KAMINARIO.

Benchmarking Microsoft SQL Server on Kaminario's K2 All-Flash Array
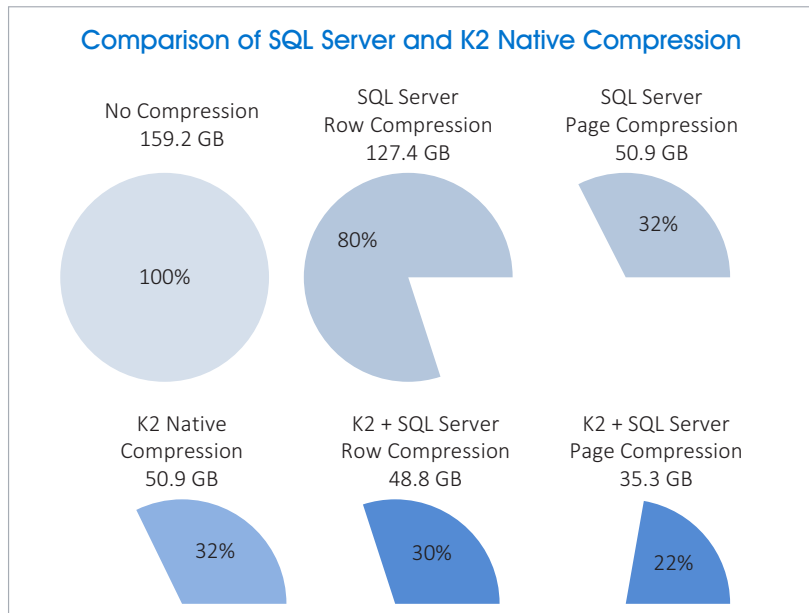
Microsoft®
SQL Server®

"The Kaminario K2 enabled us to consolidate our database environment onto one fast, reliable and scalable storage system and to expand our platform to multiple application servers to respond to the increasing demands from our users."

> **- Gregory S. Thomas**, Vice President of IT, Managed Health Care Associates, Inc.

About Microsoft SQL Server

Databases such as SQL Server form the circulatory system of most organizations, delivering both revenue-producing customer transactions and internal information needed for insights and innovations. Virtualized SQL Server databases create an especially demanding blend of I/O traffic for storage infrastructure. Kaminario's fifth-generation K2 All-Flash Array combines consistently low latency and high throughput and IOPS with a very low price per GB, making All-Flash storage economical for all of your SQL Server database servers.

We ran performance tests to quantify the benefits of Kaminario K2 flash array storage for Microsoft SQL Server run as virtualized servers on VMware's vSphere 5.5. The test results showed its ability to support a range of workloads and virtualization environments with no degradation in performance or efficiency and at a significantly lower cost than other flash storage.

Comparison of SQL Server and K2 Native Compression

No Compression
159.2 GB

SQL Server
Row Compression
127.4 GB

SQL Server
Page Compression
50.9 GB

100%

80%

32%

K2 Native
Compression
50.9 GB

K2 + SQL Server
Row Compression
48.8 GB

K2 + SQL Server
Page Compression
35.3 GB

32%

30%

22%

BENCHMARK RESULTS:

OLTP Queries:

- 135,000 peak IOPS
- Over 2,500 MB/s throughput
- Latency under 0.5 ms

OLTP Transaction:

- 2.57 million peak TPC-C transactions per minute
- 51,000 peak IOPS
- Latency under 0.8 ms

OLTP Queries:

- 760,000 rows inserted per second
- Latency 0.6 - 0.8 ms

Mixed OLTP/OLAP Workloads:

- No delays from blended I/O

K2 Native Compression:

- 68% capacity savings
- Matched best-case SQL Server compression with no delays in test processing

Scale-Out of OLTP/OLAP:

- Doubling of K2 storage yielded scaling of 1.8X to 2.0X in throughput and IOPS

K2 Benefits for SQL Server

Lowest Costs:
Deployment and operating costs can be two-thirds of legacy or hybrid storage arrays – averaging $2 per effective GB after compression

Consistent Low Latency and High Throughput/IOPS:
Ensuring that SQL databases are still responsive even under extreme peak workloads

No Single Point of Failure:
Shared nothing architecture ensures that desktops are still available even if up to two SSDs fail at once in a single shelf

Simple Management:
No disk groups to plan or manage, no manual tuning or monitoring, managed via a single web browser-based GUI

High-Efficiency RAID:
K2's dual protected K-RAID™ is highly available with 87.5% efficiency

Non-Disruptive Everything:
Upgrades, expansion and maintenance can be done online with no downtime and no loss of performance

Native Data Reduction:
K2's inline compression saves over two-thirds of database capacity, matching best-case SQL Server compression with no additional CPU load on host servers

Consolidated writes, adaptive block sizes and writeable native snapshots simplify management, optimize performance, save capacity and enhance media endurance

Test System Configurations

The system configuration used for these SQL Server tests was:	
K2 Storage	Single K-Block array with 45 TB using an out-of-box configuration with no manual tuning. The K2 array consisted of one SSD shelf holding 24 SSDs.
Server Hardware	Dell PowerEdge R810 with forty 1.994 GHz Intel Xeon CPU E7-4850, 256 GB DRAM, and two dual-port 8 Gb Qlogic FC HBAs
Server Software	SQL Server 2012 SP1 Enterprise Edition Windows Server 2012 R2 Standard VMware vSphere ESXi 5.5

Cost Effectiveness of Kaminario K2 for SQL Server

Kaminario's fifth-generation K2 All-Flash Array delivers unique cost benefits for virtualized Microsoft SQL Server database servers:

Database Server Consolidation

Consolidating database servers on a shared K2 array greatly reduces required investment in software licenses and server hardware. K2's high performance and writeable snapshots can allow formerly long-running queries and reports to share the same database with business-critical OLTP workloads.

Snapshots for Fast Database Backups/Cloning

Using K2's native writeable snapshots to clone or back up SQL Server databases saves time and prevents disruption to ongoing transaction workloads. Snapshots can save up to 90% of the capacity needed for cloned databases and let OLAP analytics run against snapshots without risk to production databases or SLAs.

Data Reduction Saves Capacity and Cost

K2's native compression can save up to two-thirds of the capacity required for databases – equivalent to the best-case results from using the native compression of SQL Server. After compression, K2 costs can be as low as $2 per effective GB of database storage.

Contact

Contact a business development representative to answer any questions you may have.

Schedule a Demo

Schedule a demo with an engineer and learn if Kaminario's solution works for you.

Request a Quote

Request a quote for your application from our business development team.

About Kaminario

Kaminario, the leading all-flash storage company, is redefining the future of modern data centers.
To learn more, please visit www.kaminario.com.