

WHITEPAPER | 3.5 in. SSD

UHC-SILO 50TB SAS SSD DATACENTER EVALUATION

Datacenter infrastructures today are often made up of a grid of modules or nodes, each with storage and compute power in a single chassis. This 'scale-out' architecture can enable data centers to better meet capacity and performance. This architecture however, needs an ever expanding amount of space that is becoming more and more valuable and in some instances more valuable than the systems themselves. With space becoming valuable, Datacenters are constantly searching for better technology that can help ease the limitations of their storage and performance needs.

Viking Technology released an Ultra-High Capacity (UHC) 3.5" SAS Solid State Drive to address the ever growing need for capacity & performance limitations of these storage nodes. Viking Technology UHC-Silo 3.5" SAS SSD was designed to reduce both storage space and energy footprint while enabling Datacenter drive performance metrics.

Viking Technology commissioned Demartek to evaluate the performance and power consumption of the UHC-Silo SSD within Datacenter environments. This paper will illustrate the set-up and results from the testing along with key performance metrics such as power consumption, read/write performance, and workloads.



FEATURES

- ▶ Provides 50TB of storage in a single 3.5" form factor, for unprecedented density & space savings
- ▶ Consumes approximately 8.8 Watts while idle & an average in the range of 16 Watts while performing the heaviest workloads
- ▶ Achieves 292 MB/s sequential write & 484 MB/s sequential read
- ▶ Achieves 61,106 reads/second & 22,993 writes/second for random small block synthetic workloads

BENEFITS

- ▶ Enables Datacenters to greatly increase overall storage and performance of existing architecture; achieving potential 5PBs of storage per rack.
- ▶ Lower power consumption versus capacity metric can enable archival workload environments
- ▶ Can easily enable HDD transition to SSD within Datacenters while greatly increase all beneficial metrics

TEST ENVIRONMENT

A server and JBOD were connected using an LSI 9300-8e 12Gbps SAS HBA. Wall power went through a Yokogawa WT310E digital power meter to be serviced to the JBOD. The server used a separate power source. The Viking UCH-Silo was inserted in one of the JBOD slots and all other slots were empty.

SSD

- ▶ 1x Viking Technology UHC-Silo 50TB SAS SSD

Servers – 2x Supermicro X10SRH-CF

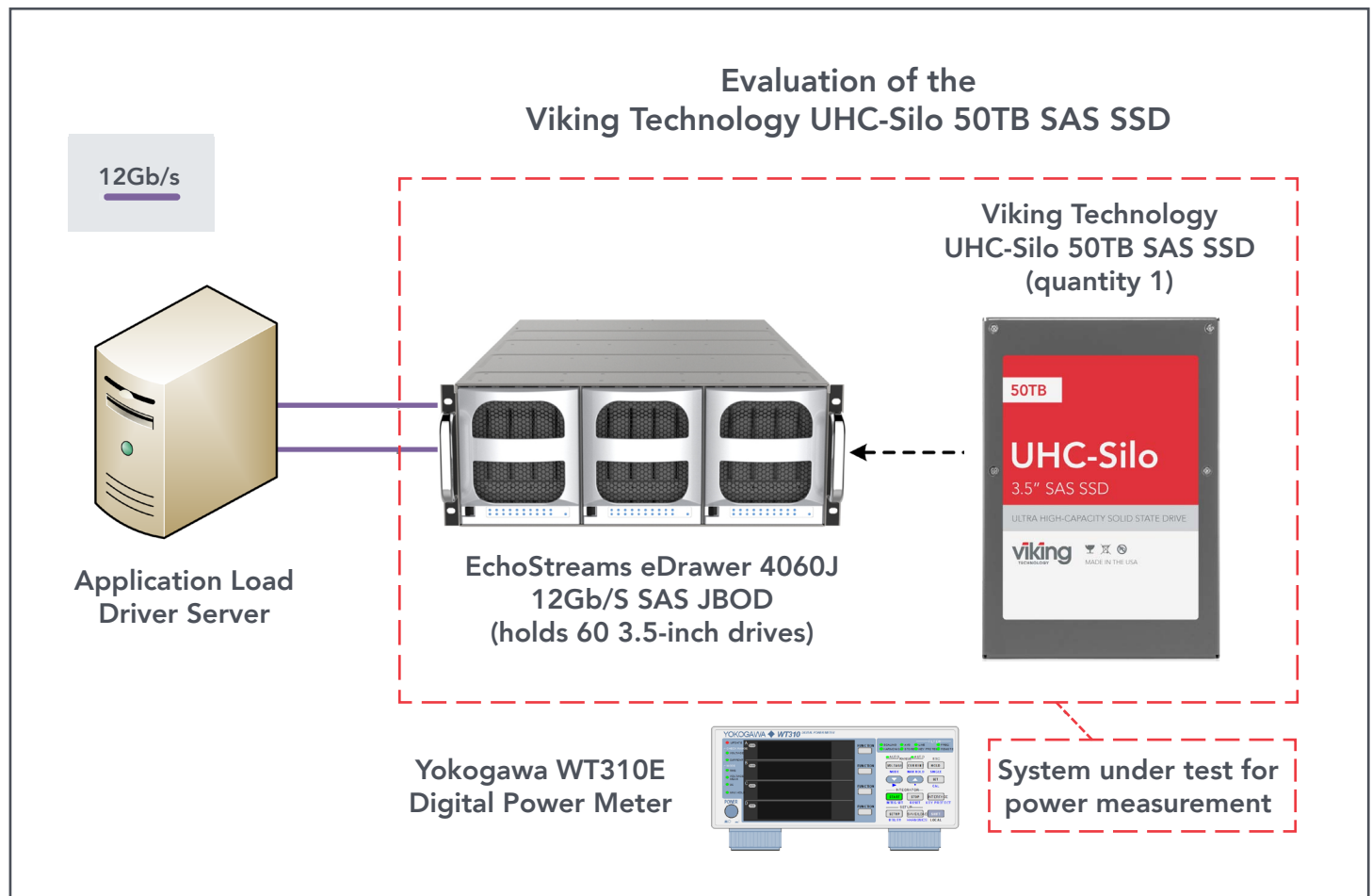
- ▶ 1x Intel Xeon E5-1650 v3, 3.5GHz, 6 total cores, 12 total threads
- ▶ 64 GB memory
- ▶ Windows Server 2016 or RedHat Enterprise Linux Server 7.3
- ▶ Iometer 2014-1.1 or fio 2.1.0

POWER MEASUREMENT

- ▶ Yokogawa WT310E Digital Power Meter

JBOD – EchoStreams eDrawer 4060J

- ▶ 60-drive, 3.5-inch form factor
- ▶ 12Gb/s SAS



TEST ENVIRONMENT

Windows Server 2016 Performance

Windows Server 2016 and Iometer, a synthetic workload generator, was installed on our server, and various block size workloads were run against the drive. A top IOPS rate of 61,106 for reads and 20,870 for writes was achieved with small block tests. A top throughput of 484 MB/s for reads and 292 MB/s for writes was achieved for large sequential tests.

Windows Server 2016 Power

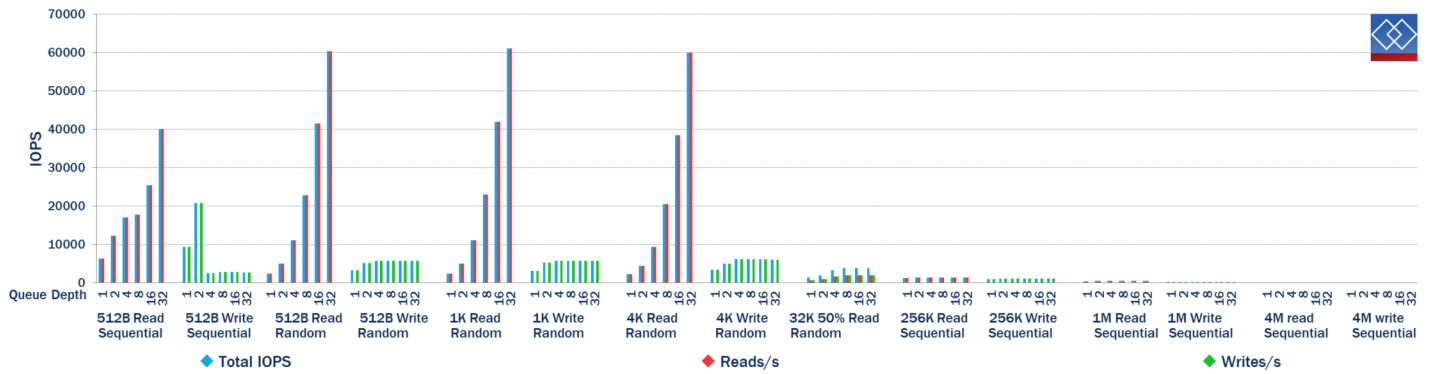
The idle power of the JBOD with no drives installed was 332.3 W. We installed the Viking UHC-Silo, refreshed our storage to discover the drive, and then waited for the drive to become idle. The power draw of the JBOD when the UHC-Silo was idle was 341.1 W.

From this, we calculate that the UHC-Silo was drawing approximately 8.8 W of power when idle. When performance testing began, doing the same arithmetic we calculate that the Viking UHC-Silo drew between 12.8 and 18.3 W, with an average draw of 16.6 W. 15.8 W was measured while performing 1 KB random reads at 61,106 IOPS, 17.48 W was measured while performing sequential 512 B writes at 20,870 IOPS.

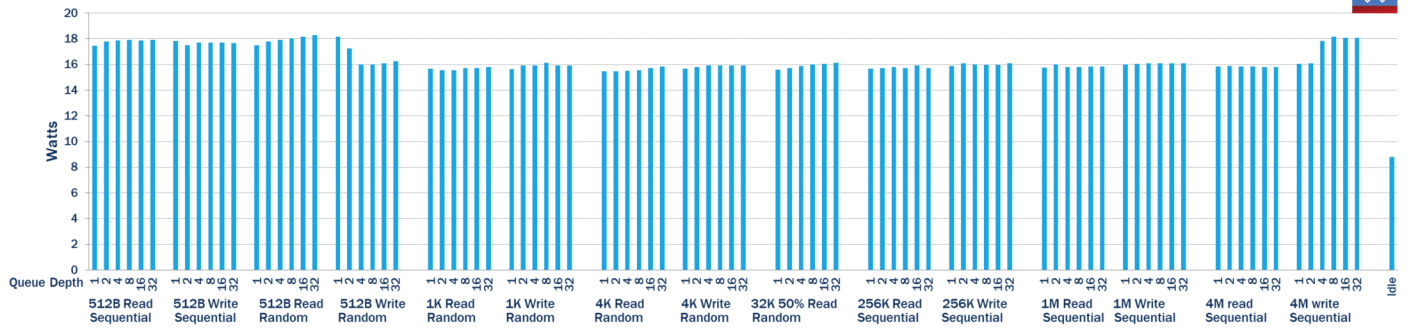
17.7 W was measured while performing 1MB sequential reads at 484 MB/s and 16.1 W was measured while performing 4 MB sequential writes at 292 MB/s.

For comparison, most HDD on the market consume a minimum of 5W idle, and 10W or more active, for capacities of 6-10TB total. An HDD solution providing 50TB of storage would require five or more drives for a grand total of at minimum of 25W idle, and 50W or more active. The UHC-Silo provides roughly an 80% reduction in space used, 65% reduction in power consumption at idle and 67% reduction in power consumption while active.

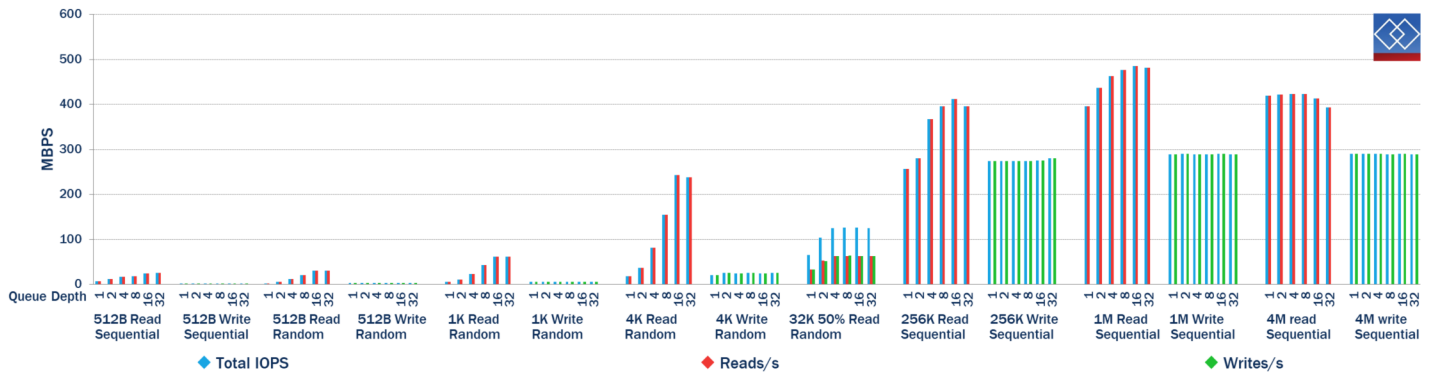
IOPS - Windows IOMeter with 1 Worker



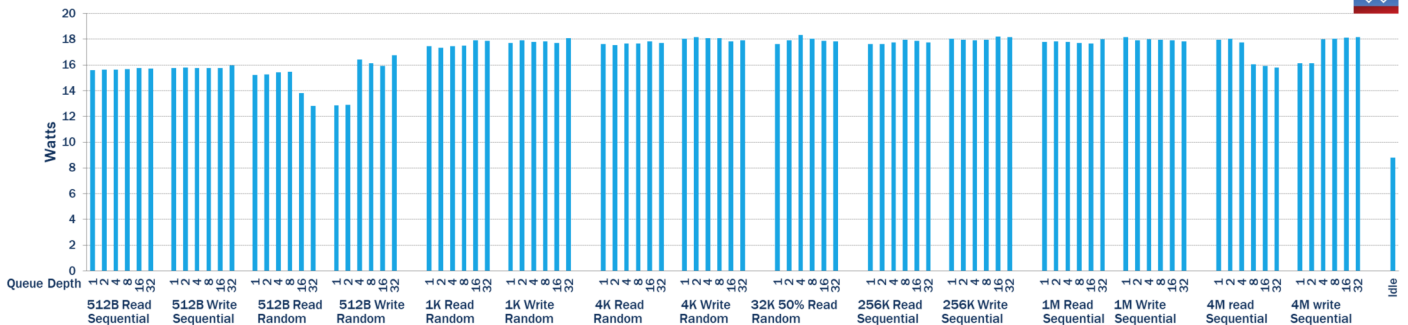
Power - Windows IOMeter with 1 Worker



Throughput - Windows IOMeter with 2 Workers



Power - Windows IOMeter with 2 Workers



REDHAT ENTERPRISE LINUX 7.3 PERFORMANCE

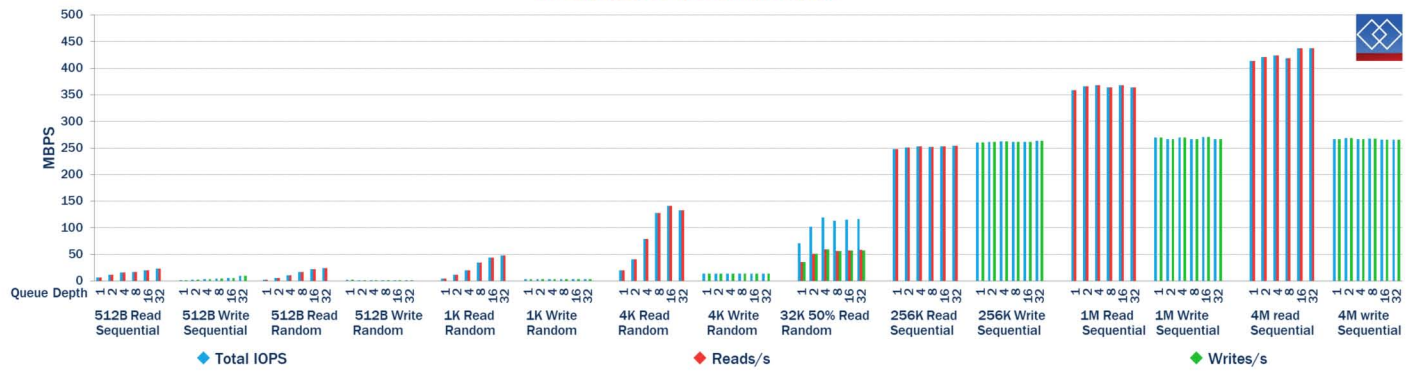
For completeness, an identical server was installed with RedHat Enterprise Linux 7.3 and fio, another synthetic workload generator. The similar performance tests were conducted and comparable results obtained. A top IOPS rate of 50,878 for reads and 22,993 for writes was achieved with 1 KB read and 512 B write small block tests. During the tests, approximately 20.5 W and 19.2 W of power were consumed respectively.

A top throughput of 438 MB/s for reads and 282 MB/s for writes was achieved for 4MB read and 1MB write sequential tests. Similarly, the power consumption for these tests was 20.8 W and 21.4 W respectively.

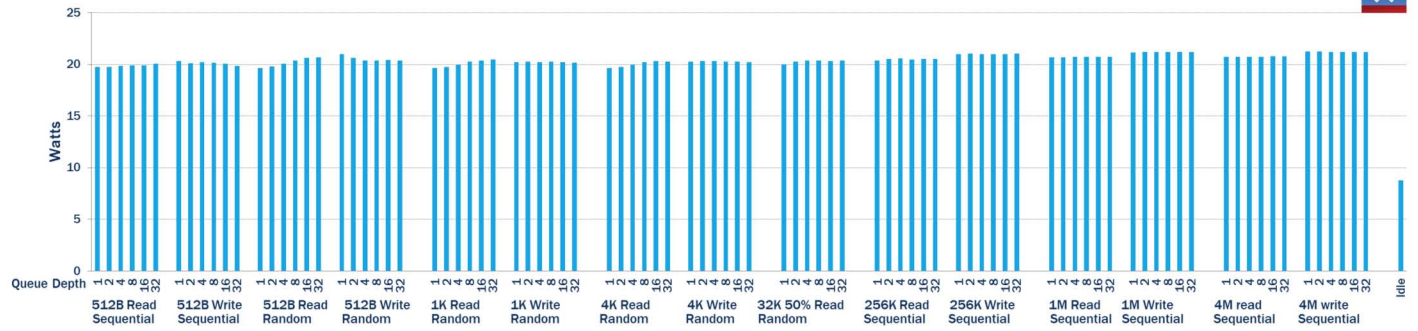
We noticed that the power consumed by the UHC-Silo appears to have an on average increase of four W during our RHEL tests. As the tests were performed at different times, environmental factors like temperature and humidity may have come in to play to cause the JBOD fans to rotate at higher or lower rates, total harmonic distortion of wall power could have changed to cause JBOD power supplies to operate less efficiently, and so on. In short, we believe that these variances are due to dynamics outside of our control and are not reflective of the RHEL operating system operating the drive in such a way as to cause it to consume more power. We believe this is a result of obtaining the approximate power consumption of a drive through measuring the change in power consumption of an entire JBOD.



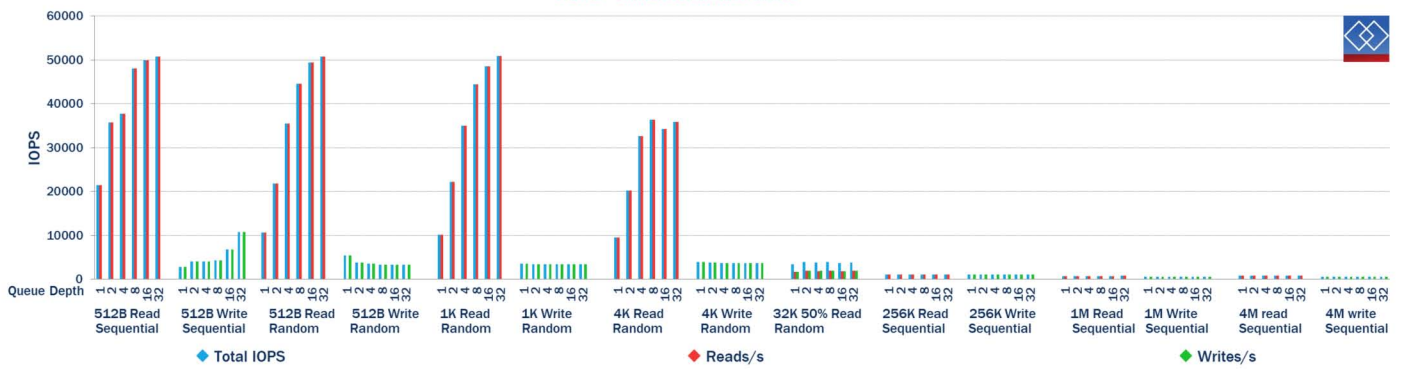
Throughput - Linux fio with 2 Jobs



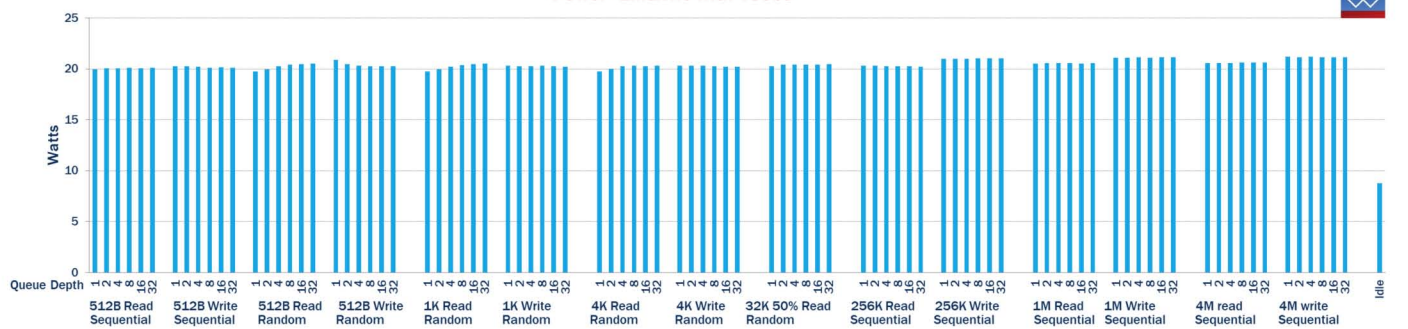
Power - Linux fio with 2 Jobs



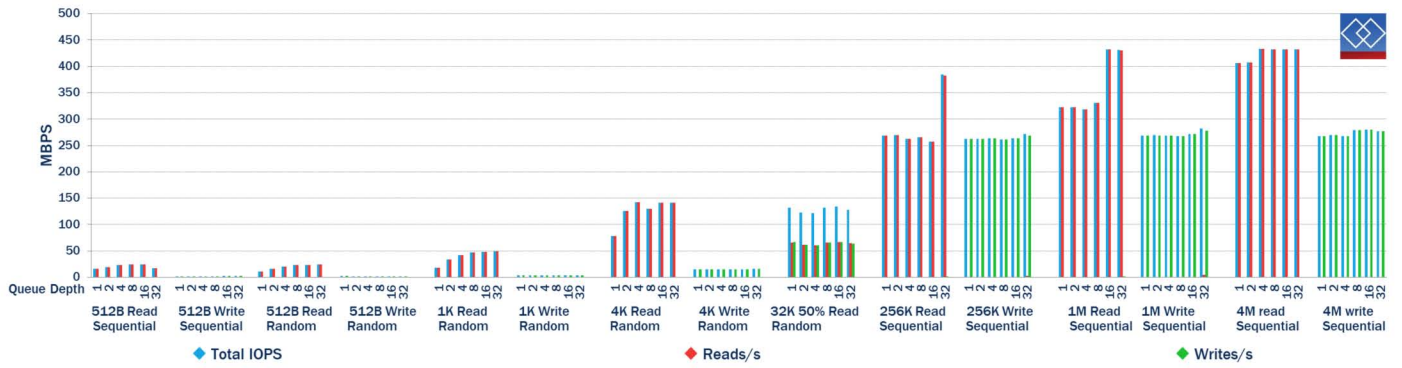
IOPS - Linux fio with 4 Jobs



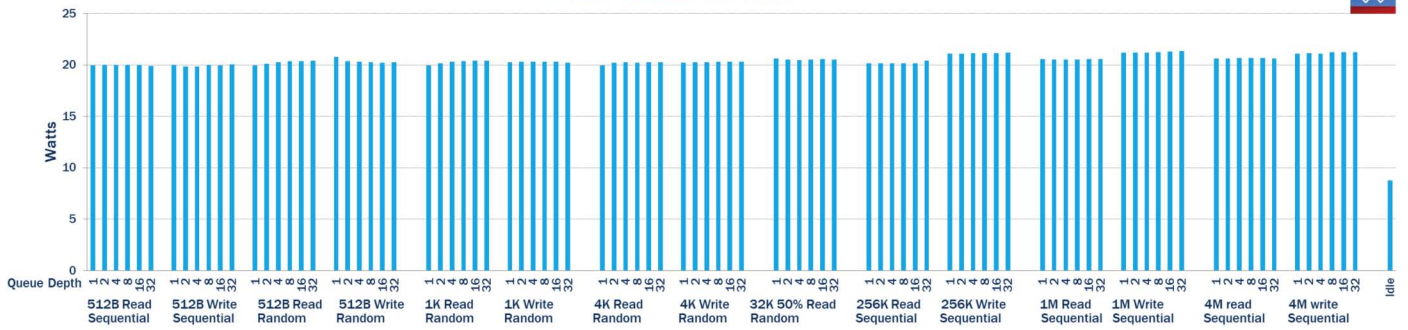
Power - Linux fio with 4 Jobs



Throughput - Linux fio with 8 Jobs



Power - Linux fio with 8 Jobs



SUMMARY & CONCLUSION

With ultra-high density and low power consumption per terabyte, the Viking Technology UHC Silo makes a compelling case for long-term storage using flash technology. With up to 68% percent lower power consumption and 80% space savings this Viking Technology UHC-Silo 50TB SAS SSD can be an excellent choice for faster-performing, high-capacity storage.



Global Locations

US Headquarters	Canada Office	Texas Office	India Office	Singapore Office
2950 Red Hill Avenue Costa Mesa, CA 92626 Main: +1 714 913 2200 Fax: +1 714 913 2202	500 March Road Ottawa, ON K2K 0J9 Canada	1201 W. Crosby Road Carrollton, TX 75006 USA	A 3, Phase II, MEPZ-Special Economic Zone NH 45, Tambaram, Chennai-600045 India	No 2 Chai Chee Drive Singapore, 109840

For sales information, email us at sales@vikingtechnology.com, or visit our website for all global locations and contact information.