



WHITEPAPER | APACHE CASSANDRA

# VIKING ENTERPRISE SOLUTIONS® NVME OVER FABRICSTM SOLUTIONS IMPROVE LATENCY AND RESILIENCY OF CASSANDRA ENVIRONMENTS

## PROBLEM

Modern NoSQL database management systems like Apache® Cassandra are designed to support environments with large amounts of data using many commodity servers and provide essentially continuous availability with no single point of failure. However, the customary practice of using internal direct-attached storage complicates storage capacity scale-up and storage performance scale-out, resulting in the restriction of potential Cassandra performance.

## CHALLENGE

The storage architecture of internal direct-attached storage inherently includes many limitations and compromises that negatively impact Cassandra environments. Scaling up storage capacity is limited by the number of unused drive bays in a server, for example. Scaling up storage performance generally involves the inefficient replacement of existing drives with faster ones, though the benefit is limited by the drive bay's connectivity (usually SATA or SAS). Compromises include the inability to independently and limitlessly adjust the ratio of Cassandra compute and storage.

## SOLUTION

Advances in storage technologies—especially solid-state drives, NVM Express® (NVMe™), and NVMe over Fabrics—now enable storage to exist outside of servers in a way that is fully transparent to Cassandra. Moving direct-attached storage outside of the servers resolves the inherent limitations and compromises of internal storage and makes it possible to adjust Cassandra compute and storage however it is desired.

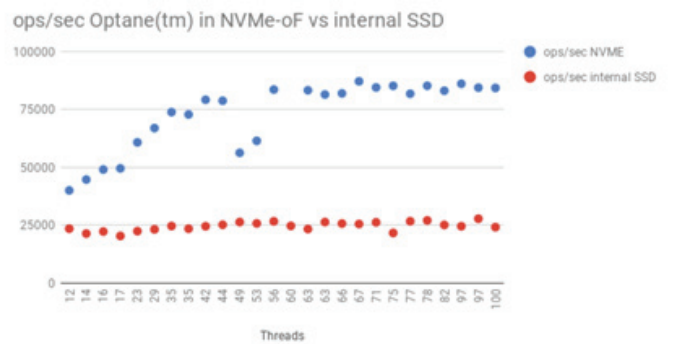
Viking Enterprise Solutions offers systems that are well optimized to support Cassandra environments. For example, the Viking Enterprise Solutions NDS-2248 JBOF (just a bunch of fabric) supports 24 NVMe drives within 2 units of rack space and offers NVMe over Fabrics connectivity for connecting Cassandra hosts.

Other NDS-2248 JBOF features include:

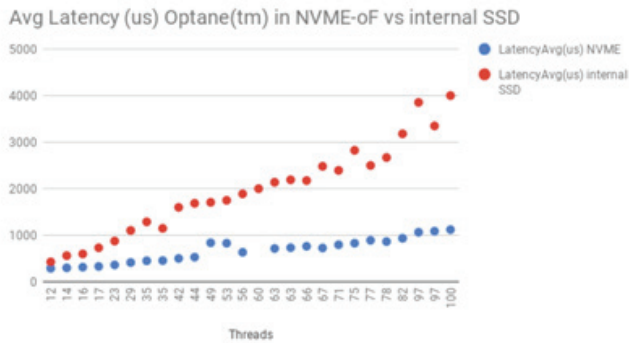
- Up to 75 GB/s (reads)
- Up to 15 million IOPS (reads)
- Six 100Gbps Ethernet ports

## PERFORMANCE BENCHMARKS

The Viking Enterprise Solutions NDS-2248 JBOF delivers impressive performance for Cassandra as shown in the following Yahoo Cloud Serving Benchmark (YCSB) test results:



OPERATIONS PER SECOND COMPARISON  
Internal SAS SSD versus External NVMe SSD



### AVERAGE LATENCY COMPARISON

Internal SAS SSD versus External NVMe SSD

The YCSB testing performed by Viking Enterprise Solutions demonstrates that the use of external NVMe over Fabrics storage can improve Cassandra performance with the following results:

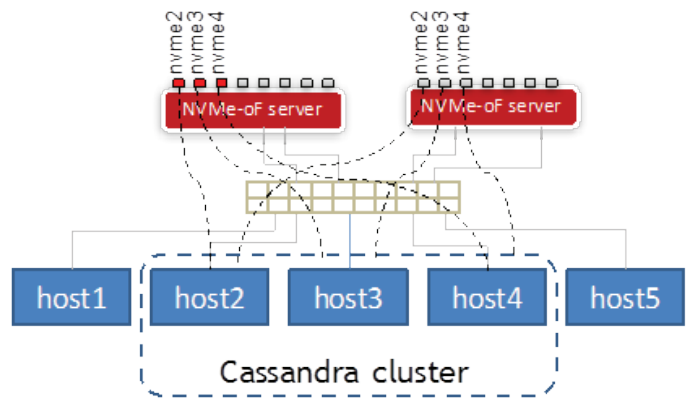
- Reduce average latency by up to 3x
- Increase operations per second by up to 4x

### RECOMMENDED CONFIGURATION

This NVMe over Fabric demonstration shows what is possible in achieving the industry's highest possible performance for Apache® Cassandra environments.

The Cassandra storage portion of this demonstration includes Viking Enterprise Solutions NDS-2248 JBOF systems configured with Intel® Optane™ SSD DC P4800X NVMe SSDs. The Cassandra compute portion includes Intel 1U servers

configured with Xeon E5 2667v4 processors and 128GB RAM. All are interconnected using multiple 100Gbps Ethernet network links.



### BENCHMARK TEST CONFIGURATION

NVMe over Fabrics Solution for Cassandra

### ABOUT VIKING ENTERPRISE SOLUTIONS

Viking Enterprise Solutions, a product division of Sanmina Corporation, provides advanced data center products including solid-state memory and disk-based storage server appliances, JBOD storage systems and other products for a variety of data center and storage applications. Viking Enterprise Solutions solutions are tailored for integration into OEM, System Integrator and Data Center products, reducing development and operating costs while improving time-to-market. More information is available at [www.vikingenterprisesolutions.com](http://www.vikingenterprisesolutions.com).



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