Automating Multi-Tenant EVPN Fabrics for Cisco NX-OS Data Centers

The Problem: Complex Dependencies Cause Big Delays and Failures

Many organizations use Cisco NX-OS leaf-spine switches to build Layer 3 BGP fabrics with EVPN VXLAN. The problem is even for a small spine-leaf network with just a handful of devices, how do you track thousands of elements from top to bottom, including logical elements like BGP sessions, ASNs, addresses and routing tables, virtual elements like VNIs, VTEPs and VXLANs / VLANs, and physical elements like redundant links, ports, interfaces and transceivers.

Let's say an app is experiencing performance issues or suffers an outage. The app consists of a VXLAN endpoint and a VLAN endpoint attached to your L3 fabric. You know how to troubleshoot this: You find endpoint MACs and IPs. You find the switch ports and interfaces they are connected to. You wade through the fabric between them hop by hop, link by link. You can do this because you built the fabric and can recall the dependencies in your head. But, this is very time-consuming and does not scale.

Plus, the dependencies are compounded in the presence of constant change: You need to move workloads, create a new tenant, or add / delete / update any element. You also need to analyze the changing network state — interface counters, syslogs, memory utilization and much more.

CHALLENGES
- Complex dependencies cause big delays and failures

SOLUTION
- Apstra Operating System (AOS®)

RESULTS
- Confidently complete Cisco NX-OS leaf-spine network design, configuration and everyday operational tasks in minutes.
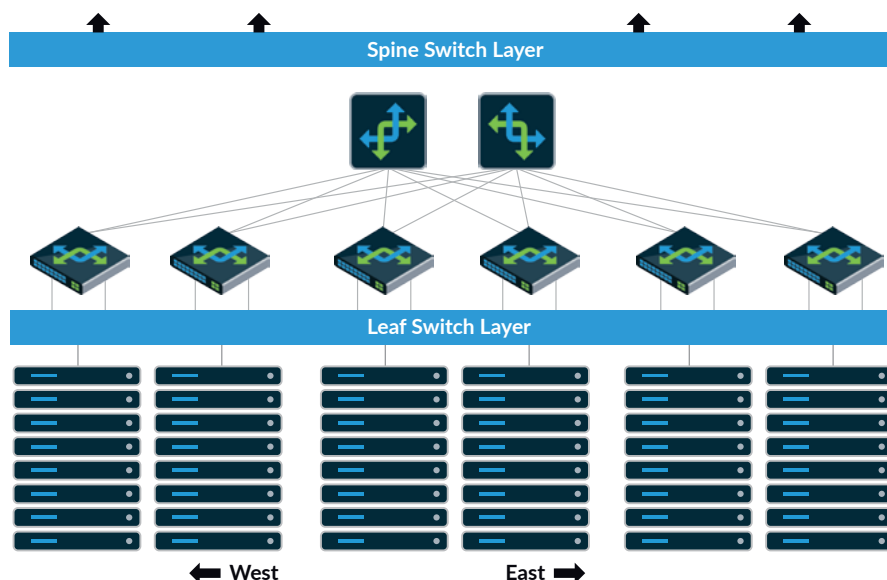

FIGURE 1:

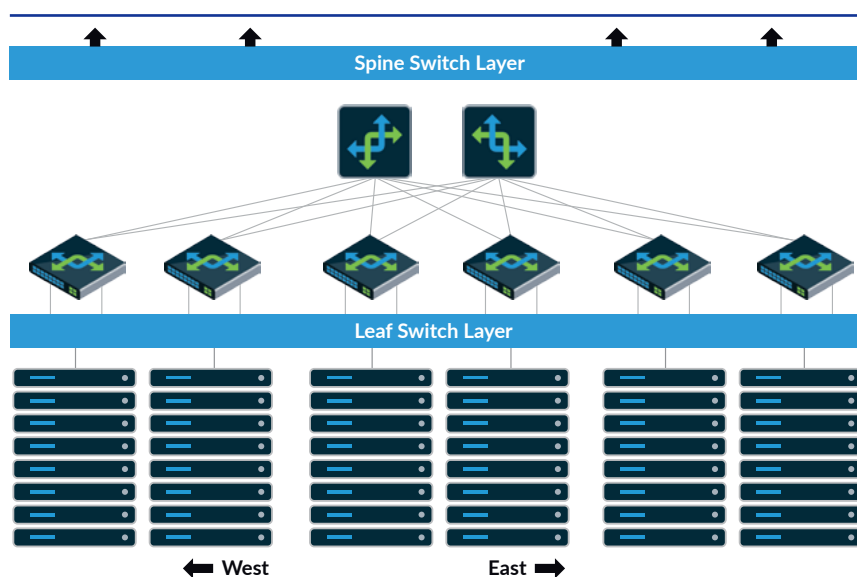CISCO LEAF-SPINE NETWORKS (NX-OS) WITH VXLAN
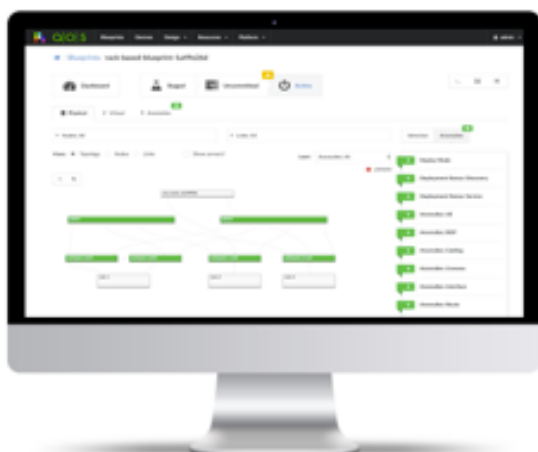
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Now imagine this: Software that treats your network as a system, with precisely coordinated individual elements. It dynamically tracks the interdependencies between all elements, because it helped you design and configure the system in day 0, based on your goals in capacity, redundancy, isolation, resource (e.g. IPs, ASNs, VXLANs / VLANs) allocation and more. It treats any of your intended changes to the network as design changes, so the interdependencies can be dynamically rendered, in minutes. When the network state changes, it extracts contextual and actionable insights from raw telemetry for you, in real-time.

We call this dynamic, system-level automation approach "**Intent-Based Networking** (IBN)".

Solution: Apstra Operating System (AOS®)

Treat Cisco Leaf-Spine Network (NX-OS) as a Cohesive System

Imagine AOS as a dozen of virtual CCIEs, performing all networking tasks with precision, such as:

- Track your design goals and policies (capacity, redundancy, isolation, addressing and more)

- Prescribe optimal config (e.g. BGP, EVPN)

- Validate all dependencies to meet your goals

- Extract relevant insights from raw telemetry

AOS works in minutes:

- While your goals and the network state change

- 24 x 7 x 365 at scale

- With Cisco NX-OS best practices and expertise baked-in

- Without requiring you to write codes and rules
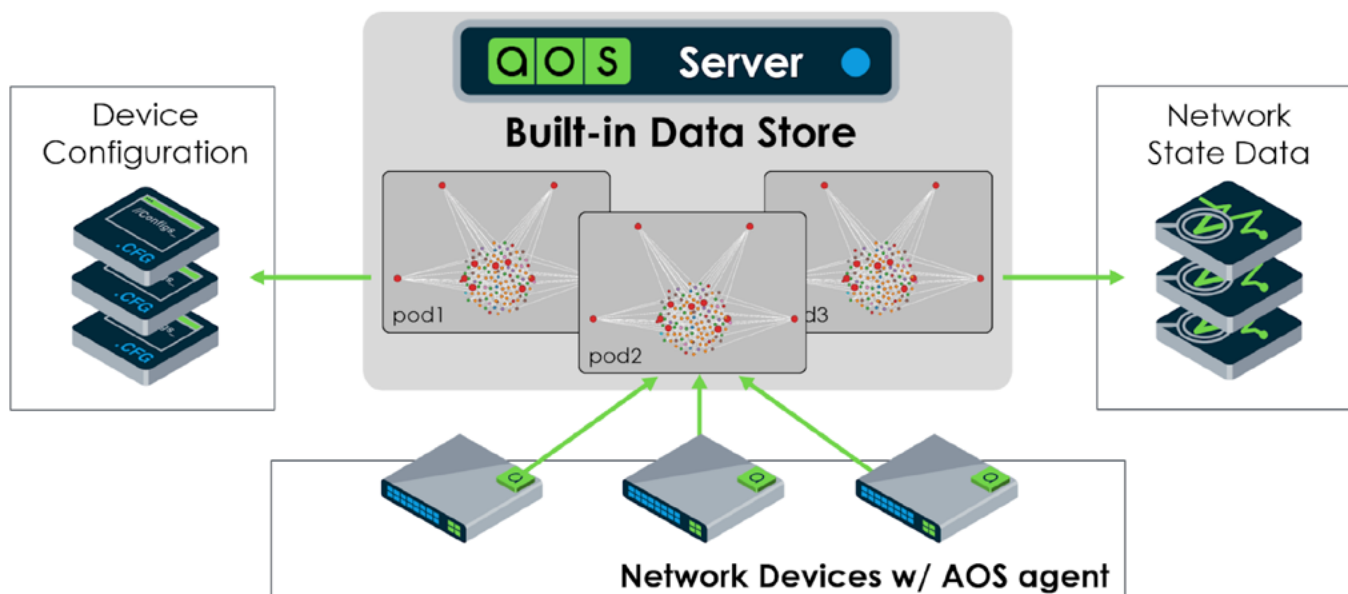
FIGURE 2:

APSTRA OPERATING SYSTEM

How does AOS work under the hood:
Hardware-Independent Intent-Based Networking

Apstra Intent-Based Networking (IBN) is your network's "Single Source of Truth." It allows you to declare your intent — a high-level specification of your desired outcome — and renders low-level implementation details for you. It knows and tracks all interdependencies, so you can focus on the "what" not the "how." It liberates you from prescribing configuration, telemetry, and complexity that stems from building networks like unique snowflakes, which is a very time-consuming and error-prone process.

Apstra IBN continuously validates your intent is being met and immediately flags deviations from that intent using real-time analytics to extract contextual and actionable insights from raw telemetry. Apstra IBN works in the presence of constant change — including business rules and policies, and the operating state of the network as transceivers fail, buffers overflow, and hardware changes occur.
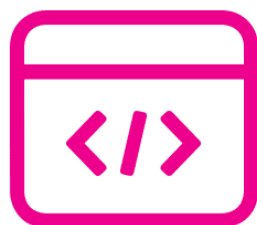
FIGURE 3:

AOS ARCHITECTURE COMPONENTS

How is Apstra different: Simple, Turnkey, Software Ops Decoupled from Hardware Lifecycle

Turnkey: works out-of-the-box w/o coding	Design	Deploy	Operate	Intent-Based Verification	Intent-Based Analytics	Multi-vendor / Hardware Independent
Apstra AOS	✅	✅	✅	✅	✅	✅
Hardware-Specific Management Software	✅	✅	✅	❌	❌	❌
Traditional NMS: Element Management, not System Management	❌	✅	✅	❌	❌	✅
Analytics Software	❌	❌	❌	❌	➖	➖
Validation Software (Read-only)	❌	❌	❌	✅	❌	➖
YANG/NETCONF-based Programming Framework	❌	❌	❌	❌	❌	➖

How Apstra differs from DIY Automation: Apstra automates the entire network lifecycle and provides 24x7x365 validations, without requiring you to write code

What is DIY network automation

Mostly day 0 and day 1 provisioning and deployment, typically pushing configs out to devices and collecting data using open-source tools

- ❌ Day 0 design
- ❌ Day 0 build config
- ✅ Day 1 deploy config
- ✅ Day 1 collect data
- ❌ Day 2 change, monitor
- ❌ Day 2 troubleshoot
- ❌ Day 2 analytics
- ❌ Day 2 validate (24x7)
- ❌ Turnkey UI
- ❌ Turnkey backend

What is Apstra?

A turnkey application (AOS) for data center leaf-spine networks: enabling autonomous day 0 design and day X operations, via continuous validations of your intent.

- ✅ Single source of truth
- ✅ Day 0 design
- ✅ Day 0 build validating config
- ✅ Day 1 validated config
- ✅ Day 2 validate (24x7) & analytics
- ✅ Turnkey UI
- ✅ Turnkey backend
- ✅ Leaf-spine network expertise
- ✅ Millions of best practice checks
- ✅ No programming out-of-the-box
- ✅ Extensible via programming (option)
- ✅ Hardware independent

Customer Testimonials

Webscale / SaaS Companies

"We were going to use OSPF because BGP seemed hard to configure. AOS did BGP configuration for us."

  - A Webscale Company

Service Providers

"We allocated months to stand up a new POD and weeks to make a configuration change. Apstra automated it down to minutes."

  - A Telco Service Provider

Large Enterprises

"We wanted to switch to vendor Y, but our engineers only knew vendor X. AOS solved the problem."

  - A Fortune 50 Bank

"All you need to do is to connect the switches to the network and Apstra automatically configures them. The efficiency of network construction and device replacement operations is greatly improved and we can easily replicate it; what used to take several days is now completed in tens of minutes! Even if you make a mistake, for example with cabling, thanks to Apstra's IBA telemetry, you can grasp the problem with a simple glance of the GUI."

YAHOO! JAPAN

About Apstra

Apstra pioneered Intent-Based Networking and Intent-Based Analytics™ to eliminate the complexities and inefficiencies that plague data center network operations today. Apstra's core mission is to deliver on the vision of a Self-Operating Network™ that delivers log scale improvements in CapEx, OpEx and capacity. Apstra was founded by leading experts in networking and abstraction (Arista, Juniper), distributed systems and automation (Google, VMware, Stanford). The company is privately funded and based in Menlo Park, California.

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