



SD Association

SD Express: From Memory Card to Removable NVMe Storage

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Executive Abstract

SD Express represents a fundamental evolution in removable storage by introducing PCIe® and NVMe® into the SD and microSD form factors. Rather than serving only as content storage, SD Express enables removable storage to function as an architectural storage tier supporting AI workloads, edge computing, gaming, and data-intensive applications. This article explains why SD Express should be viewed not simply as a faster memory card, but as removable NVMe storage enabling new levels of system flexibility, scalability, and serviceability.

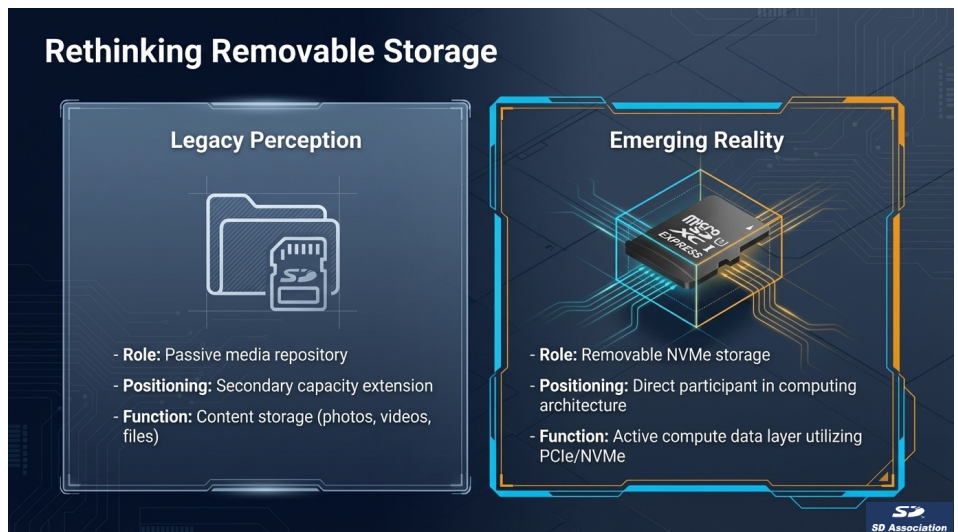
Rethinking the Role of Removable Storage

For more than two decades, SD memory cards have been primarily viewed as content storage devices — convenient removable media used to store photos, videos, and files.

Their role was typically secondary to internal storage, serving mainly as a capacity extension rather than a performance component of the system.

SD Express changes this fundamentally. By introducing PCIe and NVMe across all SD form factors, SD Express transforms removable storage from passive media into an active architectural storage tier. This evolution requires not only technical adoption but also a change in perception: SD Express is removable NVMe storage capable of participating directly in modern computing architectures.

The industry must therefore begin thinking about SD Express not as just a faster SD card, but as a new class of removable system storage.

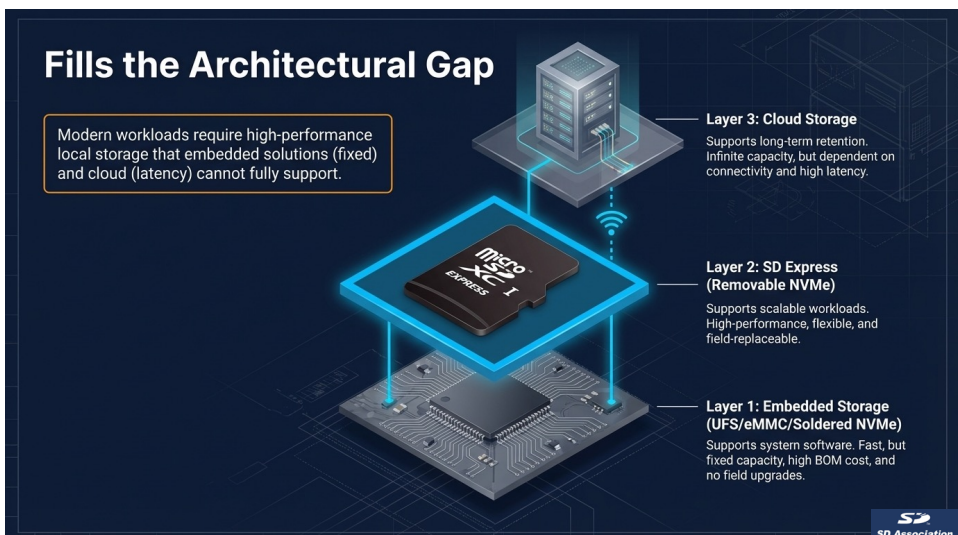


The Missing Storage Tier in Modern Devices

Modern computing devices face increasing pressure to balance performance, cost, scalability, and serviceability. Embedded storage such as UFS, eMMC, or soldered NVMe provides excellent performance but creates structural limitations such as fixed capacity, lack of field upgrades, and increased BOM costs for higher storage tiers.

At the same time, many modern workloads require high-performance local storage that cannot depend entirely on cloud connectivity. These include AI inference buffering, Sreal-time video processing, gaming asset streaming, and edge analytics.

SD Express delivers a missing architectural option: high-performance removable NVMe storage. This creates a flexible storage hierarchy where embedded storage supports the system software, SD Express supports scalable workloads, and cloud storage supports long-term retention.



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From Peripheral Storage to Architectural Component

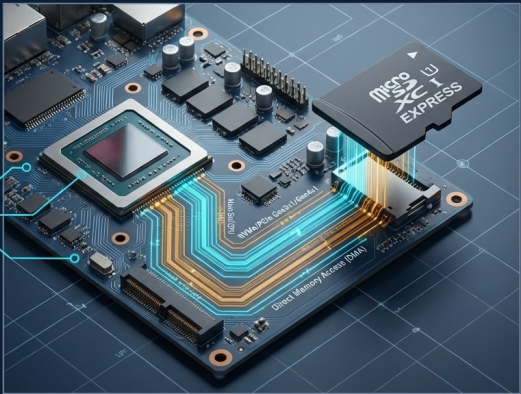
Traditional SD memory cards were treated as peripherals. SD Express enables removable storage to become part of the system architecture itself. Because SD Express uses NVMe — the same protocol used by modern SSDs — it benefits from existing software stacks, drivers, and validation methodologies. Instead of introducing a proprietary removable solution, SD Express extends a standards-based trusted storage architecture into removable form. This enables SD Express to function as a removable AI dataset repository, a high-speed inference workspace, a capture buffer, a gaming expansion drive, and a field-replaceable storage module.

For this reason, SD Express is best positioned as removable NVMe storage rather than simply the next generation of SD memory cards.

A Trusted Standard in a Removable Form

SD Express utilizes standard NVMe—the same protocol used by modern SSDs. It benefits instantly from existing software stacks, drivers, and validation methodologies.

- System Functions:
 - Seamlessly functions as:
 - Removable AI dataset repository
 - High-speed inference workspace
 - Continuous capture buffer
 - Gaming expansion drive



Enabling Data-Intensive Edge Systems

One of the most important roles for SD Express emerges in edge AI systems. These platforms increasingly require high-performance local storage to support model storage, inference workspace, rolling buffers, logging, and dataset collection. These workloads benefit from NVMe characteristics such as low latency, high random I/O capability, and predictable performance.

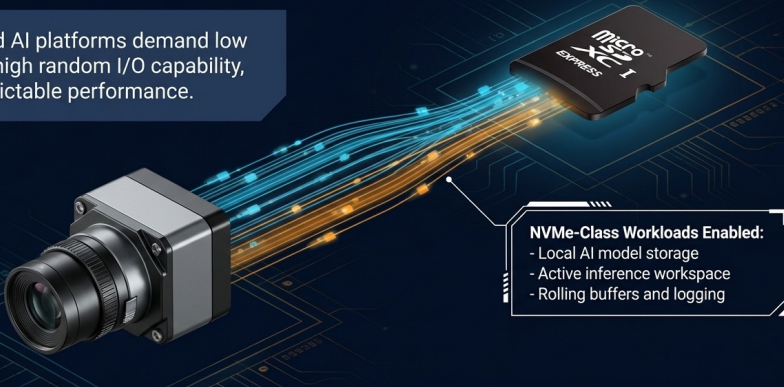
SD Express delivers new architectural flexibility. AI workloads can be updated via removable storage, capacity can scale without redesign, and devices can be serviced without replacing the full system. In this sense, SD Express behaves less like storage media and more like a removable compute data layer.

The Removable Compute Data Layer for Edge AI

Edge and AI platforms demand low latency, high random I/O capability, and predictable performance.

- NVMe-Class Workloads Enabled:
 - Local AI model storage
 - Active inference workspace
 - Rolling buffers and logging

Architectural Benefit: AI workloads and massive datasets can be instantly updated in the field via removable storage without redesigning the core system.



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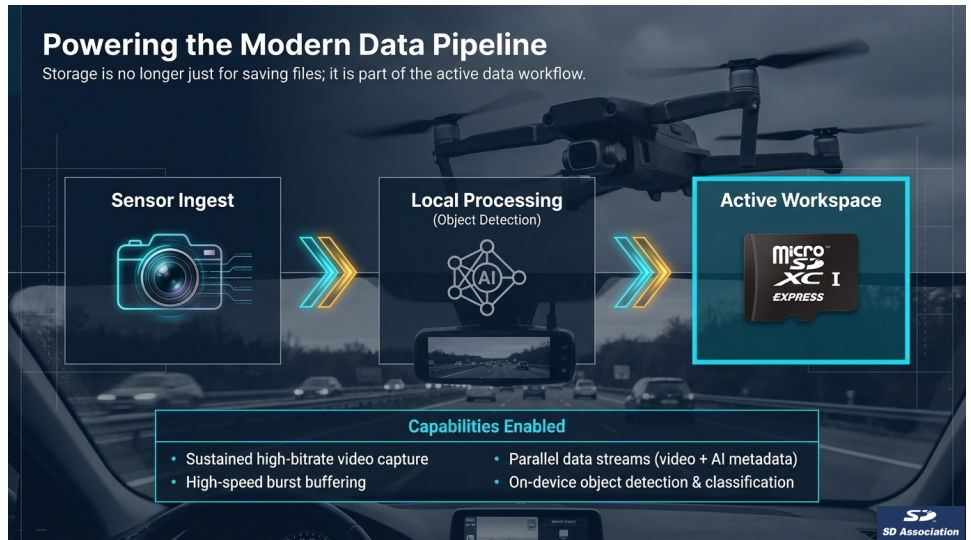
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Storage as Part of the Data Pipeline

In many modern systems, storage is no longer just about saving files. It is part of the data pipeline itself.

This is particularly visible in advanced imaging devices, automotive recording systems, robotics platforms, and AI-enabled cameras. These devices increasingly perform local processing such as object detection and event classification, requiring storage that supports both capture and processing workflows.

SD Express enables sustained high bitrate capture, burst buffering, parallel data streams, and workflow portability. This reinforces the positioning of SD Express as an enabler of next-generation computing workflows rather than simply a storage upgrade.



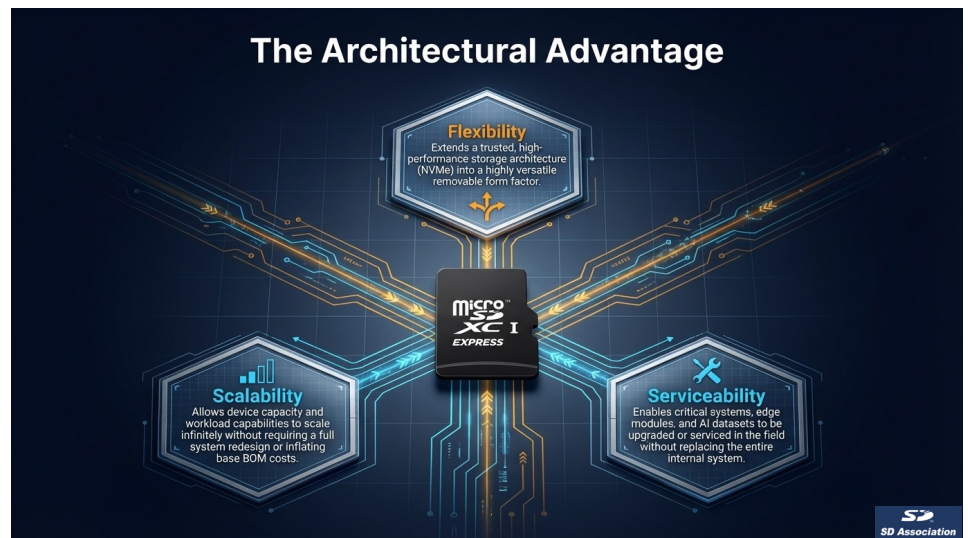
A Change in Industry Perception

For SD Express to reach its full potential, the industry must adjust how it thinks about removable storage.

The traditional perception: **removable storage equals media storage.**

The new reality: **removable storage equals architectural storage.**

SD Express extends the NVMe architectural philosophy into the removable storage domain.



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Conclusion: The Return of Architectural Removable Storage

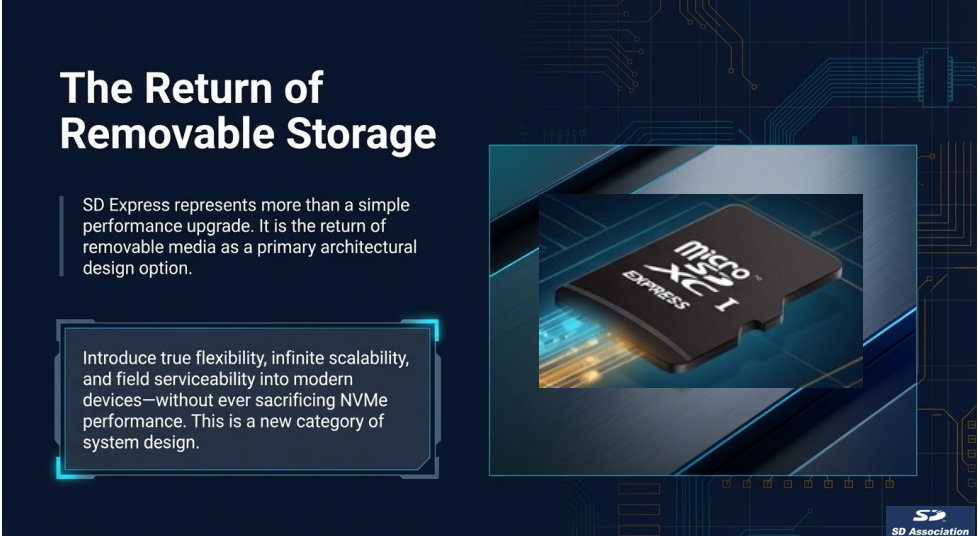
SD Express represents more than a performance improvement. It delivers the use of removable storage as an architectural design option.

By delivering NVMe performance into a removable form factor, SD Express allows system designers to offer new flexibility, scalability, and serviceability into modern devices without sacrificing performance.

The opportunity is not just about adopting a faster SD memory card. It is about recognizing a new category: **removable NVMe storage as a system architecture component.**

More information on SD Express and how-to-implement resources can be found here:

<https://www.sdcard.org/developers/sd-standard-overview/sd-express-overview-in-short-videos-and-articles/>



The Return of Removable Storage

SD Express represents more than a simple performance upgrade. It is the return of removable media as a primary architectural design option.

Introduce true flexibility, infinite scalability, and field serviceability into modern devices—without ever sacrificing NVMe performance. This is a new category of system design.

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