Vendor-Agnostic
Intent-based
Networking System

Apstra Operating System™ (AOS)

Data Sheet

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Apstra Incorporated

Networking Should Be This Easy

You log onto a "command and control" system that sits on top of your network infrastructure. You tell it what network services you want in vendor-agnostic, human language – like "I want a non-blocking network for 1,000 containers, using layer 3 routing to the host". Or "I'd like to swap a Cisco switch with an equivalent Arista switch".

The "command and control" system renders your intent into the expected network state, and continuously validates the operational state of the network. If there is any deviation between the expected state and the actual state, it tells you where the deviation is and what needs to be fixed.

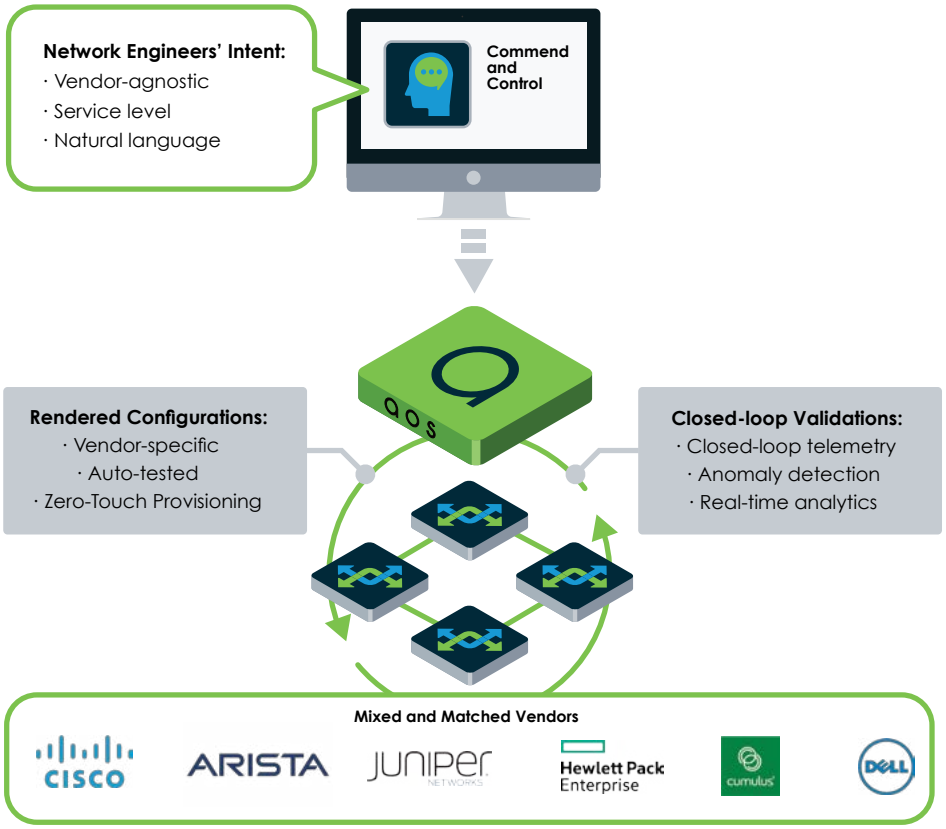

Figure 1: Apstra Operating System

APSTRA OPERATING SYSTEM™ (AOS™)

What's AOS

Apstra Operating System™ (AOS) is a vendor-agnostic, intent-based networking system (IBNS) for the data center.

AOS functions as a "command and control" software, sitting on top of network infrastructure. It decouples your network service design, implementation, and operations from vendor-specific, device-level, error-prone, and time-consuming workflows.

"We believe a full IBNS implementation can reduce network infrastructure delivery times to the business leaders by 50% to 90%, while simultaneously reducing the number and duration of outages by at least 50%."

"Innovation Insight: Intent-Based Networking Systems" Gartner Inc.
Published: 7 February 2017
ID: G00323513
Analyst(s): Andrew Lerner, Joe Skorupa, Sanjit Ganguli

Using Apstra certified reference designs based on industry best practices, you don't need to learn programming to design, implement and operate modern data center networks like L3 CLOS. You can also customize and extend AOS to your specific network environment and use cases via RESTful APIs and SDKs.

Bottom line, you can rapidly and continuously design, build, deploy and validate your data center network as a closed-loop system – not as a pile of individual devices 1-by-1.

We call this new paradigm "**Vendor-Agnostic, Intent-based Networking**".

Apstra Operating System™ (AOS) is an intent-based networking system for the data center. By deploying AOS on top of the network infrastructure, you can decouple your network service design, implementation, and operations from vendor-specific, device-level, error-prone, and time-consuming workflows.

In minutes, declare your service intents in a vendor-agnostic way. For example:

- I'd like to connect 1,000 virtual machines in the most cost-effective way".
- "I'd like to connect 5 compute racks, and 1 storage rack with 1Tb/s of east west bandwidth".
- "I'd like to swap a Cisco switch with an equivalent Arista switch"; or "I'd like to create a new virtual network".

In minutes, implement your intent with multi-vendor devices interoperating together:

- Let AOS test and validate all configurations for vendor A spine switches working with vendor B leaf switches - down to every link, interface, port, LLDP, BGP routing table, counter - you name it.
- Let AOS collect and stream the precisely-needed telemetry.

Always operate your networks in a closed-loop:

- Let AOS continuously validate the network state (telemetry) against your intent in a closed-loop.
- Use AOS REST API to extend or change your service intents, configurations, and telemetry - no more lock-in by the hardware.

The key benefits an enterprise can derive from Apstra's software include:

- Improved agility and availability through replacing the "calculated guesswork" common today in network design with algorithmically derived and verified designs
- Reduced mean time to discover and repair faults through continuous monitoring, algorithm driven analytics and dynamic optimization capability
- Reduced capital expenditure (capex) and operating expenditure (opex) through support of mixed-vendor configurations and optional disaggregated, fit-for-purpose switch hardware and software

Cool Vendors in Enterprise Networking, 2017
Gartner Inc. Published: 17 April 2017
ID: G00326666
Analyst(s): Andrew Lerner, Vivek Bhalla, Ted Corbett, Joe Skorupa

How Do You Use AOS?

Design - using vendor-agnostic reference design templates: You use AOS UI (Web GUI or RESTful API) to specify your intent - desired outcome - without prescribing imperative, vendor-specific commands to achieve the outcome. With a few mouse clicks or via RESTful API, you can rapidly formulate a reference design template, containing logical devices that are vendor-agnostic. See the example below: Your intent could be "connecting 100 servers via 10G-leaf at 1:1 oversubscription".

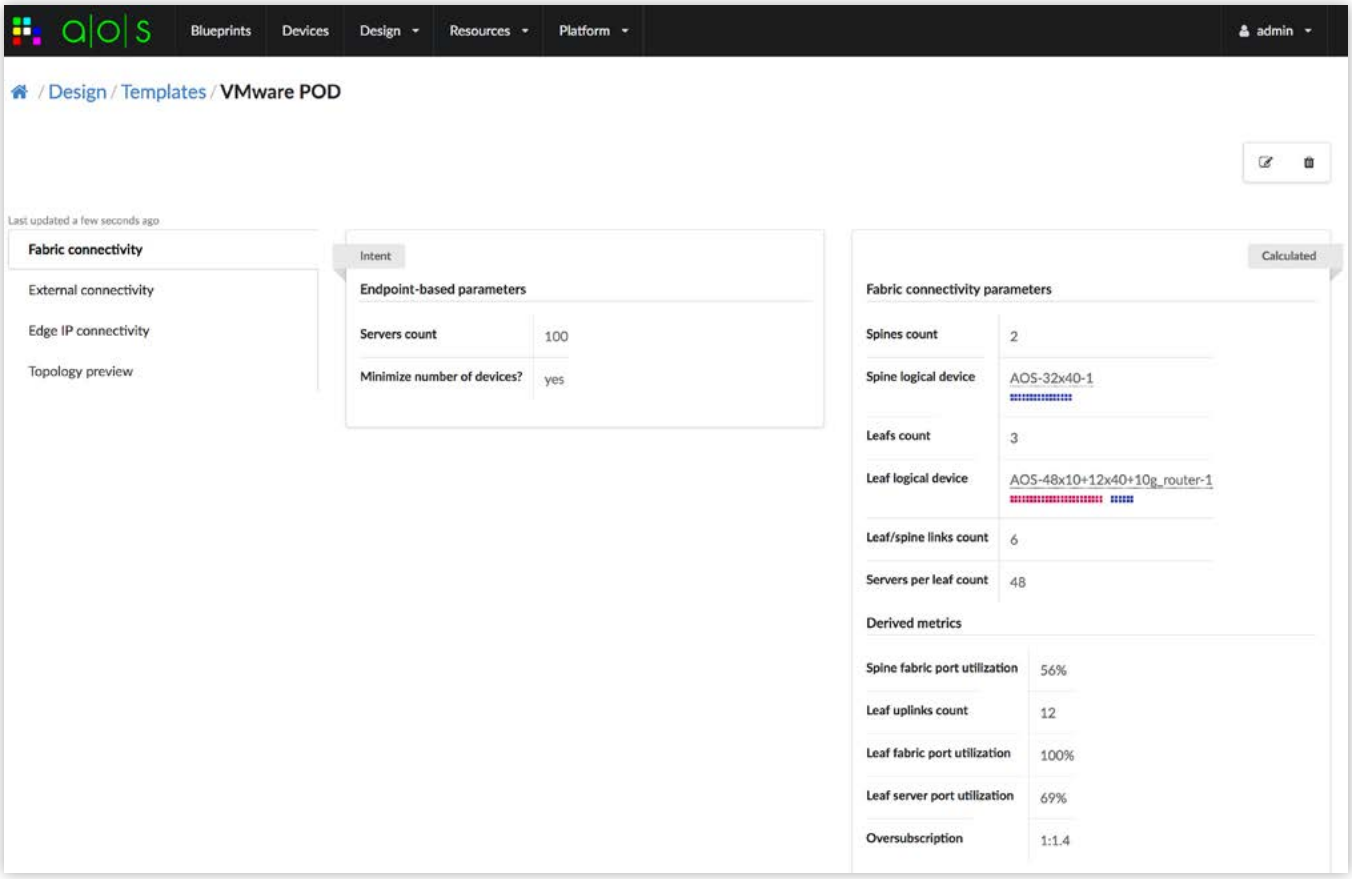

Figure 2: Specify Your Network Service Intent In Vendor-Agnostic Design Template

Build: Based on your intent, AOS allocates resources to the reference design template, resulting in a blueprint. AOS uses the artifacts in the blueprint to fabricate the network service configurations and telemetry expectations.

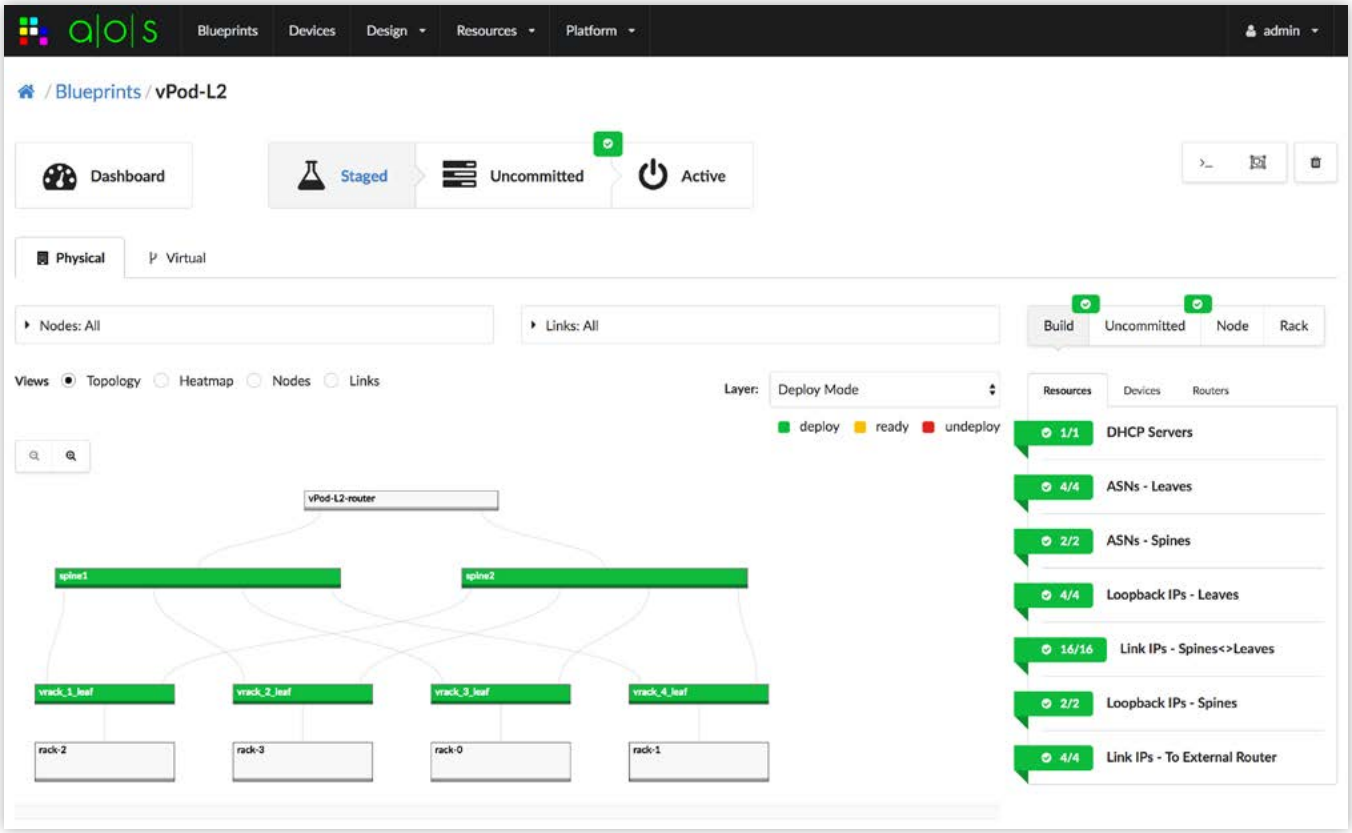

Figure 3: Fabricate Your Network From Top to Bottom

Deploy: With your approval, AOS deploys desired configurations (configuring resourses and devices according to the reference design), with auto-executed test cases.

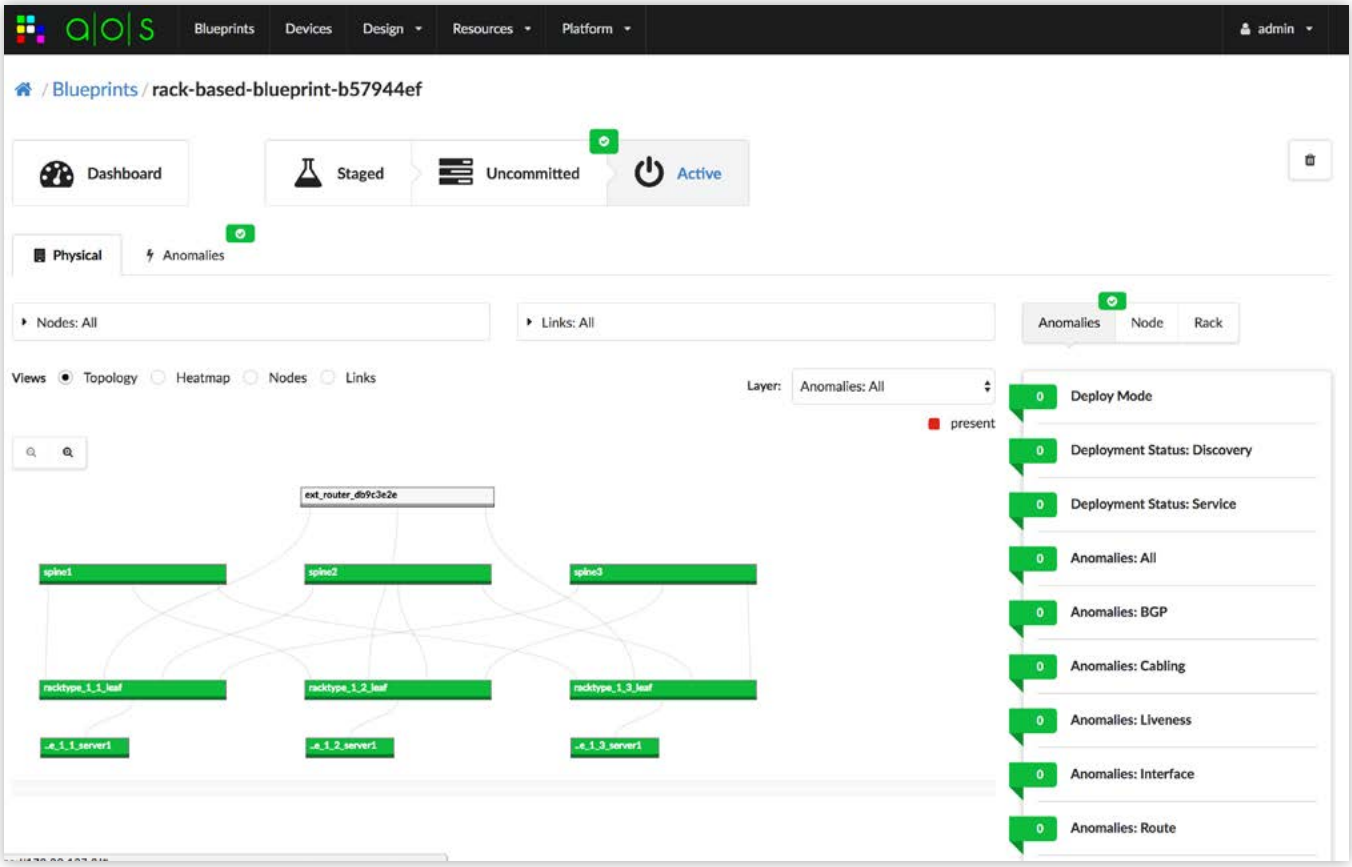

Figure 4: Deploy Auto-generated, Vendor-specific Configuration Details

Operate with Continuous Validations: AOS auto-validates your service expectations, and generates alerts and telemetry.

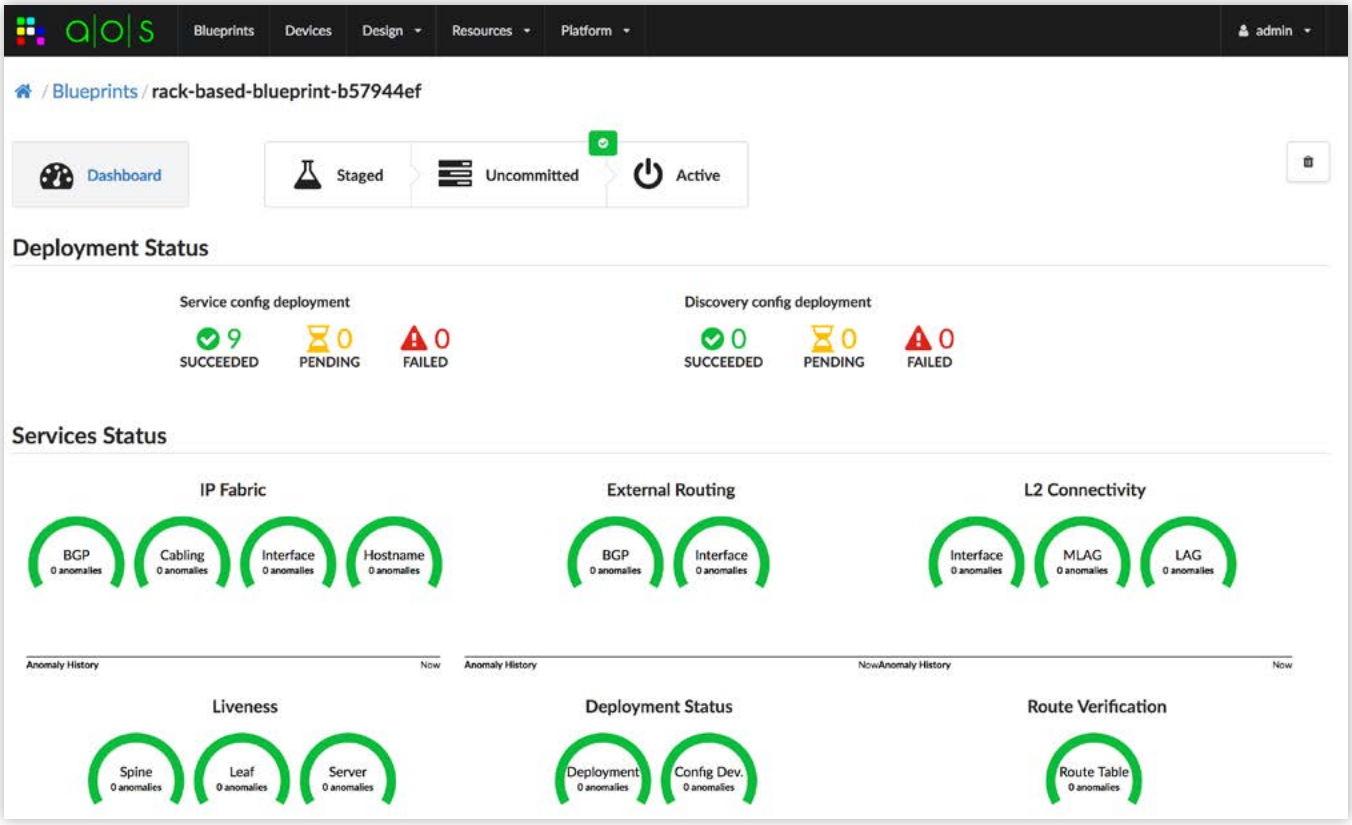

Figure 5: Continuously Validate Your Intent During Operations

Automatically implement and validate change operations: AOS doesn't stop here. When you make changes dynamically - either to the physical infrastructure (add a rack, replace a switch) - or virtual network (add a virtual network, delete virtual network, add end-point to virtual network), AOS implements these in an intent-driven, closed-loop manner.

When the user changes the intent, AOS implements the change and validates that the change was indeed implemented as intended.

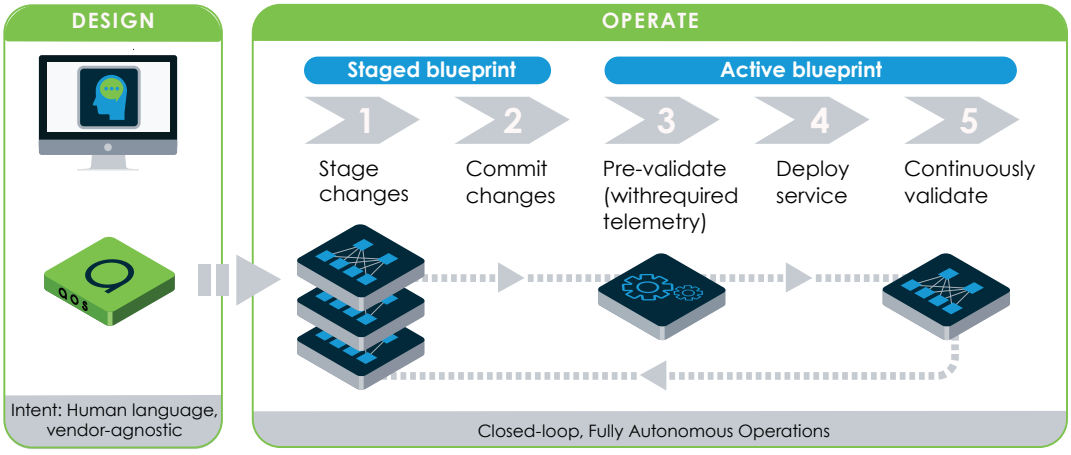

Figure 6: Autonomous Operations With AOS

Ask any question about your network: You gain transparent visibility into the correlation among service intents, topologies, configurations, and telemetry.

Enhance your day-2 operations: In minutes, you can change every aspect of the blueprint structure after deployment, and stage blueprint changes. You gain both agility and reliability.

Customize everything: You can customize every aspect of the AOS, including telemetry, vendor-specific device agents, API access to external systems (e.g. such as asset management). This gives you total flexibility when you need to program the behavior of AOS.

What are the unique capabilities of AOS, and why they matter to you?

AOS Unique Capabilities	Why They Matter (Unique Values to You)
Vendor-agnostic: Completely decouple your services and operational model from vendor specificity. You can express your intent once, and then render and re-render detailed configurations for any vendor of your choice - without having to modify your intent.	Massive reduction in time and efforts spent with vendor specific process (design, configure, deploy, change, troubleshoot) and technologies (OSes, hardware, protocols, command syntax.) Avoid lock-in, change vendors in hours.
Automatically prevent and repair network outages.	Massively improved infrastructure uptime.
Operate your network as **one closed-loop system** (not box by box). Massively reduce your dedicated tooling needs.	Massively reduced **OpEx.** Massively improved **infrastructure agility.**
Self-documenting, self-complying, self-optimizing	Produce turn-key audit deliverables.
Fully-autonomous: Fully automates day 0, day 1 and day X aspects of networking - including designing, building configurations, bootstrapping, validating configurations, deploying configurations, collecting closed-loop telemetry, changing and auditing, documenting, monitoring, troubleshooting and fixing the networks. For example, it handles all vendor-specific, device-level syntax. It allows vendor A spine switches to interoperate with vendor B leaf switches, and vendor A switches to be swapped with equivalent vendor B switches.	Improved agility and reduced risks across all aspects of networking.

AOS Unique Capabilities (Continued)	Why They Matter (Continued)
Network expert in a box	Best practice architectures at a click of a button.
Turn-key	Achieve agile networking today, without having to build and develop Amazon-like (or warehouse-scale data center) people, process and technologies from scratch.
Fully programmable and extensible	Every aspect of the AOS, including service intents and telemetry can be customized to meet your special requirements. This gives you freedom and flexibility to evolve your networks, should your service design and operations change.
Highly scalable	The AOS architecture is designed for web-scale network infrastructure.

Features and Specifications

Services:
Fabric connectivity
- Server and rack-based design intent
- BGP L3 CLOS fabric
- L3 (routing on the host) server attachment
- L2 server attachment with MLAG/LAG
- DHCP relay

Virtual Networks
Extensible services (intent, resources, expectations)*

Device OS:
- Cisco NX-OS
- Arista EOS and vEOS
- Juniper Junos*[1]
- Cumulus Linux and CVX
- SnapRoute FlexSwitch*[1]
- Ubuntu Servers

AOS Extensibility Tool For the Community (AOS ETC):
- Zero Touch Provisioning (ZTP) Server
- Demo Tools
- Template Catalog
- 3rd Party Tool Integration
- 3rd Party Big-Data Platform Integration
- Legacy Devices Integration

Telemetry:
- LLDP, BGP, Config deviation
- Interface counters
- Routing table verification
- LAG/MLAG
- MAC & ARP
- Server and devices health
- Intent-based anomaly detection
- Telemetry streaming via protocol buffers
- Extensible telemetry collection*

Platform:
- Single User Authentication, HTTPS*
- Device lifecycle management
- Resource management
- RESTful APIs
- Headless operation
- Scalability up to 1600 devices
- System configlets
- Interactive network visualization
- Extensible device agents
- AOS backup/restore - upgrade/rollbacks*
- Graph model and GraphQL API*
- Blueprint modifications with staging and commit*

Maintenance workflows:
- Scale-out Maintenance
- Replacement Maintenance
- Decommission Maintenance
- Addition and deletion of virtual networks

* Introduced in AOS Version 1.2
[1] Technology preview

About Apstra

Apstra® delivers the Apstra Operating System™ (AOS), a new category of networking solution called Intent-Based Networking System (IBNS). Apstra IBNS enables an autonomous operational model for the network. AOS is intent-based, closed-loop, and fully autonomous, and enables the only "Vendor-Agnostic Self-Operating Network™".

AOS brings organizations unmatched infrastructure economics, uptime, and agility required to deliver on today's business needs.

For more information, visit **www.apstra.com** or follow **@ApstraInc**

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Contact Us:
For more information about AOS and how it can make networking easy, email us at **sales@apstra.com**.