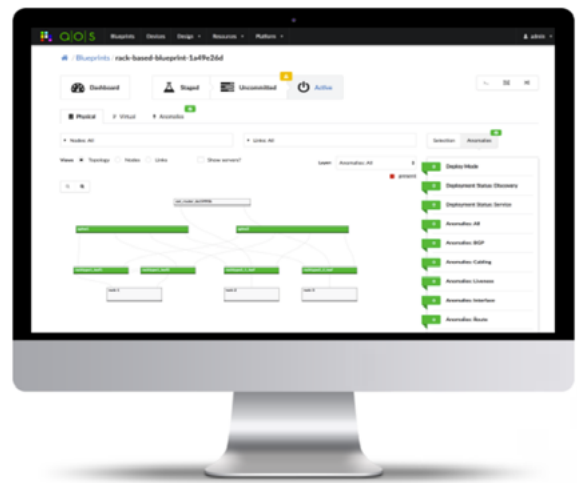


Apstra AOS - Advanced Datacenter Automation

Intent-Based Network Design and Operations

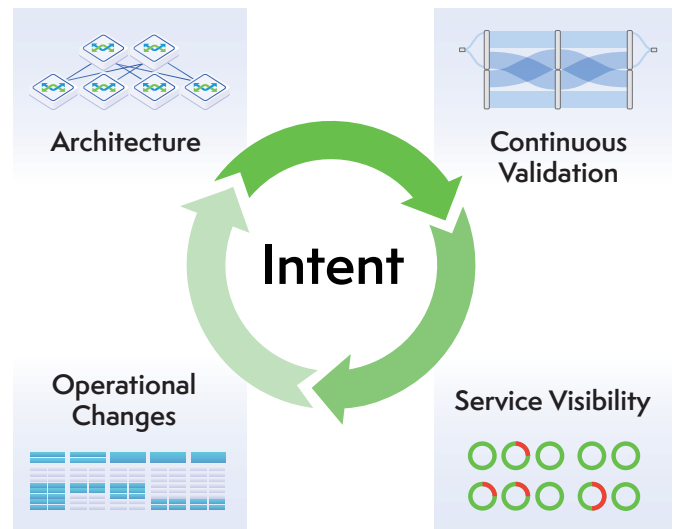
Apstra® Intent-Based Data Center Automation increases application availability and reliability, simplifies deployment and operations, and dramatically reduces costs for Enterprise, Cloud Service Provider, and Telco data centers. AOS delivers the vision of complete end-to-end data center automation as the only Intent-Based Networking technology to be hardware and device OS vendor-agnostic. AOS also integrates capabilities such as Group-Based Policy, Enterprise Scale, and significant Intent-Based Analytics enhancements.

APSTRA OPERATING SYSTEM



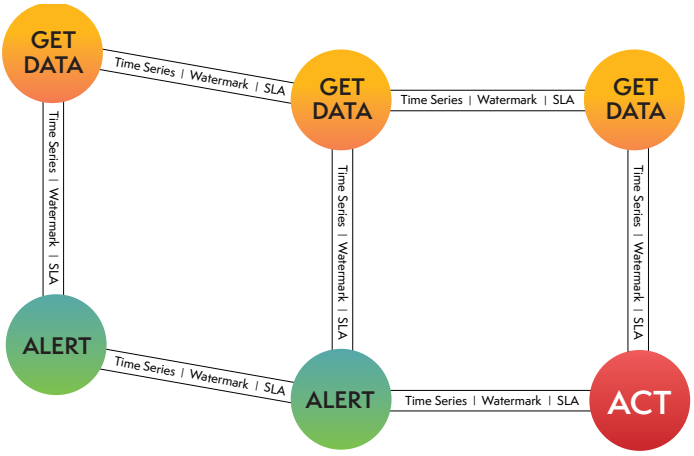
Lifecycle Management for Data Center Networks

Architects typically design the network and operators manage it. There exists a breakdown in information sharing between these two teams, which leads to the lack of a single source of truth (SSOT). As a result, architects are not aware of changes to the network and operators are not fully informed of the capabilities and known limits of the system. Apstra AOS eliminates these issues as it creates a SSOT in the Intent Datastore and tracks all moves, adds, and changes to the network. Not only does AOS track changes to the network from other systems, but it also provides simple workflows for implementing changes across the entire network.



Advanced Telemetry - Intent-Based Analytics

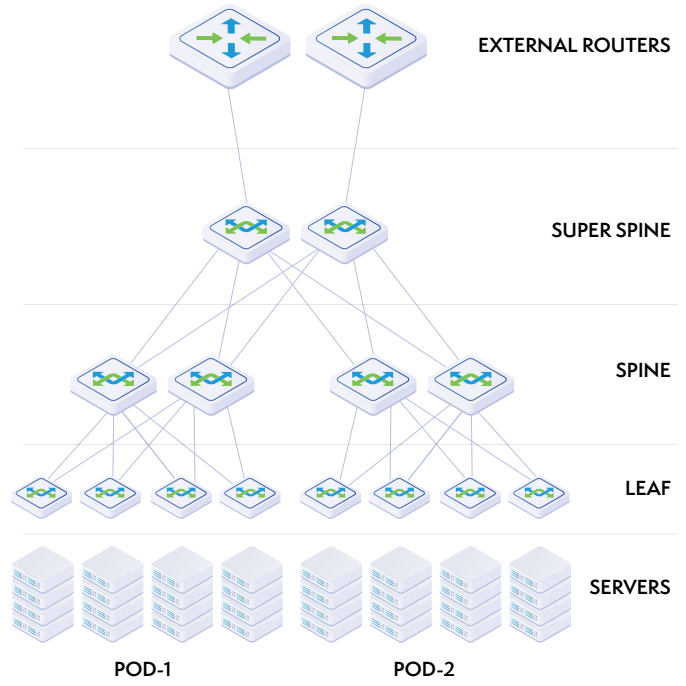
Operators frequently drown in huge amounts of telemetry being sent from their managed systems. AOS Intent-Based Analytics enables expert-level rules to be embedded into the network management system, ensuring that system checks are running all the time and updated immediately with any change to the network.



Scalability to the Largest Data Centers

AOS was designed to handle the largest data centers in the world, supporting hundreds of thousands of connected servers. This is accomplished through the support for 5 Stage Clos IP fabrics with EVPN as an overlay control protocol. Racks and pods can be added with a few clicks in a unified workflow. More importantly, AOS is focused on Intent, meaning devices have specific roles and functions in the network, as a result, the operator can simply make changes to these roles to drive large scale changes to configurations across multiple vendors and network designs.

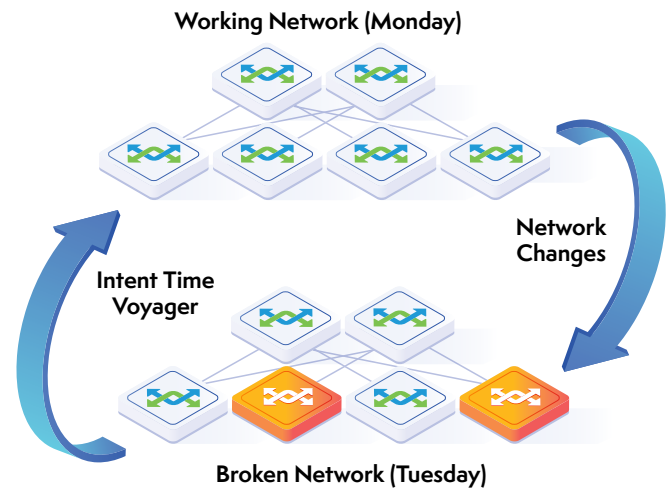
To meet these demands, AOS is built with a high throughput, highly scalable Intent Datastore. This datastore tracks all changes in real time, freeing the organization from managing individual IP addresses or configurations. The result is a rapid upleveling of the capabilities of the operator, allowing them to focus on business specific needs and less on low level troubleshooting or configuring the Network Management System (NMS) upon every network change.



Intent Time Voyager

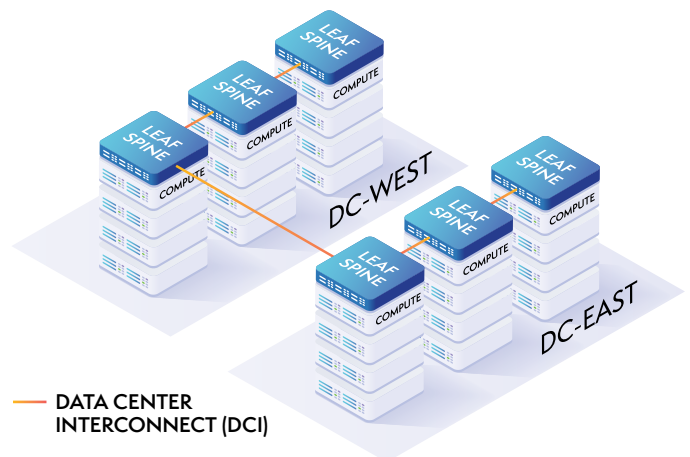
A key operational feature for any network operator is to rapidly recover from any mishaps caused by human error. Traditionally this is a complex operation that is vendor specific and requires both an understanding of the full state of each box and their relationship to each other at a certain point in time. Apstra AOS Intent Time Voyager feature speeds the time to resolution by giving the operator the ability to move the entire state of

the network (intent, configuration, and continuous validations), backwards or forwards in time with a few simple clicks. Apstra can uniquely deliver this capability due to Apstra AOS's Intent-Based approach, including its single source of truth and assurance validations which are at the foundation of AOS.



Data Center Interconnect

As networks have expanded and applications have increased their requirements for geographic diversity, there have been a number of vendor-specific proprietary features introduced to address stretched Layer-2 domains and Active-Active topologies. AOS now supports an industry standard EVPN with VXLAN overlay that extends Layer-2 application segments outside of the AOS managed topology, allowing the architect to integrate multiple disparate computing centers for effective load balancing, legacy migration, disaster recovery, or resource sharing.



Support for all modern network platforms

AOS has the industry's first and only vendor-agnostic service abstraction, allowing enterprises to design a network without consideration for the hardware platforms that will eventually be deployed. The tools used to design and manage the network are exactly the same regardless of which vendor hardware or NOS is ultimately selected. This translates to a massive reduction in OPEX, as there is no need to maintain staff expertise in multiple platforms and vendor nuances. There is also an opportunity to reduce CAPEX, since all modern vendors can be considered for inclusion in an AOS managed environment.



Summary

Apstra' AOS addresses IT application, hybrid cloud, and data center management needs via Intent-Based Data Center Automation to achieve higher reliability, vendor choice, and reduced costs. AOS is the Operating System for the Data Center and enables network engineers and operators to quickly and reliably design, build, operate, and continuously validate data centers of any size.

Apstra AOS Features and Specifications

Services:

- BGP L3 Clos Fabric with multi-tenancy EVPN (RFC 7432)
- 5 Stage Clos IP Fabric
- Intra-rack (VLAN), or Inter-rack (VXLAN)
- L3 VXLAN routing
- L3 server routing with dual attachment
- MLAG/vPC/CLAG/ESI
- BGP/OSPF Egress
- IPv6 fabric and applications
- Group Based Policy - Access Control Lists (ACLs)
- Extensible services (intent, resources, expectations)
- DHCP relay
- VRFs

Telemetry:

- LLDP, BGP, EVPN, Config Deviation
- Interface counters
- Routing table verification
- Host, transceiver, interface, LAG / MLAG
- MAC & ARP
- Server and devices health
- Network-wide external routes
- Intent-Based anomaly detection
- Telemetry streaming via protocol buffers
- Extensible telemetry collection
- Interactive Network Visualization

Root Cause Identification:

- Connectivity Fault Model
- Cabling Fault Model
- Anomaly Summarization

Intent-Based Analytics (IBA):

- Intent-Based Analytics Dashboards and Widgets
- Intent-Based Analytics Property Sets
- IBA Visualization Improvements
- Complex Data Filtering*

Device OS:

- Cisco NX-OS and NX-OSv
- Arista EOS and vEOS
- Juniper Junos OS
- Cumulus Linux and CVX
- Microsoft SONiC
- Ubuntu Servers
- CentOS Servers

Platform:

- AOS Backup / Restore
- AOS Server Health Reporting*
- RESTful APIs
- Graph model and GraphQL/QE API
- AOS-CLI
- AOS Developer SDK (Python)
- Extensible on-box or off-box device agents
- AOS Server Clustering

Security:

- Multi-User Administration
- Role Based Access Control
- LDAP Authentication
- TACACS+ Authentication
- RADIUS Authentication
- Active Directory Authentication
- 802.1x Network Admission Control
- HTTPS UI
- AOS Server Security Hardening
- Headless Operation

Blueprint Customization:

- External Routing Policy
- Advanced Configlets
- Property Sets
- Resource Management

Cloud Platform Integration:

- VMware vSphere
- VMware NSX-T
- Nutanix

AOS Extensibility:

- Zero Touch Provisioning (ZTP) Server
- Template Catalog
- External Streaming Telemetry (protobuf)
- Legacy Devices Integration
- Github
- IBA Probe Repository
- Configlets

Maintenance workflows:

- Staged/Commit Workflows
- Scale-out Maintenance
- Add Rack / Add Pod
- Intent Time-Voyager
- NOS Upgrade/Downgrade
- Change/Add Interface
- Device Maintenance Mode
- Replacement Maintenance
- Decommission Maintenance

Workload Change Operations:

- Group Based Policy
- Virtual Network Management

Device Management:

- Zero Touch Provisioning
- Device Agent Installer
- Lifecycle Management
- Device Quarantine
- NOS Management
- Device Import/Export
- Device Profiles
- Logical Devices

Intent-Based Analytics Probes:

- East-West traffic
- MLAG imbalance
- Headroom
- ECMP imbalance
- Hot / Cold fabric ports
- Interface flapping
- BGP (VRF aware)
- Default gateway count
- MLAG domain
- TCAM usage
- OS version
- Interface bandwidth
- Interface errors (overloaded int bandwidth)
- Sustained Interface discards
- SFP
- Interface buffers
- BUM traffic
- Display External Routes
- PIM state on a Leaf, Spine, Border Leaf

- PIM RP on Leaf, Spine
- PIM Anycast RP on Border Leaf
- PIM MRRoute Anomalies on Border Leaf
- VTEP
- STP state
- Flag STP state changes
- Power Supply Anomalies Probe
- Hypervisor and Fabric VLAN config mismatch
- VMs without Fabric configured VLANs
- Hypervisor and Fabric LAG config mismatch
- Hypervisor missing LLDP config
- Hypervisor MTU Mismatch
- Hypervisor MTU Check
- Hypervisor Redundancy Check

An open source [catalog of Intent-Based Analytics](#) probe configurations is available, to enable an ecosystem with customers, partners, and other third parties

Installation Requirements:

Hypervisors:

- VMware ESXi
- Supported versions - 6.5 (vCenter), 6.0, 5.5
- QEMU / KVM for Ubuntu
- Supported versions - 18.04 LTS
- Microsoft Hyper-V
- VirtualBox

VM Resources

AOS Server VM resource requirements may be greater than the recommendations below based on the size of the Blueprint and the use of Intent-Based Analytics (IBA).

Resource	Recommendation
Memory	64 GB RAM + 170 MB per installed off-box agent
CPU	8 vCPU
Disk	64 GB
Network	1 network adapter, configured with DHCP

ABOUT APSTRA

Apstra® Intent-Based Data Center Automation increases application availability and reliability, simplifies deployment and operations, and dramatically reduces costs for Enterprise, Cloud Service Provider, and Telco data centers. Apstra empowers Intent-Based Data Centers through its pioneering Intent-Based Networking, distributed system architecture, and vendor-agnostic overlay. Headquartered in Menlo Park, California and privately funded, Apstra is a Gartner Cool Vendor and Best of VMworld winner.

For more information, visit: www.apstra.com or contact sales@apstra.com or follow [@Apstralinc](#)