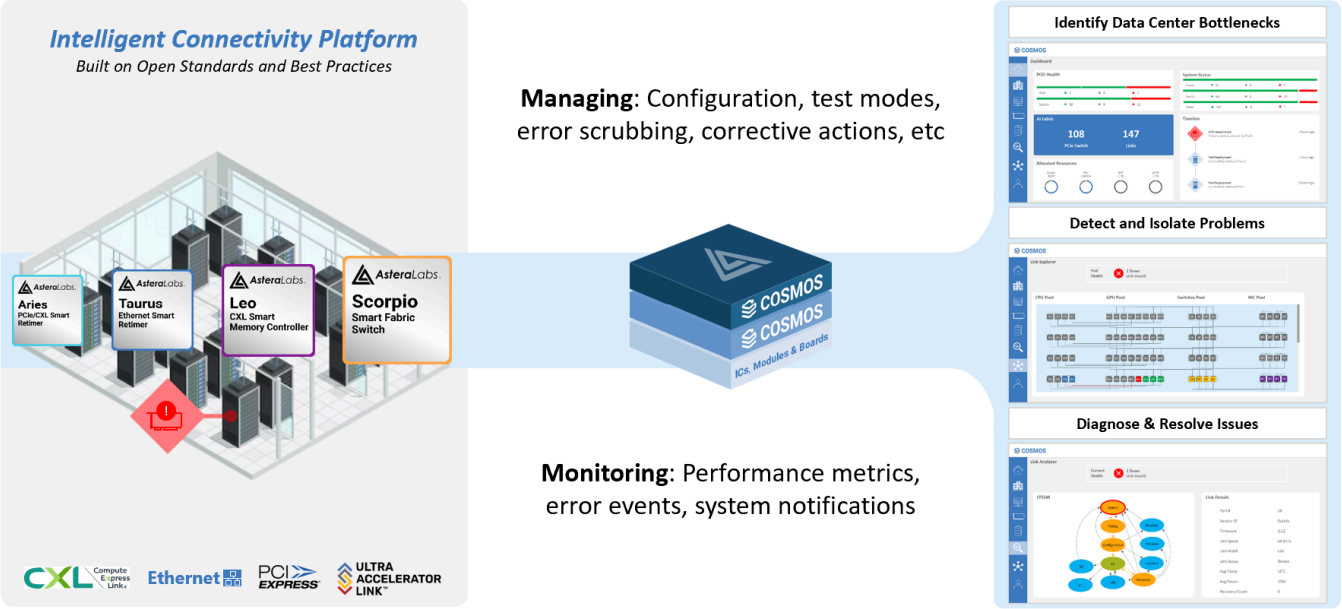
COSMOS (COnnectivity System Management Optimization Software)

Portfolio Brief

Astera Labs is a worldwide leader in purpose-built connectivity solutions for AI and cloud infrastructure. It is at the forefront of software-defined architectures that are both scalable and customizable. With PCIe®, CXL®, and Ethernet-based semiconductor solutions, Astera Labs addresses data, memory, and networking bottlenecks while fostering trusted partnerships with hyperscalers and the broader data center ecosystem.

1. Benefits and Features

- Operates on hosts and baseboard/system management controllers.
- Provides link management, fleet management and Reliability/Availability/Serviceability (RAS) capabilities.
- Delivers enhanced diagnostics and telemetry features with in-band and out-of-band management.
- Analyzes link performance and health, maximizing the return on investment for AI infrastructure.
- Ensures optimal performance, reliability, and accelerates go-to-market.
- Identifies data center bottlenecks quickly with customizable alerts and warnings.
- Facilitates the identification and isolation of issues.
- Provides capabilities to diagnose and resolve problems effectively.
- Integrates multiple devices using a single unified interface for efficient API integration.
- Ensures seamless communication across devices through unified APIs.
- Offers enhanced security features enabling device updates and configurations in a secure manner.
- Enables development and test applications for rapid prototyping and easy system integration.

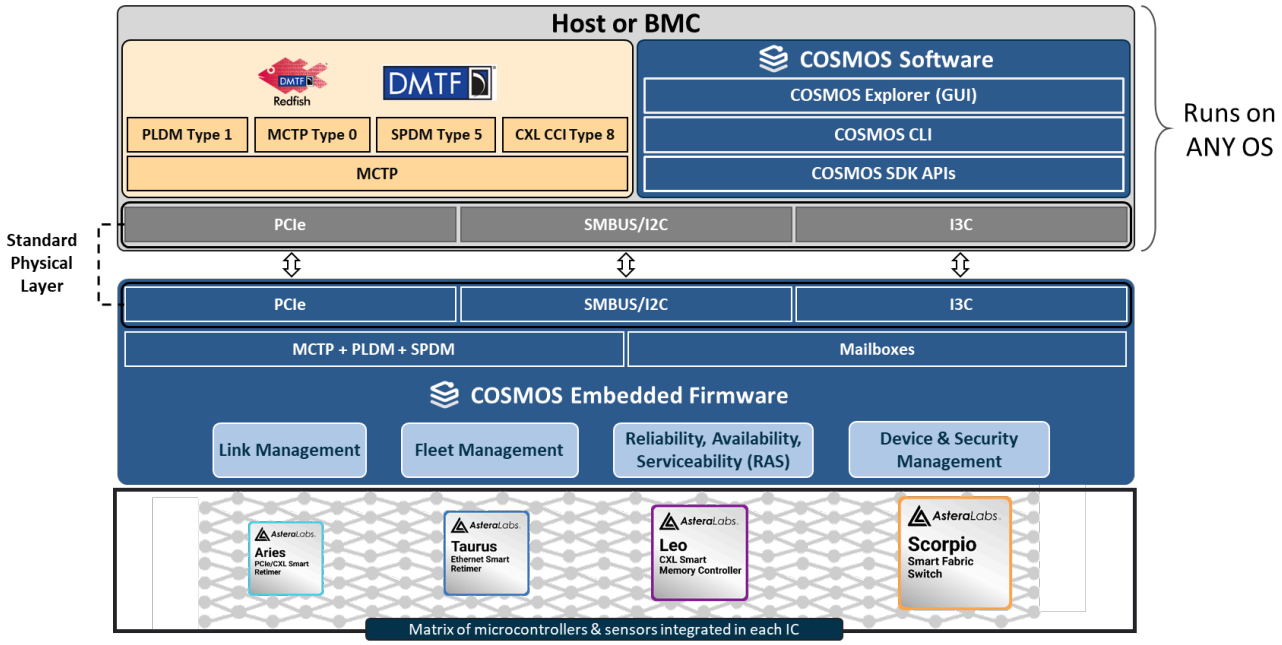


2. Description

AI infrastructure demands large server deployments in hyperscale data centers to meet requirements for compute power, efficiency, and Total Cost of Ownership (TCO). However, managing such a large fleet of systems presents complex challenges of observability, data collection, and fault isolation.

COSMOS is the platform development engine of Astera Labs' Intelligent Connectivity Platform—delivering a single, standardized API that empowers designers to configure, debug, and optimize the Astera Labs products from prototyping to rack-scale deployment.

Through extensive device-level monitoring and management capabilities, COSMOS SDK streamlines every phase of design, validation, manufacturing, and deployment for AI and cloud infrastructure.



3. Applications

Table 3-1 provides information on target applications and use cases.

Table 3-1 Target Applications and Use Cases

Deployment	Target Applications and Use Cases
Platform Integration	**Applications:** Integrates management and monitoring capabilities into host or BMC **Use Cases:** Device configuration, electrical testing, and diagnostics
Rack Deployment	**Applications:** Monitors, manages and configures devices through host or BMC **Use Cases:** System configuration, protocol testing, and stress testing
Fleet Management	**Applications:** Manages fleet, collects cloud telemetry, and optimizes performance autonomously **Use Cases:** Lifecycle management, monitoring, event notifications, and predictive analytics

4. Essential Monitoring Capabilities

Table 4-1 provides information on the essential monitoring capabilities of COSMOS.

Table 4-1 Essential Monitoring Capabilities

Type	Example	Utility
Device Information	Firmware version, device/vendor ID	Device identification, inventory management, and validation of expected configurations
Sensor Monitoring	Temperature, voltage	Temperature and voltage monitoring capabilities of device and attached media if applicable
Link Monitoring	PCIe link state, Rx/Tx eye height/width	Status checks for link health, margin, and state monitoring
Performance Counters	TLP Rd/Wr count, CXL bandwidth	Tracks system activity and throughput for performance analysis and trend monitoring
Error Counters	PCIe recoveries, PCIe link degradation	Provides error information to help with root cause analysis
Events	Link training failure, performance throttling	Timestamped records of significant occurrences or threshold crossings

5. Essential Management Capabilities

Table 5-1 provides information on the essential management capabilities of COSMOS.

Table 5-1 Essential Management Capabilities

Type	Example	Utility
Device Management	Firmware update, retrieve/clear logs	Enables fleet-level operations, FW updates, and long-term manageability
Device Configuration	Link bifurcation, temperature threshold	Device configuration required for correct setup, integration, and alerting
Debugging	Force PCIe preset, port orientation, TLP analyzer, LTSSM	Enables debugging of link or device errors and provides failure information
PHY Diagnostics	PRBS, Traffic Generator Checker	Focused testing on link testing ensuring signal integrity and electrical robustness
RAS Testing	Poison, error injection	Test RAS flows, compliance, and error handling for links or attached media if applicable
Security	Key provisioning, anti-rollback	Error injection & detection for hardware-level and debug interfaces for confidential compute environments

6. Support and Resources

- To learn more, visit: COSMOS - ASTERA LABS, INC.
- For further inquiries, contact us at info@asteralabs.com