

## Kaminario® Scale-out Performance Storage Architecture™ (SPEAR)

The Kaminario Scale-out Performance Storage Architecture™ (SPEAR) is a fundamentally new and better way to store and retrieve performance sensitive and mission critical data. Kaminario's SPEAR design combines off-the-shelf blade servers, solid-state drive (SSD) media (DRAM and/or Flash), and the revolutionary SPEAR Storage Operating System to create a blazingly fast, highly reliable, fully protected, and easy-to-deploy distributed storage cluster SAN, the Kaminario K2.

SPEAR also features Kaminario's unique DataProtect™ storage services, enabling the K2 to provide end-to-end high availability and fast, high volume data protection to SSD storage while delivering extreme performance.

### System Hardware

Kaminario K2 all solid-state SAN storage hardware is based on industry standard enterprise-grade, open system components that ensure that the K2 is well tested and easy to maintain. Due to its SPEAR design, the K2 is transparent to applications and databases (it is a standard block-level device), enabling fast deployment with no tuning (typically less than one day).

The Kaminario K2 consists of the following hardware components:

- **Rack** — Standard 42" casings to house the K2 components
- **Enclosures** — Hold blade servers, along with switches
- **Blade servers** — Blade servers are the "smart" components that manage the data (ioDirectors) and hold DRAM and/or Flash (DataNodes) for primary storage, and HDDs or Flash MLC SSDs for data backup
- **Switches** — Three types of switches are used in a Kaminario K2:
  - **Fibre Channel (FC)** — Connects the K2 to multiple external hosts
  - **10 GbE** — Interconnects all K2 blades to send data among the blades
  - **1 GbE** — Interconnects all blades for management communications
- **Uninterrupted Power Supplies (UPS)** — Two UPSs for continuous power

### SPEAR Storage Operating System (OS)

The SPEAR OS exposes industry standard SSD-based (DRAM and/or Flash) block-level storage to applications as logical shares. It manages the following SPEAR components:

- **ioDirectors** — Present the K2 data to host servers as standard block devices and load balances the data to optimize K2 system resources utilization and scalability.
- **DataNodes** — The storage layer of the K2 and responsible for storing data in Flash or DRAM SSD and mirroring data for redundancy and data protection.

## SPEAR Capabilities

### Fast

- High performance all solid-state SAN storage (DRAM and/or Flash)
- Millions of IOPS, with ultra-low latency and high throughput
- Dramatic application performance improvement
- Consistent performance for any workload over time

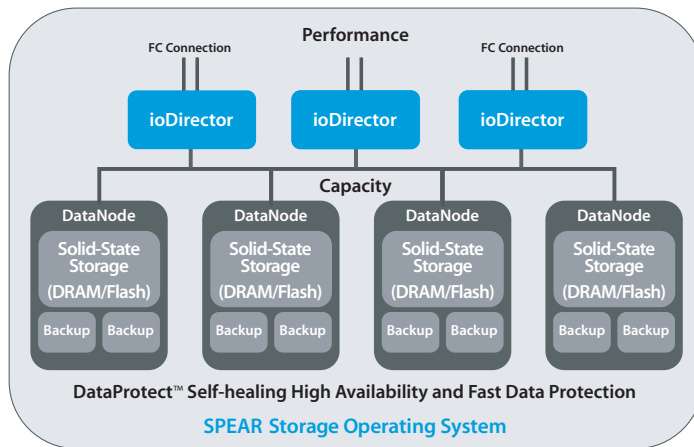
### Safe

- DataProtect™ for self-healing high availability and fast data protection
- Fast, automated failover
- Hot-swappable components
- Non-disruptive operations
- Fast mirroring and striping
- Fast, high volume snapshots
- Fast asynchronous replication

### Easy

- Open, blade-based, high-end industry standard components
- Modular, scale-out architecture
- No change to operating systems, applications, databases, or data
- Fast deployment — typically one day
- No need for performance tuning
- Supports virtualization and cloud environments

## Kaminario Scale-out Performance Storage Architecture™ (SPEAR)



### SPEAR Storage OS Revolutionary Capabilities

The SPEAR Storage OS is the intelligence behind managing the K2's performance, scalability, high availability, and data protection capabilities. It is composed of three fundamental patent-pending software capabilities:

- 1. Automated Data Distribution™** — Automatically senses the capacity available in both the I/O and storage tiers of the distributed storage grid. SPEAR optimizes data distribution by automatically and randomly allocating data over that capacity. The result is an ultra-efficient use of the available resources that speeds processing and eliminates hot spots. Data distribution is continually balanced for consistently high performance and ultra-low latency.
- 2. Intelligent Parallel I/O Processing™** — I/O requests are distributed across the K2 storage grid, smartly parallelizing all READS and WRITES. Parallelizing the I/O service over multiple nodes shortens the average response time of I/O requests (both READ and WRITE).
- 3. DataProtect™** — DataProtect assures self-healing high availability and fast data protection for backup and disaster recovery while delivering extreme storage performance to mission critical applications. It supports the following capabilities:
  - **Self-healing High Availability**
    - N+1 hardware redundancy
    - Fast automatic failover
    - Hot-swap components
    - Non-disruptive operation
  - **Fast Data Protection**
    - Fast mirroring and striping RAID 10HD (Hybrid Distributed)
    - Fast high volume snapshots: 8,000 SNAPS, capable of SNAPS in < 1 second
    - Fast asynchronous replication: < 15 second RPO

### K2 System Management and Performance Analysis GUI

The Kaminario K2 System Management Software and Performance Analysis GUI simplifies storage installation, configuration and performance monitoring and analysis.

For more information on the Kaminario SPEAR technology, go to [www.kaminario.com/products/technology](http://www.kaminario.com/products/technology).



## SPEAR Benefits

### Do More Faster

- Increases business operations productivity and responsiveness

### Data Is Safe, Secure and Fast at All Times

- No single point of failure and high availability ensure non-disruptive operations
- Fast, high volume data protection means reduced costs related to data loss and or unavailability

### Simplify and Reduce Complexity

- Easy one-day deployment
- Cost-effective growth — start small and grow capacity and performance as needed

### Save Money, Be Green

- Lower cost and footprint per I/O than legacy SAN storage
- Supports “green” initiatives by lowering storage footprint and power requirements

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Dell is a Kaminario reseller

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Simply Faster