

# **BUILT-IN DATA PROTECTIONS FOR “ALWAYS-ON” OPERATIONS**

HOW AMD RAIDXPRT<sub>2</sub> DELIVERS BUILT-IN STORAGE  
PROTECTIONS FOR SELECT AMD EPYC™ CPU-BASED  
SERVER PLATFORMS<sup>1</sup>

## THE FOUNDATION OF “ALWAYS-ON” OPERATIONS

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**THE REALITY.** Every organization, from a five-person office to a global enterprise, depends on data that should always remain available. Customer records, financial systems, operational applications, and compliance archives can all reside on server storage. When a storage drive fails, the question is how severely and for how long the business will be affected.

**THE SCALE OF THE PROBLEM.** Drive failures are not rare events. Backblaze, which operates a fleet of nearly 300,000 drives in production, recorded an annualized failure rate of 1.57% in 2024<sup>2</sup>, equivalent to roughly 12 drive failures every day across that fleet alone.

At that rate, an organization managing even a modest number of servers will regularly experience drive failures rather than as an exception. A New Relic study found that every minute of operational downtime costs businesses a median of \$33,333, and outages cost businesses a median of \$76 million annually.<sup>3</sup> For smaller organizations, even modest outages carry disproportionate risk, as limited IT staff and tighter margins leave less room to absorb disruption. Smaller businesses face losses that can threaten their viability.

**THE SHIFT IN DRIVE TECHNOLOGY DOES NOT ELIMINATE THE RISK.** Backblaze reports an annualized SSD failure rate of 0.9% across its solid-state boot drive fleet, lower than HDDs but not zero.<sup>4</sup> When SSDs fail, failures tend to be sudden rather than gradual. Because SSDs lack the mechanical wear signals HDDs produce, failure is often silent: sudden read errors, blue-screen events, or the drive simply not being recognized. Recovery time is limited. Whether an organization uses SATA hard drives, NVMe SSDs, or a mix of both, storage protection remains a fundamental requirement.

**AMD DELIVERS.** To address the persistent risk of drive failure without adding cost or complexity, AMD integrates RAID management directly into its server platform. RAIDxpert2 is a built-in RAID (redundant array of independent disks) management solution for select AMD EPYC™ CPU-based server platforms. It offers enterprise-class data protection, performance optimization, and storage cost efficiency at no additional cost and without requiring a separate hardware controller or proprietary add-ons.

### USERS EXPERIENCE<sup>5</sup>:

- **COMPLETE RAID PROTECTION**—RAID 0, 1, 5, and 10 are included with no additional licensing fees, no hardware keys, and no per-server charges.
- **UNIFIED MANAGEMENT ACROSS DRIVE TYPES**—SATA, NVMe, and M.2 drives are managed through a single interface, simplifying operations across mixed storage environments.
- **OPERATIONAL SIMPLICITY**—an intuitive management console can reduce the learning curve for IT generalists and enable rapid deployment and ongoing management.

\*Available RAID features may vary depending on the server manufacturer's implementation. Check with your server vendor for platform-specific capabilities.

## WHY DATA PROTECTION MATTERS NOW

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Organizations deploying server infrastructure, whether in a headquarters server room, a branch office, or an edge location, face converging pressures to maintain uptime, control costs, and protect critical data.

### THE RISING COST OF DOWNTIME

According to a study by EMA Research, the average cost per minute increased by 60% for organizations with fewer than 10,000 employees between 2022 and 2024, while the largest organizations remained relatively stable, with a reported 5% decrease.<sup>5</sup> For smaller organizations, the numbers may be proportionally just as punishing. In many cases, the real cost extends beyond infrastructure to lost productivity, as employees may be unable to work during an outage.

### COMPLIANCE EXPECTATIONS

Regulatory frameworks such as GDPR, HIPAA, PCI DSS 4.0, and SOX require organizations to implement technical safeguards that help ensure data availability and integrity. Demonstrating that controls are in place to help protect business-critical data from loss is a core component of compliance.












RAID is a widely accepted and well-understood technical control for addressing compliance objectives. For organizations handling sensitive customer data, financial records, health information, or payment card data, the absence of storage redundancy exposes them to compliance risks, not just operational risk.



## UNDERSTANDING RAID

RAID distributes, and often duplicates, data across multiple drives to improve reliability, performance, or both. Different RAID configurations, known as “levels,” offer trade-offs among protection, performance, and storage efficiency.

### CHOOSING THE RIGHT RAID LEVEL

AMD RAIDXpert2 supports four RAID levels, each suited to different operational priorities. The right choice depends on what matters most for a given workload: maximum performance, maximum protection, cost-efficient capacity, or a balance of all three.

LEVEL	HOW IT WORKS	IF A DRIVE FAILS	SPECS	BEST FOR
<b>RAID 0</b>	<b>Striping</b> Splits data across drives so they read and write together. No copies, no safety net.	 	Drives: 2+ Capacity: 100% Read: Excellent Write: Excellent	Scratch storage, render caches, temp data
<b>RAID 1</b>	<b>Mirroring</b> Keeps an identical copy on a second drive. If one fails, the other takes over instantly.	  Keeps running	Drives: 2+ Capacity: 50% Read: Good Write: Standard	Boot volumes, critical data in small deployments
<b>RAID 5</b>	<b>Striping + parity</b> Spreads data across drives with recovery info mixed in. If a drive is lost, the data is rebuilt from what the other drives still hold.	   Rebuilds	Drives: 3+ Capacity: 67-80% Read: Good Write: Reduced Rebuild: Slow	File servers, app servers, cost-sensitive deployments
<b>RAID 10</b>	<b>Striping + mirroring</b> Mirrors drives in pairs for protection, then stripes across the pairs for speed. Combines the strengths of RAID 0 and 1.	    Keeps running	Drives: 4+ Capacity: 50% Read: Excellent Write: Good Rebuild: Fast	Databases, VMs, transaction workloads

 Drive operational     Drive failed

All four RAID levels included at no additional cost with compatible AMD EPYC server platforms running AMD RAIDXpert2. RAID level availability and feature support depend on the server vendor's platform configuration.

#### RAID 0 – STRIPING PERFORMANCE

RAID 0 splits data across two or more drives to maximize read and write speed, using 100% of available capacity. It provides no redundancy and is generally appropriate only for temporary or easily replaceable data, such as rendering caches or scratch storage.

#### RAID 1 – MIRRORING SIMPLICITY AND PROTECTION

RAID 1 maintains an exact copy of data on two drives, so if one fails, the other continues without interruption. With fast, simple rebuilds and 50% usable capacity, it is the best choice for boot volumes, critical data in small deployments, and environments where simplicity matters most.

#### RAID 5 – STRIPING WITH PARITY CAPACITY AND COST EFFICIENCY

RAID 5 distributes data and parity across three or more drives, tolerating a single drive failure while providing 67-80% usable capacity. It is the preferred choice for file servers, application servers, and cost-sensitive deployments, with the trade-off being reduced write performance and longer rebuild times.

#### RAID 10 – STRIPED MIRRORS PERFORMANCE AND PROTECTION

RAID 10 stripes data across mirrored pairs, combining high throughput and low latency with tolerance for at least one drive failure per pair. It requires a minimum of four drives at 50% usable capacity and is the preferred choice for databases, virtualization hosts, and transaction-heavy workloads.

**RAID LEVEL COMPARISON**

FEATURE	RAID 0	RAID 1	RAID 5	RAID 10
MIN. DRIVES	2	2	3	4
USABLE CAPACITY	100%	50%	67-80%+	50%
FAULT TOLERANCE	None	1 drive	1 drive	1+ drives
READ PERF.	Excellent	Good	Good	Excellent
WRITE PERF.	Excellent	Standart	Reduced	Good
REBUILD SPEED	N/A	Fast	Slow	Fast
BEST FOR	Scratch/cache	Boot, critical	File/app servers	DBs, VMs

**SOFTWARE RAID AND THE MODERN SERVER**

Traditional hardware RAID controllers use a dedicated processor and memory to manage RAID operations. For decades, this was the only viable approach. With modern multi-core server CPUs, software RAID has become a practical alternative for a wide range of workloads, offering integrated data protection without the cost, complexity, or single point of failure of a hardware controller.

Software RAID also has a structural advantage for NVMe. Because NVMe drives connect directly to the CPU via PCIe®, software RAID can leverage native drive bandwidth without routing I/O through a separate RAID controller.

**INTRODUCING AMD RAIDXPRT2**

AMD RAIDXpert2 is an integrated RAID management utility for compatible AMD EPYC CPU-based Server platforms. It provides a GUI and App/CLI interface for configuring, managing, and monitoring RAID arrays, leveraging built-in platform capabilities without requiring a separate hardware controller card.

By embedding RAID functionality directly into the server architecture, RAIDXpert2 enables organizations to implement data protection as a standard capability rather than an added layer of infrastructure.

**KEY CAPABILITIES OF AMD RAIDXPRT2**

**Complete RAID level support.** RAID 0, 1, 5, and 10, with availability depending on the server platform and disk configuration. All RAID levels are included at no additional charge with compatible AMD platforms. There are no license tiers, no hardware activation keys, and no per-server fees. Every feature is available from the start.

**GUI App/CLI management interface.** An intuitive graphical interface accessible via a web browser for RAID array creation, configuration, and ongoing management. No command-line expertise is required for standard operations.

**Real-time monitoring and alerts.** Proactive health status monitoring, event logging, and notification capabilities that surface potential drive issues before they become outages. Because not all drive failures produce sufficient advance warning from standard SMART monitoring, the ability to detect early signs of degradation and alert administrators is a critical operational advantage.

**Bootable RAID volumes.** RAIDXpert2 supports configuring bootable RAID volumes, enabling organizations to help protect the operating system and data on the same array.

**DRIVE TYPES AND RAID**

AMD RAIDXpert2 supports all major drive interfaces through a single management tool.

- **SATA drives** – Proven reliability and cost efficiency for bulk storage and backup workloads.
- **NVMe drives** – Solid-state drives (SSDs) that connect directly to the CPU via PCIe®, delivering dramatically higher throughput and lower latency for performance-sensitive applications when compared to SATA connected Hard Disk Drives (HDDs).
- **M.2 form factor**– A compact form factor that can carry either SATA or NVMe drives, increasingly standard on single-socket server platforms.

Unlike traditional hardware RAID controllers, which were designed primarily for SATA (and SAS, an older bulk storage technology), RAIDXpert2 manages these drive types without requiring additional adapters or proprietary hardware.

**Cross-platform OS support.** Compatible with Microsoft Windows Server 2022 and 2025, and Linux distributions listed in the AMD RAID User Guide.<sup>6</sup>

**Broad drive compatibility.** Supports SATA, NVMe, and M.2 drives through a single management interface, providing flexibility as organizations adopt new drive technologies or maintain mixed-drive environments.

## RAIDXPert2 IN PRACTICE

**Setup and configuration.** Deploying RAIDXpert2 follows a straightforward workflow: select drives, choose a RAID level, configure the array through the GUI App/CLI interface, and begin operation. The process is designed for IT generalists who manage servers alongside other responsibilities, not only for dedicated storage specialists.

**Day-to-day management.** Once configured, RAIDXpert2 runs in the background, continuously monitoring drive health and array status. The management dashboard provides at-a-glance health indicators and alert notifications that inform administrators of potential issues before they escalate.

**Drive failure and recovery.** When a drive fails in a redundant RAID array (RAID 1, 5 or 10), the array continues operating in degraded mode, maintaining data access while alerting the administrator to the failure. The failed drive can then be replaced without shutting down the server. RAIDXpert2 automatically initiates a rebuild process, restoring full redundancy. Rebuild duration depends on the RAID level, array size, and drive speed. RAID 0, which provides striping without redundancy, does not survive a drive failure and is appropriate only for non-critical or replaceable data.

**Adaptation as needs evolve.** RAIDXpert2 supports migration capabilities, including Online Capacity Expansion (OCE) and Online RAID Level Migration (ORLM) for organizations that need to adjust their RAID configuration as storage requirements change, whether scaling up capacity or changing RAID levels to match evolving workload demands.<sup>7</sup>

## APPLICATIONS

Data protection is not limited to a specific type of organization or deployment. Any environment running mission-critical workloads on server infrastructure can benefit from RAID protection. The following scenarios illustrate how RAIDXpert2 can address real-world operational requirements.

### EXAMPLE: BUSINESS SOFTWARE AND FILE SERVER

SCENARIO	CHALLENGE	SOLUTION
A professional services firm running line-of-business applications, file sharing, and email on an AMD EPYC CPU-based server, managed by a small IT team with broad responsibilities.	The server supports daily operations across the organization. A drive failure without RAID protection could result in downtime measured in hours or days, disrupting employee productivity and client commitments.	RAIDXpert2 with RAID 5 provides fault tolerance while efficiently utilizing storage. The GUI App/CLI interface allows the IT team to monitor array health and receive alerts without deep RAID expertise. If a drive fails, the array continues operating in degraded mode while a replacement is installed, and the rebuild automatically completes.

## REMOTE AND BRANCH OFFICE

SCENARIO	CHALLENGE	SOLUTION
A distributed organization with dozens of locations, each running a local server for transaction processing, record-keeping, or point-of-sale operations.	Most locations have on-site IT support. Data must be protected locally before replication to central systems.	RAIDXpert2 with RAID 1 (mirroring) helps ensure continued operation in the event of a drive failure. Its simplicity enables fast rebuilds with minimal intervention, and the management interface allows centralized IT to remotely monitor array health across all sites.

## HIGH-THROUGHPUT CRITICAL DATABASE SERVER

SCENARIO	CHALLENGE	SOLUTION
A database server supporting transaction-heavy workloads, where both speed and data integrity are critical, such as e-commerce, risk management, or analytics applications.	These workloads demand high I/O performance, particularly for write operations, while mission-critical data must be protected against drive failure. Performance degradation or data loss can directly impact revenue and business continuity.	RAIDXpert2 with RAID 10 combines striping for performance with mirroring for protection. The array delivers strong read and write throughput while tolerating drive failures. Fast rebuild times minimize the window of reduced redundancy.

## EDGE AND EMBEDDED DEPLOYMENTS

SCENARIO	CHALLENGE	SOLUTION
An edge server or IoT gateway is deployed at a manufacturing site, distribution center, retail location, or telecommunications facility.	These deployment environments are often physically constrained, with limited space for drive bays, restricted physical access for maintenance, and strict uptime requirements.	AMD RAIDXpert2 monitoring and alerting provide early warning of drive degradation, enabling proactive maintenance scheduling rather than reactive emergency response. Support for M.2 and NVMe drives in compact form factors aligns with the space constraints of edge deployments.

## THE VALUE OF AMD RAIDXPRT2

AMD RAIDXpert2 delivers a unique combination of cost efficiency, operational simplicity, and platform-level integration, enabling organizations to implement enterprise-grade storage protections without added complexity.

### COST EFFICIENCY AT SCALE

AMD RAIDXpert2 is included at no additional charge on compatible AMD EPYC CPU-based Server platforms. All RAID levels and management features are available without paid license tiers, physical hardware keys, or per-server activation fees. Alternatives can require separate purchases for full RAID functionality, which compounds costs as the number of sites and deployments grows.

Because RAIDXpert2 is integrated directly into select AMD EPYC CPU-based Server platforms, it eliminates the need for a dedicated hardware RAID controller card, reducing system power consumption and cooling requirements.

The cost advantage is most visible at scale. For organizations deploying servers across dozens or hundreds of locations, the elimination of per-server RAID licensing represents a meaningful reduction in total deployment cost – not just at initial deployment, but also across every expansion and every refresh cycle.

## SIMPLIFIED OPERATIONS

RAIDXpert2 reduces the operational burden of managing storage protection. Its GUI App/CLI management interface enables configuration and monitoring without specialized expertise, making it accessible to IT teams with broad responsibilities. No command-line expertise is required for standard RAID operations.

Because RAID functionality is a software solution integrated into the platform, there is no need for separate hardware controllers, reducing the number of components to purchase, install, and maintain. This also frees up PCIe® capacity for higher-value uses such as networking, GPUs, or additional NVMe storage.

## AMD EPYC PLATFORM INTEGRATION

AMD EPYC Server CPUs bring the multi-core performance required to support software RAID alongside primary application workloads. By embedding RAID capabilities directly into the platform, AMD enables a cost-effective, self-contained server platform with built-in data protections.

## LOOKING AHEAD

The need for reliable, manageable, and affordable data protection will grow as organizations continue to deploy workloads across centralized data centers, branch offices, retail locations, manufacturing floors, and edge sites. The cost of downtime is significant, and the threat landscape is intensifying. At the same time, infrastructure teams are under increasing pressure to deliver resilience without adding complexity or cost.

In this environment, storage protection is a foundational requirement for any server platform supporting critical workloads.

By integrating RAID capabilities directly into the server architecture, AMD enables organizations to implement reliable, cost-effective storage protections as standard features, rather than as an added layer of infrastructure.

AMD remains committed to expanding its storage management capabilities alongside its server platforms, helping to ensure that data protection remains integrated, accessible, and cost-effective across current and future AMD EPYC generations.

## LEARN MORE

**EXPLORE AMD EPYC SERVER CPUS:** [AMD.COM/EPYC](https://www.amd.com/en/epyc)

**ACCESS THE AMD RAIDXPRT2 USER GUIDE:** [AMD RAIDXPRT2 USER GUIDE](#)

**CONTACT YOUR SERVER PROVIDER FOR DETAILS ON SUPPORT AND IMPLEMENTATION.**

<sup>1</sup>EPYC platforms supporting RAID are EPYC 4004 and EPYC 4005

<sup>2</sup>Backblaze, "Hard Drive Failure Rates: The Official Backblaze Drive Stats for 2024," February 11, 2025, <https://www.backblaze.com/blog/backblaze-drive-stats-for-2024/>

<sup>3</sup>New Relic, September 17, 2025, "New Relic Study Reveals Businesses Face Annual Median Cost of \$76 Million from High-Impact Outages", <https://newrelic.com/press-release/20250917>

<sup>4</sup>Backblaze, "The SSD Edition: 2023 Drive Stats Mid-Year Review" September 26, 2023, <https://www.backblaze.com/blog/ssd-edition-2023-mid-year-drive-stats-review/>

<sup>5</sup>EMA Research, April 2024, "IT Outages: 2024 Costs and Containment," <https://www.bigpanda.io/wp-content/uploads/2024/04/EMA-BigPanda-final-Outage-eBook.pdf>

<sup>6</sup>AMD, "AMD RAID User Guide," Publication #53987 Sections 2.5–2.6. Available at: [https://drivers.amd.com/relnotes/amd\\_raid\\_user\\_guide\\_53987\\_1.pdf](https://drivers.amd.com/relnotes/amd_raid_user_guide_53987_1.pdf)

<sup>7</sup>RAID level availability and feature support depend on the specific server vendor's platform configuration. Consult your server vendor for supported RAID levels and configurations.