



Aviz Networks

WHITEPAPER

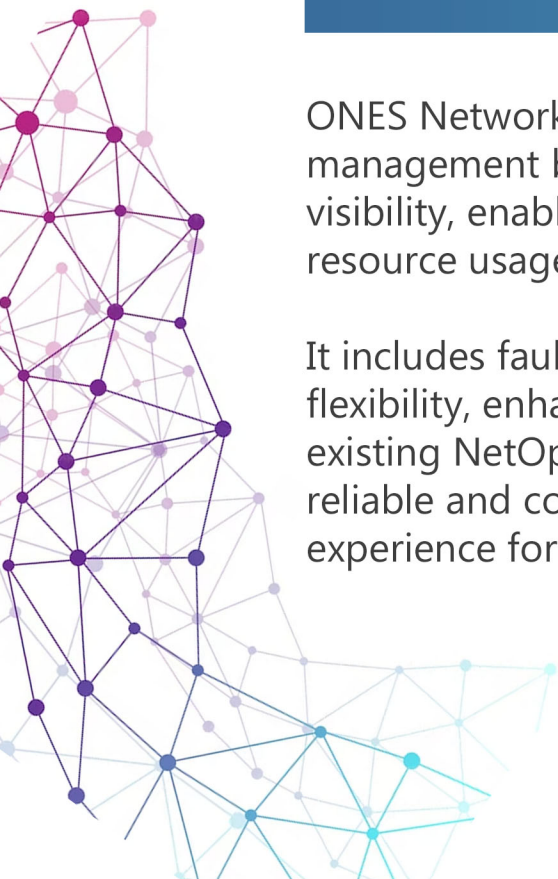
All You Need to Know About Open Networking Enterprise Suite (ONES)



Aviz's ONES (Open Networking Enterprise Suite)

ONES Network supportability offers numerous benefits to network management by simplifying operations, providing end-to-end visibility, enabling policy-driven automation and optimization of resource usage.

It includes fault detection and troubleshooting features, scalability, flexibility, enhancing compliance, security and integration with existing NetOps tools. These advantages result in a more efficient, reliable and cost-effective network infrastructure with a better user experience for administrators and stakeholders.



Use Case: Data Center Network Orchestration & Visibility

Network Orchestration includes Day 1 operation for bringing up the network and involves Day-2 maintenance for operational effectiveness. Following are some of the critical requirements for orchestration

Automated Configuration Management

Network orchestration enables automatic provisioning and configuration of network devices, reducing human errors and ensuring consistent network settings.

Network Virtualisation Orchestration

It facilitates the creation and management of virtual networks, allowing implementations and better network segmentation

Continuous Integration/Continuous Deployment (CI/CD)

Existing customer CI/CD pipelines integration is possible for automated testing and deployment processes, accelerating application delivery.

Network telemetry and visualization

plays a critical role in modern Data centers, offering valuable in-sights and enabling proactive decision-making.

Data Service Deployment and Scaling

Orchestration streamlines the deployment of data traffic services and applications across the network as well as scaling resources to meet the changing demands.

Network Policy Enforcement

Orchestration tools enforce network policies and access controls across all devices, ensuring security and compliance.

Multi-Vendor Network Management

Orchestration solution provides a unified management interface for multi-vendor environments powered by SONiC network operating system, simplifying network administration.

Following are some of the important use cases for advanced network telemetry and visualization:

01 Real-Time Network Monitoring

Telemetry and visualization tools allow network administrators to monitor network traffic, performance metrics and device health status in a real-time environment. This use case helps detect anomalies, identify bottlenecks and promptly respond to issues, reducing downtime and improving network reliability.

02 Capacity Planning and Resource Optimization

Advanced telemetry provides historical data on network resource utilization trends. By analyzing this data through visualizations, network engineers can make informed decisions about capacity planning ensuring that the network is adequately provisioned to handle future growth and traffic demands.

03 Network Troubleshooting & Root Cause Analysis

In the event of network issues, historical telemetry data and visualizations enable network engineers to conduct root cause analysis. Understanding past incidents helps identify underlying problems and implement preventive measures to avoid similar issues in the future.

04 Application Performance Optimization

Network telemetry can be correlated with application performance metrics to pinpoint performance bottlenecks. Visualizing this data allows network teams to optimize application delivery and ensure a seamless user experience.

05 Compliance and Reporting

Advanced telemetry can help in compliance monitoring by tracking network activity and generating reports on network usage, security events, and adherence to policies.

The Next Generation modern Cloud and Data Center networks are moving towards dynamic workloads and applications and there has been a demand for the ever-evolving data center architectures with advanced telemetry and visibility tools.

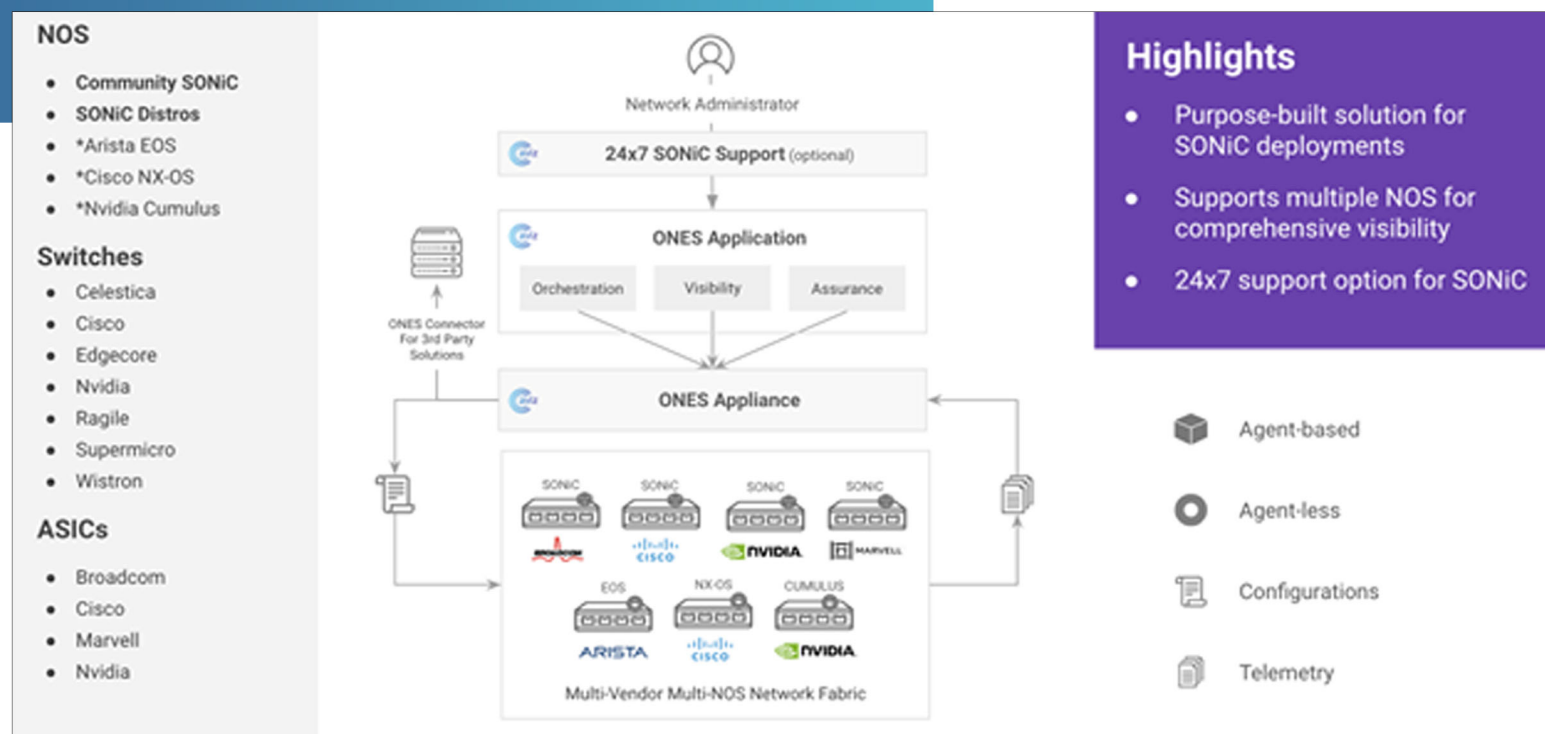
Next Gen Data Center architectures have to provide fine-grained visibility into application performance and network-wide monitoring. Data Center Operators are transforming their Monitoring infrastructure from Legacy SNMP applications for network services monitoring to GNMI and gRPC based live telemetry streaming time series based monitoring and visualization.



Disadvantage of Legacy SNMP monitoring approach

- Pull model has scalability issues with modern data center networks.
- Complex OID management for supporting vendor specific metrics
- Does not provide real-time event driven metrics which is critical for troubleshooting and support

ONES Overview



What is ONES Orchestration?

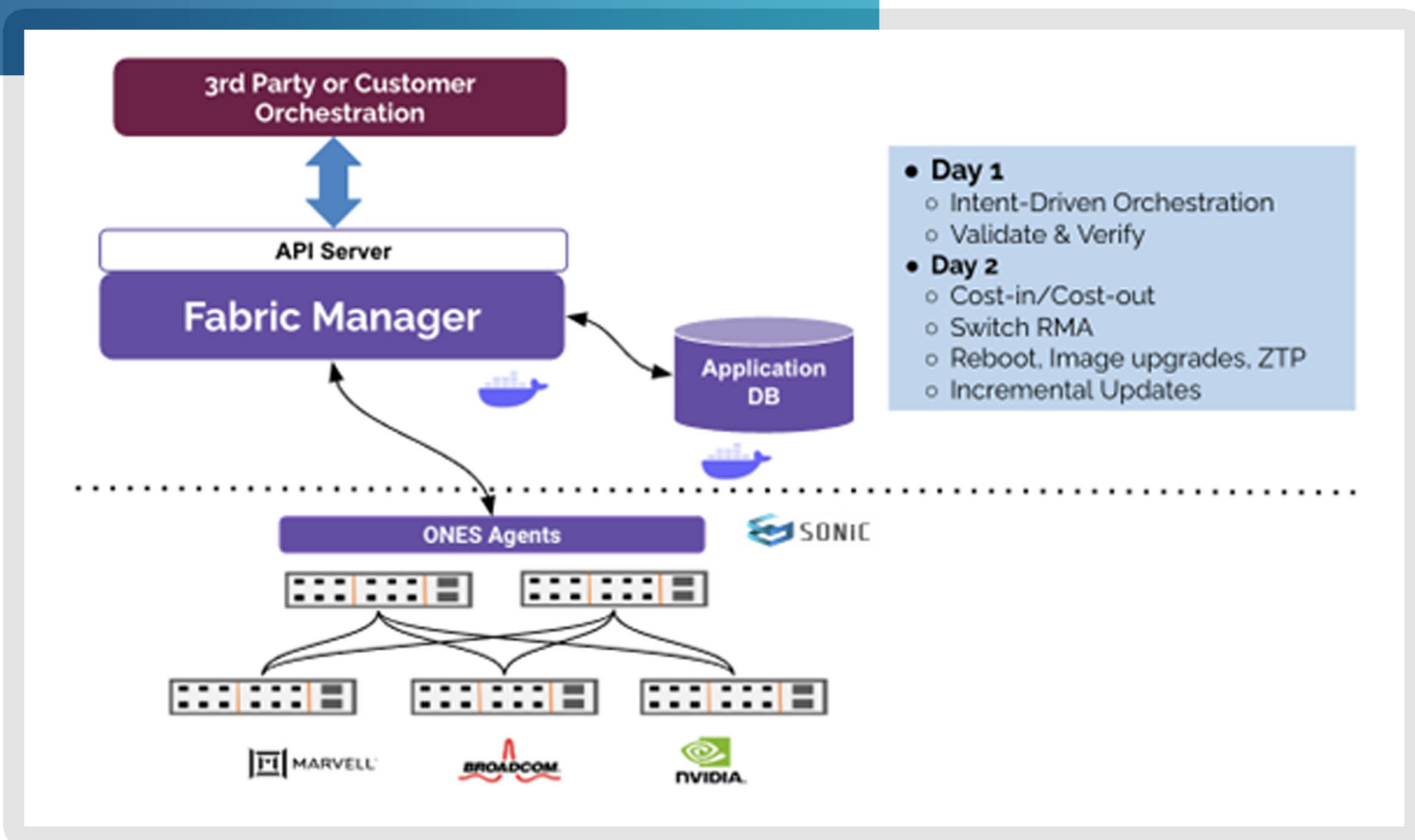
Enterprise Data-Centers have home-grown network orchestration and monitoring tools managed by the local NetOps team. ONES application simplifies the Day1 network entities provisioning to provide a smooth transition for NetOps teams to use SONiC(Software for open networking in the cloud). Aviz networks' ONES application provides a clear GUI access and Rest APIs based automated provision for the Data center operators.

ONES provides the following unique value proposition

- Data Center Day 1 and Day2 Operations and commissioning of services
- Improves operational efficiency of Data center operations with respect to time, accuracy and scalability
- Unified fabric Orchestration for multi-vendor networks
- Simplified integrating with 3rd party netops infrastructure tools
- Secure APIs for network orchestration and maintenance
- Factor authentication of enrolled devices by ONES

Figure 1:

ONES Fabric Orchestration architecture



The ONES Orchestration function on the application which enables data center operators to compose, deploy and validate network configurations across any SONiC, be it a community version or a vendor distribution .

For CLOS deployment in the data center, the IP interfaces grow dramatically due to the full connection between spines and LEAFs where each peer connection needs IPv4 addresses . To eliminate this situation, we need the unnumbered interface to establish peer connections. AVIZ Networks ONES application supports YAML for managing devices running SONiC operating systems across multi vendor switches. SONiC brings uniformity in the Network operating system across fabric and ONES brings a unified orchestration control for provisioning, discovery and diagnostics of enrolled devices enabled by SONiC .

ONES API architecture is open and flexible in NBI plug-in integration with 3rd party NetOps tools. It also offers an open SDK integration for any open-source tools integration with ONES network orchestration and configuration management performance being seamless through API calls and UI template based orchestration. ONES Orchestration supports the following Layer2 and Layer 3 Data center Fabric building features automation through GUI and Rest APIs -

- Create and configure CLOS topology for ToR, Leaf, Spine, and Super-Spine switches.
- Apply and validate configurations on switches during pre- deployment and post-deployment
- Upgrade devices with a single click via ZTP or custom NOS images
- Compare running configurations against applied configurations at any point.
- ONES supported deployment over SONiC enabled Fabric are defined at <https://www.OVD.ai>
- Automate configuration of physical interfaces, layer 3 configuration for building IP-CLOS fabric using BGP as a routing protocol including BGP-unnumbered, system services including NTP, SNMP, SYSLOG etc.

ONES ensures that the Data Center Fabric is operational by validating the configuration at every stage

ONES Orchestration Workflow



Day-1 Operations

- Generate, Validate and Apply Day1 network configurations
- Configure and validate IPv4/IPv6/BGP-Unnumbered Underlay Fabric.
- Configure and validate Layer2 Leaf Spine Fabric bring up
- Configure and validate L2-VXLAN with BGP EVPN Multihoming
- Configure and validate L2-VXLAN EVPN BGP with MC-LAG
- Configure and validate VXLAN EVPN Asymmetric and Symmetric IRB

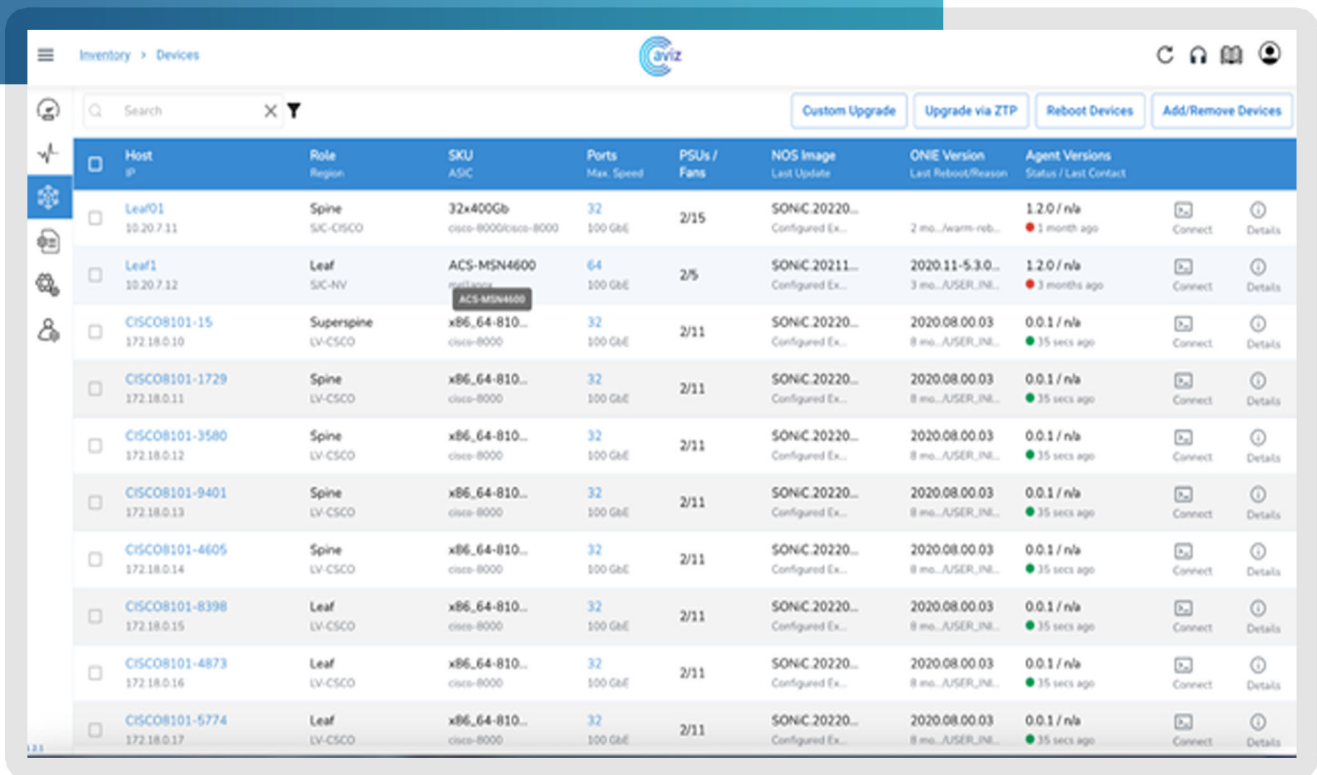
Day-2 Operations

ONES applications support Day2 operations like configuration changes, modifications during maintenance windows seamlessly through ONES APIs.

- Cost-in/Cost-out of Devices during maintenance
- Switch RMA, Reboot and Custom Image Upgrades
- Incremental Updates for Configuration

Figure 1:

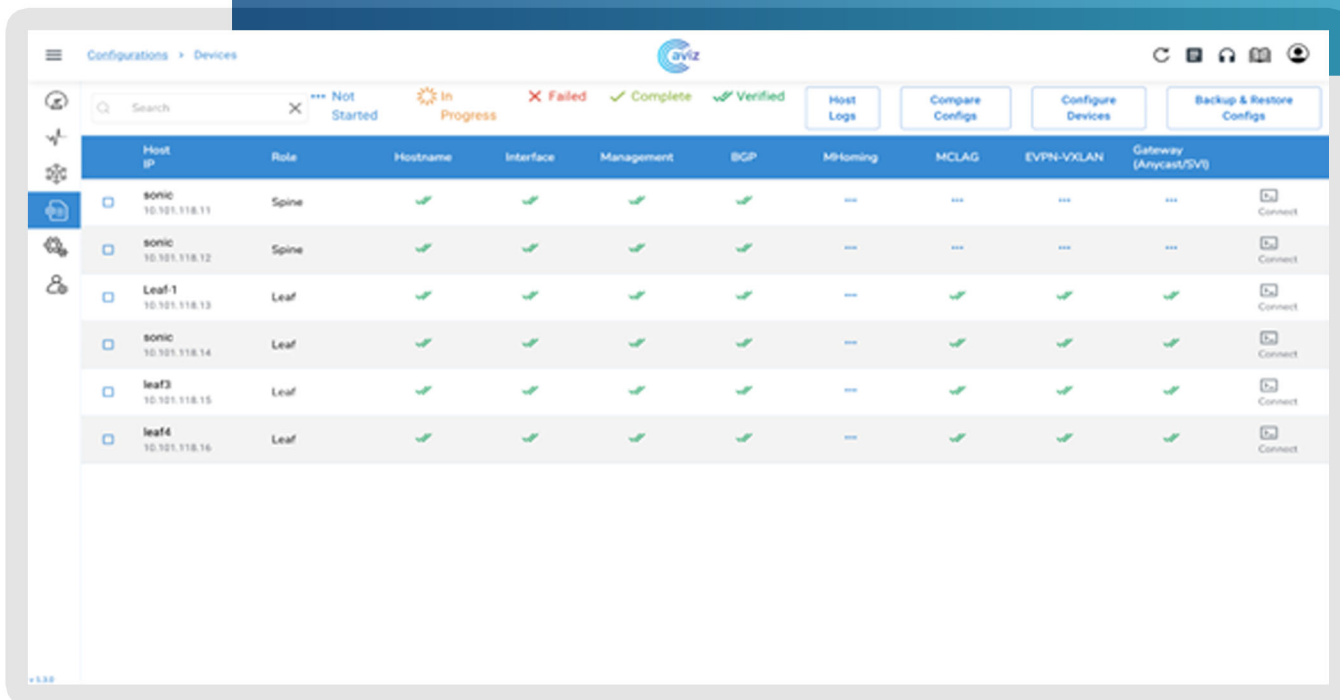
ONES orchestration UI View of Onboarded Switches



Host IP	Role	Region	SKU	Ports	PSUs / Fans	NOS Image	ONIE Version	Agent Versions	Status / Last Contact	Connect	Details
Leaf01 10.20.7.11	Spine	SV-CISCO	32x400Gb cisco-8000/cisco-8000	32 100 GbE	2/15	SONIC 20220... Configured Ex...	2 mo..._warm-rb...	1.2.0 / n/a	1 month ago	Connect	Details
Leaf1 10.20.7.12	Leaf	SV-IV	ACS-MSN4600 ACS-MSN4600	64 100 GbE	2/5	SONIC 20211... Configured Ex...	2020.11-5.3.0... 3 mo..._USER_INL...	1.2.0 / n/a	3 months ago	Connect	Details
CISCO8101-15 172.18.0.10	Superspine	LV-CISCO	x86_64-810... cisco-8000	32 100 GbE	2/11	SONIC 20220... Configured Ex...	2020.08.00.03 8 mo..._USER_INL...	0.0.1 / n/a	35 secs ago	Connect	Details
CISCO8101-1729 172.18.0.11	Spine	LV-CISCO	x86_64-810... cisco-8000	32 100 GbE	2/11	SONIC 20220... Configured Ex...	2020.08.00.03 8 mo..._USER_INL...	0.0.1 / n/a	35 secs ago	Connect	Details
CISCO8101-3580 172.18.0.12	Spine	LV-CISCO	x86_64-810... cisco-8000	32 100 GbE	2/11	SONIC 20220... Configured Ex...	2020.08.00.03 8 mo..._USER_INL...	0.0.1 / n/a	35 secs ago	Connect	Details
CISCO8101-9401 172.18.0.13	Spine	LV-CISCO	x86_64-810... cisco-8000	32 100 GbE	2/11	SONIC 20220... Configured Ex...	2020.08.00.03 8 mo..._USER_INL...	0.0.1 / n/a	35 secs ago	Connect	Details
CISCO8101-4605 172.18.0.14	Spine	LV-CISCO	x86_64-810... cisco-8000	32 100 GbE	2/11	SONIC 20220... Configured Ex...	2020.08.00.03 8 mo..._USER_INL...	0.0.1 / n/a	35 secs ago	Connect	Details
CISCO8101-8398 172.18.0.15	Leaf	LV-CISCO	x86_64-810... cisco-8000	32 100 GbE	2/11	SONIC 20220... Configured Ex...	2020.08.00.03 8 mo..._USER_INL...	0.0.1 / n/a	35 secs ago	Connect	Details
CISCO8101-4873 172.18.0.16	Leaf	LV-CISCO	x86_64-810... cisco-8000	32 100 GbE	2/11	SONIC 20220... Configured Ex...	2020.08.00.03 8 mo..._USER_INL...	0.0.1 / n/a	35 secs ago	Connect	Details
CISCO8101-5774 172.18.0.17	Leaf	LV-CISCO	x86_64-810... cisco-8000	32 100 GbE	2/11	SONIC 20220... Configured Ex...	2020.08.00.03 8 mo..._USER_INL...	0.0.1 / n/a	35 secs ago	Connect	Details

Figure 2:

ONES Orchestration configuration apply for EVPN-VXLAN



Host IP	Role	Hostname	Interface	Management	BGP	M-Homing	MLAG	EVPN-VXLAN	Gateway (Anycast/SV)	Connect
sonic 10.101.118.11	Spine	✓	✓	✓	✓	---	---	---	---	Connect
sonic 10.101.118.12	Spine	✓	✓	✓	✓	---	---	---	---	Connect
Leaf-1 10.101.118.13	Leaf	✓	✓	✓	✓	---	✓	✓	✓	Connect
sonic 10.101.118.14	Leaf	✓	✓	✓	✓	---	✓	✓	✓	Connect
leaf3 10.101.118.15	Leaf	✓	✓	✓	✓	---	✓	✓	✓	Connect
leaf4 10.101.118.16	Leaf	✓	✓	✓	✓	---	✓	✓	✓	Connect

What is ONES Monitoring?

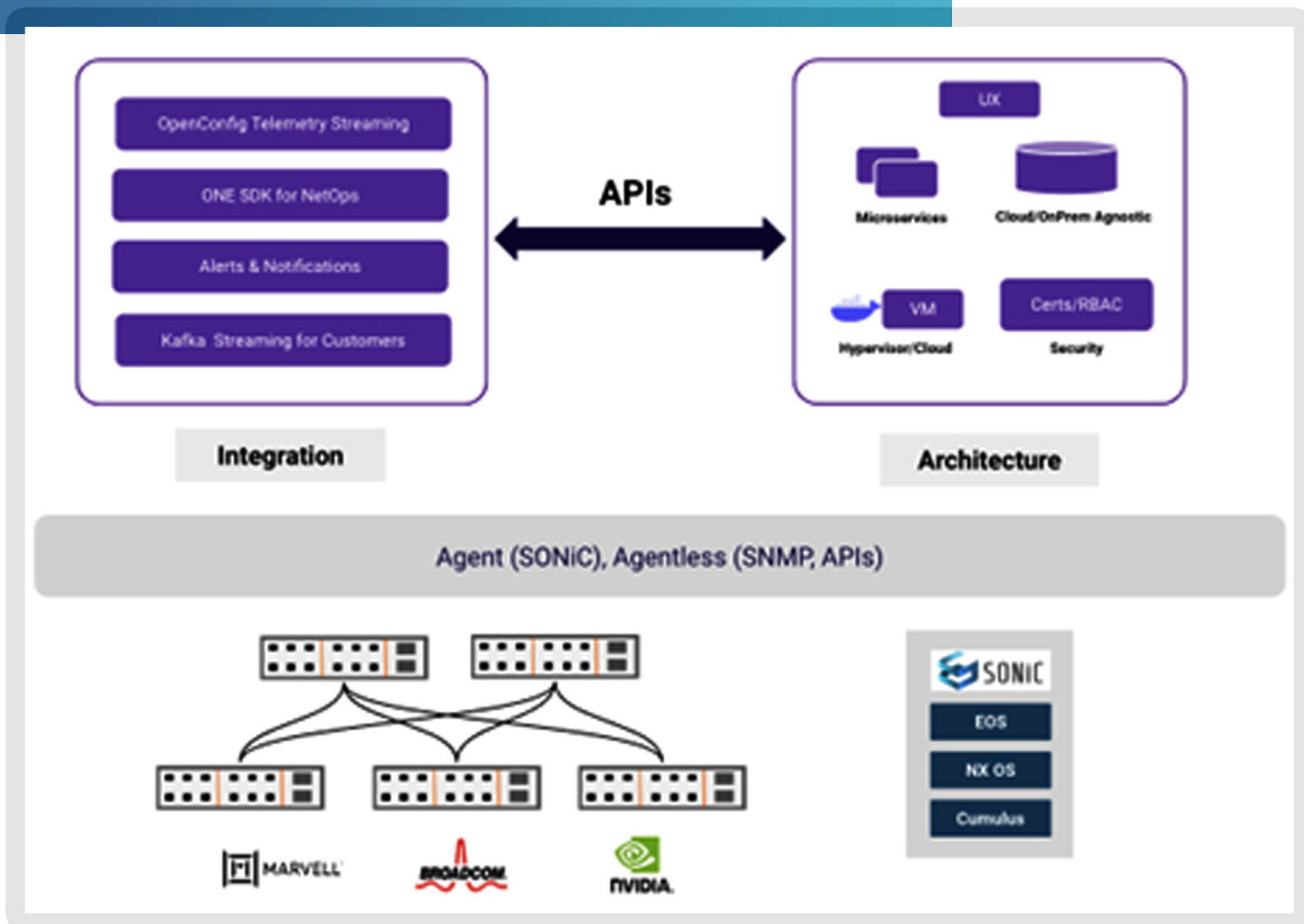
ONES Telemetry Agent brings truly unparalleled visibility across ONES 's enrolled Switches running SONiC .ONES Telemetry Agent Leverages an advanced GNMI based live streaming telemetry mechanism to provide assurance support to operations with measured key metrics on-demand so customers can deliver SLAs of five-nines (99.999% availability) for their operations DC network.



ONES Telemetry Overview

Figure 1:

ONES Telemetry architecture overview



- Time series based real time monitoring and streaming techniques to isolate faults in the Data center fabric network.
- ONES streaming telemetry is powered with various techniques that transport the data which includes industry standard channels like gRPC, GNMI etc
- ONES agent can stream data into OpenConfig telemetry model as well for any 3rd party NetOps tool integration
- Manages the inventory of enrolled SONiC devices on various platforms (BRCM, Nvidia, Marvell)
- Continuously probes and measures various network SLA metrics like network latency, packet loss, path traces .
- Monitors heterogeneous Data Center fabric consisting of SONiC and Non-SONiC enabled Multi vendor Switches with a complete view of Data Center topology across availability zones and network sites

ONES Telemetry Value Proposition

Real-time Telemetry Streaming

Collects real-time data from enrolled network devices through GNMI channel .

Anomalies Detection & Alerting

Detects fault over network links , devices , components, and sends rule engine alert notification to NetOps over Slack and Zendesk .

Secure Telemetry

ONES telemetry helps in detecting and analyzing potential security threats or anomalies in network traffic to enhance overall network security through encrypted GNMI channels .

Historical Data Storage

ONES telemetry stores historical data for trend analysis, capacity planning and troubleshooting of past network issues.

Integration

Integration of telemetry APIs with 3rd party NetOps tools running in customer's existing data center infrastructure

Network Topology & Connectivity

Monitor links through GUI interface where it shows the number of active links and down links between enrolled switches in a data center fabric .It also provides view on voltage , temperature of ports over enrolled switches , transfer and receive power of various ports hosted on enrolled devices by ONES application

Hardware & Software Inventory

Aviz Networks ONES shows complete inventory of all enrolled devices, management IPs , hostname , SKU details , Ports , PSU, Fan components , NOS images , ONIE Version etc

Metrics Collected by ONES

Function	Metrics
Connectivity	LLDP Information
	Role, Region
Inventory & Compliance	Hardware SKU, Model, MAC, Serial number
	NOS, Linux Distro, ONIE
	Uptime, Reboot reason
	Services (Dockers) - CPU utilization, Memory utilization, Health
Platform	FAN - Model, RPM, Tray, Direction
	PSU - Model, Serial, Voltage, Temperature, Power, LED Status
	CPU Cores, Temperature
	Cabling Information
Links	Port Speed , FEC , MTU , Breakout , Serdes , Auto Negotiation, Interface Flaps
	Admin Status, Oper Status, Alias
	Transceivers Information - Type, Serial, Vendor date, Vendor Name
	Transceivers DOM Information - RX/TX Power, TX Bias, Voltage, Temperature
Control Plane	BGP Neighbors, Prefixes
	IPv4/v6 Routes , Kernel Routes
System	System and Services - CPU, Memory Utilization
	Traffic Bandwidth - TX/RX Pkts, Errors, Packet Discards
	Resource Utilization - ASIC routes, nextops, ACLs
Data Plane	Traffic Input/Output Packet, Octets, Rate
	Traffic Input/Output Errors, Discards
	Traffic Input/Output Queue Counters
Topology	Topology with Drilldown

Figure 1:

Topology and Connectivity

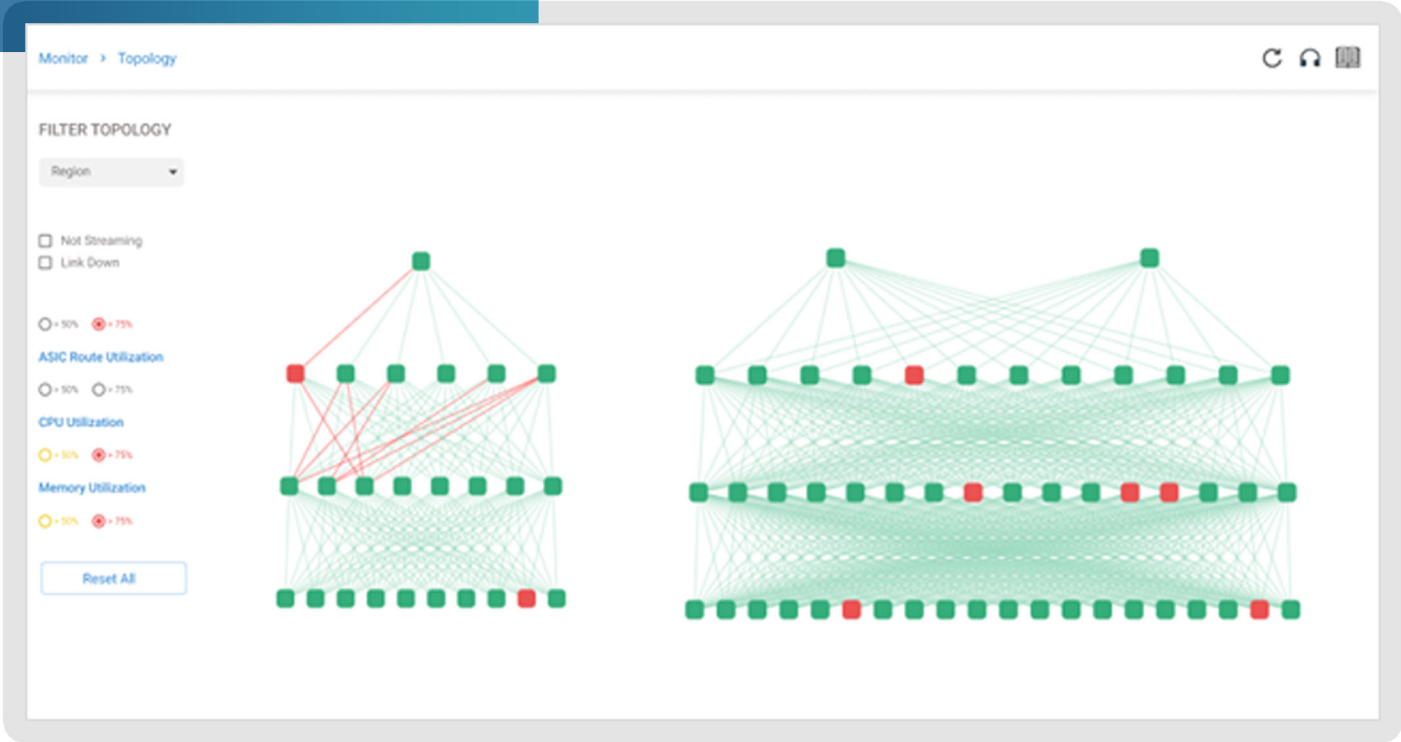


Figure 2:

Link and Device state monitoring

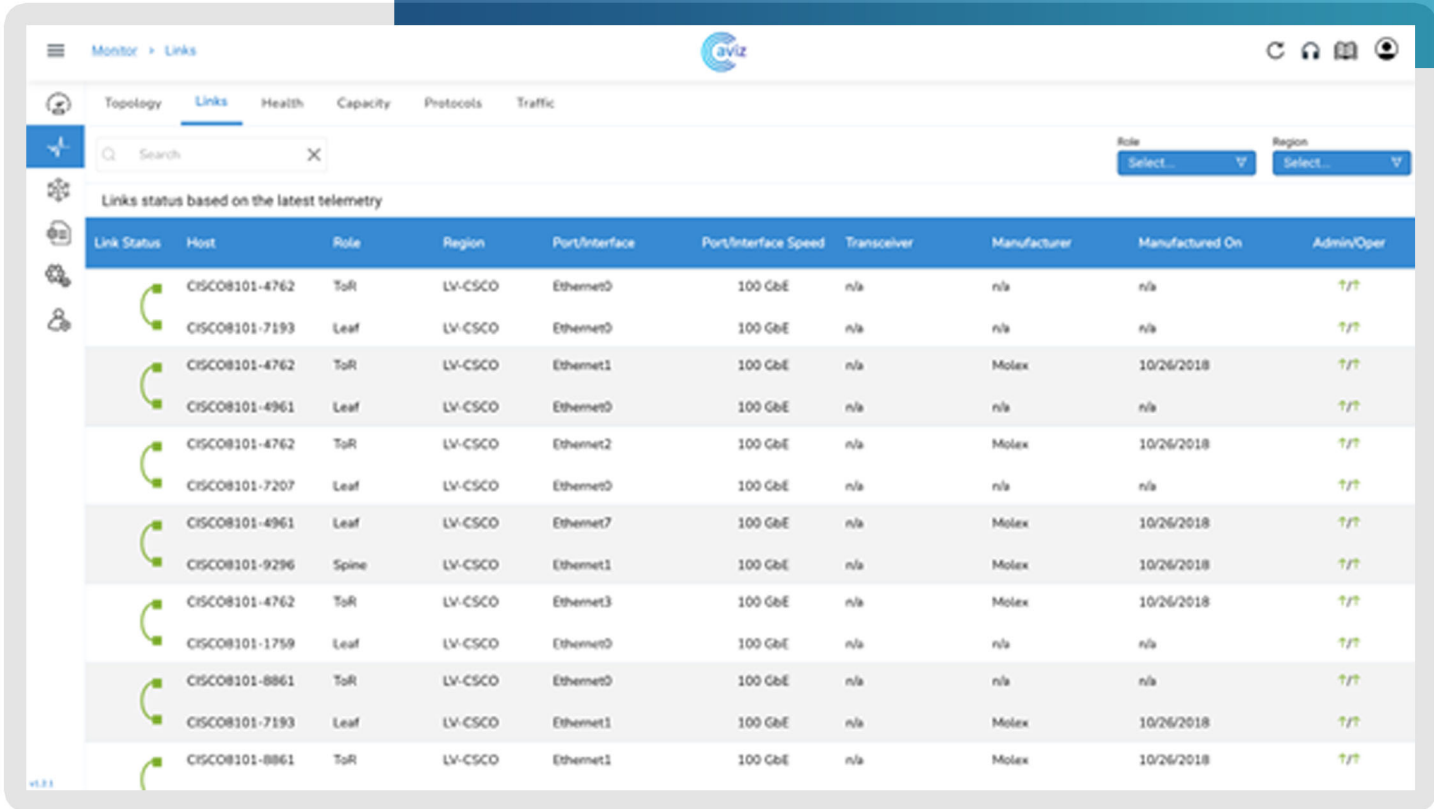


Figure 3:

Platform Health Monitoring

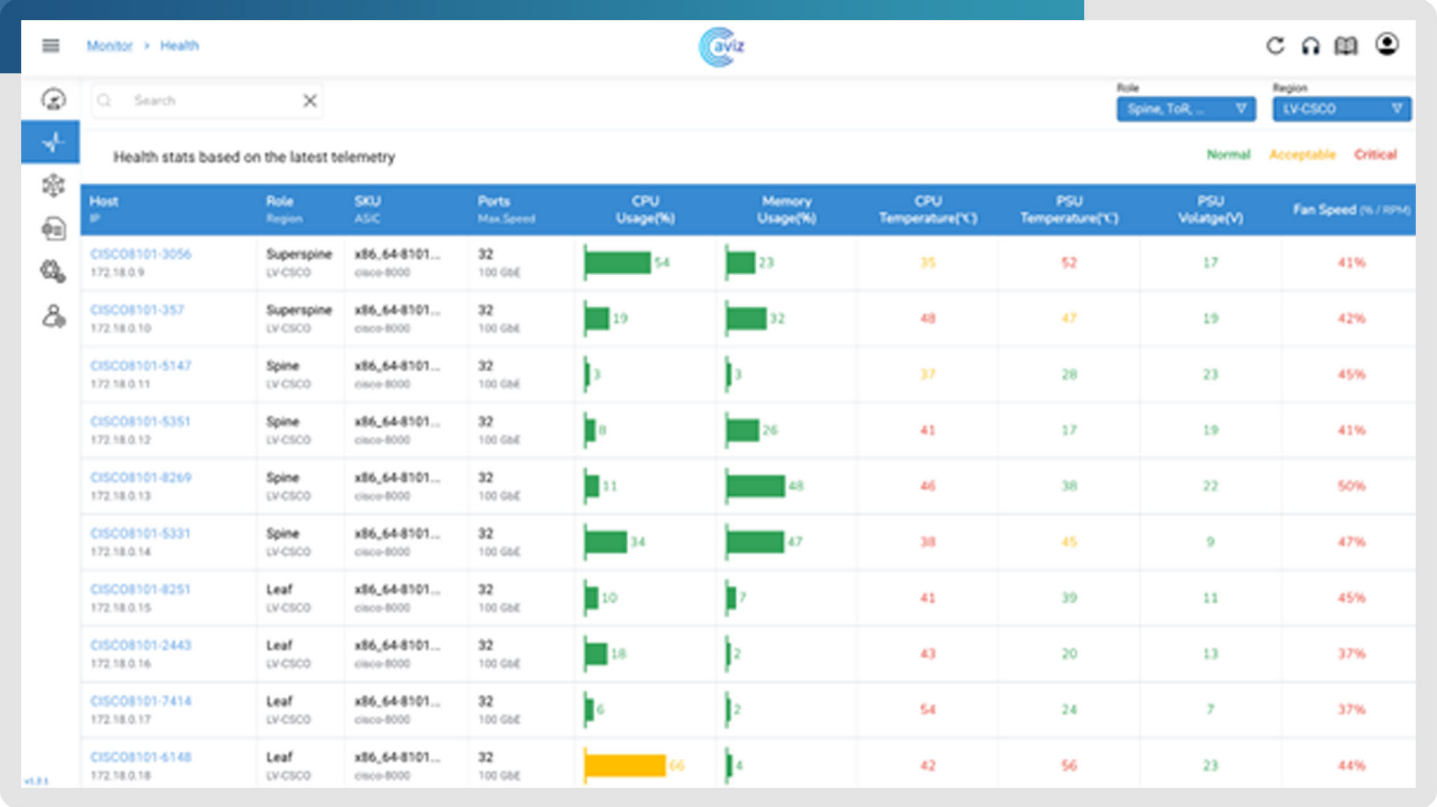
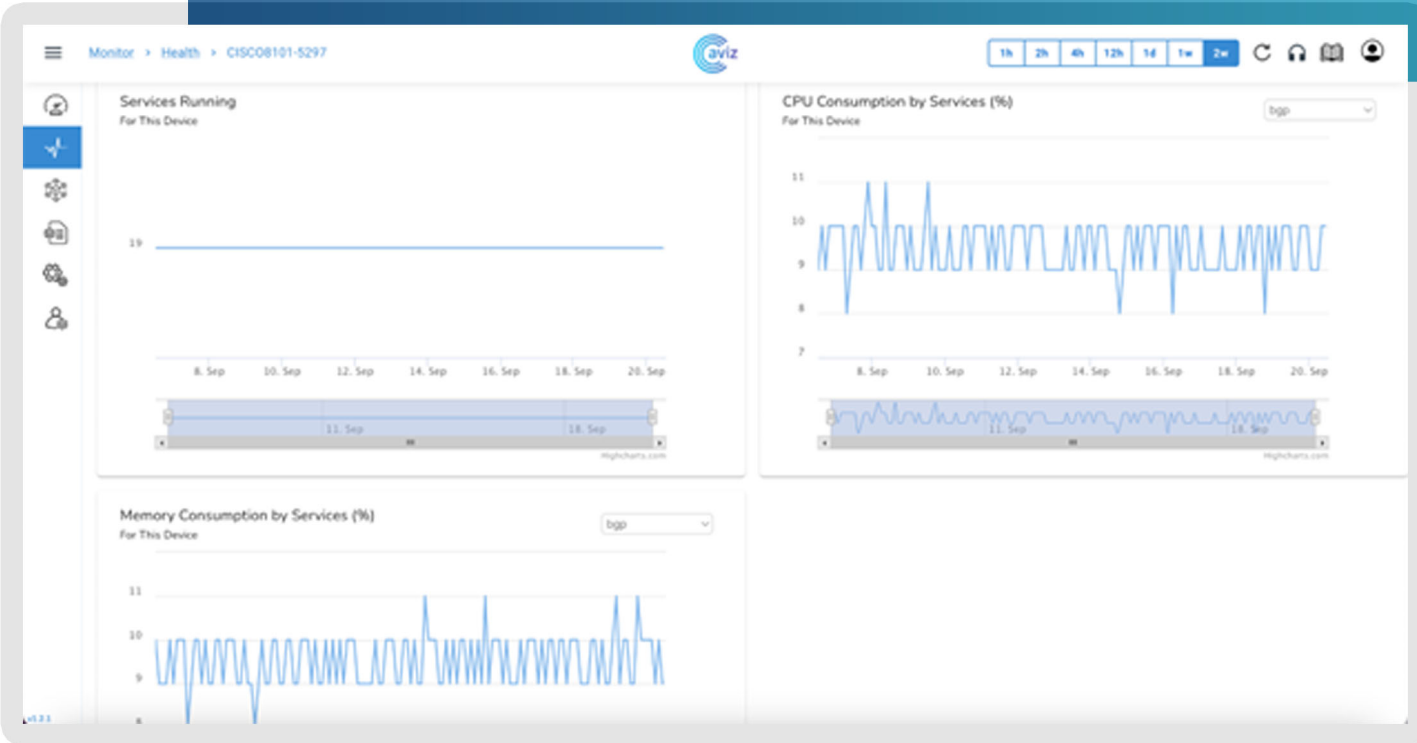


Figure 4:

Monitor Services (docker) BGP resource utilization



ONES API Explorer

Data center operations and Support teams can login to <https://<ONES-serverIP>/explorer> and get access to all the REST APIs which customers can leverage to develop their own custom scripts to orchestrate and monitor the SONiC based data center. Aviz ONES REST API explorer section ensures customers get flexibility in their DevOps operation approach with limited resources and OEM dependency .



Aviz delivers switch platform agnostic, easy-to-use applications for network orchestration, visibility, and assurance. Aviz also provides SLA-backed disaggregated support for multi-vendor SONiC deployments in data center and edge networks.



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