Arista Netdi™

Delivering Reliable AI and Cloud Networking

Introduction

As the demands of AI and cloud networking push data center infrastructure to its limits, operators need networks that are not only high-performing and extremely reliable but also adaptable to the latest advancements in power, thermal management, and physical connectivity. Arista has been addressing this challenge with **Network Diagnostics Infrastructure (Netdi)**.

Netdi is a core component of the lower layer of Arista EOS® and embodies the deep network engineering expertise and troubleshooting capabilities required for complex hardware platforms. Netdi ensures that every Arista platform has the same meticulous validation, robust diagnostics, and expert support to deliver a consistent and superior experience regardless of whether an operator chooses to run Arista's flagship EOS or an open-source NOS.

Netdi goes beyond the classic Switch Abstraction Interface (SAI) by leveraging the state of low-level firmware for validation capabilities. Built on more than 7,000 person-years of EOS development experience and comprehensive automated testing, Netdi enables Arista to offer "**Arista Blue Box**" as a superior solution to the commodity "white box" solutions, providing a compelling choice to our customers for building next-generation AI and cloud networks.

The Arista Netdi Suite Delivers Rich Diagnostics Infrastructure

The rapid rise of generative AI and large models has introduced a new era of network complexity at many layers across hardware, control planes, physical active and passive components, as well as cable and optics management. Arista understands that the traditional, discrete approach to hardware, software, and interconnects places an immense burden on operators. Therefore, Arista has addressed this challenge with a holistic validation strategy encompassing network hardware, firmware, and software.

Arista Netdi showcases our core engineering DNA for quality, reliability, and validation of physical and low-level diagnostics, providing a rich underlay of features. Based on the state-rich EOS, it enables a rigorous, end-to-end governance of the lifecycle of every Arista platform. Leveraging our two decades of proven switch expertise and track record, Netdi is that critical layer for expressing the quality, reliability, and secure boot. This profound concept is fundamental to our belief that switch hardware must be validated as a system to establish a resilient foundation agnostic to the Network Operating System (NOS) running on top.

Common Foundation with Optional NOS

Arista EOS is widely recognized as the industry's most robust open network operating system, extensively deployed in mission-critical networks, but some operators with in-house development resources and expertise, as well as support teams, are adopting open-source solutions, such as SONiC and FBOSS, for specific use cases. Alternative NOS facilitates standardization across diverse hardware platforms, allows for branching to enable extensive NOS customization, and provides an avenue for deploying home-grown or community-sourced protocols if needed. Many operators opt for hybrid leaf-spine topologies where the leaf could be connected to Arista EOS-based spine to achieve the best of both worlds.

Netdi Enables Scale Across Arista Blue or Branded Platforms

Arista Netdi provides a critical capability in this environment, ensuring that Arista Blue Box hardware and platform software are meticulously validated to provide a consistent, world-class experience, whether the network runs Arista EOS or an alternative NOS. Unlike generic ODM/JDM white box alternatives, this brings Arista's advanced suite of diagnostics and lifecycle advantage rooted in our commitment to engineering scale and deployment of thousands of switches and millions of ports.

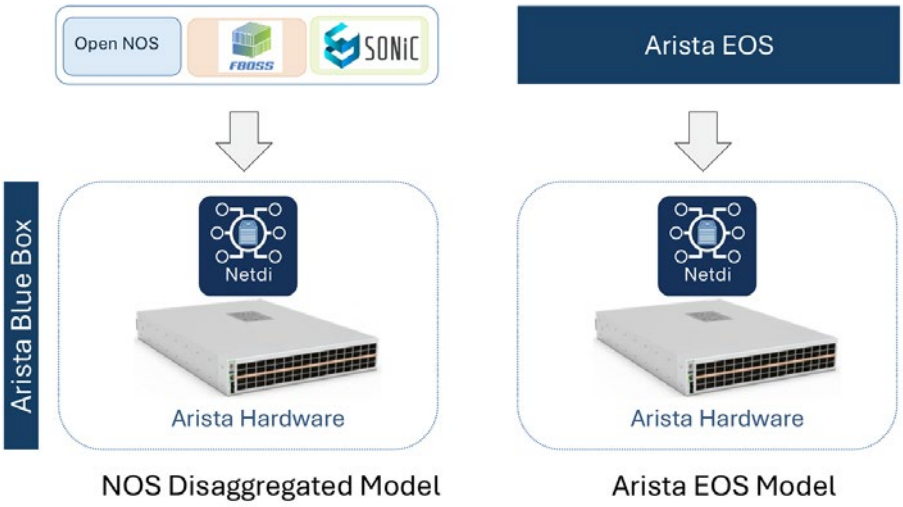

Figure 1: Netdi - NOS disaggregated and Arista EOS integrated models.

Arista Netdi: A Comprehensive Suite for Network Scale

The development of a new network platform poses significant technical and logistical challenges. The Arista Netdi suite of comprehensive features accelerates operational deployment with high quality and reliability. This begins with our "right first time" engineering and regression pipeline that is crucial to scale and exacting standards.

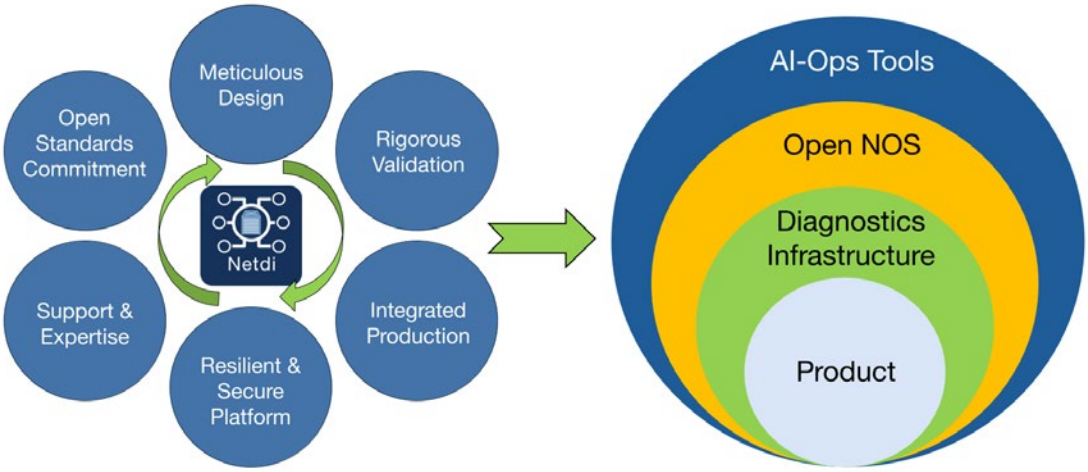

Figure 2: The Arista Netdi middleware is a rich suite of functionality for reliable products across hardware and higher-level NOS functions that enables the Arista Blue Box.

World Class Netdi Engineering

Netdi foundational architecture emphasizes meticulous design up front, coupled with deep research and development efforts to address potential issues proactively before they emerge in production deployments. This is evident in our world-class Signal Integrity (SI) and Power Integrity (PI) research, which consistently pushes boundaries. Our deep expertise, particularly in high-speed signaling of 224G, has enabled superior channel performance, leading to innovative hardware designs. Since optics account for approximately 50% of the total switch power consumption, Arista has focused on low-power solutions such as Linear-Drive Pluggable Optics (LPO) by combining its expertise in high-speed link design and innovative thermal management solutions. These solutions enable a smaller network footprint, increase switch reliability, and reduce Total Cost of Ownership (TCO). This collaborative approach is built on strong partnerships with key AI and cloud customers, fostering the development of multi-NOS platforms, such as 7368X4, 7388X5, and DES 7700.

Rigorous Validation for Sustained Durability and Scale

Our steadfast commitment to design is complemented by world-class validation and process control. We've engineered our products for rapid bring-up and characterization, utilizing a custom suite of diagnostic software that enhances both our manufacturing and customer deployment processes. Arista Platforms are subject to rigorous stress and compliance testing on large sample sizes, including Electrical Design Validation Testing (EDVT), Mechanical Design Validation Testing (MDVT), Emissions and Radio Frequency Interference (EMI), Highly Accelerated Life Testing (HALT), Safety, Packaging, and Reliability Demonstration Testing (RDT). These long-duration stress tests validate hardware performance under real-world conditions. This is further reinforced by a dedicated hardware fleet that runs a 24/7 automated software validation framework that executes more than 250,000 automated tests daily. These tests validate the stability of all hardware and platform software components across all supported NOSes under varying environmental conditions, physical component failures (fans, power supplies, cables, etc.), reboots, hotswaps, and link flaps to assure successful production of large-scale AI/Cloud networks.

Lifecycle Management: From Concept to Supply Chain Manufacturing

Netdi delivers lifecycle management from the moment a project begins. Arista's custom-built software ecosystem provides a comprehensive, transparent, and globally synchronized control system. Our program management software acts as the central nervous system, tracking product milestones, providing integrated bug tracking, and automatically generating build forecasts

for our contract manufacturers. Our systems leverage custom tools to identify supply chain risks, logistics risks, and component shortages, manage engineering change control, and analyze manufacturing metrics. This integrated approach to engineering development, production, and supply chain planning ensures a high-quality product that can rapidly scale to high volumes.

A Resilient and Secure Platform for Demanding Environments

The true value of Arista's engineering approach is realized in the platform's resilience. Through Netdi, a platform is not a static product; it is a precisely designed and validated system capable of withstanding the most demanding environments. This begins with a boot loader that is both secure and robust, and extends to the control and health of every single hardware component.

Arista's custom-developed bootloader provides a consistent, reliable, and secure boot layer for any NOS. With robustness and security as core design objectives, it ensures the platform is always operational. It provides resiliency through BIOS and bootloader image redundancy, allowing the system to fall back to a known-good image if the primary image is corrupted. This is further enhanced by Arista's measured boot and hardware attestation, which leverages a tamper-resistant Trusted Platform Module (TPM) to record critical boot stages, allowing users to verify that the software's integrity has not been compromised.

Arista's Netdi is designed to handle Single Event Upsets (SEUs), a natural occurrence in all hardware that can cause catastrophic failures from momentary bit flips, leading to data corruption, system crashes, or corrupted control logic. In AI networks, which are highly sensitive to data integrity, SEUs can be particularly devastating. This is because pinpointing the exact SEU that caused the issue is incredibly challenging, leading to prolonged debugging and downtime, and consequently, a significant increase in Job Completion Time (JCT). By baking SEU resiliency directly into every product, our software and hardware-assisted mechanisms can rapidly detect and automatically correct these events. We rigorously validate this resilience through a fully automated process, utilizing both error injection and live neutron beam testing. Furthermore, our platforms are engineered to precisely control and contain Layer-0 passive events (e.g., fans, flash memory, and power supplies) while also tracking and managing Layer-1 active events (e.g,. PHY, cables, and optics). This advanced hardware design, combined with sophisticated software algorithms, leverages detailed environmental telemetry to optimize temperature, minimize power consumption and noise, and maximize Mean Time Between Failures (MTBF).

The Strategic Impact

The value of Arista's Netdi is fully realized in the operational experience we provide to our customers. This is particularly critical in the large, multi-NOS AI/Cloud environments, where the switch hardware, software, and interconnect configurations can introduce complexities and a support gap. Arista bridges this gap by offering a cohesive support and expertise model that is a direct extension of our Netdi process. While White Boxes may offer some basic level functionality and are sometimes "good enough", Arista Netdi brings better capabilities with Blue Box and the best resilience with EOS and Netdi combinations.

Netdi Driven Support

Netdi framework provides a holistic view of the system, fundamentally simplifying support. By generating a rich stream of data, from design validation to production analytics, our engineering and manufacturing processes allow a shift from reactive Technical Assistance Center (TAC) to proactive troubleshooting led by Arista Autonomous Virtual Assist (AVA™). Our specialized Arista TAC team leverages a state-based Network Data Lake (NetDL™) architecture and diagnostic infrastructure to provide faster, more accurate diagnoses, serving as a single point of contact for all issues, including those related to non-Arista software. This Netdi capability provides our customers with a unique level of confidence and operational efficiency.

Commitment to Open Standards

Arista's commitment to an open networking ecosystem is a natural extension of our Netdi. Our deep engagement with the Switch Abstraction Interface (SAI) ensures our hardware's advanced capabilities are openly programmable and accessible to SONiC and other open-source NOS solutions. This core principle of platform agnosticism underpins our approach, ensuring customers leverage our hardware's inherent advantages. We actively lead and contribute to standards and consortia like the Ultra Ethernet Consortium (UEC), OSFP MSA, LPO MSA, and various data center protocols. Our position as a Premier Member of the SONiC Foundation is a testament to this commitment. We support the SONiC ecosystem's growth and stability through direct contributions and a broad

array of SONiC-compatible hardware. This collaborative approach promotes genuine disaggregation, empowering our customers to confidently build robust, multi-vendor networks with the assurance that comes from a trusted partner.

Summary: The Arista Advantage

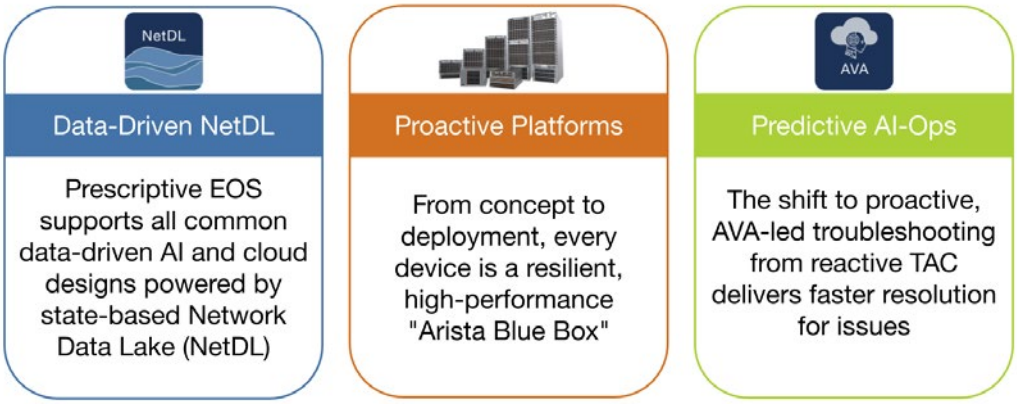

Figure 3: Netdi complements Arista NetDL Platforms to deliver the Arista Blue Box Experience

Arista's core strength is our engineering-driven Netdi, which champions relentless quality, integration and continuous improvement, and permeates every aspect of our business. Netdi ensures that every device, from concept to deployment, is an Arista Blue Box, a resilient, high-performance platform with a choice of NOS. By providing a NOS-agnostic foundation, Arista empowers customers with true choice, enabling them to build the next generation of AI and cloud networks on their own terms. The Arista advantage lies in our commitment to how we build, not just what we build. Through Netdi, we transform traditional networking to a strategic platform and asset, enabling our customers to build and operate the most demanding networks at scale with confidence.

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