Unlocking Day2Ops Excellence

Nexus Dashboard Innovations for ACI & NX-OS N9K Fabrics

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Session ID: BRKDCN-3924

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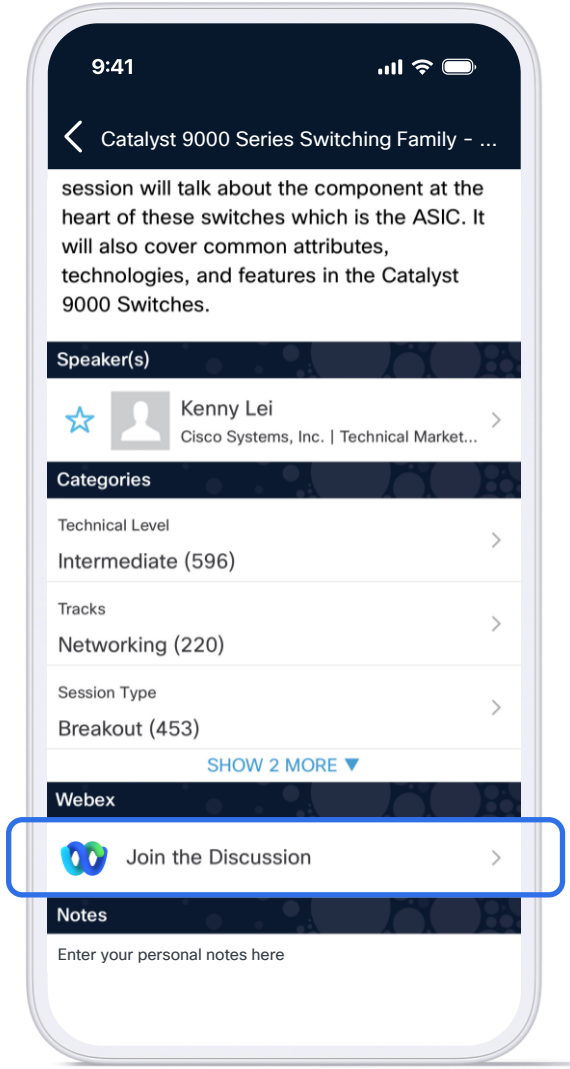

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Agenda

01 Day 2 Ops

02 Nexus Dashboard Overview

03 Features

04 Troubleshooting Demos

05 Conclusion

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Day 2 OPS

Managing the Complete Lifecycle

Infrastructure planning, delivery and installation

Discover, configure and secure

Assure, monitor and troubleshoot

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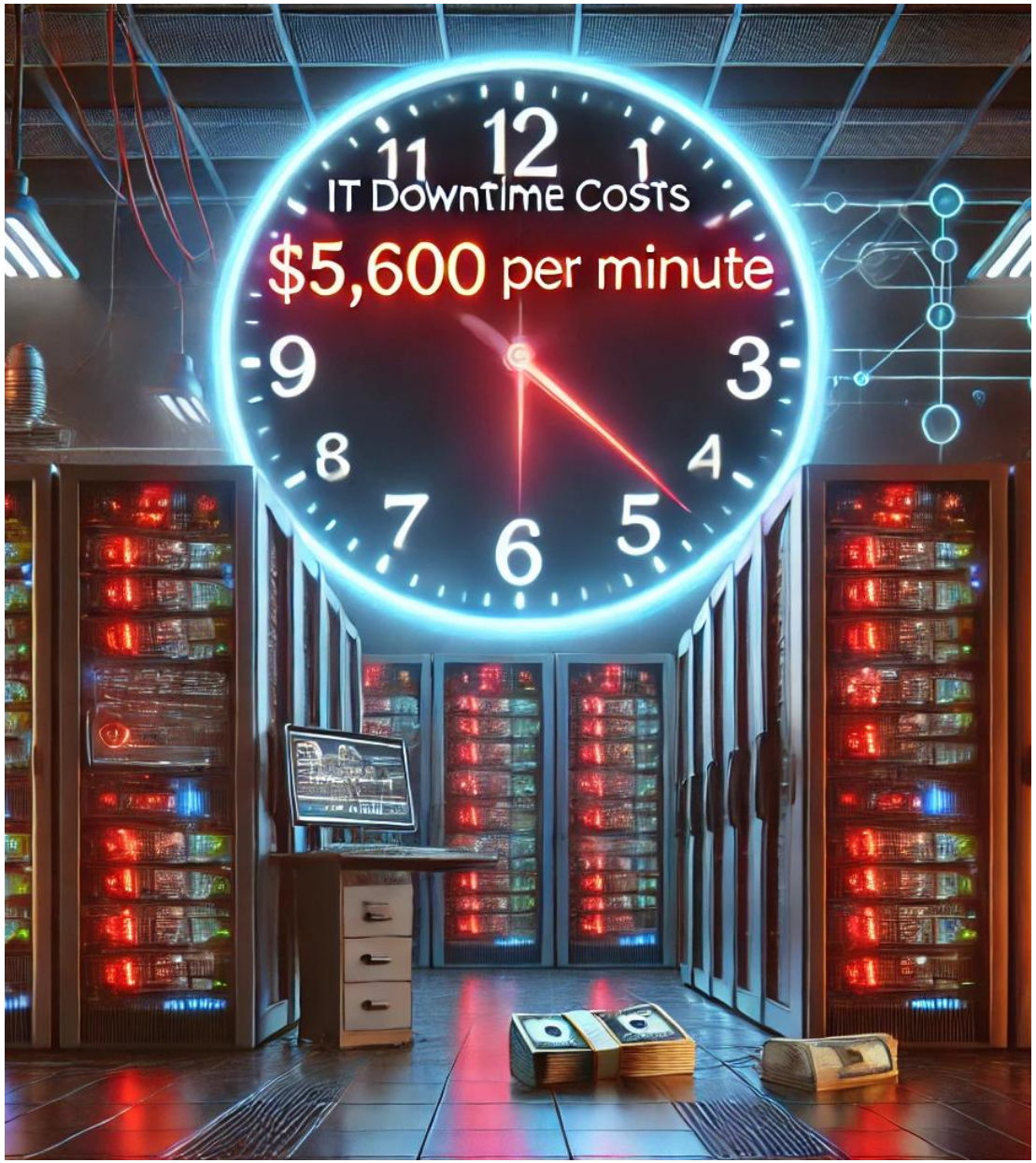
"The average cost of IT downtime is $5,600 per minute" – Gartner



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"Organizations that focus on proactive problem management can resolve issues 43% faster compared to reactive problem solving." – IDC (International Data Corporation)

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What’s happening on Day 2 and what needs to change?

Customer Challenges

Tools

Fragmented

- Too many tools addressing silo-ed visibility use cases
- Some are old, and some are expensive
- Different protocols/mechanisms

Analyze

Reactive

- Inconsistent API architecture
- Specialized knowledge required
- Difficult to root-cause issue, and often time too late to react to it

Insights

Limited

- Low data fidelity that is not actionable
- Lack of data correlation, don't get the full picture
- No dataplane visibility

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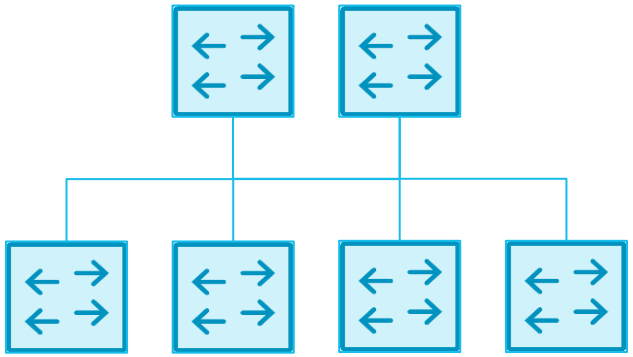
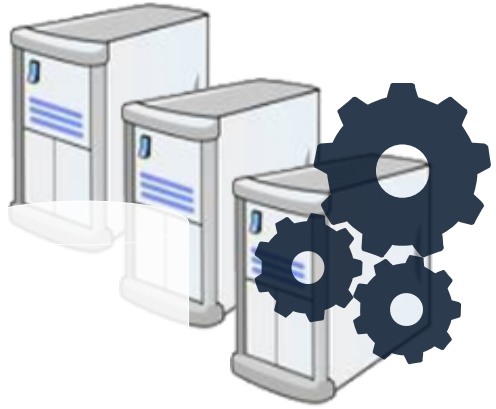
Network Telemetry Frees the Data

Where Data Is Created



As Much Useful Data
As Efficiently as Possible

Where Data Is Useful



Storage &
analysis

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Key Streaming Telemetry Characteristics

Push not Pull

Efficient Delivery

{JSON} JavaScript Object Notation

protobuf Protocol Buffers

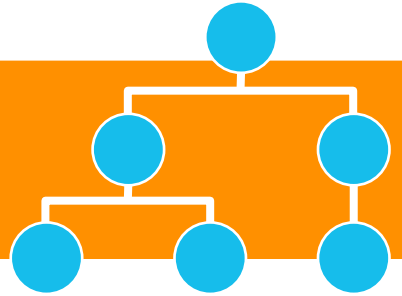
GRPC

http://

UDP

Analytics-ready Data

Tool-Chain Integration



Data-model Driven

Granularity

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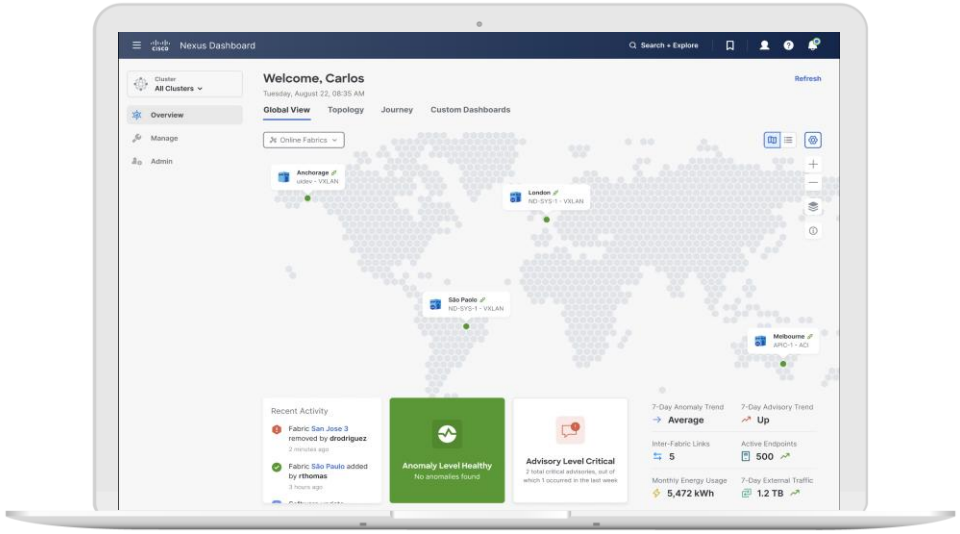
Nexus Dashboard Overview

Nexus Dashboard

Operations Use cases and highlights



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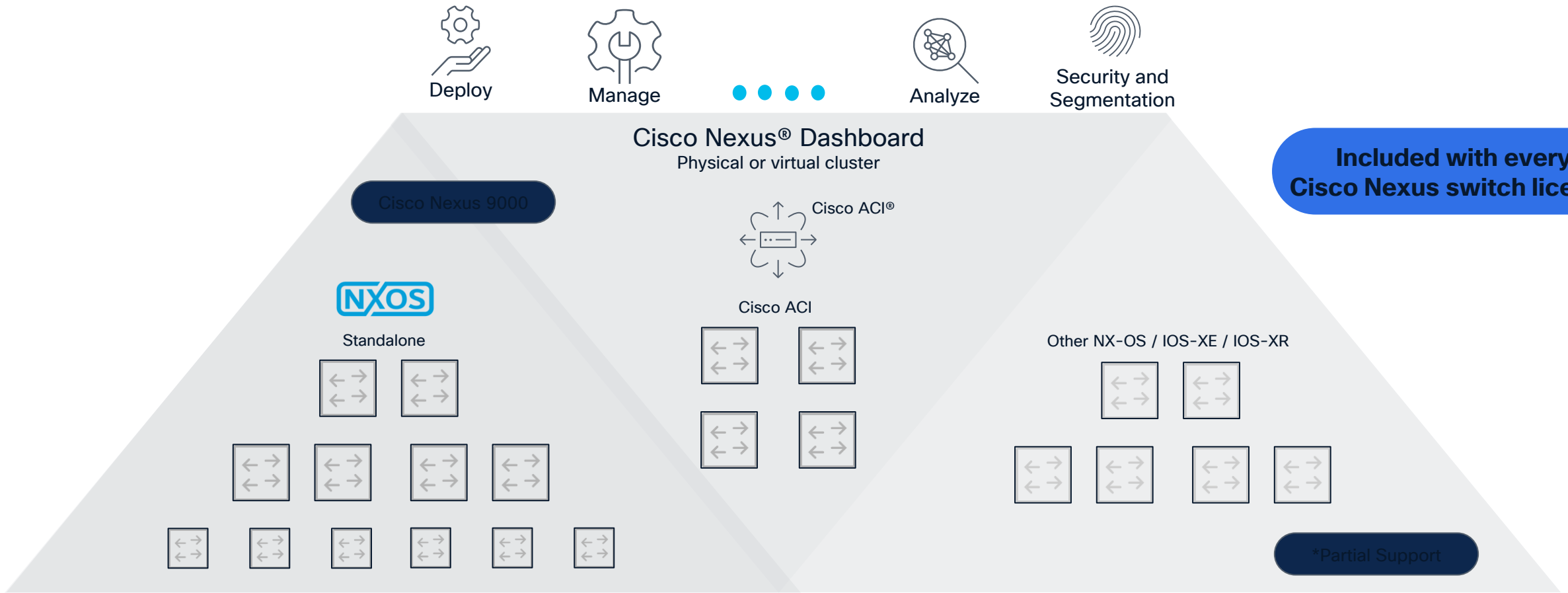
Unified data-center network operations

Visibility, analytics, troubleshooting tools, and compliance all in one place



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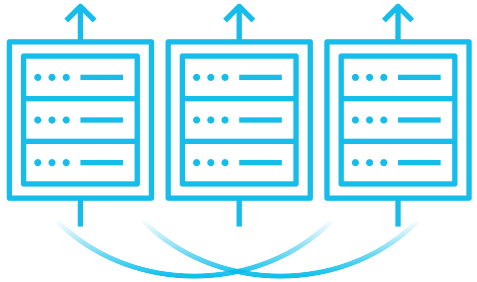
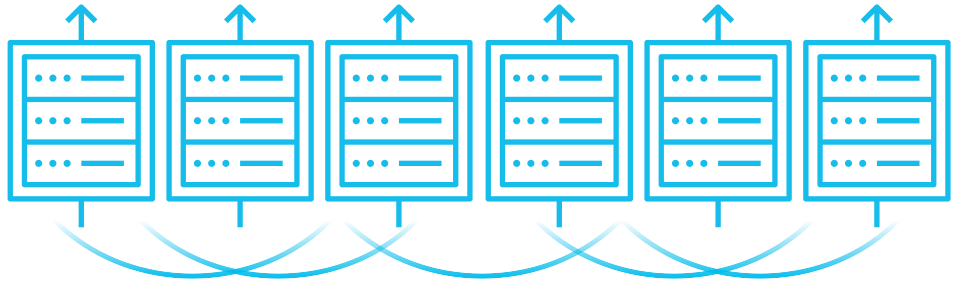
Nexus Dashboard

Nexus Dashboard Form Factors and scale

One Node pND – Up to 50 switches

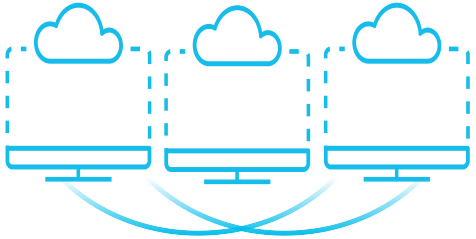


Three Node pND – Up to 400 switches

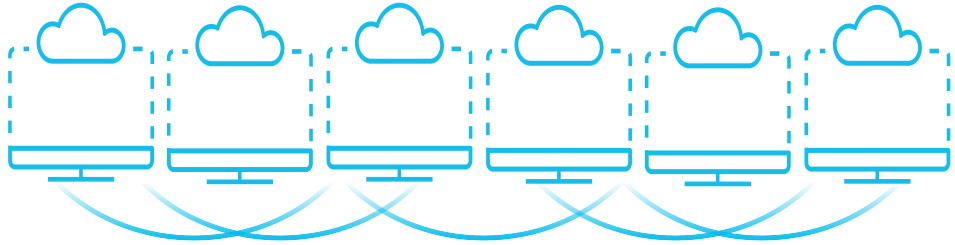


Six Node pND – Up to 750 switches

One Node vND Data – Up to 25 switches



Three Node vND –
Up to 50 switches



Six Node vND – Up to 200 switches

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Nexus Dashboard – Green/Brown Field

LAN Fabric automation and/or onboarding for AI analytics

Classic
2 or 3-tier NX-OS architectures

VXLAN
BGP EVPN fabrics for Nexus & Catalyst (IOS-XE)

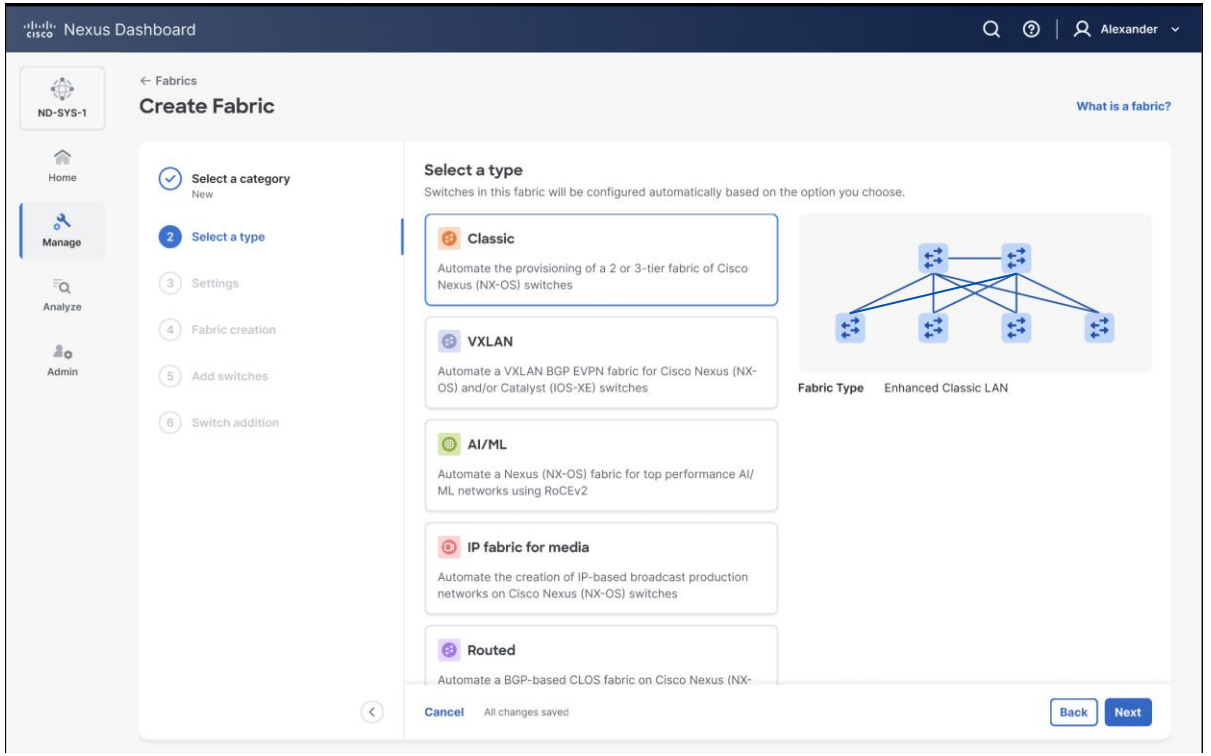
AI/ML
Fine-tuned network provisioning to transport AI/ML apps with the best performance

External & Inter-Fabric Networks
NX-OS, IOS-XE, XR & 3rd party networks mainly used to interconnect ACI, NX-OS, & Campus

IP fabrics for media
Fine-tuned network provisioning and monitoring for broadcasting and media

Routed
BGP-based CLOS NX-OS fabrics

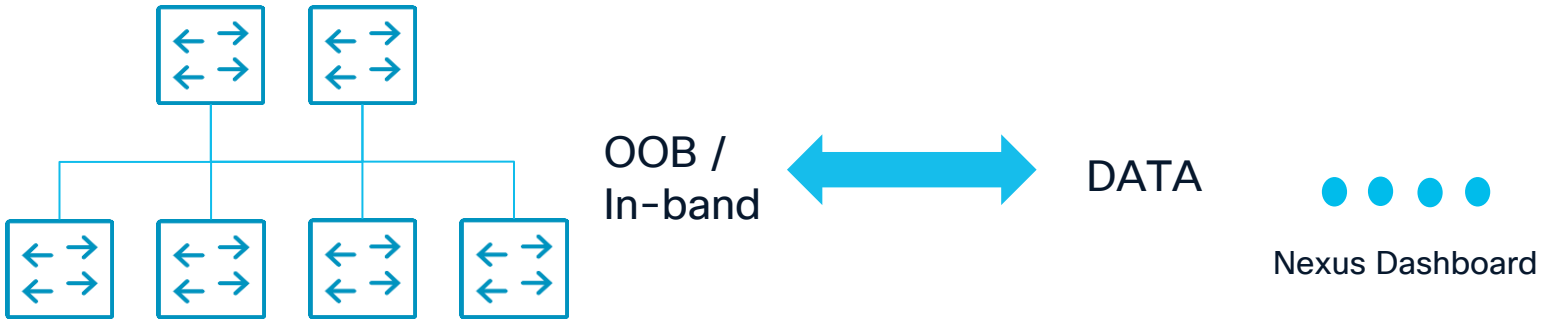
ACI



LAN

Unified Connectivity (OOB or In-band)

- Select the Streaming Telemetry Connectivity
- Connectivity always to ND Data
- Stream out Software Telemetry
- Support for Traffic Analytics*



*No support for FT and flow troubleshooting jobs

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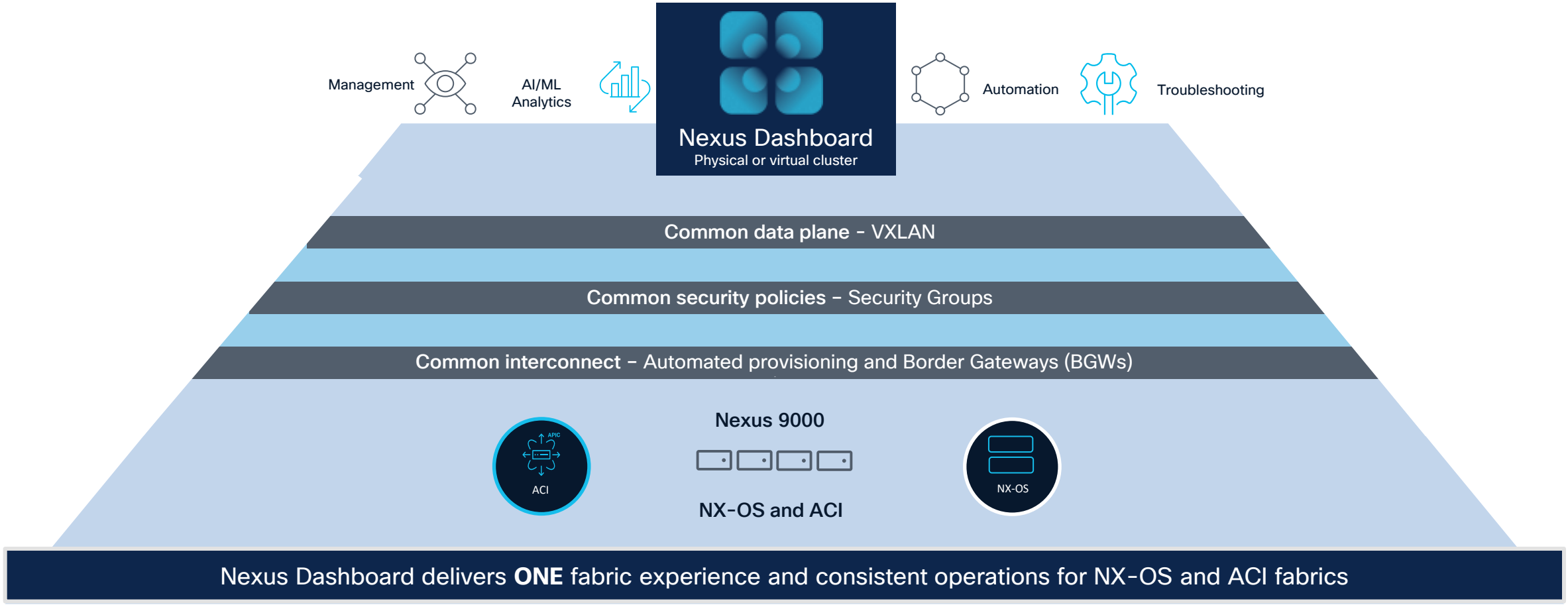
The power of ONE Nexus fabric experience



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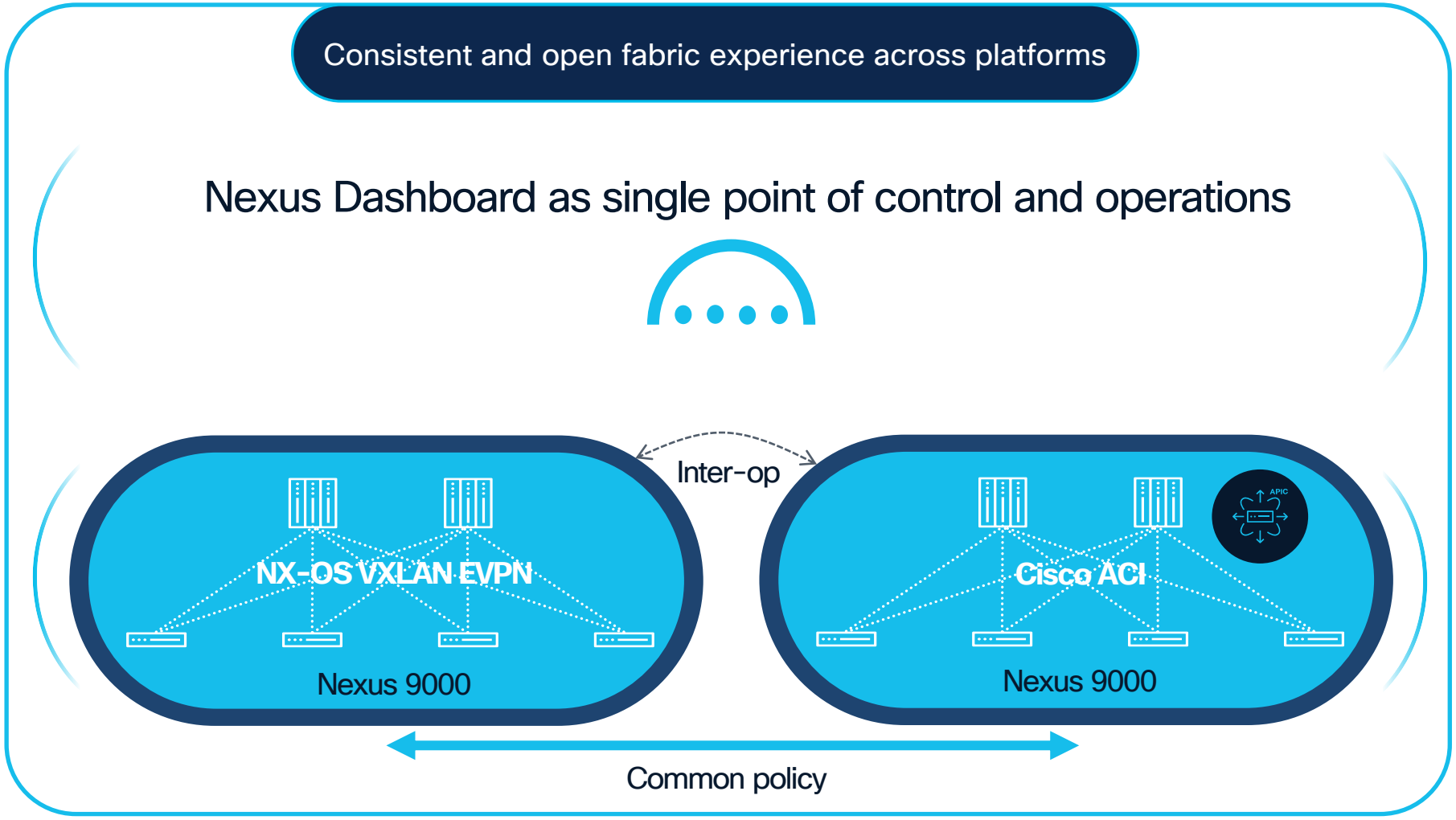
Introducing Cisco Nexus ONE

Solution Components

- Zero trust networking and micro-segmentation based on endpoint / security groups
- Advanced service chaining and service redirection
- Administrative multi-tenancy
- Standards based inter-op with 3rd party networks using open networking protocols
- Integration with CI/CD pipelines with DevOps ready APIs



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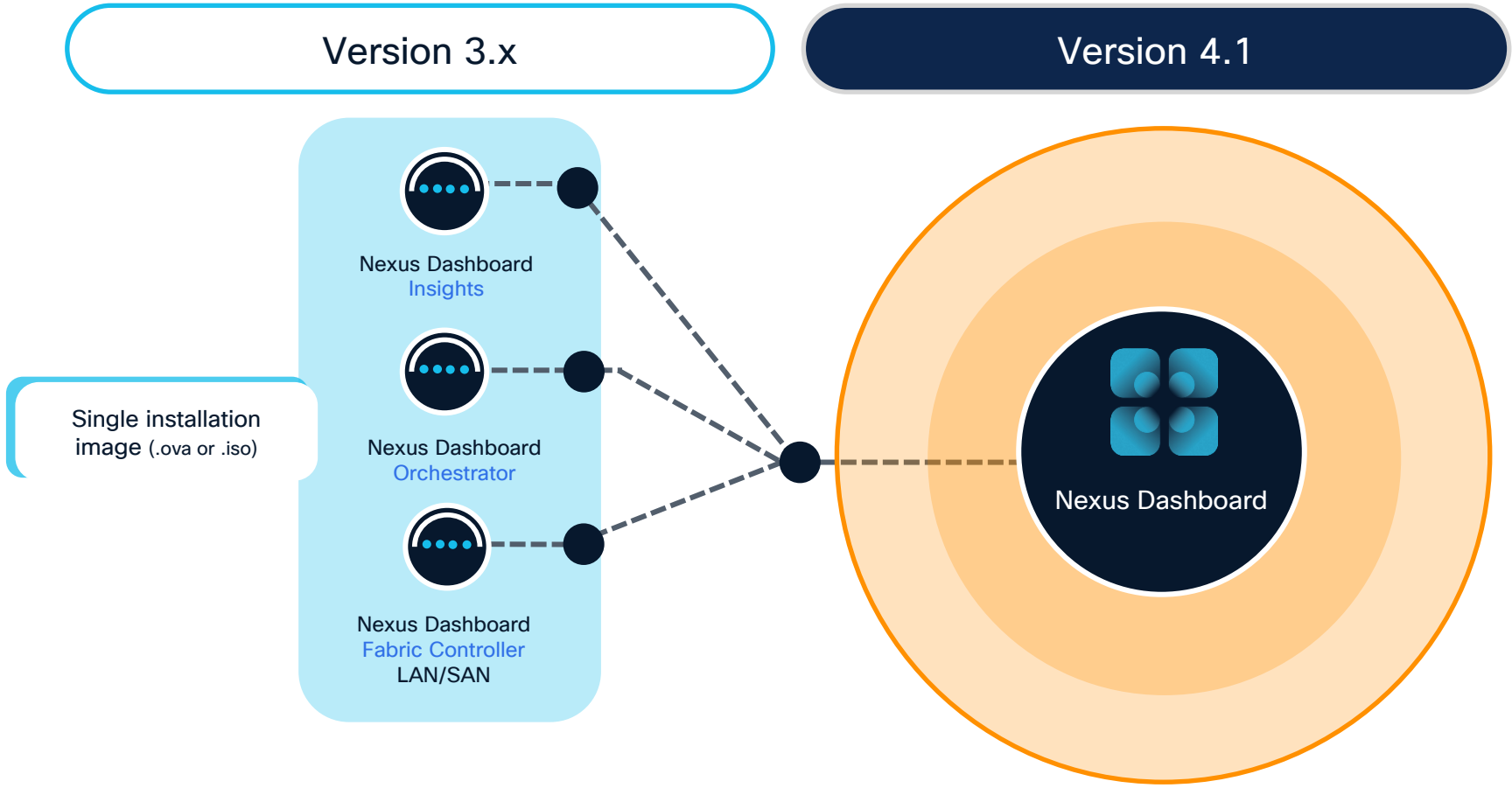
Unified Nexus Dashboard

Toward simplification and unification



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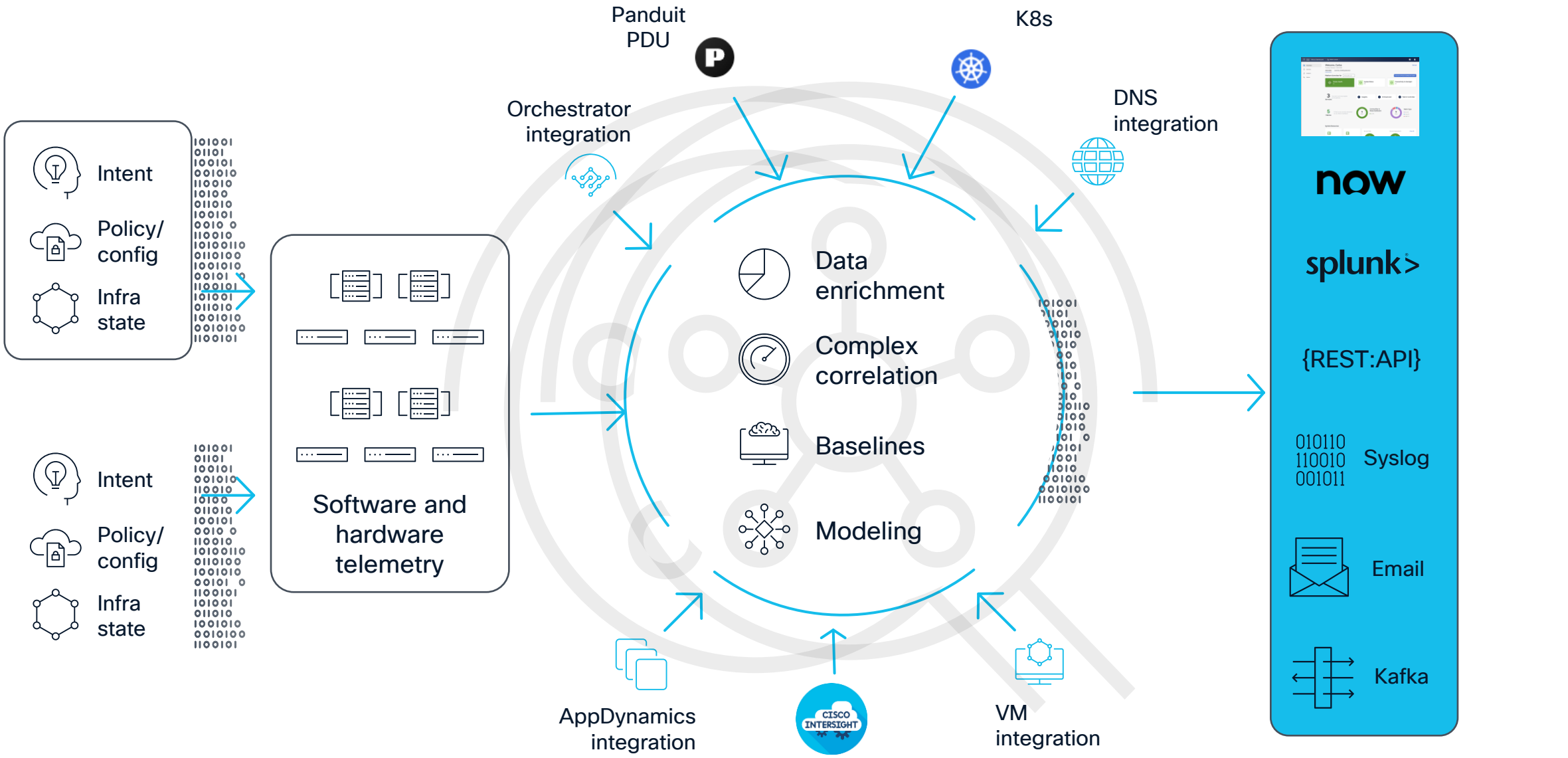
ND Telemetry Architecture

Nexus Dashboard

Virtual form-factor

Physical form-factor



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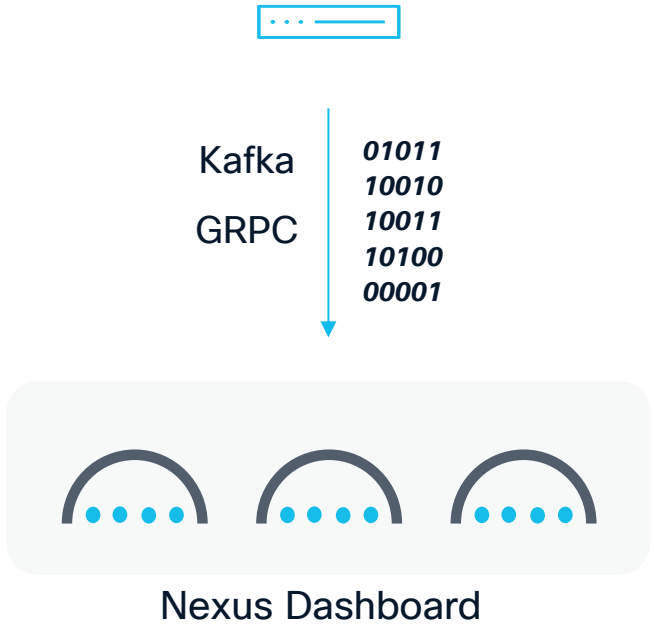
Telemetry Data Collection

Software Telemetry

- Software Telemetry allow devices to export data only with an initial subscription request
- Telemetry can collect any objects stored in the Data Management Engine(DME), i.e.
  - Interface and hardware statistics
  - Endpoints
  - Show commands output
  - Routing protocols information
- Real Time telemetry allows on-demand subscription of specific resources for a limited time



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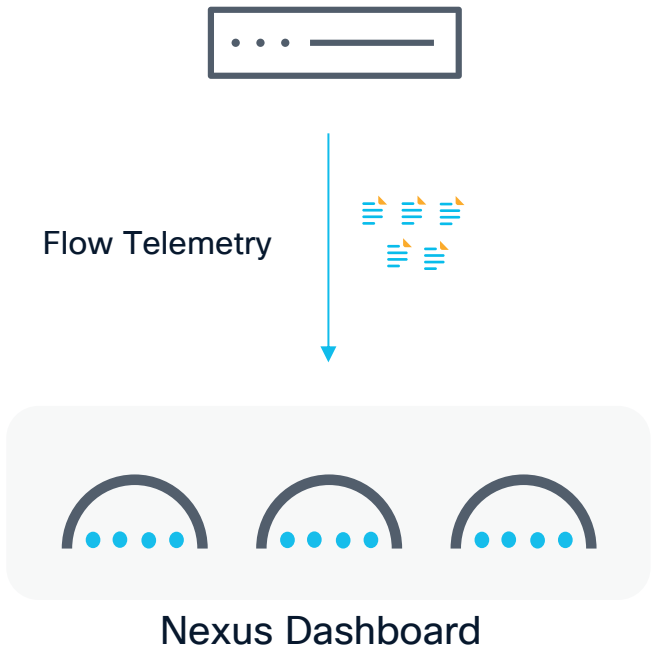
Telemetry Data Collection

Hardware Telemetry

- Hardware Telemetry exports data about
  - Flow Information
    - Flow Telemetry
    - Traffic Analytics (NetflowV9)
  - Packet Drops (Flow Telemetry Events)



*Traffic Analytics involves some CPU operations too

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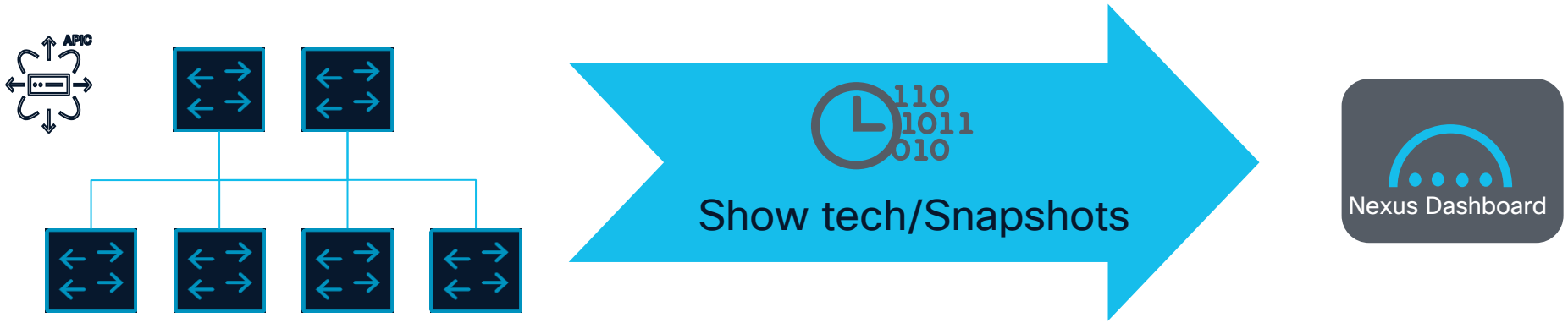
Telemetry Data Collection

Fabric Snapshots and Show Tech Collection

- Every 2 hours Insights performs a full snapshot of the fabric
- Every week* show tech is collected for all switches and controllers
- Data is stored for 30+ days in historical DB



*2 weeks if fabric has more than 100 switches

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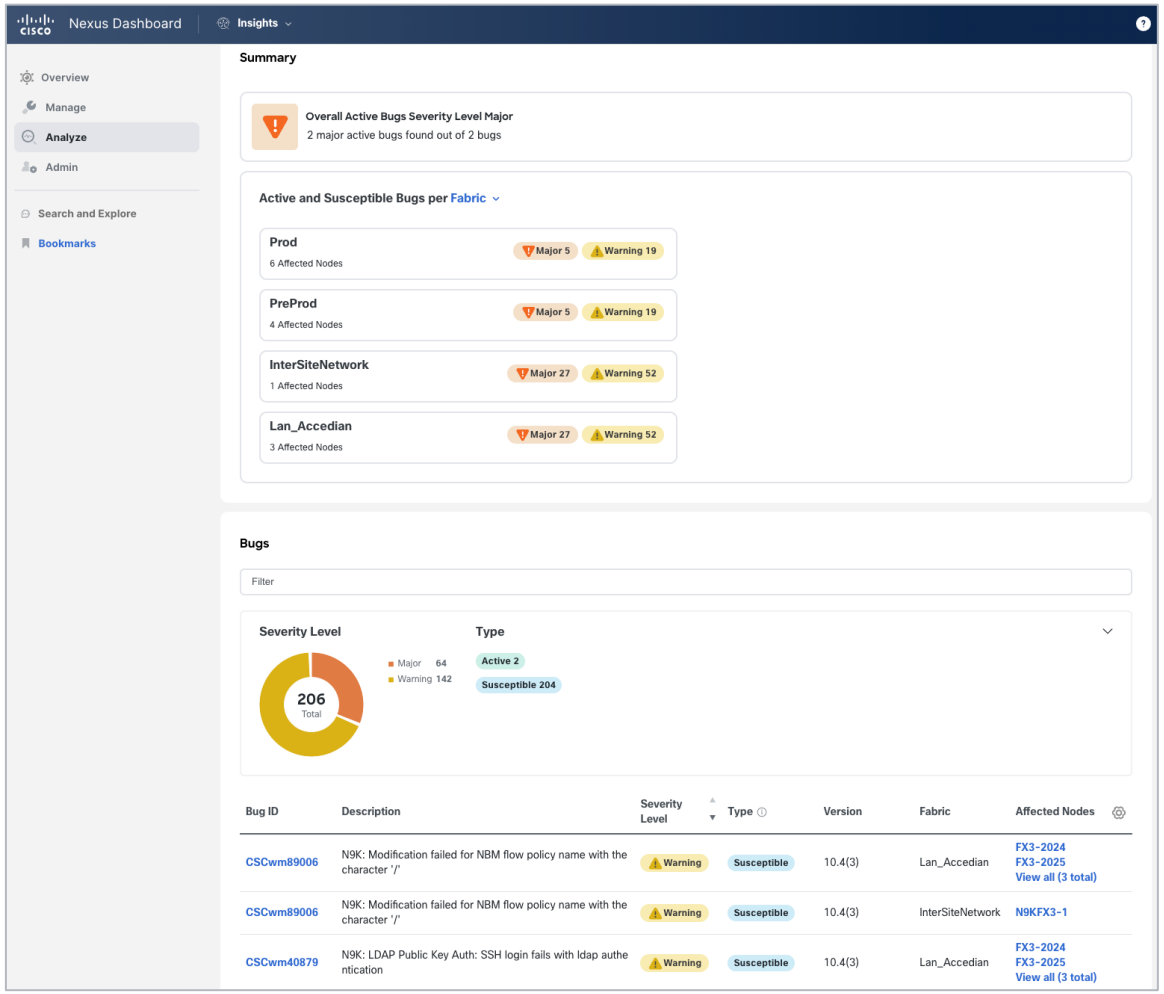
Bug Scan

show tech and signature based



Known bugs based on Cisco RN

Active bugs through digital signature

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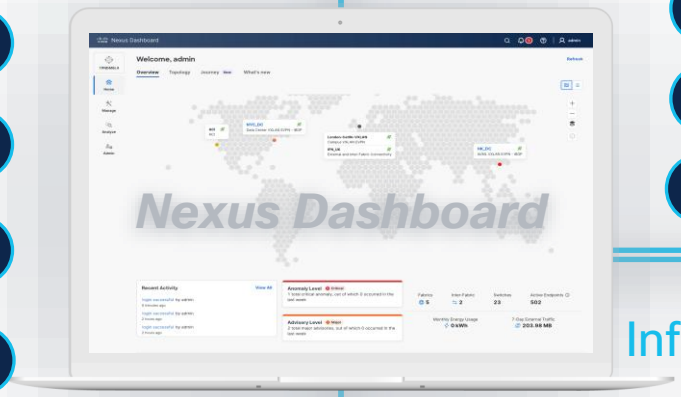
Shipping

Cisco Nexus Dashboard

AI capabilities – What is here today!

Descriptive analysis

- Hardware conformance
- Software conformance
- Scale conformance
- Configuration compliance
- SAN Insights
- Delta analysis
- Automated bug scan
- Global Product Search
- Advisory reporting



Time series analysis

- Traffic analytics
- Interface consumption
- Energy Management analysis
- Optics (SFP) Failure Prediction
- Micro-burst detection

Inferential/Correlation analysis

- Root cause analysis
- Anomaly correlation

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Features

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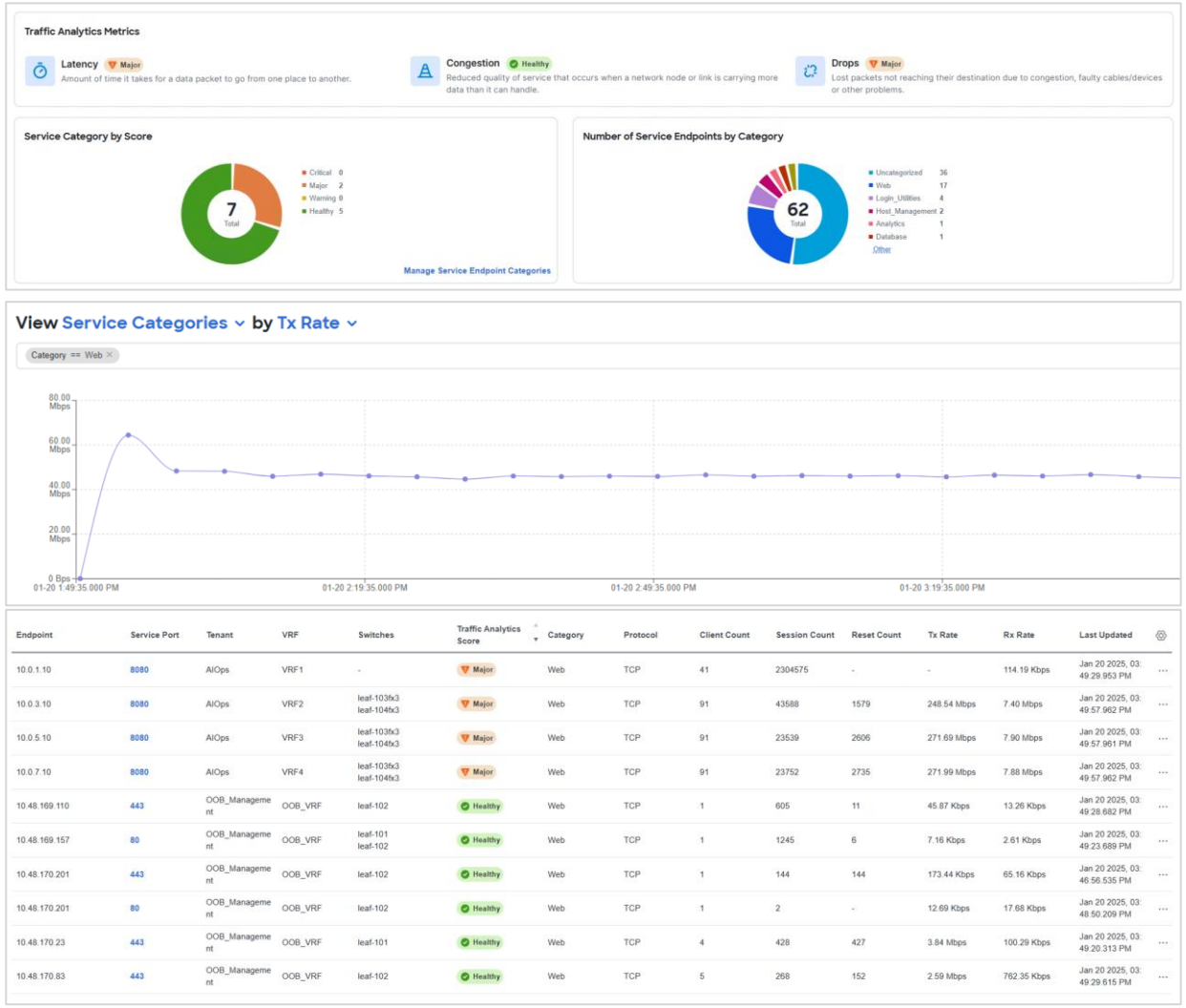
Live UI/Feature Walkthrough
The remaining slides in this deck are for your reference

Demos

How to troubleshoot an application connectivity issue

Traffic Analytics

Highlights and benefits



- Monitor all flows for Congestion, Latency, Drops
- Traffic Categorization
- Pervasive Visibility
- Detect potential issues faster
- Historical flow data maintained for up to 7 days

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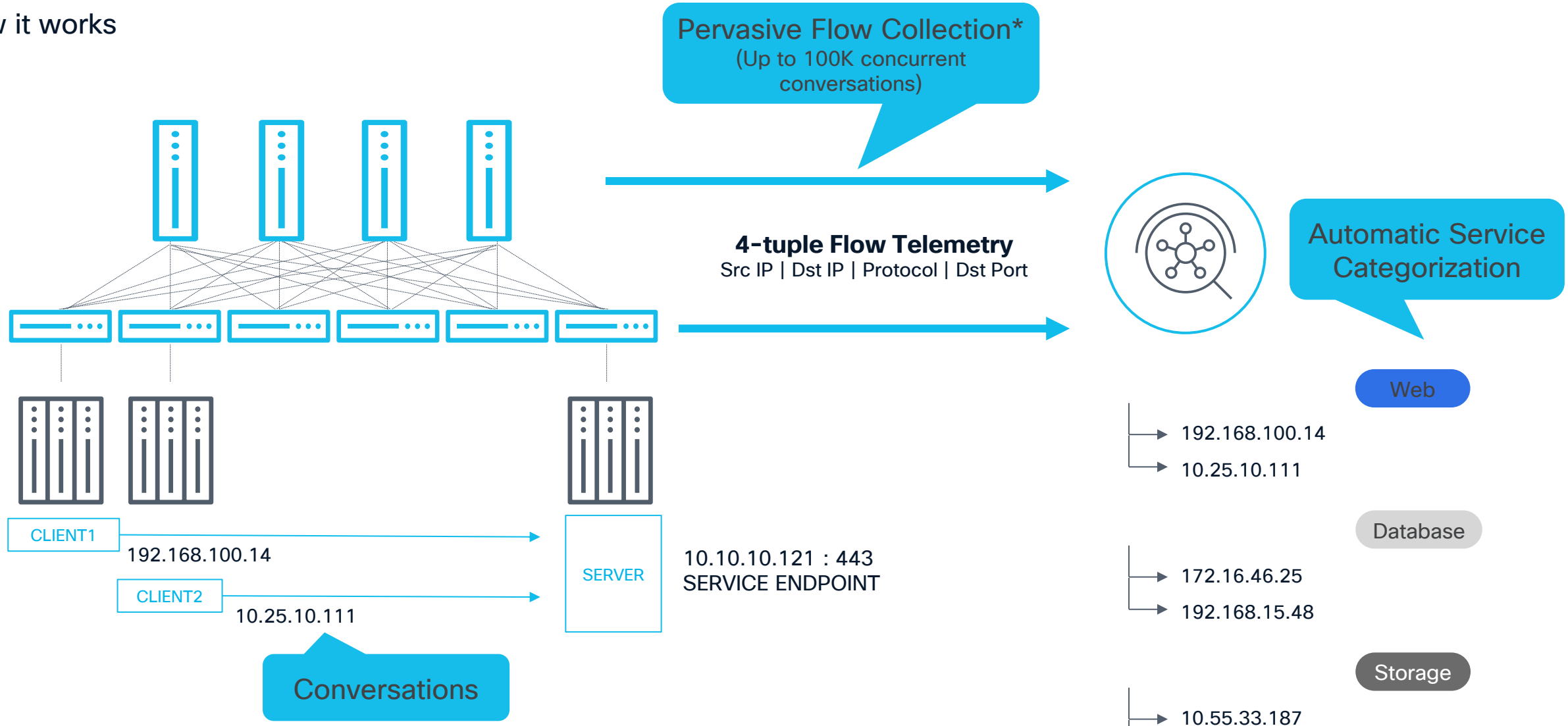
Traffic Analytics

How it works



*TCP and UDP only, L3 flows only, no transit routing

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Connectivity Analysis

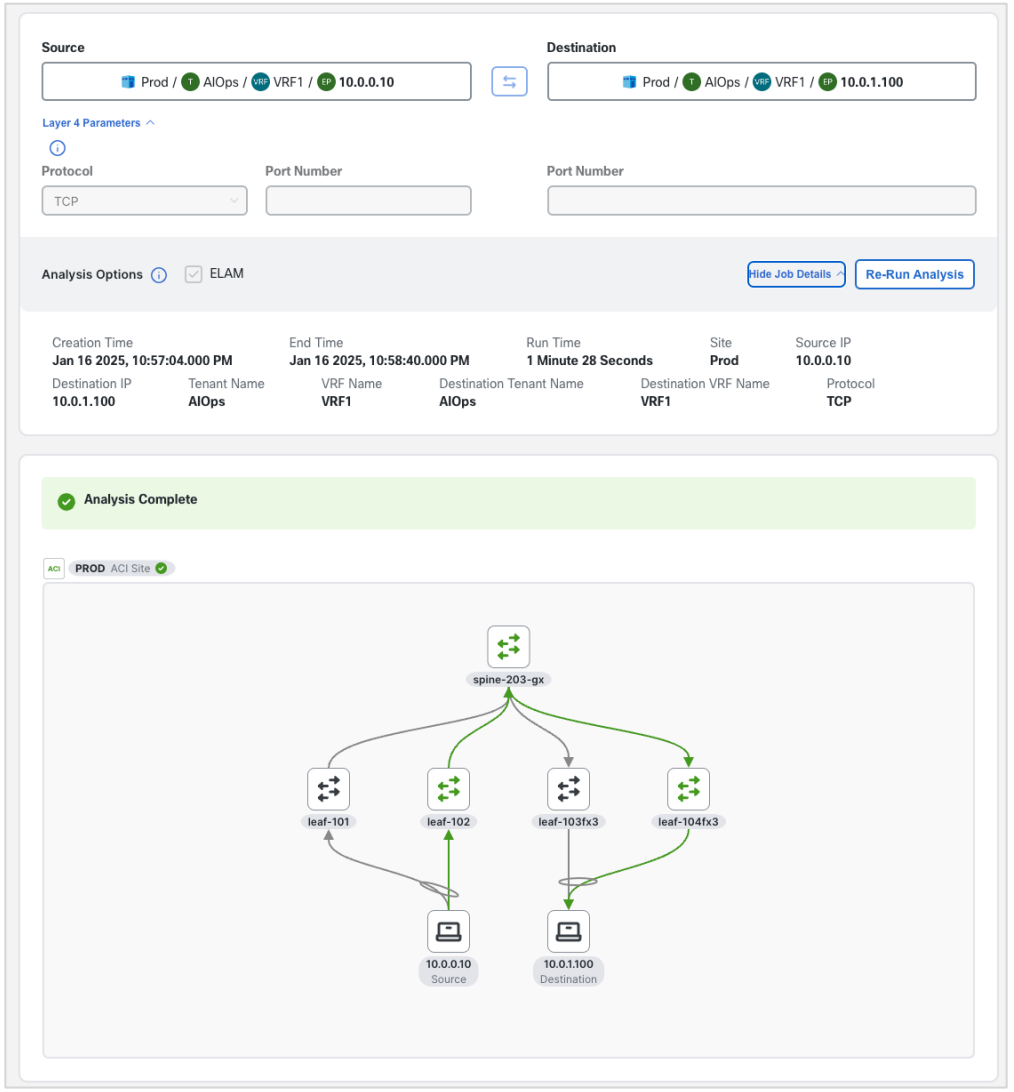
Connectivity Analysis

On Demand Helper

Traces all possible forwarding paths between source and destination

Identifies if there are problems in the path and where the issues are

Helps narrowing down the root cause, running forwarding checks



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Connectivity Analysis

Analysis Options

ELAM

Supported on: ACI;NX-OS

ELAM captures live traffic crossing the devices

Then a report will be generated and retrieved by ND

ELAM can provide additional information on why the packets are dropped

OAM

Supported on: NX-OS

OAM is a protocol that facilitates troubleshooting in VXLAN EVPN

The main goal is to understand if the path between two EPs is healthy

No real traffic between EP is required. Can be generated by the devices

Consistency-Checker

Supported on: NX-OS

CC is a NX-OS utility that validates the consistency between the software and hardware tables

Can be used to detect a mis programming caused by a bug or an unexpected configuration

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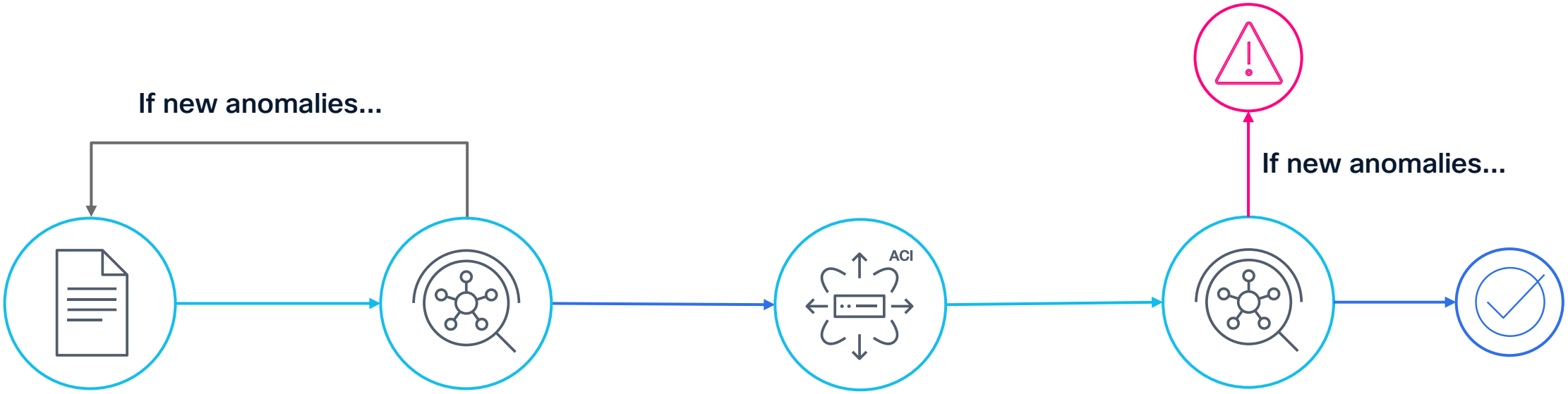
CICD Pipeline

Enhancing Change Management



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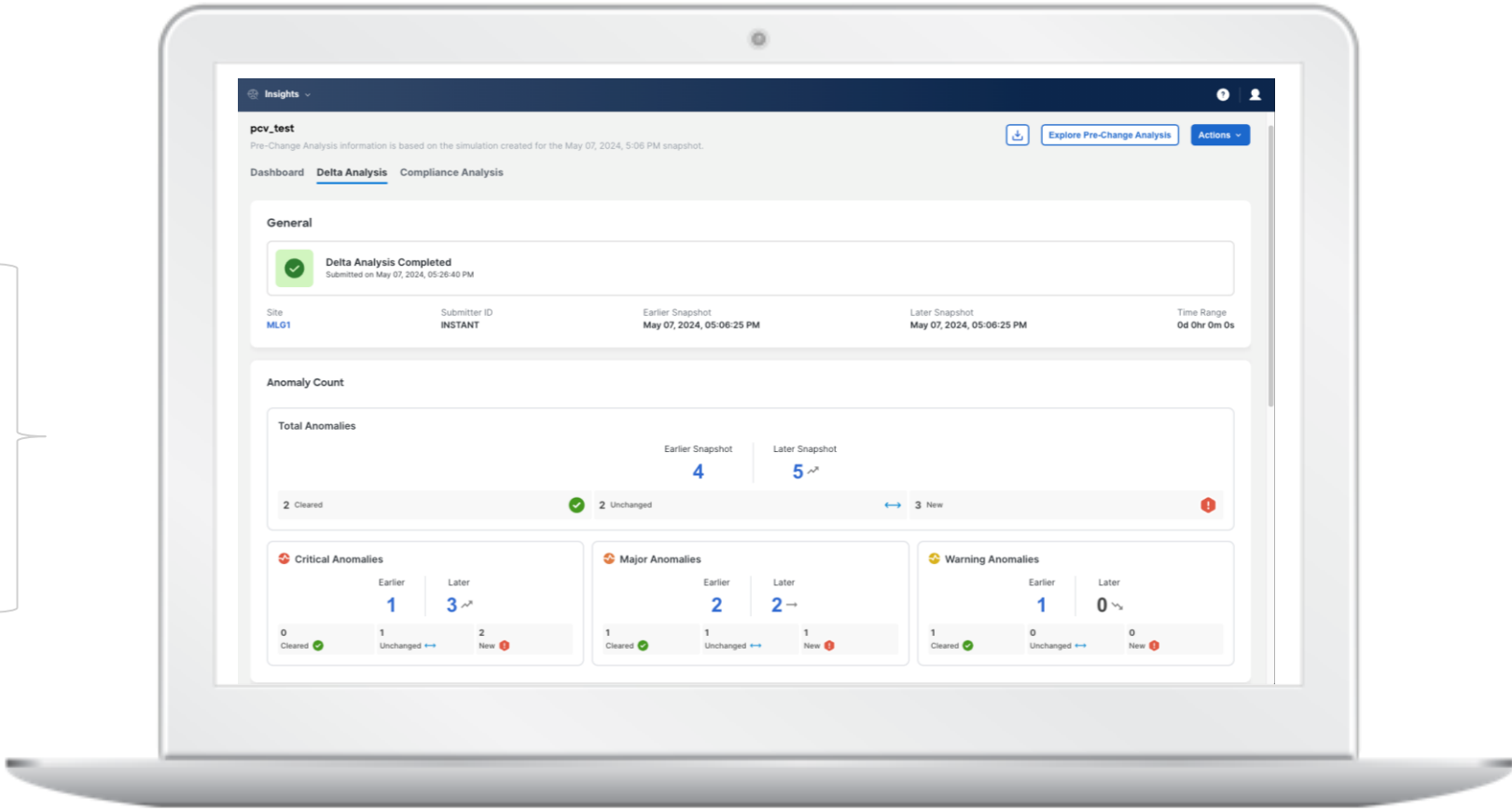
Enhancing Change Management

Model intended configuration

Current configuration → Assurance Analysis results

Intended changes → Assurance Analysis results

See impact of intended changes



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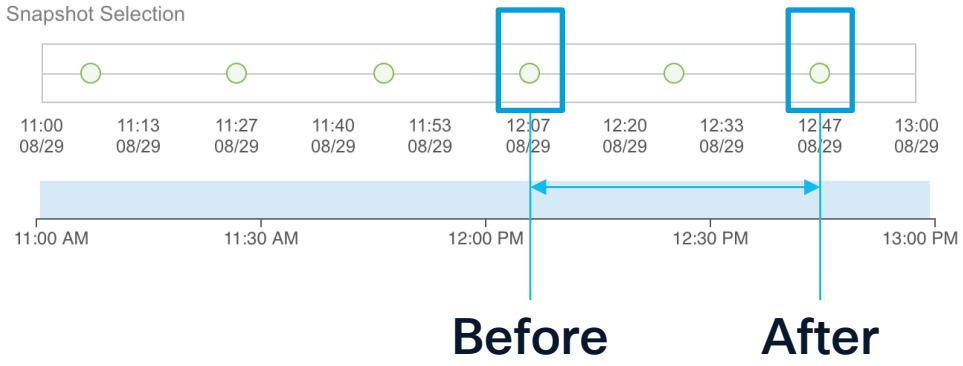
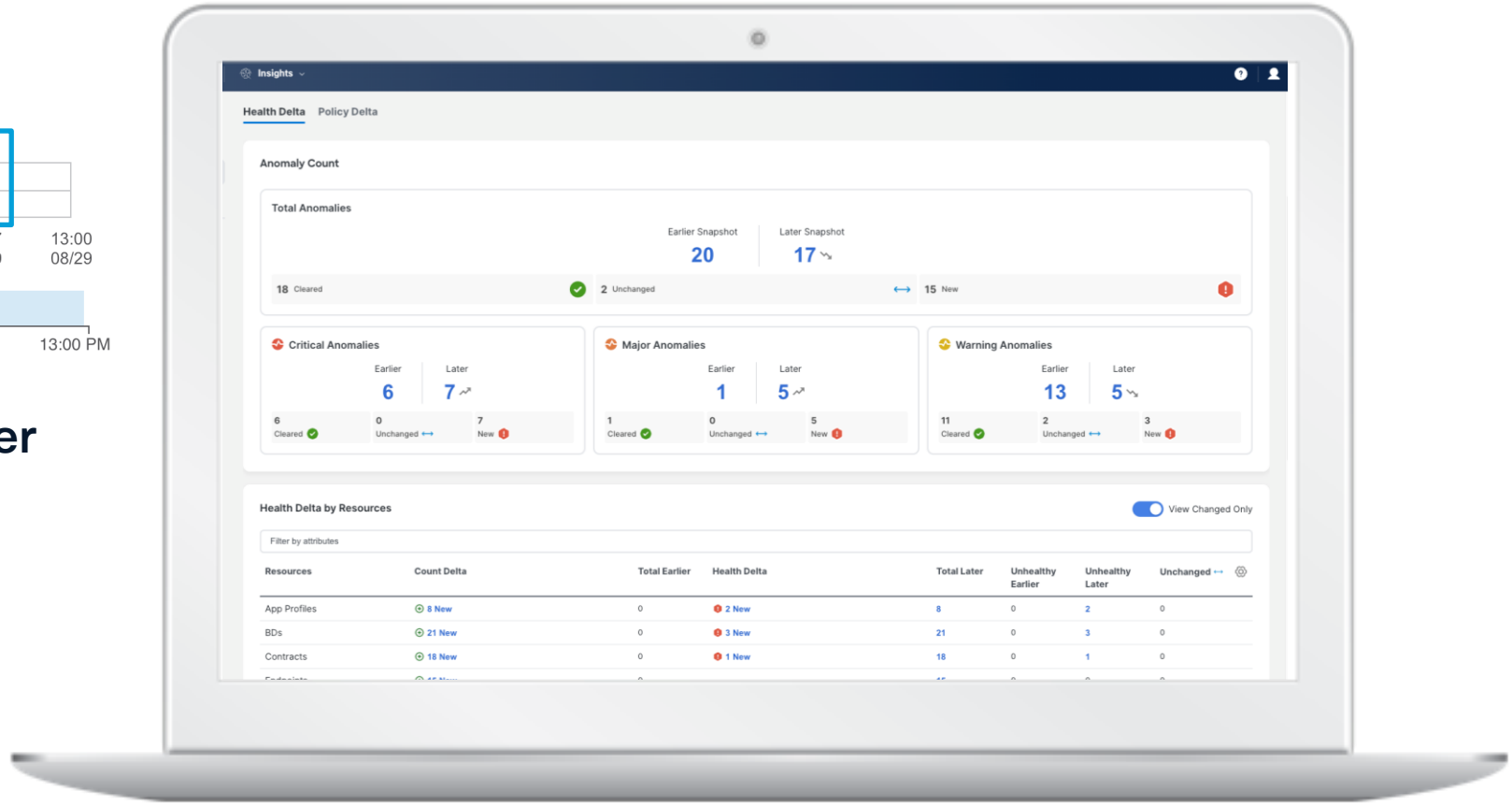
Enhancing Change Management





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Enforcing Config Compliance

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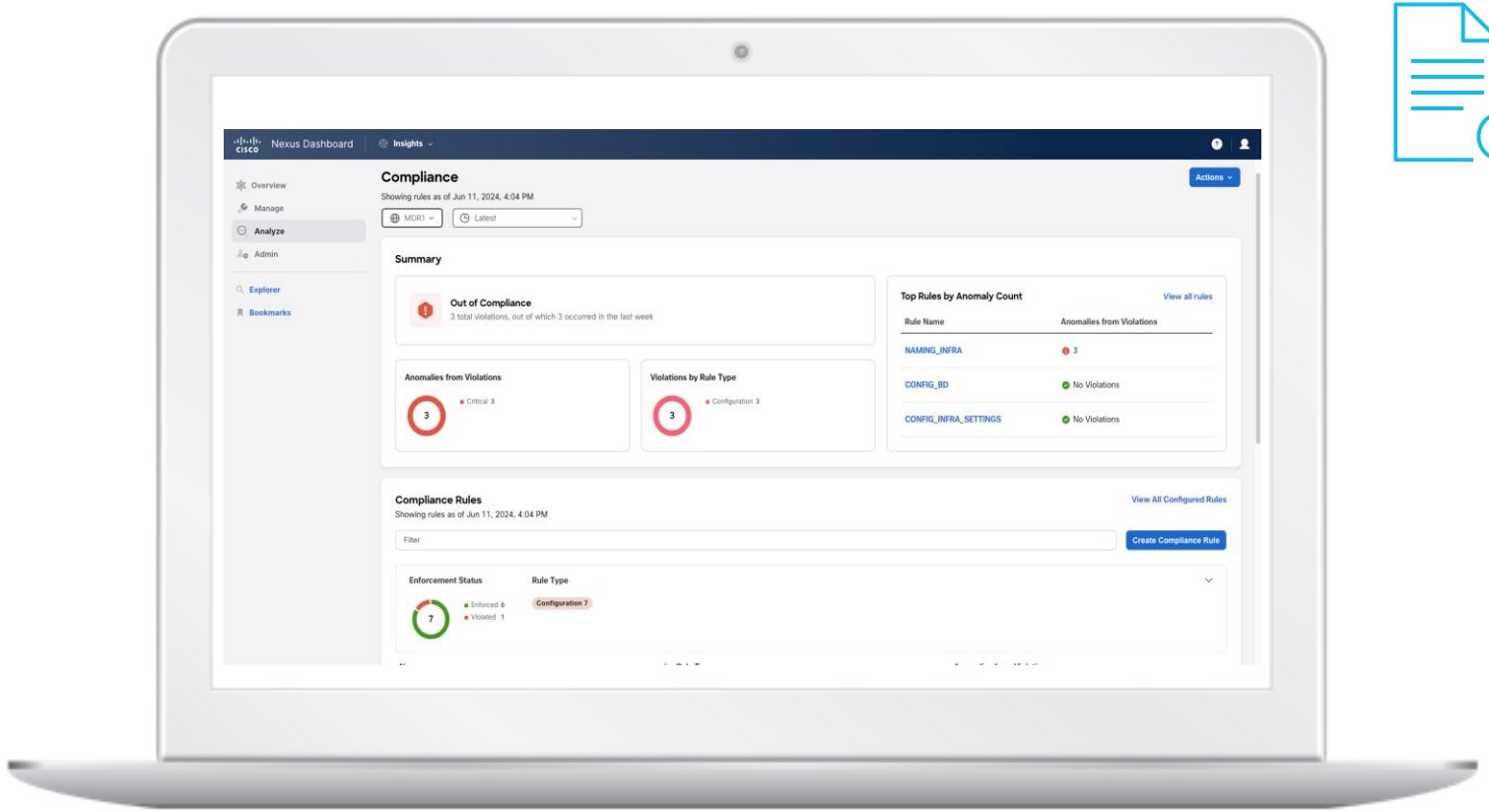
Configuration Compliance

Use Case Overview



Naming Convention

"VRF names shall end with _vrf"

Configuration Rules

"VRF shall be enforced"

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Configuration Compliance using Insights

One option for each Use Case

Snapshot-based

Compares the current config against the selected snapshot, allowing or not the addition of new objects

Import-based

Compares the current config against a partial config, allowing or not the addition of new objects

Template-based

Verifies that the attributes of a set of selected objects match the criteria specified in a template

Manual

Verifies that the attributes of a set of selected objects match the criteria specified manually in the UI

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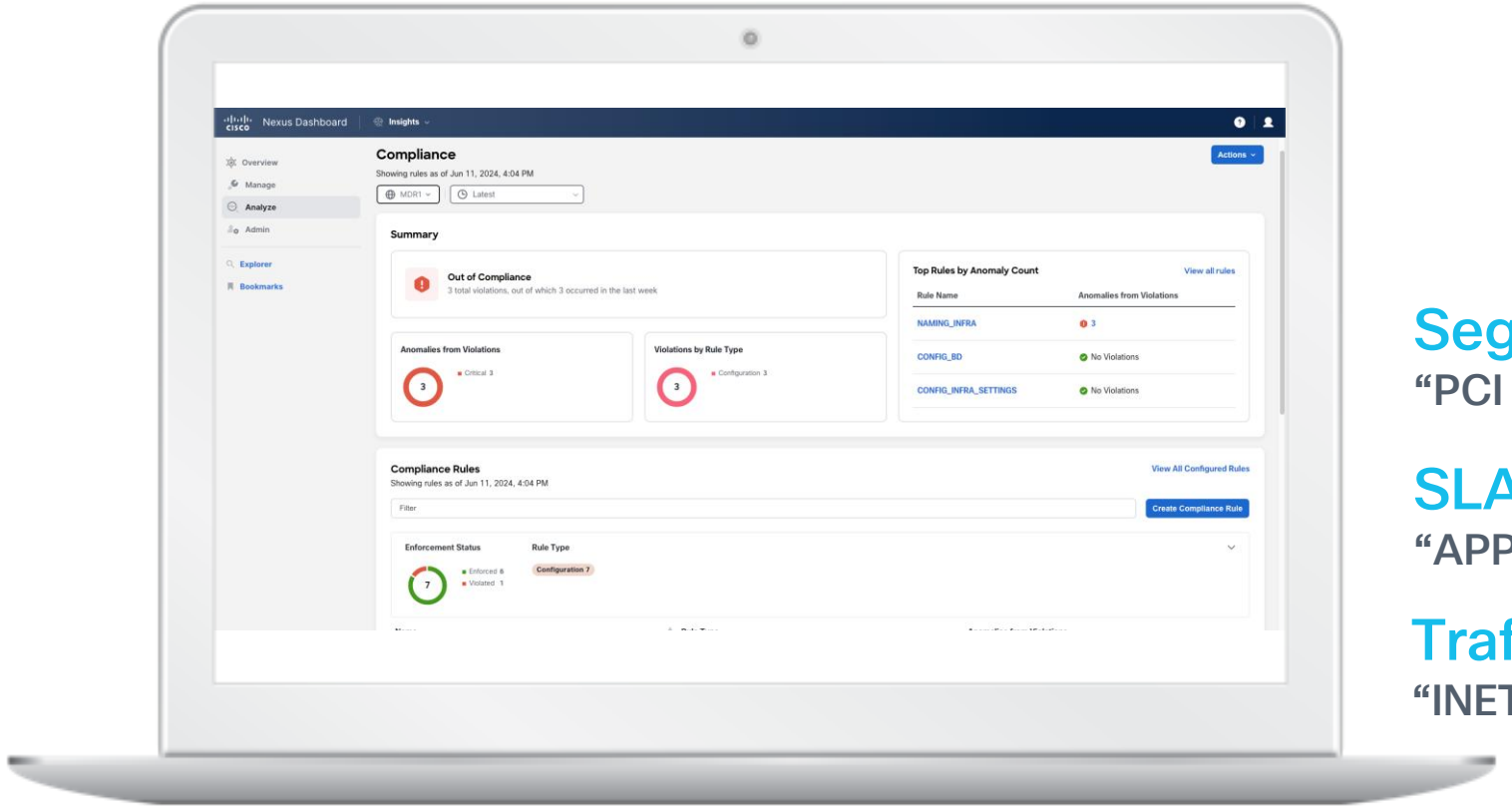
Configuration and Segmentation Compliance

Use Case Overview



Segmentation

"PCI must not talk to non PCI"

SLA

"APP must talk to DB on 1433"

Traffic Restriction

"INET must not talk to WEB on ssh"

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Firmware Update Analysis

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Upgrading with Confidence

Typical Challenges

Assurance that all pre-requisites have been satisfied

Time required to run all pre-checks and post-checks

Complexity of analysis of potential issues in target release

Lack of visibility of potential impact

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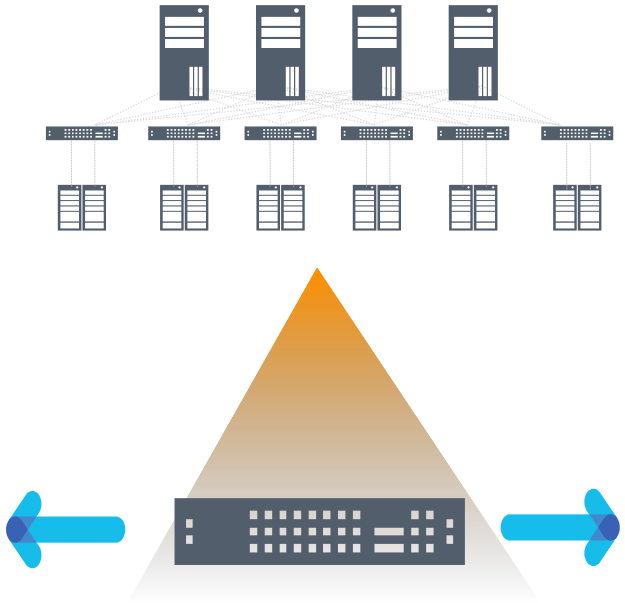
Upgrading with Confidence

Pre-Upgrade and Post-Upgrade

Pre-upgrade checks	
Physical interfaces	✓
Neighbors	✓
Routes	✓
Endpoints	✓
Capacity utilization	✓



Post-upgrade checks	
Physical interfaces	✓
Neighbors	✓
Routes	✓
Endpoints (lower number discovered)	✗
Capacity utilization	✓

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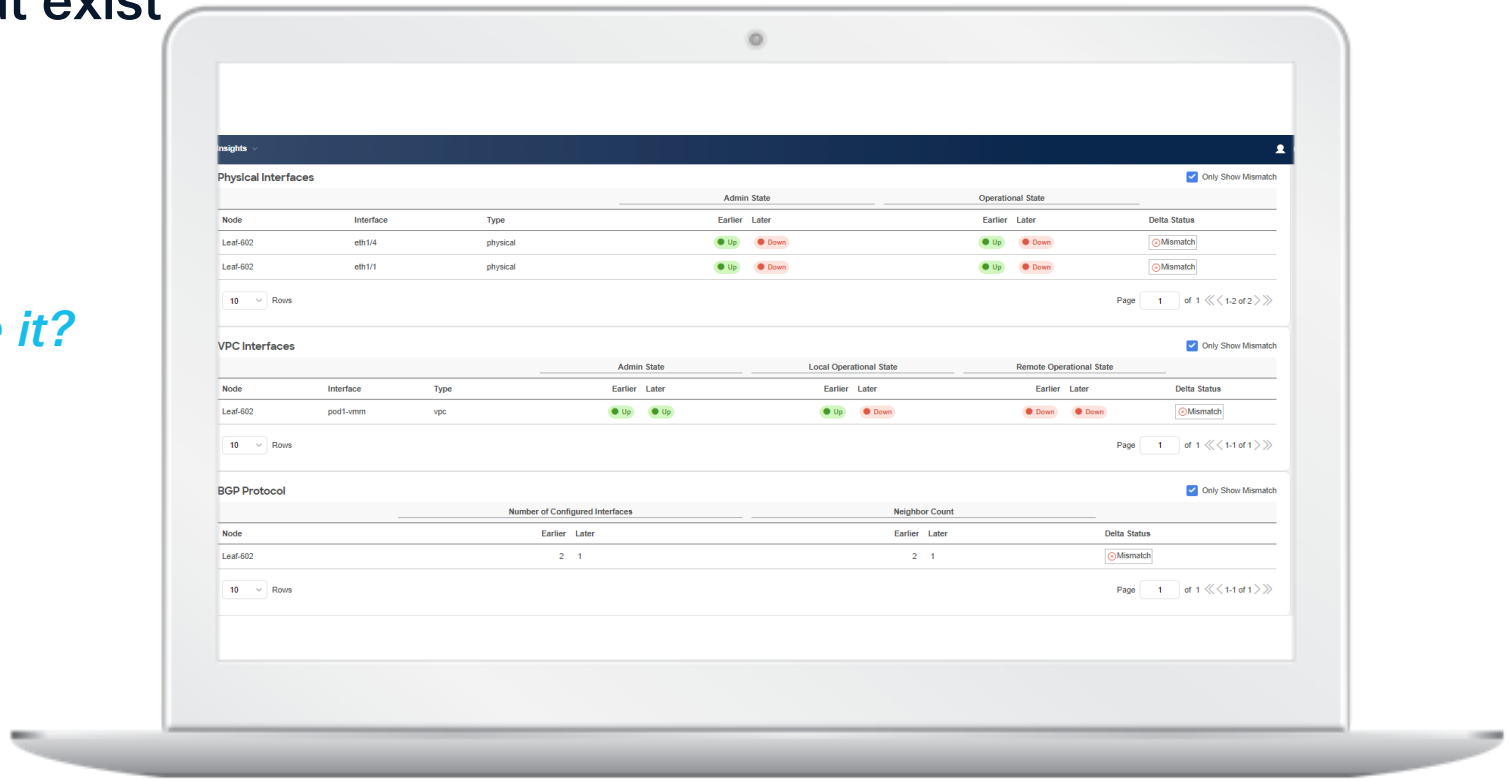
Upgrading with Confidence

Pre-Upgrade and Post-Upgrade

- Pre-Upgrade Checks
- Version and Bug Info / Validation
- Advice about potential conditions that exist before upgrade (not just faults)
- Post-Upgrade Delta Analysis
  - *Did I fix it? Did I break it? Did I change it?*



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Open-Source Monitoring for Cisco ACI

Overview

- Built on Proven Technologies that you might be already using
  - Grafana for Visualization
  - Prometheus for Monitoring
  - Memgraph for Config Exploration
- Flexibility and Customization
- Comes preconfigured with several dashboards
  - EPGs, VLAN Usage and Contract Explore
  - Fabric and Node Capacity
  - Statistics about Interfaces, Routing Protocols, Power Usage
- Extremely light weight (can run on a small VM/Laptop)

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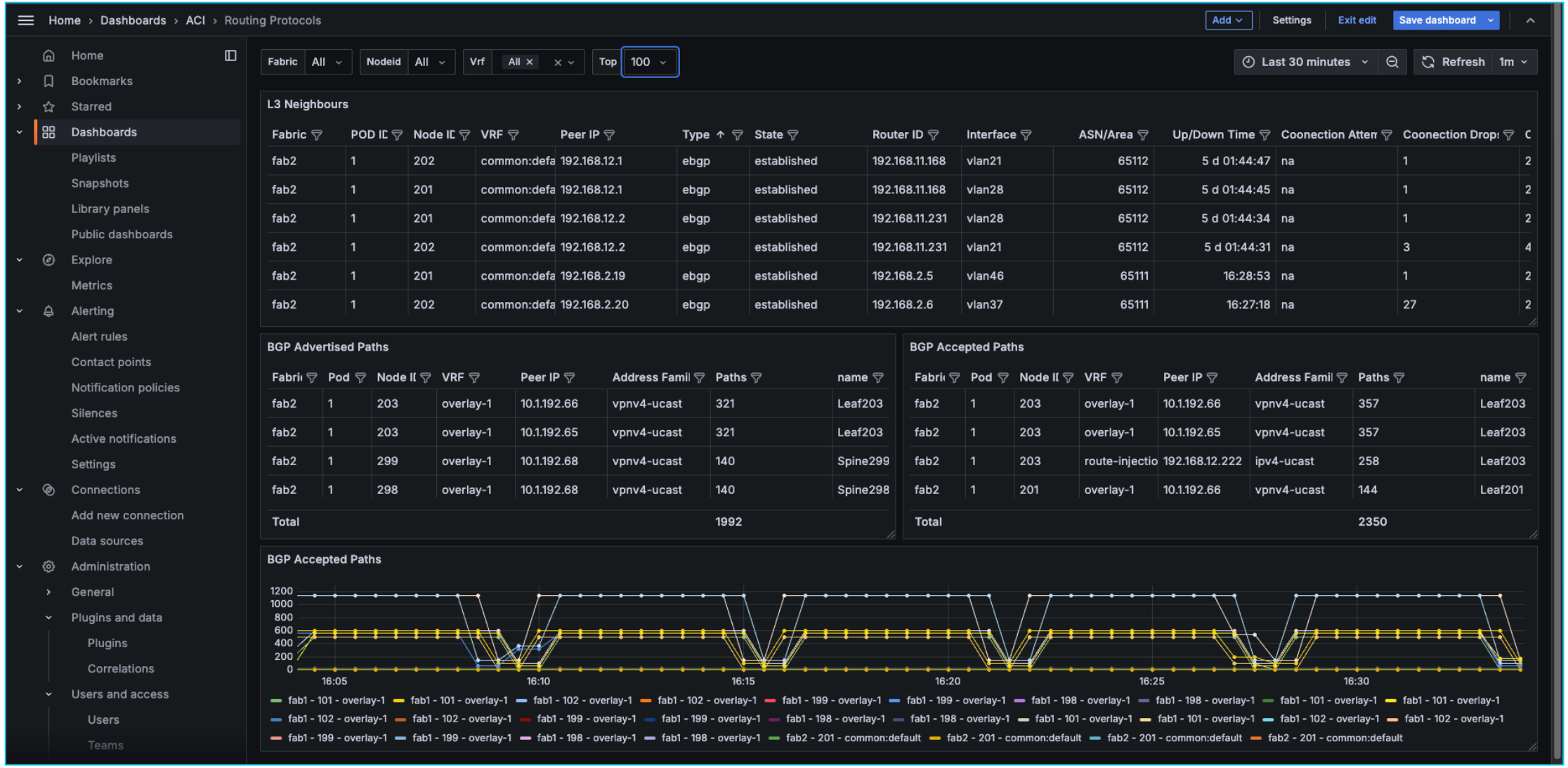
To find out more

https://github.com/datacenter/aci-monitoring-stack



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Conclusion

Conclusion

- Nexus Dashboard is the most comprehensive tool for operating Nexus 9000 fabrics. It can help with and not only:
  - Assurance
  - Conformance
  - Monitoring with Real Time Telemetry
  - Reporting
  - Compliance
  - Software and Change Management
- For highly customizable dashboard and basic inventory and statistics telemetry visibility, opensource tools are available and can combine with ND capabilities

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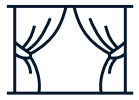

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