Large Appliance		
CNAEL-VAPLK9-3Y-M	1	179,430.12
CNAEL-ORCHZ-3Y-SD	1	0.00
SVS-CAN-SUPT-B	1	0.00
<a href="#">Cisco Network Assurance Engine Leaf License</a>		
<a href="#">Cisco Network Assurance Engine Orchestration License</a>		
<b>Subtotal</b>		<b>179,430.12</b>
<b>Estimated Lead Time</b>		<b>28 days</b>

[Reset Configuration](#) Cancel Done

Option Search | Multiple Options Search

CNAEL-ACI-SPARES > Cisco Network Assurance Engine Small-Medium-Large Appliance

[Expand All](#) | [Collapse All](#)

Cisco Network Assurance Engine Small-Medium-Large Appliance

SKU	Term (Month(s))	Billing Model	Auto Renewal	Qty	Unit List Price (USD)
<input type="checkbox"/> CNAEL-VAPLK9-3Y-S CNAE Small Virtual Appliance 3 YR Term	36 <small>Range: 36 to 59 Start Date 7-May-2019 Requested Start/End Date</small>	Prepaid Term	<input type="checkbox"/>	Qty	89,730.00 <small>Per Device/36 Month(s)</small>
<input type="checkbox"/> CNAEL-VAPLK9-5Y-S CNAE Small Virtual Appliance 5 YR Term	60 <small>Range: 60 to 60 Start Date 8-May-2019 Requested Start/End Date</small>	Prepaid Term	<input type="checkbox"/>	Qty	144,250.20 <small>Per Device/60 Month(s)</small>
<input checked="" type="checkbox"/> CNAEL-VAPLK9-3Y-M CNAE Medium Virtual Appliance 3 YR Term	36 <small>Range: 36 to 59 Start Date 8-May-2019 Requested Start/End Date</small>	Prepaid Term	<input type="checkbox"/>	1	179,430.12 <small>Per Device/36 Month(s)</small>
<input type="checkbox"/> CNAEL-VAPLK9-5Y-M CNAE Medium Virtual Appliance 5 YR Term	60 <small>Range: 60 to 60</small>	Prepaid Term	<input type="checkbox"/>	Qty	288,499.80 <small>Per Device/60</small>

# NAE Leaf: CNAEL-LEAF-3Y-SD

OPTION SELECTION CNAEL-ACI-SPARES Global Price List in US Dollars (USD)

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**Configuration Summary** [View Full Summary](#)

Option Search ⓘ Multiple Options Search ⓘ ▼

---

**Category ⓘ** Qty Extended List Price (USD)

⊖ Subscriptions

**Cisco Network Assurance Engine Small-Medium-Large Appliance** ^

CNAEL-VAPLK9-3Y-M	1	179,430.12
CNAEL-ORCHZ-3Y-SD	1	0.00
SVS-CAN-SUPT-B	1	0.00

**Cisco Network Assurance Engine Leaf License** ^

CNAEL-LEAF-3Y-SD	1	14,969.88
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**Cisco Network Assurance Engine Orchestration License**

**Subtotal** 194,400.00

**Estimated Lead Time** 28 days

[Reset Configuration](#) Cancel Done

CNAEL-ACI-SPARES > Cisco Network Assurance Engine Leaf License

[Expand All](#) | [Collapse All](#)

⊖ Cisco Network Assurance Engine Leaf License

SKU	Term (Month(s))	Billing Model	Auto Renewal	Qty	Unit List Price (USD)
<input checked="" type="checkbox"/> <b>CNAEL-LEAF-3Y-SD</b> CNAE License to assure Leaf 3 YR Term, Std Option	<input type="text" value="36"/> <small>Range: 36 to 59</small> <b>Start Date</b> 8-May-2019 <small>Requested Start/End Date</small>	Prepaid Term ▼	<input type="checkbox"/>	<input type="text" value="1"/>	<b>14,969.88</b> <small>Per Device/36 Month(s)</small>
<input type="checkbox"/> <b>CNAEL-LEAF-5Y-SD</b> CNAE License to assure Leaf 5 YR Term, Std Option	<input type="text" value="60"/> <small>Range: 60 to 60</small> <b>Start Date</b> 8-May-2019 <small>Requested Start/End Date</small>	Prepaid Term ▼	<input type="checkbox"/>	<input type="text" value="Qty"/>	<b>24,049.80</b> <small>Per Device/60 Month(s)</small>

# NAE 3 Month Service Deliverables

## Deliverables

- AS deployed NAE Instance will provide assurance for upwards of **1 assurance group (1 ACI Fabric) per ASF**.
- Post installation of NAE Appliance. There will be half-day training session focusing on product features and how to operate the appliance.
- Fabric Event - Identify top 10 Smart events **weekly** and provide interpretation to customer via email. Up to 3 times a week, identification is based on samples collected...Secure File Exchange, Secure Box or Jump host to NAE appliance
- Fabric Analysis Report - Review events collected during the week, generate report to customer on up to 4 events with expert analysis and recommendation. Webex meeting: weekly in M1, bi-weekly in M2 and M3. Weekly touchpoint - Webex based Updates on NAE Assurance - Review critical issues, if any, observed during the week requiring prioritized action
- Ongoing Knowledge Transfer for staff - Product features, Operational use cases
- Operations Knowledge Transfer (Full-day) - Workshop focused on NAE Day 2 operations use cases. Use cases covered will include Change Management, Optimization and Troubleshooting. Help customer update and streamline their operational process to create a new customized playbook.

# NAE Roadmap

## 3.0(1)

CCO: Nov 2018

### Assurance

- Forward Conn Analysis/Visuals
- PC/vPC
- Dynamic Path Binding
- ACI 4.0
- 200 Leaf Scale

### Workflow

- Compliance: Segmentation
- Policy Delta

### Usability

- Event Suppression
- LDAP

## 3.1(1)

CCO: April 8, 2019

### Assurance

- IPv6 Forwarding
- PBR compatibility (False Positive Removal)
- 400 Leaf Support

### Workflow

- Compliance: SLA
- Compliance: Traffic Restriction

### Usability

- Production Ready APIs

### Packaging

- vSphere, vCenter 6.7 support

## 4.0(1)

Target CCO: August/Sept 2019

### Assurance

- ACI 4.1
- Global Search
- Smart Event Lifecycle
- Remote Leaf
- Black list contracts
- ACI GOLF support

### Workflow

- Config Compliance

### Usability

- UI Simplification
- NAE PE natural lang query
- Multiple Fabric Scheduler
- Offline Analysis Delete

## Roadmap

Target: Q4CY'19/1HCY20

### Assurance

- Multi-Site
- Ecosystem Assurance VMM/ LB
- ACI Anywhere

### Workflow

- Pre-Change Verification
- Compliance: Config naming
- Report Generation for Epoch Delta Analysis and Compliance

### Usability

- Import/Export NAE Config
- TACACS+

### Packaging

- Smart Licensing
- Service Engine



# Vision : Assurance Everywhere

## Cross Platform, Multi-cloud

Available  
2019

Cross-platform  
Network Integration



CITRIX



Virtual  
Machine  
Manager

Available  
Now

Integration with  
Operations Toolchains

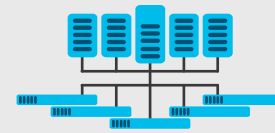
splunk>

servicenow

turbonomic  
CWOM



ACI Data Center  
Fabric





# Cisco Network Assurance Engine

## Deployment Model

Zero Touch

No sensors, No Packet Data

## Time to Value

30 mins to deploy

60 mins to value

## Form Factors

Software only OVA

Lightweight: 3 VMs

**Available Now**

**30-Day Free Trial**

**Subscription Licensing**

# NAE Virtual Appliance VM Specs

<b>Requirement</b>	<b>Appliance Model: Small</b>	<b>Appliance Model: Medium</b>	<b>Appliance Model: Large</b>
Model	NAE-V500-S	NAE-V1000-M	NAE-V2000-L
Virtual Machines	3 VMs	3 VMs	3 VMs
CPU (vCores per VM)	8	12	24
Memory (GB per VM)	40	64	96
Disk	1 TB in total per VM	2 TB in total per VM	4 TB in total per VM
Storage	SSD	SSD	SSD
APIC Fabric Size	50 leaf switches for a 3 VM cluster	100 leaf switches for a 3 VM cluster	400 leaf switches for a 3 VM cluster

# For More Information – NAE Summary

- How to reach us:
  - [ask-nae-pm@cisco.com](mailto:ask-nae-pm@cisco.com)
  - [nae-pm-team@cisco.com](mailto:nae-pm-team@cisco.com)
  - [nae-tme-team@cisco.com](mailto:nae-tme-team@cisco.com)
- Network Assurance Engine: <http://www.cisco.com/go/nae>
- Customer Testimonial by Cisco IT: <http://cs.co/nae-Cisco-IT>
- NAE Packet Pusher Podcast: <http://cs.co/nae-packetpusher>
- Youtube useful videos:
  - Youtube: search = “Cisco NAE”

# Benefits of Cisco ACI and Cisco NAE

Cisco ACI



AUTOMATION & AGILITY

Cisco Network  
Assurance Engine



DAY 2 OPERATIONS  
REACTIVE TO PROACTIVE

Delivering Intent Based Networking in the Data Center



Thank you!